aws

Developer Guide

Amazon Rekognition

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Amazon Rekognition: Developer Guide

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Table of Contents

What is Amazon Rekognition? 1
Key capabilities 1
Use cases 2
Benefits 3
Amazon Rekognition and HIPAA eligibility 4
Are you a first-time Amazon Rekognition user? 4
How Rekognition works 6
Understanding Rekognition's types of analysis 7
Labels 9
Custom labels 10
Face Liveness Detection 10
Facial detection and analysis 11
Face search 11
People paths 11
Personal Protective Equipment 12
Celebrities 12
Text detection 12
Inappropriate or offensive content 12
Customization 12
Bulk analysis 13
Understanding Rekognition's image and video operations 13
Amazon Rekognition Image operations 14
Amazon Rekognition Video operations 14
Non-storage and storage-based operations 15
Using the AWS SDK or HTTP to call Amazon Rekognition API operations 15
Non-storage and storage API operations 15
Non-storage operations 16
Storage-based API operations 18
Understanding model versioning 19
Getting started 21
Step 1: Set up an AWS account and create a User 21
Create an AWS Account and User 22
Step 2: Set up the AWS CLI and AWS SDKs 24
Grant programmatic access 26

Working with AWS SDKs ... 30
Step 3: Getting started using the AWS CLI and AWS SDK API ... 31
Formatting the AWS CLI examples ... 31
Next step ... 32
Step 4: Getting started using the console ... 32
Set up console permissions ... 33
Exercise 1: Detect objects and scenes (console) ... 36
Exercise 2: Analyze faces (console) ... 43
Exercise 3: Compare faces (console) ... 46
Exercise 4: See aggregated metrics (console) ... 49
Working with images and videos ... 51
Working with images ... 51
Image specifications ... 52
Analyzing images in an Amazon S3 bucket ... 54
Using a local file system ... 70
Displaying bounding boxes ... 86
Getting image orientation and bounding box coordinates ... 98
Working with stored video analysis operations ... 109
Types of analysis ... 109
Amazon Rekognition Video API overview ... 110
Calling Amazon Rekognition Video operations ... 113
Configuring Amazon Rekognition Video ... 119
Analyzing a stored video (SDK) ... 123
Analyzing a video (AWS CLI) ... 152
Reference: Video analysis results notification ... 156
Troubleshooting Amazon Rekognition Video ... 157
Working with streaming video events ... 159
Overview of Amazon Rekognition Video stream processor operations ... 160
Add tags to a new stream processor ... 161
Add tags to an existing stream processor ... 161
List tags in a stream processor ... 162
Delete tags from a stream processor ... 163
Error handling ... 163
Error components ... 163
Error messages and codes ... 164
Error handling in your application ... 169

Using Amazon Rekognition with FedRAMP 170
Best practices for sensors, input images, and videos 174
Amazon Rekognition Image operation latency 174
Recommendations for facial comparison input images 175
General recommendations for input images for face operations 175
Recomendations for searching faces in a collection 176
Recommendations for camera setup (image and video) 176
Recommendations for camera setup (stored and streaming video) 178
Recommendations for camera setup (streaming video) 179
Recommendations for Usage of Face Liveness 179
Detecting objects and concepts 181
Label Response Objects 182
Bounding Boxes 182
Confidence Score 183
Parents 183
Categories 184
Aliases 184
Image Properties 184
Model Version 186
Inclusion and Exclusion Filters 186
Sorting and Aggregating Results 187
Detecting labels in an image 187
DetectLabels operation request 198
DetectLabels response 199
Transforming the DetectLabels response 203
Detecting labels in a video 207
StartLabelDetection Request 207
GetLabelDetection Operation Response 209
Transforming the GetLabelDetection Response 215
Detecting labels in streaming video events 224
Setting up your Amazon Rekognition Video and Amazon Kinesis resources 225
Calling label detection operations for streaming video events 229
Detecting custom labels 236
Detecting and analyzing faces 237
Overview of face detection and face comparison 238
Guidelines on face attributes 240

Detecting faces in an image ... 241
DetectFaces operation request ... 252
DetectFaces operation response ... 253
Comparing faces in images ... 260
CompareFaces operation request ... 272
CompareFaces operation response ... 273
Detecting faces in a stored video ... 276
GetFaceDetection operation response ... 285
Searching faces in a collection ... 290
Managing face collections, faces, and users ... 293
Managing a collection ... 293
Managing faces in a collection ... 294
Managing users in a collection ... 294
Using similarity thresholds for associating and matching faces ... 295
Using similarity thresholds for associating faces ... 295
Using similarity thresholds to match faces ... 295
Guidance for indexing faces in common scenarios ... 296
Critical or public safety applications ... 296
Photo sharing and social media applications ... 296
General usage ... 296
Searching for faces and users within a collection ... 297
Use cases that involve public safety ... 297
Using Amazon Rekognition to help public safety ... 299
Creating a collection ... 300
CreateCollection operation request ... 306
CreateCollection operation response ... 306
Tagging collections ... 307
Add tags to a new collection ... 307
Add tags to an existing collection ... 308
List tags in a collection ... 309
Delete tags from a collection ... 311
Listing collections ... 311
ListCollections operation request ... 318
ListCollections operation response ... 318
Describing a collection ... 319
DescribeCollection operation request ... 326

DescribeCollection operation response ... 326
Deleting a collection ... 327
DeleteCollection operation request ... 333
DeleteCollection operation response ... 333
Adding faces to a collection ... 333
Filtering faces ... 335
IndexFaces operation request ... 344
IndexFaces operation response ... 345
Listing faces and associated users in a collection ... 353
ListFaces operation request ... 359
ListFaces operation response ... 360
Deleting faces from a collection ... 361
DeleteFaces operation request ... 367
DeleteFaces operation response ... 367
Creating a user ... 368
Deleting a user ... 371
Associating faces to a user ... 374
AssociateFaces operation response ... 377
Disassociating faces from a user ... 378
DisassociateFaces operation response ... 381
Listing users in a collection ... 382
ListUsers operation response ... 384
Searching for a face (face ID) ... 385
SearchFaces operation request ... 392
SearchFaces operation response ... 392
Searching for a face (image) ... 393
SearchFacesByImage operation request ... 401
SearchFacesByImage operation response ... 401
Searching for users (face ID/ user ID) ... 402
SearchUsers operation request ... 406
SearchUsers operation response ... 407
Searching for users (image) ... 408
SearchUsersByImage operation request ... 412
SearchUsersByImage operation response ... 412
Searching stored videos for faces ... 414
GetFaceSearch operation response ... 423

Searching faces in a collection in streaming video ... 428
Setting up your Amazon Rekognition Video and Amazon Kinesis resources ... 428
Searching faces in a streaming video ... 432
Streaming using a GStreamer plugin ... 455
Troubleshooting streaming video ... 458
People pathing ... 465
GetPersonTracking operation response ... 474
Detecting personal protective equipment ... 479
Types of PPE ... 480
Face cover ... 480
Hand cover ... 480
Head cover ... 480
PPE detection confidence ... 481
Summarizing PPE detected in an image ... 481
Tutorial: Creating a AWS Lambda function that detects images with PPE ... 482
Understanding the PPE detection API ... 482
Supplying an image ... 482
Understanding the DetectProtectiveEquipment response ... 483
Detecting PPE in an image ... 489
Example: bounding boxes and face covers ... 501
Recognizing celebrities ... 517
Celebrity recognition compared to face search ... 517
Recognizing celebrities in an image ... 518
Calling RecognizeCelebrities ... 519
RecognizeCelebrities operation request ... 528
RecognizeCelebrities operation response ... 528
Recognizing celebrities in a stored video ... 531
GetCelebrityRecognition operation response ... 547
Getting celebrity information ... 549
Calling GetCelebrityInfo ... 549
GetCelebrityInfo operation request ... 555
GetCelebrityInfo operation response ... 555
Moderating content ... 556
Using the image and video moderation APIs ... 558
Label Categories ... 558
Content type ... 569

Confidence ... 569
Versioning ... 570
Sorting and Aggregating ... 570
Custom Moderation adapter statuses ... 571
Testing Content Moderation version 7 and transforming the API response ... 571
AWS SDK and Usage Guide for Content Moderation version 7 ... 571
Label mappings for Versions 6.1 to 7 ... 572
Detecting inappropriate images ... 577
Detecting inappropriate content in an image ... 577
... 577
DetectModerationLabels operation request ... 584
DetectModerationLabels operation response ... 585
Detecting inappropriate stored videos ... 586
GetContentModeration operation response ... 595
Enhancing accuracy with Custom Moderation ... 597
Creating and using adapters ... 598
Preparing your datasets ... 601
Managing adapters with the AWS CLI and SDKs ... 603
Custom Moderation adapter tutorial ... 610
Evaluating and improving your adapter ... 628
Manifest file formats ... 630
Best practices for training adapters ... 635
Setting up AutoUpdate permissions ... 636
AWS Health Dashboard notfication for Rekognition ... 639
Reviewing inappropriate content with Amazon A2I ... 640
Detecting text ... 646
Detecting text in an image ... 648
DetectText operation request ... 656
DetectText operation response ... 657
Detecting text in a stored video ... 663
Filters ... 672
GetTextDetection response ... 673
Detecting video segments ... 679
Technical cues ... 680
Black frames ... 680
Credits ... 680

Color bars ... 680
Slates ... 681
Studio logos ... 681
Content ... 681
Shot detection ... 682
About the Amazon Rekognition Video Segment detection API ... 683
Using the Amazon Rekognition Segment API ... 683
Starting segment analysis ... 683
Getting segment analysis results ... 685
Example: Detecting segments in a stored video ... 689
Detecting face liveness ... 703
User-Side Face Liveness Requirements ... 705
Architecture and Sequence Diagrams ... 706
Prerequisites ... 708
Step 1: Set up an AWS account ... 708
Step 2: Set up the Face Liveness AWS SDKs ... 708
Step 3: Set up AWS Amplify Resources ... 709
Best Practices for Detecting Face Liveness ... 709
Programming the Amazon Rekognition Face Liveness APIs ... 709
Step 1: CreateFaceLivenessSession ... 710
Step 2: StartFaceLivenessSession ... 711
Step 3: GetFaceLivenessSessionResults ... 711
Step 4: Respond to results ... 712
Calling the Face Liveness APIs ... 712
Configuring and Customizing Your Application ... 719
Configuring Your Application ... 719
Customize Your Application ... 719
Face Liveness Shared Responsibility Model ... 719
Face Liveness update guidelines ... 724
Versioning and time-frames ... 724
Version release and compatiblity matrix ... 725
Communication of new releases ... 725
Face Liveness FAQ ... 726
Bulk analysis ... 729
Processing images in bulk ... 729
To create a bulk analysis job (CLI) ... 729

Bulk analysis output manifests ... 731
Content type ... 732
Verifying predictions and training adapters ... 732
Tutorials ... 733
Storing Amazon Rekognition Data with Amazon RDS and DynamoDB ... 733
Prerequisites ... 734
Getting Labels for Images in an Amazon S3 Bucket ... 734
Creating an Amazon DynamoDB Table ... 736
Uploading Data to DynamoDB ... 737
Creating a MySQL Database in Amazon RDS ... 739
Uploading Data to a Amazon RDS MySQL Table ... 740
Using Amazon Rekognition and Lambda to tag assets in an Amazon S3 bucket ... 742
Prerequisites ... 744
Configure the IAM Lambda role ... 744
Create the project ... 745
Write the code ... 748
Package the project ... 758
Deploy the Lambda function ... 759
Test the Lambda method ... 760
Creating AWS video analyzer applications ... 761
Prerequisites ... 762
Procedure ... 762
Creating an Amazon Rekognition Lambda function ... 763
Prerequisites ... 765
Create the SNS topic ... 765
Create the Lambda function ... 765
Configure the Lambda function ... 766
Configure the IAM Lambda role ... 766
Create the AWS Toolkit for Eclipse Lambda project ... 768
Test the Lambda function ... 771
Using Amazon Rekognition for Identity Verification ... 773
Prerequisites ... 774
Creating a Collection ... 774
New User Registration ... 775
Existing User Login ... 784
Using Amazon Rekognition (REK) to detect labels for marketing applications ... 786

Prerequisites ... 787
Creating and populating a DynamoDB table ... 788
Creating a Lambda Function with Logging and Notification ... 790
Setting up permissions and the Lambda function ... 792
Uploading Images to Amazon S3 with Metadata ... 794
Polling CloudWatch Logs from the Client ... 795
Detecting Labels in an Image Using Lambda and Python ... 797
Create an Lambda function (console) ... 797
(Optional) Create a layer (console) ... 799
Add Python code (console) ... 800
To add Python code (console) ... 802
Code examples ... 806
Basics ... 810
Hello Amazon Rekognition ... 811
Actions ... 814
Scenarios ... 972
Build a collection and find faces in it ... 973
Create a serverless application to manage photos ... 985
Detect PPE in images ... 989
Detect and display elements in images ... 990
Detect faces in an image ... 1006
Detect information in videos ... 1006
Detect objects in images ... 1046
Detect people and objects in a video ... 1049
Save EXIF and other image information ... 1051
API Reference ... 1052
Security ... 1053
Identity and access management ... 1053
Audience ... 1054
Authenticating with identities ... 1054
Managing access using policies ... 1057
How Amazon Rekognition works with IAM ... 1060
AWS managed policies ... 1066
Policy best practices ... 1074
Using the console ... 1075
Examples of using identity-based policy examples ... 1075

Examples of Resource-based policies 1078
Troubleshooting 1079
Data protection 1081
Data encryption 1082
Internetwork traffic privacy 1084
Using Amazon Rekognition with Amazon VPC endpoints 1084
Creating Amazon VPC endpoints for Amazon Rekognition 1085
Create a VPC endpoint policy for Amazon Rekognition 1086
Compliance validation 1087
Resilience 1088
Configuration and vulnerability analysis 1088
Cross-service confused deputy prevention 1088
Infrastructure security 1091
Monitoring 1092
Monitoring Rekognition with Amazon CloudWatch 1092
Using CloudWatch metrics for Rekognition 1093
Access Rekognition metrics 1094
Create an alarm 1095
CloudWatch metrics for Rekognition 1097
Logging Amazon Rekognition API calls with AWS CloudTrail 1101
Amazon Rekognition information in CloudTrail 1101
Understanding Amazon Rekognition log file entries 1102
Guidelines and quotas 1106
Supported regions 1106
Set quotas 1106
Amazon Rekognition Image 1106
Amazon Rekognition Image Bulk Analysis 1106
Amazon Rekognition Video stored video 1107
Amazon Rekognition Video streaming video 1108
Default quotas 1108
Calculate TPS quota change 1108
Best practices for TPS quotas 1109
Create a case to change TPS quotas 1109
Document history 1112
AWS Glossary 1124

What is Amazon Rekognition?

Amazon Rekognition is a cloud-based image and video analysis service that makes it easy to add advanced computer vision capabilities to your applications. The service is powered by proven deep learning technology and it requires no machine learning expertise to use. Amazon Rekognition includes a simple, easy-to-use API that can quickly analyze any image or video file that's stored in Amazon S3.

You can add features that detect objects, text, unsafe content, analyze images/videos, and compare faces to your application using Rekognition's APIs. With Amazon Rekognition's face recognition APIs, you can detect, analyze, and compare faces for a wide variety of use cases, including user verification, cataloging, people counting, and public safety.

The service is based on the same proven, highly scalable, deep learning technology developed by Amazon's computer vision scientists, technology that can analyze billions of images and videos daily. Rekognition routinely learns from new data, and we frequently add new labels and features to the service.

For more information, see the Amazon Rekognition FAQs.

Key capabilities

Image Analysis:

- Object, Scene, and Concept Detection - Detects and classify objects, scenes, concepts, and celebrities in images.
- Text Detection - Detect and recognize printed and handwritten text in images in a variety of languages.
- Unsafe Content - Detect and filter explicit, inappropriate, and violent content and images. Detects granular unsafe content labels.
- Celebrity recognition - Recognize tens of thousands of celebrities in your images across different categories, such as politicians, athletes, actors, and musicians.
- Facial Analysis - Detect, analyze, and compare faces, along with facial attributes, such as gender, age, and emotions. Use cases may include user verification, cataloging, people counting, and public safety.

- Custom Labels - Build custom classifiers to detect objects specific to your use case, such as logos, products, characters.
- Image Properties - Analyze image properties like quality, color, sharpness, contrast.

Video Analysis:

- Object, Scene, and Concept Detection - Detects and classify objects, scenes, concepts, and celebrities in videos.
- Text Detection - Detect and recognize printed and handwritten text in videos in a variety of languages.
- People pathing - Track identified people as they move across video frames.
- Facial Analysis - Detect, analyze, and compare faces in streaming or stored videos.
- Celebrity recognition - Recognize tens of thousands of celebrities in your stored videos across different categories, such as politicians, athletes, actors, and musicians.
- Unsafe Content Detection - Detect explicit, inappropriate, and violent content in videos.
- Video segmentation - Automatically identify useful segments of video, such as black frames and end credits.
- Face liveness - Detect if a live user is present during face verification.

Use cases

Searchable Media Libraries - Rekognition detects labels, objects, concepts and scenes in images and videos. You can make these labels searchable based on this visual content analysis. Useful for building searchable image and video libraries.

Face-Based User Identity Verification - Confirm user identities by comparing faces in images to reference face images. Useful for identity verification in applications.

Face Liveness Detection - Rekognition Face Liveness is a fully managed machine learning (ML) feature designed to help developers deter fraud during face-based identity verification. The feature helps you verify that a user is physically present in front of the camera and isn’t a bad actor spoofing the user's face. Using Rekognition Face Liveness can help you detect spoof attacks presented to a camera, such as printed photos, digital photos/videos, or 3D masks. It also helps detect spoof attacks that bypass a camera, such as pre-recorded or deepfake videos injected directly into the video capture subsystem.

Facial Search - With Rekognition, you can search images, stored videos, and streaming videos for faces that match those stored in a container known as a face collection. A face collection is an index of faces that you own and manage. Searching for people based on their faces requires that you **Index** the faces and then **Search** for the faces.

Unsafe Content Detection - Detect and filter explicit, inappropriate, and violent content in images and videos. Uses labels for granular filtering based on business needs. The Content Moderation API also returns a hierarchical list of any detected labels (objects and concepts), along with confidence scores. These objects/labels indicate specific categories of unsafe content, which enables granular filtering and management of large volumes of user-generated content (UGC). You can customize the output of the Content Moderation API with adapters, which enhance performance for images like those you provide as training data.

Detection of Personal Protective Equipment - Detect personal protective equipment in images to monitor safety compliance across various industries. You can automatically flag unsafe conditions by detecting improper equipment and receive alerts about these conditions, which can improve compliance and training.

Celebrity Recognition - Recognize celebrities in your images and videos across categories, such as politicians, athletes, actors, and musicians. You can identify celebrity appearances without needing to provide names.

Text Detection - Detect and extract text in images for visual search or extracting metadata. This works on different fonts and styles. Detects orientation to handle text on signs and banners.

Custom Labels - Identify custom objects, concepts and scenes specific to business use cases, such as logo detection. You can train custom classifiers to handle niche or proprietary objects, which improves accuracy on key objects versus general classifiers. For more information, see What is Amazon Rekognition Custom Labels? in the *Amazon Rekognition Custom Labels Developer Guide*.

Benefits

Integrating powerful image and video analysis into your app - Add accurate image and video analysis to apps without expertise. The Amazon Rekognition API enables analysis via deep learning without requiring any machine learning knowledge. You can quickly build computer vision into web, mobile, and device apps.

Deep learning-based image and video analysis - Analyzes images and videos using deep learning for high accuracy. Amazon Rekognition' can detect labels, objects, scenes, faces, celebrities. Filter the results to include/exclude specific labels.

Scalable image analysis - Analyzes millions of images to organize massive visual data sets. Scales to handle growing image libraries and traffic. You do not need to plan for capacity, and you pay only for what you use.

Analyze and filter images based on properties - Analyze and filter images by properties, such as quality, color, and visual content, and detect image sharpness, brightness, contrast.

Integration with other AWS services - Amazon Rekognition integrates out of the box with S3 and Lambda. You can call Amazon Rekognition' APIs from Lambda and process images in Amazon S3 without moving data. Rekognition has built-in scalability and security using AWS IAM.

Low cost - Pay-as-you-go pricing, no minimums or commitments. Free tier available to get started. Save more as usage scales via tiered pricing. Cost effective relative to in-house solutions.

Simple customization - Customize accuracy for your use case with adapters. Provide sample images to train adapters. Improves object and label detection for given domains. Easy way to tailor analysis without ML expertise.

For more information, see the Amazon Rekognition FAQs.

Amazon Rekognition and HIPAA eligibility

This is a HIPAA Eligible Service. For more information about AWS, U.S. Health Insurance Portability and Accountability Act of 1996 (HIPAA), and using AWS services to process, store, and transmit protected health information (PHI), see HIPAA Overview.

Are you a first-time Amazon Rekognition user?

If you're a first-time user of Amazon Rekognition, we recommend that you read the following sections in order:

1. **How Amazon Rekognition works** – This section introduces various Amazon Rekognition components that you work with to create an end-to-end experience.
2. **Getting started with Amazon Rekognition** – In this section, you set up your account, install the SDK that reflects the language of your choice, and test the Amazon Rekognition API. For a list of

the programming languages supported by Amazon Rekognition, see Using Rekognition with an AWS SDK.

3. **Working with images** – This section provides information about using Amazon Rekognition with images stored in Amazon S3 buckets and images loaded from a local file system.
4. **Working with stored video analysis operations** – This section provides information about using Amazon Rekognition with videos stored in an Amazon S3 bucket.
5. **Working with streaming video events** – This section provides information about using Amazon Rekognition with streaming videos.

How Amazon Rekognition works

Amazon Rekognition provides two API sets for visual analysis:

- Amazon Rekognition Image for image analysis
- Amazon Rekognition Video for video analysis

Image analysis

With Amazon Rekognition Image your applications can:

- Detect objects, scenes, and concepts in images
- Recognize celebrities
- Detect text in a variety of languages
- Detect explicit, inappropriate, or violent content or images
- Detect, analyze, and compare faces and facial attributes like age and emotions
- Detect the presence of PPE

Use cases include enhancing photo apps, cataloging images, and moderating content.

Video analysis

With Amazon Rekognition Video, your applications can:

- Track people and objects across video frames
- Recognize objects
- Recognize celebrities
- Search stored and streaming video for persons of interest
- Analyze faces for attributes like age and emotions
- Detect explicit, inappropriate, or violent content or images
- Aggregate and sort analysis results by timestamps and segments
- Detect people, pets, and packages in streaming video

Use cases include video analysis, cataloging videos, and filtering inappropriate content.

Key features

- Powerful deep learning analysis
- High accuracy detection for objects, scenes, faces, text
- Easy to use API for integrating into apps
- Customizable models tuned to your data
- Scalable analysis of media libraries

Amazon Rekognition lets you enhance the accuracy of certain deep learning models by training a custom adapter. For example, with Amazon Rekognition Custom Moderation, you can adapt Amazon Rekognition 's base image analysis model by training a custom adapter with your images. See Enhancing accuracy with Custom Moderation for more information.

The following sections cover the types of analysis that Amazon Rekognition provides and an overview of Amazon Rekognition Image and Amazon Rekognition Video operations. Also covered is the difference between non-storage and storage operations.

To demo the Amazon Rekognition APIs, you can see Step 3: Getting started using the AWS CLI and AWS SDK API, which covers trying out Rekognition in the AWS console.

Topics

- Understanding Rekognition's types of analysis
- Understanding Rekognition's image and video operations
- Understanding non-storage and storage API operations
- Understanding model versioning

Understanding Rekognition's types of analysis

The following are the types of analysis that the Amazon Rekognition Image API and Amazon Rekognition Video API can perform. For information about the APIs, see Understanding Rekognition's image and video operations.

The following table lists the operations you need to use with respect to the type of media you're working with and your use case:

Use Case	Media Type	Operations
Moderating content	Images	DetectModerationLabels, StartMediaAnalysisJob, GetMediaAnalysisJob, ListMediaAnalysisJobs
	Stored video	StartContentModeration, GetContentModeration
Identity verification	Images	CreateCollection, CreateUser, IndexFaces, AssociateFaces, SearchFacesByImage, SearchUsersByImage
	Stored video	CreateCollection, IndexFaces, StartFaceSearch, GetFaceSearch
	Streaming video (Detecting face liveness)	CreateFaceLivenessSession, StartFaceLivenessSession, GetFaceLivenessSessionResults,
Facial analysis	Images	DetectFaces, CompareFaces
	Stored video	StartFaceDetection, GetFaceDetection
	Streaming video	CreateStreamProcessor, StartStreamProcessor
Object and activity recognition	Images	DetectLabels
	Stored videos	StartLabelDetection, GetLabelDetection
Connected Home	Streaming Video	StartStreamProcessor

Use Case	Media Type	Operations
Media Analysis	Stored video	StartSegmentDetection, GetSegmentDetection
Workplace safety	Images	DetectProtectiveEquipment
Text detection	Images	DetectText
	Video	StartTextDetection, GetTextDetection
People pathing	Video	StartPersonTracking, GetPersonTracking
Celebrity recognition	Images	RecognizeCelebrities
	Video	StartCelebrityRecognition, GetCelebrityRecognition
Custom label detection	Images	DetectCustomLabels
	Model training	See Custom Labels developer guide

Labels

A *label* refers to any of the following: objects (for example, flower, tree, or table), events (for example, a wedding, graduation, or birthday party), concepts (for example, a landscape, evening, and nature) or activities (for example, running or playing basketball). Amazon Rekognition can detect labels in images and videos. For more information, see Detecting objects and concepts.

Rekognition can detect a large list of labels in image and stored video. Rekognition can also detect a small number of labels in streaming video.

Use the following operations to detect labels based on your use case:

- To detect labels in images: Use DetectLabels. You can identify image properties like dominant image colors and image quality. To achieve this, use DetectLabels with `IMAGE_PROPERTIES` as input parameter.

- To detect labels in stored videos: Use StartLabelDetection. Detection of dominant image colors and image quality is not supported for stored video.
- To detect labels in streaming video: Use CreateStreamProcessor. Detection of dominant image colors and image quality is not supported for streaming video.

You can specify what types of labels you want returned for both image and stored video label detection by using inclusive and exclusive filtering options.

Custom labels

Amazon Rekognition Custom Labels can identify the objects and scenes in images that are specific to your business needs by training a machine learning model. For example, you can train a model to detect logos or detect engineering machine parts on an assembly line.

> **Note**
>
> For information about Amazon Rekognition Custom Labels, see the Amazon Rekognition Custom Labels Developer Guide.

Amazon Rekognition provides a console that you use to create, train, evaluate, and run a machine learning model. For more information, see Getting Started with Amazon Rekognition Custom Labels in the *Amazon Rekognition Custom Labels Develope Guide*. You can also use the Amazon Rekognition Custom Labels API to train and run a model. For more information, see Getting Started with the Amazon Rekognition Custom Labels SDK in the *Amazon Rekognition CustomLabels Developer Guide*.

To analyze images using a trained model, use DetectCustomLabels.

Face Liveness Detection

Amazon Rekognition Face Liveness can help you verify that a user going through face-based identity verification is physically present in front of the camera and isn't a bad actor spoofing the user's face. It detects spoof attacks that are presented to a camera and attacks that bypass a camera. A user can complete a Face Liveness check by taking a short video selfie, and a Liveness score is returned for the check. Face Liveness is determined with a probabilistic calculation and a confidence score (between 0–100) is returned after the check. The higher the score, the greater the confidence that the person taking the check is live.

For more information regarding Face Liveness, see Detecting face liveness.

Facial detection and analysis

Amazon Rekognition can detect faces in images and stored videos. With Amazon Rekognition, you can get information about:

- Where faces are detected in an image or video
- Facial landmarks such as the position of eyes
- The presence of facial occlusion in images
- Detected emotions, such as happy or sad
- Eye gaze direction of a person's gaze in images

You can also interpret and demographic information such as gender or age. You can compare a face in an image with faces detected in another image. Information about faces can also be stored for later retrieval. For more information, see Detecting and analyzing faces.

To detect faces in images, use DetectFaces. To detect faces in stored videos, use StartFaceDetection.

Face search

Amazon Rekognition can search for faces. Facial information is indexed into a container known as a collection. Face information in the collection can then be matched with faces detected in images, stored videos, and streaming video. For more information, Searching faces in a collection.

To search for known faces in images, use DetectFaces. To search for known faces in stored videos, use StartFaceDetection. To search for known faces in streaming videos, use CreateStreamProcessor.

People paths

Amazon Rekognition can track the paths of people detected in a stored video. Amazon Rekognition Video provides path tracking, face details, and in-frame location information for people detected in a video. For more information, see People pathing.

To detect people in stored videos, use StartPersonTracking.

Personal Protective Equipment

Amazon Rekognition can detect Personal Protective Equipment (PPE) worn by persons detected in an image. Amazon Rekognition detects face covers, hand covers, and head covers. Amazon Rekognition predicts if an item of PPE covers the appropriate body part. You can also get bounding boxes for detected persons and PPE items. For more information, see Detecting personal protective equipment.

To detect PPE in images, use DetectProtectiveEquipment.

Celebrities

Amazon Rekognition can recognize thousands of celebrities in images and stored videos. You can get information about where a celebrity's face is located on an image, facial landmarks, and the pose of a celebrity's face. You can get tracking information for celebrities as they appear throughout a stored video. You can also get further information about a recognized celebrity, like the emotion expressed, and presentation of gender. For more information, see Recognizing celebrities.

To recognize celebrities in images, use RecognizeCelebrities. To recognize celebrities in stored videos, use StartCelebrityRecognition.

Text detection

Amazon Rekognition Text in Image can detect text in images and convert it into machine-readable text. For more information, see Detecting text.

To detect text in images, use DetectText.

Inappropriate or offensive content

Amazon Rekognition can analyze images and stored videos for adult and violent content. For more information, see Moderating content.

To detect unsafe images, use DetectModerationLabels. To detect unsafe stored videos, use StartContentModeration.

Customization

Certain image analysis APIs offered by Rekognition allow you to enhance the accuracy of deep learning models by creating custom adapters trained on your own data. Adapters are components

that plug-in to Rekognition's pre-trained deep learning model, enhancing it's accuracy with domain knowledge based on your images. You train an adapter to meet your needs by providing and annotating sample images.

After you create an adapter, you're provided with an AdapterId. You can provide this AdapterId to an operation to specify that you want to use the adapter you've created. For example, you provide the AdapterId to the DetectModerationLabels API for synchronous image analysis. Providing the AdapterId as part of the request and Rekognition will automatically use it to enhance predictions for your images. This allows you to leverage the capabilities of Rekognition while customizing it to fit your needs.

You also have the option to obtain predictions for images in bulk with the StartMediaAnalysisJob API. See Bulk analysis for more information.

You can assess the accuracy of Rekognition's operations by uploading images to the Rekognition console and running analysis on these images. Rekognition will annotate your images using the selected feature, and you can then review the predictions, using the verified predictions to determine which labels would benefit from creating an adapter.

Currently you can use adapters with the DetectModerationLabels. For more information on creating and using adapters, see Enhancing accuracy with Custom Moderation.

Bulk analysis

Rekognition Bulk Analysis lets you process a large collection of images asynchronously by using a manifest file along with the StartMediaAnalysisJob operation. See Bulk analysis for more information.

Understanding Rekognition's image and video operations

Amazon Rekognition offers two primary API sets for image and video analysis:

- Amazon Rekognition Image: This API is designed for analyzing images.
- Amazon Rekognition Video: This API focuses on analyzing both stored and streaming videos.

Both APIs can detect various entities such as faces and objects. For a comprehensive understanding of the comparison and detection types supported, refer to the section on Understanding Rekognition's types of analysis.

Amazon Rekognition Image operations

Amazon Rekognition Image operations are synchronous. The input and response are in JSON format. Amazon Rekognition Image operations analyze an input image that is in .jpg or .png image format. The image passed to an Amazon Rekognition Image operation can be stored in an Amazon S3 bucket. If you are not using the AWS CLI, you can also pass Base64 encoded images bytes directly to an Amazon Rekognition operation. For more information, see Working with images.

Amazon Rekognition Video operations

The Amazon Rekognition Video API facilitates the analysis of videos either stored in an Amazon S3 bucket or streamed via Amazon Kinesis Video Streams.

For stored video operations, note the following:

- Operations are asynchronous.
- Analysis must be initiated with a “Start” operation (e.g., StartFaceDetection for face detection in stored videos).
- The completion status of analysis is published to an Amazon SNS topic.
- To retrieve the results of an analysis, use the corresponding “Get” operation (e.g., GetFaceDetection).
- For more information, see Working with stored video analysis.

For streaming video analysis:

- Capabilities include face search in Rekognition Video collections and label (object or concept) detection.
- Analysis results for labels are sent as Amazon SNS and Amazon S3 notifications.
- Face search results are output to a Kinesis data stream.
- Management of streaming video analysis is done via an Amazon Rekognition Video stream processor (e.g., create a processor using CreateStreamProcessor).
- For more information, see Working with streaming video events.

Each video analysis operation returns metadata about the video being analyzed, as well as a job ID and a job tag. Operations like Label Detection and Content Moderation for video allow sorting by timestamp or label name, and aggregating results by timestamp or by segment.

Non-storage and storage-based operations

Amazon Rekognition operations are grouped into the following categories.

- **Non-storage API operations** – In these operations, Amazon Rekognition doesn't persist any information. You provide input images and videos, the operation performs the analysis, and returns results, but nothing is saved by Amazon Rekognition. For more information, see Non-storage operations.
- **Storage-based API operations** – Amazon Rekognition servers can store detected facial information in containers known as collections. Amazon Rekognition provides additional API operations you can use to search the persisted face information for face matches. For more information, see Storage-based API operations.

Using the AWS SDK or HTTP to call Amazon Rekognition API operations

You can call Amazon Rekognition API operations using either the AWS SDK or directly by using HTTP. Unless you have a good reason not to, you should always use the AWS SDK. The Java examples in this section use the AWS SDK. A Java project file is not provided, but you can use the AWS Toolkit for Eclipse to develop AWS applications using Java.

The .NET examples in this section use the AWS SDK for .NET. You can use the AWS Toolkit for Visual Studio to develop AWS applications using .NET. It includes helpful templates and the AWS Explorer for deploying applications and managing services.

The API Reference in this guide covers calling Amazon Rekognition operations using HTTP. For Java reference information, see AWS SDK for Java.

The Amazon Rekognition service endpoints you can use are documented at AWS Regions and Endpoints.

When calling Amazon Rekognition with HTTP, use POST HTTP operations.

Understanding non-storage and storage API operations

Amazon Rekognition provides two types of API operations. They are non-storage operations where no information is stored by Amazon Rekognition, and storage operations where certain facial information is stored by Amazon Rekognition.

Non-storage operations

Amazon Rekognition provides the following non-storage API operations for images:

- DetectLabels
- DetectFaces
- CompareFaces
- DetectModerationLabels
- DetectProtectiveEquipment
- RecognizeCelebrities
- DetectText
- GetCelebrityInfo

Amazon Rekognition provides the following non-storage API operations for videos:

- StartLabelDetection
- StartFaceDetection
- StartPersonTracking
- StartCelebrityRecognition
- StartContentModeration

These are referred to as *non-storage* API operations because when you make the operation call, Amazon Rekognition does not persist any information discovered about the input image. Like all other Amazon Rekognition API operations, no input image bytes are persisted by non-storage API operations.

The following example scenarios show where you might integrate non-storage API operations in your application. These scenarios assume that you have a local repository of images.

Example 1: An application that finds images in your local repository that contain specific labels

First, you detect labels (objects and concepts) using the Amazon Rekognition `DetectLabels` operation in each of the images in your repository and build a client-side index, as shown following:

```
Label        ImageID
```

```
tree          image-1
flower        image-1
mountain      image-1
tulip         image-2
flower        image-2
apple         image-3
```

Then, your application can search this index to find images in your local repository that contain a specific label. For example, display images that contain a tree.

Each label that Amazon Rekognition detects has a confidence value associated. It indicates the level of confidence that the input image contains that label. You can use this confidence value to optionally perform additional client-side filtering on labels depending on your application requirements about the level of confidence in the detection. For example, if you require precise labels, you might filter and choose only the labels with higher confidence (such as 95% or higher). If your application doesn't require higher confidence value, you might choose to filter labels with lower confidence value (closer to 50%).

Example 2: An application to display enhanced face images

First, you can detect faces in each of the images in your local repository using the Amazon Rekognition `DetectFaces` operation and build a client-side index. For each face, the operation returns metadata that includes a bounding box, facial landmarks (for example, the position of mouth and ear), and facial attributes (for example, gender). You can store this metadata in a client-side local index, as shown following:

```
ImageID     FaceID     FaceMetaData

image-1     face-1     <boundingbox>, etc.
image-1     face-2     <boundingbox>, etc.
image-1     face-3     <boundingbox>, etc.
...
```

In this index, the primary key is a combination of both the `ImageID` and `FaceID`.

Then, you can use the information in the index to enhance the images when your application displays them from your local repository. For example, you might add a bounding box around the face or highlight facial features.

Storage-based API operations

Amazon Rekognition Image supports the IndexFaces operation, which you can use to detect faces in an image and persist information about facial features detected in an Amazon Rekognition collection. This is an example of a *storage-based* API operation because the service persists information on the server.

Amazon Rekognition Image provides the following storage API operations:

- IndexFaces
- ListFaces
- SearchFacesByImage
- SearchFaces
- DeleteFaces
- DescribeCollection
- DeleteCollection
- ListCollections
- CreateCollection

Amazon Rekognition Video provides the following storage API operations:

- StartFaceSearch
- CreateStreamProcessor

To store facial information, you must first create a face collection in one of the AWS Regions in your account. You specify this face collection when you call the `IndexFaces` operation. After you create a face collection and store facial feature information for all faces, you can search the collection for face matches. For example, you can detect the largest face in an image and search for matching faces in a collection by calling `searchFacesByImage`.

Facial information stored in collections by `IndexFaces` is accessible to Amazon Rekognition Video operations. For example, you can search a video for persons whose faces match those in an existing collection by calling StartFaceSearch.

For information about creating and managing collections, see Searching faces in a collection.

> **Note**
>
> Collections store face vectors, which are mathematical representations of faces. Collections do not store images of faces.

Example 1: An application that authenticates access to a building

You start by creating a face collection to store scanned badge images using the `IndexFaces` operation, which extracts faces and stores them as searchable image vectors. Then, when an employee enters the building, an image of the employee's face is captured and sent to the `SearchFacesByImage` operation. If the face match produces a sufficiently high similarity score (say 99%), you can authenticate the employee.

Understanding model versioning

Amazon Rekognition uses deep learning models to perform face detection and to search for faces in collections. It continues to improve the accuracy of its models based on customer feedback and advances in deep learning research. These improvements are shipped as model updates. For example, with version 1.0 of the model, IndexFaces can index the 15 largest faces in an image. Later versions of the model enable `IndexFaces` to index the 100 largest faces in an image.

When you create a new collection, it's associated with the most recent version of the model. To improve accuracy, the model is occasionally updated.

When a new version of the model is released, the following happens:

- New collections you create are associated with the latest model. Faces that you add to new collections by using IndexFaces are detected using the latest model.
- Your existing collections continue to use the version of the model that they were created with. The face vectors stored in these collections aren't automatically updated to the latest version of the model.
- New faces that are added to an existing collection are detected by using the model that's already associated with the collection.

Different versions of the model aren't compatible with each other. Specifically, if an image is indexed into multiples collections that use different versions of the model, the face identifiers

for the same detected faces are different. If an image is indexed into multiple collections that are associated with the same model, the face identifiers are the same.

Your application might face compatibility issues if your collection management doesn't account for updates to the model. You can determine the version of the model a collection uses by using the `FaceModelVersion` field that's returned in the response of a collection operation (for example, `CreateCollection`). You can get the model version of an existing collection by calling DescribeCollection. For more information, see Describing a collection.

Existing face vectors in a collection can't be updated to a later version of the model. Because Amazon Rekognition doesn't store source image bytes, it can't automatically reindex images by using a later version of the model.

To use the latest model on faces that are stored in an existing collection, create a new collection (CreateCollection) and reindex the source images into the new collection (`Indexfaces`). You need to update any face identifiers that are stored by your application because the face identifiers in the new collection are different from the face identifiers in the old collection. If you no longer need the old collection, you can delete it by using DeleteCollection.

Stateless operations, such as DetectFaces, use the latest version of the model.

Getting started with Amazon Rekognition

This section provides topics to get you started using Amazon Rekognition. If you're new to Amazon Rekognition, we recommend that you first review the concepts and terminology presented in How Amazon Rekognition works.

Before you can use Rekognition, you'll need to create an AWS account and obtain an AWS account ID. You will also want to create a user, which enables the Amazon Rekognition system to determine if you have the permissions needed to access its resources.

After creating your accounts, you'll want to install and configure the AWS CLI and AWS SDKs. The AWS CLI lets you interact with Amazon Rekognition and other services through the command line, while the AWS SDKs let you use programming languages like Java and Python to interact with Amazon Rekognition.

Once you have set up the AWS CLI and AWS SDKs, you can look at some examples of how to use both of them. You can also view some examples of how to interact with Amazon Rekognition using the console.

The Amazon Rekognition console allows you to use the Bulk Analysis and Custom Moderation workflows. Beyond those capabilities, you can also use the console to demo a number of different Amazon Rekognition features. Note that use of the API is required to make use of most Amazon Rekognition features.

Topics

- Step 1: Set up an AWS account and create a User
- Step 2: Set up the AWS CLI and AWS SDKs
- Step 3: Getting started using the AWS CLI and AWS SDK API
- Step 4: Getting started using the Amazon Rekognition console

Step 1: Set up an AWS account and create a User

Before you use Amazon Rekognition for the first time, you must complete the following tasks:

1. Sign up for an AWS account.
2. Create a User.

This section of the developer guide explains why and how you'll create an AWS account and user.

Topics

- Create an AWS Account and User

Create an AWS Account and User

AWS Accounts

When you sign up for Amazon Web Services (AWS), your AWS account is automatically signed up for all services in AWS, including Amazon Rekognition. You're charged only for the services that you use.

With Amazon Rekognition, you pay only for the resources that you use.

If you're a new AWS customer, you can get started with Amazon Rekognition for free. For more information, see AWS Free Usage Tier.

Refer to the upcoming Sign up for an AWS account section for account creation instructions.

If you already have an AWS account, skip account setup and create an administrative user.

Users

Services in AWS, such as Amazon Rekognition, require that you provide credentials when you access them. This is so that the service can determine whether you have permissions to access the resources owned by that service.

You can create access keys for your AWS account to access the AWS CLI or APIs while using the console requires your password. However, we don't recommend that you access AWS by using the credentials for your AWS account root user. Instead, we recommend that you use AWS Identity and Access Management (IAM) to create an administrative user.

You can then access AWS by using a special URL and that administrative user's credentials.

If you signed up for AWS, but you haven't yet created a user for yourself, you can create one by using the IAM console. Refer to the upcoming Create a user with administrative access section for instructions about how to create an administrative user.

Sign up for an AWS account

If you do not have an AWS account, complete the following steps to create one.

To sign up for an AWS account

1. Open https://portal.aws.amazon.com/billing/signup.
2. Follow the online instructions.

   Part of the sign-up procedure involves receiving a phone call or text message and entering a verification code on the phone keypad.

   When you sign up for an AWS account, an *AWS account root user* is created. The root user has access to all AWS services and resources in the account. As a security best practice, assign administrative access to a user, and use only the root user to perform tasks that require root user access.

AWS sends you a confirmation email after the sign-up process is complete. At any time, you can view your current account activity and manage your account by going to https://aws.amazon.com/ and choosing **My Account**.

Create a user with administrative access

After you sign up for an AWS account, secure your AWS account root user, enable AWS IAM Identity Center, and create an administrative user so that you don't use the root user for everyday tasks.

Secure your AWS account root user

1. Sign in to the AWS Management Console as the account owner by choosing **Root user** and entering your AWS account email address. On the next page, enter your password.

   For help signing in by using root user, see Signing in as the root user in the *AWS Sign-In User Guide*.
2. Turn on multi-factor authentication (MFA) for your root user.

   For instructions, see Enable a virtual MFA device for your AWS account root user (console) in the *IAM User Guide*.

Create a user with administrative access

1. Enable IAM Identity Center.

   For instructions, see Enabling AWS IAM Identity Center in the *AWS IAM Identity Center User Guide*.

2. In IAM Identity Center, grant administrative access to a user.

   For a tutorial about using the IAM Identity Center directory as your identity source, see Configure user access with the default IAM Identity Center directory in the *AWS IAM Identity Center User Guide*.

Sign in as the user with administrative access

- To sign in with your IAM Identity Center user, use the sign-in URL that was sent to your email address when you created the IAM Identity Center user.

  For help signing in using an IAM Identity Center user, see Signing in to the AWS access portal in the *AWS Sign-In User Guide*.

Assign access to additional users

1. In IAM Identity Center, create a permission set that follows the best practice of applying least-privilege permissions.

   For instructions, see Create a permission set in the *AWS IAM Identity Center User Guide*.

2. Assign users to a group, and then assign single sign-on access to the group.

   For instructions, see Add groups in the *AWS IAM Identity Center User Guide*.

Step 2: Set up the AWS CLI and AWS SDKs

Topics

- Grant programmatic access
- Using Rekognition with an AWS SDK

The following steps show you how to install the AWS Command Line Interface (AWS CLI) and AWS SDKs that the examples in this documentation use. There are a number of different ways to authenticate AWS SDK calls. The examples in this guide assume that you're using a default credentials profile for calling AWS CLI commands and AWS SDK API operations.

For a list of available AWS Regions, see Regions and Endpoints in the *Amazon Web Services General Reference*.

Follow the steps to download and configure the AWS SDKs.

To set up the AWS CLI and the AWS SDKs

1. Download and install the AWS CLI and the AWS SDKs that you want to use. This guide provides examples for the AWS CLI, Java, Python, Ruby, Node.js, PHP, .NET, and JavaScript. For information about installing AWS SDKs, see Tools for Amazon Web Services.
2. Create an access key for the user you created in Create an AWS Account and User.
   a. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
   b. In the navigation pane, choose **Users**.
   c. Choose the name of the user you created in Create an AWS Account and User.
   d. Choose the **Security credentials** tab.
   e. Choose **Create access key**. Then choose **Download .csv file** to save the access key ID and secret access key to a CSV file on your computer. Store the file in a secure location. You will not have access to the secret access key again after this dialog box closes. After you have downloaded the CSV file, choose **Close**.
3. If you have installed the AWS CLI, you can configure the credentials and region for most AWS SDKs by entering `aws configure` at the command prompt. Otherwise, use the following instructions.
4. On your computer, navigate to your home directory, and create an `.aws` directory. On Unix-based systems, such as Linux or macOS, this is in the following location:

   ```
   ~/.aws
   ```

   On Windows, this is in the following location:

   ```
   %HOMEPATH%\.aws
   ```

5. In the `.aws` directory, create a new file named `credentials`.
6. Open the credentials CSV file that you created in step 2 and copy its contents into the `credentials` file using the following format:

   ```
   [default]
   aws_access_key_id = your_access_key_id
   aws_secret_access_key = your_secret_access_key
   ```

   Substitute your access key ID and secret access key for *your_access_key_id* and *your_secret_access_key*.
7. Save the `Credentials` file and delete the CSV file.
8. In the `.aws` directory, create a new file named `config`.
9. Open the `config` file and enter your region in the following format.

   ```
   [default]
   region = your_aws_region
   ```

   Substitute your desired AWS Region (for example, `us-west-2`) for *your_aws_region*.

   > **Note**
   >
   > If you don't select a region, then us-east-1 will be used by default.

10. Save the `config` file.

Grant programmatic access

You can run the AWS CLI and code examples in this guide on your local computer or other AWS environments, such as an Amazon Elastic Compute Cloud instance. To run the examples, you need to grant access to the AWS SDK operations that the examples use.

Topics

- Running code on your local computer
- Running code in AWS environments

Running code on your local computer

To run code on a local computer, we recommend that you use short-term credentials to grant a user access to AWS SDK operations. For specific information about running the AWS CLI and code examples on a local computer, see Using a profile on your local computer.

Users need programmatic access if they want to interact with AWS outside of the AWS Management Console. The way to grant programmatic access depends on the type of user that's accessing AWS.

To grant users programmatic access, choose one of the following options.

Which user needs programmatic access?	To	By
Workforce identity (Users managed in IAM Identity Center)	Use temporary credentials to sign programmatic requests to the AWS CLI, AWS SDKs, or AWS APIs.	Following the instructions for the interface that you want to use. • For the AWS CLI, see Configuring the AWS CLI to use AWS IAM Identity Center in the *AWS Command Line Interface User Guide*. • For AWS SDKs, tools, and AWS APIs, see IAM Identity Center authentication in the *AWS SDKs and Tools Reference Guide*.
IAM	Use temporary credentials to sign programmatic requests to the AWS CLI, AWS SDKs, or AWS APIs.	Following the instructions in Using temporary credentials with AWS resources in the *IAM User Guide*.
IAM	(Not recommended) Use long-term credentials to sign programmatic requests	Following the instructions for the interface that you want to use.

Which user needs programmatic access?	To	By
	to the AWS CLI, AWS SDKs, or AWS APIs.	• For the AWS CLI, see Authenticating using IAM user credentials in the *AWS Command Line Interface User Guide*. • For AWS SDKs and tools, see Authenticate using long-term credentials in the *AWS SDKs and Tools Reference Guide*. • For AWS APIs, see Managing access keys for IAM users in the *IAM User Guide*.

Using a profile on your local computer

You can run the AWS CLI and code examples in this guide with the short-term credentials you create in Running code on your local computer. To get the credentials and other settings information, the examples use a profile named `profile-name` For example:

```
session = boto3.Session(profile_name="profile-name")
rekognition_client = session.client("rekognition")
```

The user that the profile represents must have permissions to call the Rekognition SDK operations and other AWS SDK operations needed by the examples.

To create a profile that works with the AWS CLI and code examples, choose one of the following. Make sure the name of the profile you create is `profile-name`.

- Users managed by IAM — Follow the instructions at Switching to an IAM role (AWS CLI).
- Workforce identity (Users managed by AWS IAM Identity Center) — Follow the instructions at Configuring the AWS CLI to use AWS IAM Identity Center. For the code examples, we recommend using an Integrated Development Environment (IDE), which supports the AWS Toolkit enabling

authentication through IAM Identity Center. For the Java examples, see Start building with Java. For the Python examples, see Start building with Python. For more information, see IAM Identity Center credentials.

> **Note**
>
> You can use code to get short-term credentials. For more information, see Switching to an IAM role (AWS API). For IAM Identity Center, get the short-term credentials for a role by following the instructions at Getting IAM role credentials for CLI access.

Running code in AWS environments

You shouldn't use user credentials to sign AWS SDK calls in AWS environments, such as production code running in an AWS Lambda function. Instead, you configure a role that defines the permissions that your code needs. You then attach the role to the environment that your code runs in. How you attach the role and make temporary credentials available varies depending on the environment that your code runs in:

- AWS Lambda function — Use the temporary credentials that Lambda automatically provides to your function when it assumes the Lambda function's execution role. The credentials are available in the Lambda environment variables. You don't need to specify a profile. For more information, see Lambda execution role.
- Amazon EC2 — Use the Amazon EC2 instance metadata endpoint credentials provider. The provider automatically generates and refreshes credentials for you using the Amazon EC2 *instance profile* you attach to the Amazon EC2 instance. For more information, see Using an IAM role to grant permissions to applications running on Amazon EC2 instances
- Amazon Elastic Container Service — Use the Container credentials provider. Amazon ECS sends and refreshes credentials to a metadata endpoint. A *task IAM role* that you specify provides a strategy for managing the credentials that your application uses. For more information, see Interact with AWS services.

For more information about credential providers, see Standardized credential providers.

Using Rekognition with an AWS SDK

AWS software development kits (SDKs) are available for many popular programming languages. Each SDK provides an API, code examples, and documentation that make it easier for developers to build applications in their preferred language.

SDK documentation	Code examples
AWS SDK for C++	AWS SDK for C++ code examples
AWS CLI	AWS CLI code examples
AWS SDK for Go	AWS SDK for Go code examples
AWS SDK for Java	AWS SDK for Java code examples
AWS SDK for JavaScript	AWS SDK for JavaScript code examples
AWS SDK for Kotlin	AWS SDK for Kotlin code examples
AWS SDK for .NET	AWS SDK for .NET code examples
AWS SDK for PHP	AWS SDK for PHP code examples
AWS Tools for PowerShell	AWS Tools for PowerShell code examples
AWS SDK for Python (Boto3)	AWS SDK for Python (Boto3) code examples
AWS SDK for Ruby	AWS SDK for Ruby code examples
AWS SDK for Rust	AWS SDK for Rust code examples
AWS SDK for SAP ABAP	AWS SDK for SAP ABAP code examples
AWS SDK for Swift	AWS SDK for Swift code examples

For examples specific to Rekognition, see Code examples for Amazon Rekognition using AWS SDKs.

Example availability

Can't find what you need? Request a code example by using the **Provide feedback** link at the bottom of this page.

Step 3: Getting started using the AWS CLI and AWS SDK API

After you've set up the AWS CLI and AWS SDKs that you want to use, you can build applications that use Amazon Rekognition. Most interactions with Amazon Rekognition happen by using the API operations, although a select few Amazon Rekognition's features have console workflows.

The following topics show you how to get started with Amazon Rekognition Image and Amazon Rekognition Video via the AWS CLI or the AWS SDKs.

- Working with images – Covers the process of analyzing images with Amazon Rekognition Image.
- Working with stored video analysis operations - Covers the process of analyzing stored, non-streaming video with Amazon Rekognition Video.
- Working with streaming video events - Covers the process of analyzing streaming video with Amazon Rekognition Video.

The sections listed above have examples which use the AWS CLI. If you intend to use the AWS CLI, see the following section for information on how to format your API calls.

Formatting the AWS CLI examples

The AWS CLI examples in this guide are formatted for the Linux operating system. To use the samples with Microsoft Windows, you need to change the JSON formatting of the `--image` parameter, and change the line breaks from backslashes (\) to carets (^). For more information about JSON formatting, see Specifying Parameter Values for the AWS Command Line Interface.

The following is an example AWS CLI command that's formatted for Microsoft Windows (note that these commands will not run as is, they are just formatting examples):

```
aws rekognition detect-labels ^
  --image "{\"S3Object\":{\"Bucket\":\"photo-collection\",\"Name\":\"photo.jpg\"}}" ^
  --region region-name
```

You can also provide a shorthand version of the JSON that works on both Microsoft Windows and Linux.

```
aws rekognition detect-labels --image "S3Object={Bucket=photo-
collection,Name=photo.jpg}" --region region-name
```

For more information, see Using Shorthand Syntax with the AWS Command Line Interface.

Next step

Step 4: Getting started using the Amazon Rekognition console

Step 4: Getting started using the Amazon Rekognition console

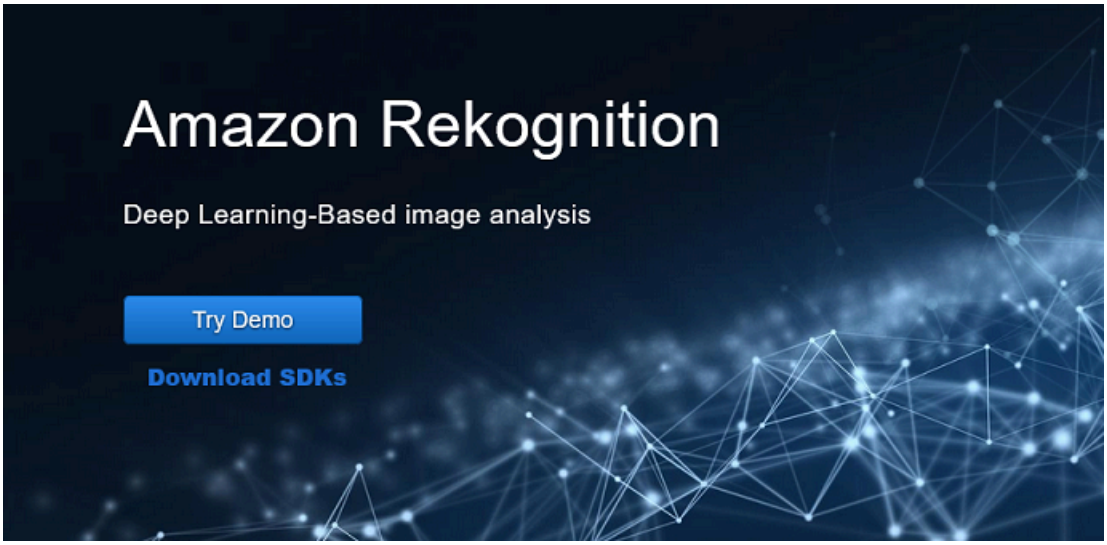
The Amazon Rekognition console allows you to manage resources related to Rekognition Custom Labels and the Custom Moderation feature. The console only provides demos of other Rekognition features.

This section shows you how to use a subset of Amazon Rekognition's capabilities such as object and scene detection, facial analysis, and face comparison in a set of images. For more information, see How Amazon Rekognition works. You can also use the Amazon Rekognition API or AWS CLI to detect objects and scenes, detect faces, and compare and search faces. For more information, see Step 3: Getting started using the AWS CLI and AWS SDK API.

This section also shows you how to see aggregated Amazon CloudWatch metrics for Rekognition by using the Rekognition console.

Topics

- Set up console permissions
- Exercise 1: Detect objects and scenes (Console)
- Exercise 2: Analyze faces in an image (console)
- Exercise 3: Compare faces in images (console)
- Exercise 4: See aggregated metrics (console)



Set up console permissions

To use the Rekognition console you need to have the appropriate permissions for the role or account accessing the console. For some operations, Rekognition will automatically create an Amazon S3 bucket to store files handled during operation. If you want to store your training files in a bucket other than this console bucket, you will need additional permissions.

Allowing console access

To use the Rekognition console, you can use an IAM policy like the following one, which covers Amazon S3 and the Rekognition console. For information about assigning permissions, see Assigning permissions.

```
            {
"Version": "2012-10-17",
"Statement": [
    {
        "Sid": "RekognitionFullAccess",
        "Effect": "Allow",
        "Action": [
            "rekognition:*"
        ],
        "Resource": "*"
    },
    {
        "Sid": "RekognitionConsoleS3BucketSearchAccess",
        "Effect": "Allow",
```

```
            "Action": [
                "s3:ListAllMyBuckets",
                "s3:ListBucket",
                "s3:GetBucketAcl",
                "s3:GetBucketLocation"
            ],
            "Resource": "*"
        },
        {
            "Sid": "RekognitionConsoleS3BucketFirstUseSetupAccess",
            "Effect": "Allow",
            "Action": [
                "s3:CreateBucket",
                "s3:PutBucketVersioning",
                "s3:PutLifecycleConfiguration",
                "s3:PutEncryptionConfiguration",
                "s3:PutBucketPublicAccessBlock",
                "s3:PutCors",
                "s3:GetCors"
            ],
            "Resource": "arn:aws:s3:::rekognition-custom-projects-*"
        },
        {
            "Sid": "RekognitionConsoleS3BucketAccess",
            "Effect": "Allow",
            "Action": [
                "s3:ListBucket",
                "s3:GetBucketLocation",
                "s3:GetBucketVersioning"
            ],
            "Resource": "arn:aws:s3:::rekognition-custom-projects-*"
        },
        {
            "Sid": "RekognitionConsoleS3ObjectAccess",
            "Effect": "Allow",
            "Action": [
                "s3:GetObject",
                "s3:HeadObject",
                "s3:DeleteObject",
                "s3:GetObjectAcl",
                "s3:GetObjectTagging",
                "s3:GetObjectVersion",
                "s3:PutObject"
            ],
```

```
            "Resource": "arn:aws:s3:::rekognition-custom-projects-*/*"
        },
        {
            "Sid": "RekognitionConsoleManifestAccess",
            "Effect": "Allow",
            "Action": [
                "groundtruthlabeling:*",
            ],
            "Resource": "*"
        },
        {
            "Sid": "RekognitionConsoleTagSelectorAccess",
            "Effect": "Allow",
            "Action": [
                "tag:GetTagKeys",
                "tag:GetTagValues"
            ],
            "Resource": "*"
        },
        {
            "Sid": "RekognitionConsoleKmsKeySelectorAccess",
            "Effect": "Allow",
            "Action": [
                "kms:ListAliases"
            ],
            "Resource": "*"
        }
    ]
}
```

Accesssing external Amazon S3 buckets

When you first open the Rekognition console in a new AWS Region, Rekognition creates a bucket (console bucket) that's used to store project files. Alternatively, you can use your own Amazon S3 bucket (external bucket) to upload the images or manifest file to the console. To use an external bucket, add the following policy block to the preceding policy.

```
{
            "Sid": "s3ExternalBucketPolicies",
            "Effect": "Allow",
            "Action": [
```

```
                "s3:GetBucketAcl",
                "s3:GetBucketLocation",
                "s3:GetObject",
                "s3:GetObjectAcl",
                "s3:GetObjectVersion",
                "s3:GetObjectTagging",
                "s3:ListBucket",
                "s3:PutObject"
            ],
            "Resource": [
                "arn:aws:s3:::amzn-s3-demo-bucket*"
            ]
}
```

Assigning permissions

To provide access, add permissions to your users, groups, or roles:

- Users and groups in AWS IAM Identity Center (successor to AWS Single Sign-On):

  Create a permission set. Follow the instructions in Create a permission set in the *AWS IAM Identity Center (successor to AWS Single Sign-On) User Guide*.

- Users managed in IAM through an identity provider:

  Create a role for identity federation. Follow the instructions in Creating a role for a third-party identity provider (federation) in the *IAM User Guide*.

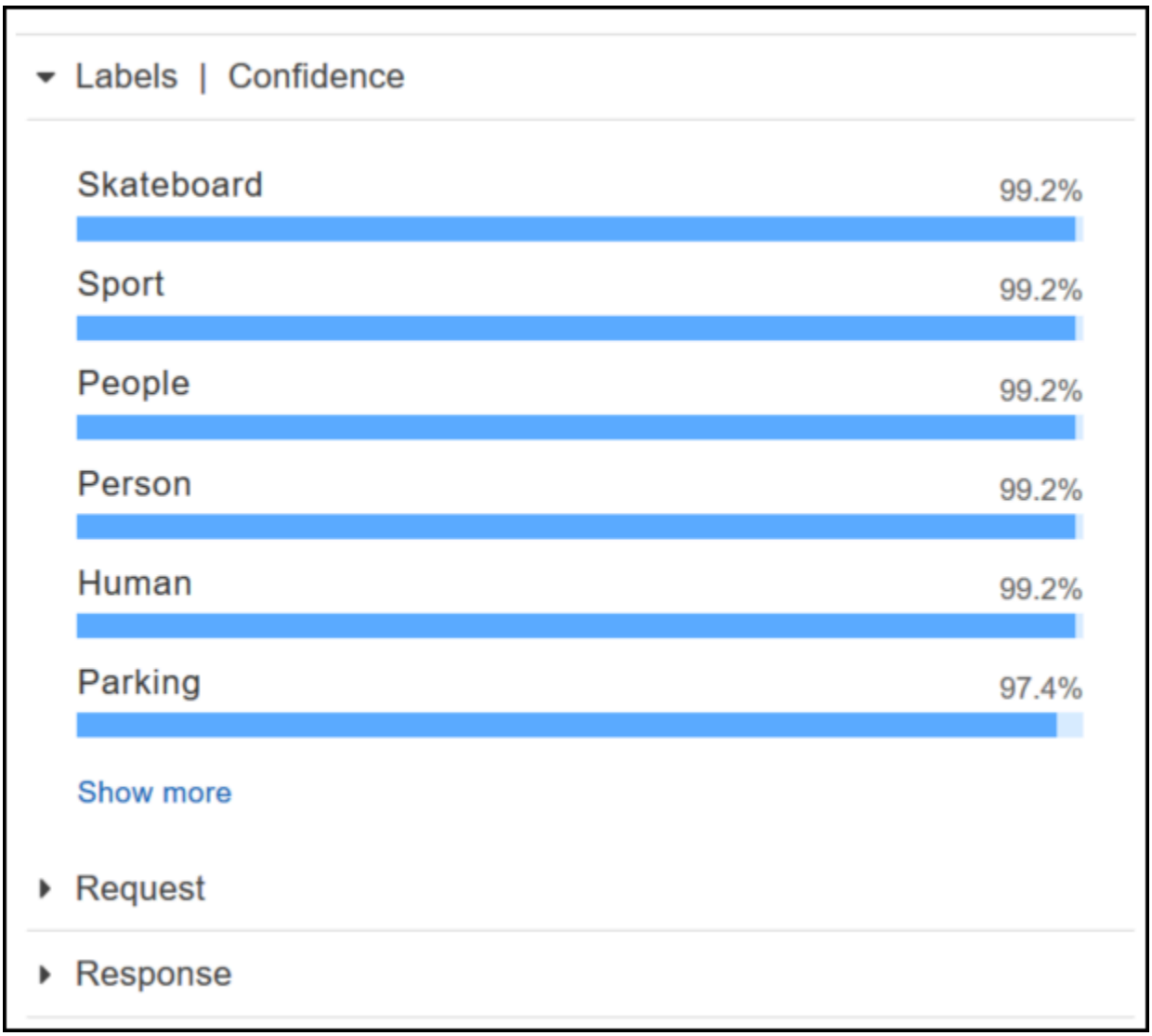
- IAM users:
  - Create a role that your user can assume. Follow the instructions in Creating a role for an IAM user in the *IAM User Guide*.
  - (Not recommended) Attach a policy directly to a user or add a user to a user group. Follow the instructions in Adding permissions to a user (console) in the *IAM User Guide*.

Exercise 1: Detect objects and scenes (Console)

This section shows how, at a very high level, Amazon Rekognition's objects and scenes detection capability works. When you specify an image as input, the service detects the objects and scenes in the image and returns them along with a percent confidence score for each object and scene.

For example, Amazon Rekognition detects the following objects and scenes in the sample image: skateboard, sport, person, auto, car and vehicle.

Amazon Rekognition also returns a confidence score for each object detected in the sample image, as shown in the following sample response.



To see all the confidence scores shown in the response, choose **Show more** in the **Labels | Confidence** pane.

You can also look at the request to the API and the response from the API as a reference.

Request

```
{
   "contentString":{
      "Attributes":[
         "ALL"
      ],
      "Image":{
         "S3Object":{
            "Bucket":"console-sample-images",
```

```
            "Name":"skateboard.jpg"
         }
      }
   }
}
```

Response

```
{
   "Labels":[
      {
         "Confidence":99.25359344482422,
         "Name":"Skateboard"
      },
      {
         "Confidence":99.25359344482422,
         "Name":"Sport"
      },
      {
         "Confidence":99.24723052978516,
         "Name":"People"
      },
      {
         "Confidence":99.24723052978516,
         "Name":"Person"
      },
      {
         "Confidence":99.23908233642578,
         "Name":"Human"
      },
      {
         "Confidence":97.42484283447266,
         "Name":"Parking"
      },
      {
         "Confidence":97.42484283447266,
         "Name":"Parking Lot"
      },
      {
         "Confidence":91.53300476074219,
         "Name":"Automobile"
      },
      {
```

```
            "Confidence":91.53300476074219,
            "Name":"Car"
         },
         {
            "Confidence":91.53300476074219,
            "Name":"Vehicle"
         },
         {
            "Confidence":76.85114288330078,
            "Name":"Intersection"
         },
         {
            "Confidence":76.85114288330078,
            "Name":"Road"
         },
         {
            "Confidence":76.21503448486328,
            "Name":"Boardwalk"
         },
         {
            "Confidence":76.21503448486328,
            "Name":"Path"
         },
         {
            "Confidence":76.21503448486328,
            "Name":"Pavement"
         },
         {
            "Confidence":76.21503448486328,
            "Name":"Sidewalk"
         },
         {
            "Confidence":76.21503448486328,
            "Name":"Walkway"
         },
         {
            "Confidence":66.71541595458984,
            "Name":"Building"
         },
         {
            "Confidence":62.04711151123047,
            "Name":"Coupe"
         },
         {
```

```
            "Confidence":62.04711151123047,
            "Name":"Sports Car"
         },
         {
            "Confidence":61.98909378051758,
            "Name":"City"
         },
         {
            "Confidence":61.98909378051758,
            "Name":"Downtown"
         },
         {
            "Confidence":61.98909378051758,
            "Name":"Urban"
         },
         {
            "Confidence":60.978023529052734,
            "Name":"Neighborhood"
         },
         {
            "Confidence":60.978023529052734,
            "Name":"Town"
         },
         {
            "Confidence":59.22066116333008,
            "Name":"Sedan"
         },
         {
            "Confidence":56.48063278198242,
            "Name":"Street"
         },
         {
            "Confidence":54.235477447509766,
            "Name":"Housing"
         },
         {
            "Confidence":53.85226058959961,
            "Name":"Metropolis"
         },
         {
            "Confidence":52.001792907714844,
            "Name":"Office Building"
         },
         {
```

```
            "Confidence":51.325313568115234,
            "Name":"Suv"
         },
         {
            "Confidence":51.26075744628906,
            "Name":"Apartment Building"
         },
         {
            "Confidence":51.26075744628906,
            "Name":"High Rise"
         },
         {
            "Confidence":50.68067932128906,
            "Name":"Pedestrian"
         },
         {
            "Confidence":50.59548568725586,
            "Name":"Freeway"
         },
         {
            "Confidence":50.568580627441406,
            "Name":"Bumper"
         }
      ]
}
```


For more information, see How Amazon Rekognition works.

Detect objects and scenes in an image you provide

You can upload an image that you own or provide the URL to an image as input in the Amazon Rekognition console. Amazon Rekognition returns the object and scenes, confidence scores for each object, and scene it detects in the image you provide.

> **Note**
>
> The image must be less than 5MB in size and must be of JPEG or PNG format.

To detect objects and scenes in an image you provide

1. Open the Amazon Rekognition console at https://console.aws.amazon.com/rekognition/.

2. Choose **Label detection**.
3. Do one of the following:
   - Upload an image – Choose **Upload**, go to the location where you stored your image, and then select the image.
   - Use a URL – Type the URL in the text box, and then choose **Go**.
4. View the confidence score of each label detected in the **Labels | Confidence** pane.

For more image analysis options, see the section called “Working with images”.

Detect objects and people in a video you provide

You can upload a video that you provide as input in the Amazon Rekognition console. Amazon Rekognition returns the people, objects, and labels detected in the video.

> **Note**
>
> The demo video must not be more than a minute long or larger than 30 MB. It must be in MP4 file format and encoded using the H.264 codec.

To detect objects and people in a video you provide

1. Open the Amazon Rekognition console at https://console.aws.amazon.com/rekognition/.
2. Choose **Stored Video Analysis** from the navigation bar.
3. Under **Choose a sample or upload your own**, select **Your own video** from the drop-down menu.
4. Drag and drop your video or select your video from the location where you've stored it.

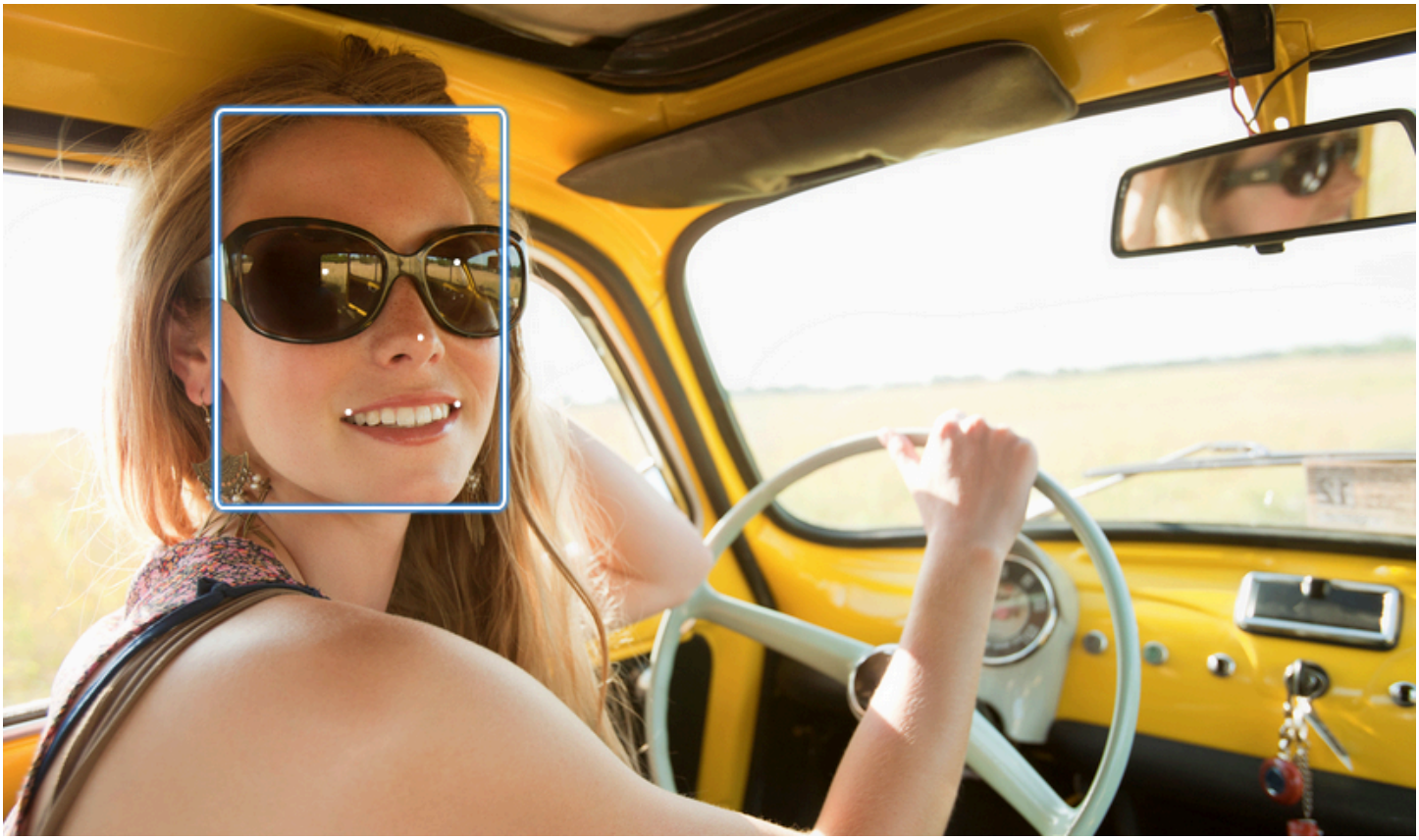
For more video analysis options, see the section called “Working with stored video analysis operations” or the section called “Working with streaming video events”.

Exercise 2: Analyze faces in an image (console)

This section shows you how to use the Amazon Rekognition console to detect faces and analyze facial attributes in an image. When you provide an image that contains a face as input, the service

detects the face in the image, analyzes the facial attributes of the face, and then returns a percent confidence score for the face and the facial attributes detected in the image. For more information, see How Amazon Rekognition works.

For example, if you choose the following sample image as input, Amazon Rekognition detects it as a face and returns confidence scores for the face and the facial attributes detected.



The following shows the sample response.

Results

looks like a face	99.8%
appears to be female	100%
age range	23 - 38 years old
smiling	99.4%
appears to be happy	93.2%
wearing eyeglasses	99.9%
wearing sunglasses	97.6%
eyes are open	96.2%
mouth is open	72.5%
does not have a mustache	77.6%
does not have a beard	97.1%

Show less

If there are multiple faces in the input image, Rekognition detects up to 100 faces in the image. Each face detected is marked with a square. When you click the area marked with a square on a face, Rekognition displays the confidence score of that face and its attributes detected in the **Faces | Confidence** pane.

Analyze faces in an image you provide

You can upload your own image or provide the URL to the image in the Amazon Rekognition console.

> **Note**
>
> The image must be less than 5MB in size and must be of JPEG or PNG format.

To analyze a face in an image you provide

1. Open the Amazon Rekognition console at https://console.aws.amazon.com/rekognition/.
2. Choose **Facial analysis**.
3. Do one of the following:
   - Upload an image – Choose **Upload**, go to the location where you stored your image, and then select the image.
   - Use a URL – Type the URL in the text box, and then choose **Go**.
4. View the confidence score of one the faces detected and its facial attributes in the **Faces | Confidence** pane.
5. If there are multiple faces in the image, choose one of the other faces to see its attributes and scores.

Exercise 3: Compare faces in images (console)

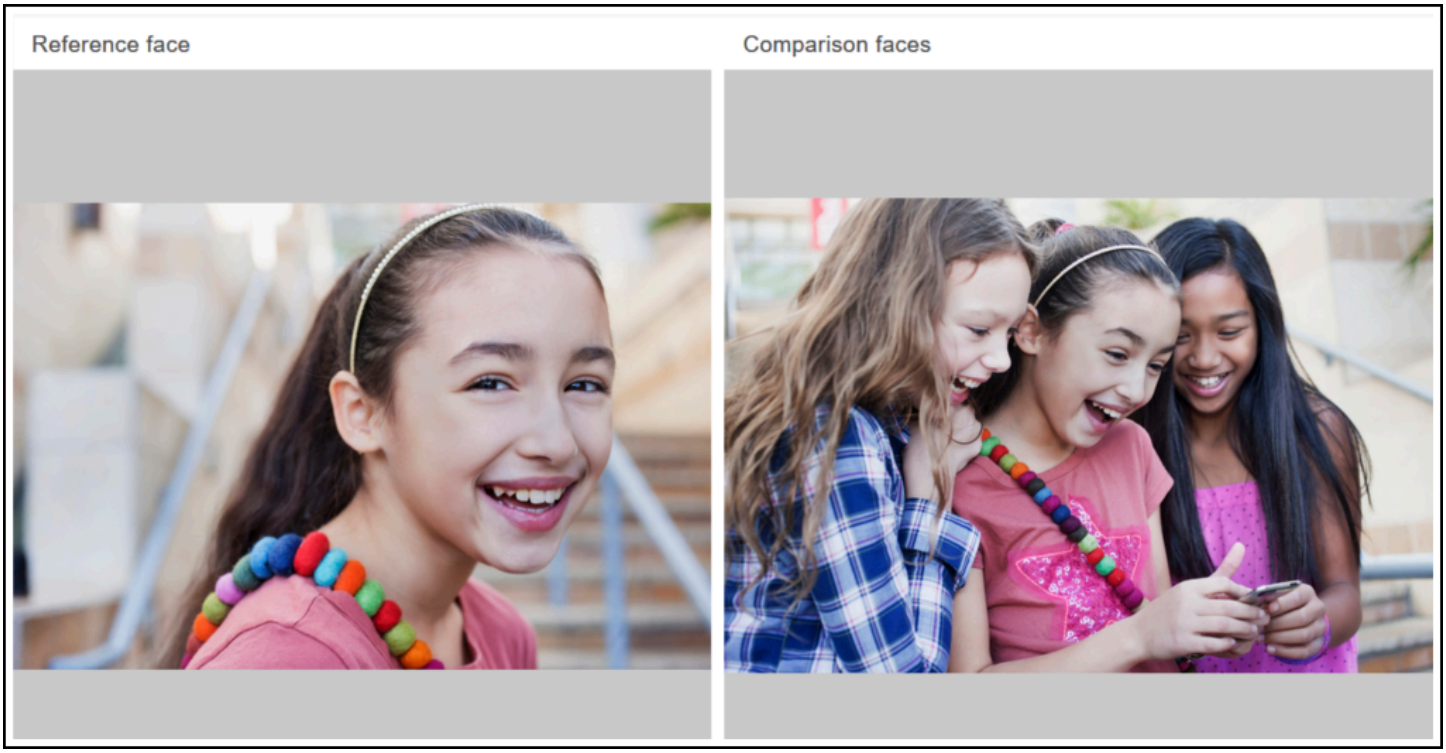
This section shows you how to use the Amazon Rekognition console to compare faces within a set of images with multiple faces in them. When you specify a **Reference face** (source) and a **Comparison faces** (target) image, Rekognition compares the largest face in the source image (that is, the reference face) with up to 100 faces detected in the target image (that is, the comparison faces), and then finds how closely the face in the source matches the faces in the target image. The similarity score for each comparison is displayed in the **Results** pane.

If the target image contains multiple faces, Rekognition matches the face in the source image with up to 100 faces detected in target image, and then assigns a similarity score to each match.

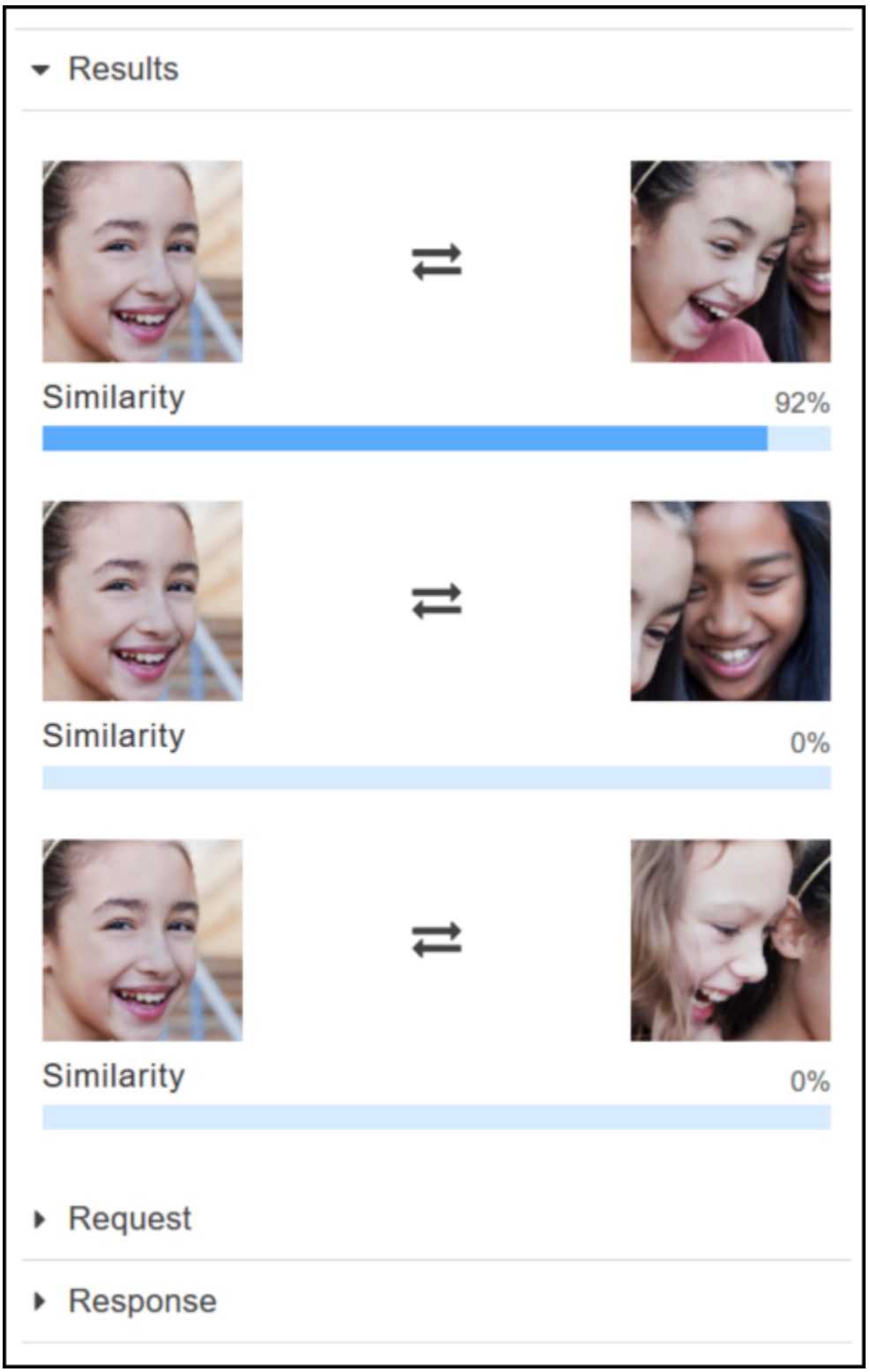
If the source image contains multiple faces, the service detects the largest face in the source image and uses it to compare with each face detected in the target image.

For more information, see Comparing faces in images.

For example, with the sample image shown on the left as a source image and the sample image on the right as a target image, Rekognition detects the face in the source image, compares it with each face detected in the target image, and displays a similarity score for each pair.



The following shows the faces detected in the target image and the similarity score for each face.



Compare faces in an image you provide

You can upload your own source and target images for Rekognition to compare the faces in the images or you can specify a URL for the location of the images.

> **Note**
>
> The image must be less than 5MB in size and must be of JPEG or PNG format.

To compare faces in your images

1. Open the Amazon Rekognition console at https://console.aws.amazon.com/rekognition/.
2. Choose **Face comparison**.
3. For your source image, do one of the following:
   - Upload an image – Choose **Upload** on the left, go to the location where you stored your source image, and then select the image.
   - Use a URL – Type the URL of your source image in the text box, and then choose **Go**.
4. For your target image, do one of the following:
   - Upload an image – Choose **Upload** on the right, go to the location where you stored your source image, and then select the image.
   - Use a URL – Type the URL of your source image in the text box, and then choose **Go**.
5. Rekognition matches the largest face in your source image with up to 100 faces in the target image and then displays the similarity score for each pair in the **Results** pane.

Exercise 4: See aggregated metrics (console)

The Amazon Rekognition metrics pane shows activity graphs for an aggregate of individual Rekognition metrics over a specified period of time. For example, the `SuccessfulRequestCount` aggregated metric shows the total number of successful requests to all Rekognition API operations over the last seven days.

The following table lists the graphs displayed in the Rekognition metrics pane and the corresponding Rekognition metric. For more information, see CloudWatch metrics for Rekognition.

Graph	Aggregated Metric
Successful calls	SuccessfulRequestCount
Client errors	UserErrorCount

Graph	Aggregated Metric
Server errors	ServerErrorCount
Throttled	ThrottledCount
Detected labels	DetectedLabelCount
Detected faces	DetectedFaceCount

Each graph shows aggregated metric data collected over a specified period of time. A total count of aggregated metric data for the time period is also displayed. To see metrics for individual API calls, choose the link beneath each graph.

To allow users access to the Rekognition metrics pane, ensure that the user has appropriate CloudWatch and Rekognition permissions. For example, a user with `AmazonRekognitionReadOnlyAccess` and `CloudWatchReadOnlyAccess` managed policy permissions can see the metrics pane. If a user does not have the required permissions, when the user opens the metrics pane, no graphs appear. For more information, see Identity and access management for Amazon Rekognition.

For more information about monitoring Rekognition with CloudWatch see Monitoring Rekognition with Amazon CloudWatch.

To see aggregated metrics (console)

1. Open the Amazon Rekognition console at https://console.aws.amazon.com/rekognition/.
2. In the navigation pane, choose **Metrics**.
3. In the dropdown, select the period of time you want metrics for.
4. To update the graphs, choose the **Refresh** button.
5. To see detailed CloudWatch metrics for a specific aggregated metric, choose **See details on CloudWatch** beneath the metric graph.

Working with images and videos

You can use Amazon Rekognition API operations with three different types of media: images, stored videos, and streaming videos. This section provides general information about writing code that accesses Amazon Rekognition to process the different types of media. For guidance on best practices and considerations, see the respective sections listed below, depending on the type of media you're processing.

Other sections in this guide provide information about specific types of image and video analysis, such as face detection.

Topics

- Working with images
- Working with stored video analysis operations
- Working with streaming video events
- Error handling
- Using Amazon Rekognition as a FedRAMP authorized service

Working with images

This section covers the types of analysis that Amazon Rekognition Image can perform on images.

- Object and scene detection
- Face detection and comparison
- Searching faces in a collection
- Celebrity recognition
- Image moderation
- Text in image detection

These are performed by non-storage API operations where Amazon Rekognition Image doesn't persist any information discovered by the operation. No input image bytes are persisted by non-storage API operations. For more information, see Understanding non-storage and storage API operations.

Amazon Rekognition Image can also store facial metadata in collections for later retrieval. For more information, see Searching faces in a collection.

In this section, you use the Amazon Rekognition Image API operations to analyze images stored in an Amazon S3 bucket and image bytes loaded from the local file system. This section also covers getting image orientation information from a .jpg image.

Rekognition only uses RGB channels to perform inference. AWS recommends users remove the Alpha Channel before using a Display to visually (manually by a human) inspect the comparison.

Topics

- Image specifications
- Analyzing images stored in an Amazon S3 bucket
- Analyzing an image loaded from a local file system
- Displaying bounding boxes
- Getting image orientation and bounding box coordinates

Image specifications

Amazon Rekognition Image operations can analyze images in .jpg or .png format.

You pass image bytes to an Amazon Rekognition Image operation as part of the call or you reference an existing Amazon S3 object. For an example of analyzing an image stored in an Amazon S3 bucket, see Analyzing images stored in an Amazon S3 bucket. For an example of passing image bytes to an Amazon Rekognition Image API operation, see Analyzing an image loaded from a local file system.

If you use HTTP and pass the image bytes as part of an Amazon Rekognition Image operation, the image bytes must be a base64-encoded string. If you use the AWS SDK and pass image bytes as part of the API operation call, the need to base64-encode the image bytes depends on the language you use.

The following common AWS SDKs automatically base64-encode images, and you don't need to encode image bytes before calling an Amazon Rekognition Image API operation.

- Java
- JavaScript
- Python

- PHP

If you're using another AWS SDK and get an image format error when calling a Rekognition API operation, try base64-encoding the image bytes before passing them to a Rekognition API operation.

If you use the AWS CLI to call Amazon Rekognition Image operations, passing image bytes as part of the call isn't supported. You must first upload the image to an Amazon S3 bucket, and then call the operation referencing the uploaded image.

> **Note**
>
> The image doesn't need to be base64 encoded if you pass an image stored in an `S3Object` instead of image bytes.

For information about ensuring the lowest possible latency for Amazon Rekognition Image operations, see Amazon Rekognition Image operation latency.

Correcting image orientation

In several Rekognition API operations, the orientation of an analyzed image is returned. Knowing image orientation is important as it allows you to reorient images for display. Rekognition API operations that analyze faces also return bounding boxes for the location of faces within an image. You can use bounding boxes to display a box around a face on an image. The bounding box coordinates returned are affected by image orientation and you may need to translate bounding box coordinates to correctly display a box around a face. For more information, see Getting image orientation and bounding box coordinates.

Image resizing

During analysis, Amazon Rekognition internally resizes images using a set of predefined ranges that best suit a particular model or algorithm. Because of this, Amazon Rekognition might detect a different number of objects, or provide different results, depending on the resolution of the input image. For example, suppose you have two images. The first image has a resolution of 1024x768 pixels. The second image, a resized version of the first image, has a resolution of 640x480 pixels. If you submit the images to DetectLabels, the responses from the two calls to `DetectLabels` might differ slightly.

Analyzing images stored in an Amazon S3 bucket

Amazon Rekognition Image can analyze images that are stored in an Amazon S3 bucket or images that are supplied as image bytes.

In this topic, you use the DetectLabels API operation to detect objects, concepts, and scenes in an image (JPEG or PNG) that's stored in an Amazon S3 bucket. You pass an image to an Amazon Rekognition Image API operation by using the Image input parameter. Within `Image`, you specify the S3Object object property to reference an image stored in an S3 bucket. Image bytes for images stored in Amazon S3 buckets don't need to be base64 encoded. For more information, see Image specifications.

Example request

In this example JSON request for `DetectLabels`, the source image (`input.jpg`) is loaded from an Amazon S3 bucket named `amzn-s3-demo-bucket`. Note that the region for the S3 bucket containing the S3 object must match the region you use for Amazon Rekognition Image operations.

```
{
    "Image": {
        "S3Object": {
            "Bucket": "amzn-s3-demo-bucket",
            "Name": "input.jpg"
        }
    },
    "MaxLabels": 10,
    "MinConfidence": 75
}
```

The following examples use various AWS SDKs and the AWS CLI to call `DetectLabels`. For information about the `DetectLabels` operation response, see DetectLabels response.

To detect labels in an image

1. If you haven't already:

    a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs. Ensure that you have given the user calling the API operations the proper permissions for programmatic access, see Grant programmatic access for instructions on how to do this.

2. Upload an image that contains one or more objects—such as trees, houses, and boat—to your S3 bucket. The image must be in *.jpg* or *.png* format.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following examples to call the `DetectLabels` operation.

   Java

   This example displays a list of labels that were detected in the input image. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package com.amazonaws.samples;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
import com.amazonaws.services.rekognition.model.DetectLabelsRequest;
import com.amazonaws.services.rekognition.model.DetectLabelsResult;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.Label;
import com.amazonaws.services.rekognition.model.S3Object;
import java.util.List;

public class DetectLabels {

   public static void main(String[] args) throws Exception {

      String photo = "input.jpg";
      String bucket = "bucket";
```

```
      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

      DetectLabelsRequest request = new DetectLabelsRequest()
           .withImage(new Image()
           .withS3Object(new S3Object()
           .withName(photo).withBucket(bucket)))
           .withMaxLabels(10)
           .withMinConfidence(75F);

      try {
         DetectLabelsResult result = rekognitionClient.detectLabels(request);
         List <Label> labels = result.getLabels();

         System.out.println("Detected labels for " + photo);
         for (Label label: labels) {
            System.out.println(label.getName() + ": " +
 label.getConfidence().toString());
         }
      } catch(AmazonRekognitionException e) {
         e.printStackTrace();
      }
   }
}
```

AWS CLI

This example displays the JSON output from the `detect-labels` CLI operation. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
aws rekognition detect-labels --image '{ "S3Object": { "Bucket": "bucket-name",
 "Name": "file-name" } }' \
--features GENERAL_LABELS IMAGE_PROPERTIES \
--settings '{"ImageProperties": {"MaxDominantColors":1}, {"GeneralLabels":
{"LabelInclusionFilters":["Cat"]}}}' \
--profile profile-name \
--region us-east-1
```

If you are using Windows you may need to escape the qutations marks as seen in the example below.

```
aws rekognition detect-labels --image "{\"S3Object\":{\"Bucket\":\"bucket-
name\",\"Name\":\"file-name\"}}" --features GENERAL_LABELS IMAGE_PROPERTIES --
settings "{\"GeneralLabels\":{\"LabelInclusionFilters\":[\"Car\"]}}" --profile
 profile-name --region us-east-1
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.detect_labels.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.DetectLabelsRequest;
import software.amazon.awssdk.services.rekognition.model.DetectLabelsResponse;
import software.amazon.awssdk.services.rekognition.model.Label;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import java.util.List;

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class DetectLabels {

    public static void main(String[] args) {

        final String usage = "\n" +
            "Usage: " +
            "   <bucket> <image>\n\n" +
            "Where:\n" +
            "   bucket - The name of the Amazon S3 bucket that contains the
 image (for example, ,ImageBucket)." +
```

```
            "   image - The name of the image located in the Amazon S3 bucket
 (for example, Lake.png). \n\n";

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String image = args[1];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        getLabelsfromImage(rekClient, bucket, image);
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.detect_labels_s3.main]
    public static void getLabelsfromImage(RekognitionClient rekClient, String
 bucket, String image) {

        try {
            S3Object s3Object = S3Object.builder()
                .bucket(bucket)
                .name(image)
                .build() ;

            Image myImage = Image.builder()
                .s3Object(s3Object)
                .build();

            DetectLabelsRequest detectLabelsRequest =
 DetectLabelsRequest.builder()
                .image(myImage)
                .maxLabels(10)
                .build();

            DetectLabelsResponse labelsResponse =
 rekClient.detectLabels(detectLabelsRequest);
            List<Label> labels = labelsResponse.labels();
```

```
            System.out.println("Detected labels for the given photo");
            for (Label label: labels) {
                System.out.println(label.name() + ": " +
 label.confidence().toString());
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
 // snippet-end:[rekognition.java2.detect_labels.main]
}
```

Python

This example displays the labels that were detected in the input image. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def detect_labels(photo, bucket):

     session = boto3.Session(profile_name='profile-name')
     client = session.client('rekognition')

     response = client.detect_labels(Image={'S3Object':
{'Bucket':bucket,'Name':photo}},
     MaxLabels=10,
     # Uncomment to use image properties and filtration settings
     #Features=["GENERAL_LABELS", "IMAGE_PROPERTIES"],
     #Settings={"GeneralLabels": {"LabelInclusionFilters":["Cat"]},
     # "ImageProperties": {"MaxDominantColors":10}}
     )

     print('Detected labels for ' + photo)
     print()
```

```
    for label in response['Labels']:
        print("Label: " + label['Name'])
        print("Confidence: " + str(label['Confidence']))
        print("Instances:")

        for instance in label['Instances']:
            print(" Bounding box")
            print(" Top: " + str(instance['BoundingBox']['Top']))
            print(" Left: " + str(instance['BoundingBox']['Left']))
            print(" Width: " + str(instance['BoundingBox']['Width']))
            print(" Height: " + str(instance['BoundingBox']['Height']))
            print(" Confidence: " + str(instance['Confidence']))
            print()

        print("Parents:")
        for parent in label['Parents']:
           print(" " + parent['Name'])

        print("Aliases:")
        for alias in label['Aliases']:
            print(" " + alias['Name'])

            print("Categories:")
        for category in label['Categories']:
            print(" " + category['Name'])
            print("----------")
            print()

    if "ImageProperties" in str(response):
        print("Background:")
        print(response["ImageProperties"]["Background"])
        print()
        print("Foreground:")
        print(response["ImageProperties"]["Foreground"])
        print()
        print("Quality:")
        print(response["ImageProperties"]["Quality"])
        print()

    return len(response['Labels'])

def main():
    photo = 'photo-name'
    bucket = 'amzn-s3-demo-bucket'
```

```
    label_count = detect_labels(photo, bucket)
    print("Labels detected: " + str(label_count))

if __name__ == "__main__":
    main()
```

Node.Js

This example displays information about labels detected in an image.

Change the value of `photo` to the path and file name of an image file that contains one or more celebrity faces. Change the value of `bucket` to the name of the S3 bucket containing the provided image file. Change the value of `REGION` to the name of the region associated with your account. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
// Import required AWS SDK clients and commands for Node.js
import { DetectLabelsCommand } from  "@aws-sdk/client-rekognition";
import  { RekognitionClient } from "@aws-sdk/client-rekognition";

import {fromIni} from '@aws-sdk/credential-providers';

// Set the AWS Region.
const REGION = "region-name"; //e.g. "us-east-1"

// Create SNS service object.
const rekogClient = new RekognitionClient({
  region: REGION,
  credentials: fromIni({
       profile: 'profile-name',
  }),
});

const bucket = 'bucket-name'
const photo = 'photo-name'

// Set params
const params = {For example, to grant
    Image: {
      S3Object: {
        Bucket: bucket,
        Name: photo
```

```
      },
    },
  }

const detect_labels = async () => {
    try {
        const response = await rekogClient.send(new
 DetectLabelsCommand(params));
        console.log(response.Labels)
        response.Labels.forEach(label =>{
            console.log(`Confidence: ${label.Confidence}`)
            console.log(`Name: ${label.Name}`)
            console.log('Instances:')
            label.Instances.forEach(instance => {
                console.log(instance)
            })
            console.log('Parents:')
            label.Parents.forEach(name => {
                console.log(name)
            })
            console.log("-------")
        })
        return response; // For unit tests.
      } catch (err) {
        console.log("Error", err);
      }
};

detect_labels();
```

.NET

This example displays a list of labels that were detected in the input image. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;
```

```
public class DetectLabels
{
    public static void Example()
    {
        String photo = "input.jpg";
        String bucket = "amzn-s3-demo-bucket";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        DetectLabelsRequest detectlabelsRequest = new DetectLabelsRequest()
        {
            Image = new Image()
            {
                S3Object = new S3Object()
                {
                    Name = photo,
                    Bucket = bucket
                },
            },
            MaxLabels = 10,
            MinConfidence = 75F
        };

        try
        {
            DetectLabelsResponse detectLabelsResponse =
 rekognitionClient.DetectLabels(detectlabelsRequest);
            Console.WriteLine("Detected labels for " + photo);
            foreach (Label label in detectLabelsResponse.Labels)
                Console.WriteLine("{0}: {1}", label.Name, label.Confidence);
        }
        catch (Exception e)
        {
            Console.WriteLine(e.Message);
        }
    }
}
```

Ruby

This example displays a list of labels that were detected in the input image. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2.

```
 # Add to your Gemfile
 # gem 'aws-sdk-rekognition'
 require 'aws-sdk-rekognition'
 credentials = Aws::Credentials.new(
    ENV['AWS_ACCESS_KEY_ID'],
    ENV['AWS_SECRET_ACCESS_KEY']
 )
 bucket = 'bucket' # the bucket name without s3://
 photo  = 'photo' # the name of file
 client   = Aws::Rekognition::Client.new credentials: credentials
 attrs = {
   image: {
     s3_object: {
       bucket: bucket,
       name: photo
     },
   },
   max_labels: 10
 }
response = client.detect_labels attrs
puts "Detected labels for: #{photo}"
response.labels.each do |label|
  puts "Label:      #{label.name}"
  puts "Confidence: #{label.confidence}"
  puts "Instances:"
  label['instances'].each do |instance|
    box = instance['bounding_box']
    puts "  Bounding box:"
    puts "    Top:        #{box.top}"
    puts "    Left:       #{box.left}"
    puts "    Width:      #{box.width}"
    puts "    Height:     #{box.height}"
    puts "  Confidence: #{instance.confidence}"
  end
```

```
    puts "Parents:"
    label.parents.each do |parent|
      puts "  #{parent.name}"
    end
    puts "------------"
    puts ""
  end
```

Example response

The response from `DetectLabels` is an array of labels detected in the image and the level of confidence by which they were detected.

When you perform the `DetectLabels` operation on an image, Amazon Rekognition returns output similar to the following example response.

The response shows that the operation detected multiple labels including Person, Vehicle, and Car. Each label has an associated level of confidence. For example, the detection algorithm is 98.991432% confident that the image contains a person.

The response also includes the ancestor labels for a label in the `Parents` array. For example, the label Automobile has two parent labels named Vehicle and Transportation.

The response for common object labels includes bounding box information for the location of the label on the input image. For example, the Person label has an instances array containing two bounding boxes. These are the locations of two people detected in the image.

The field `LabelModelVersion` contains the version number of the detection model used by `DetectLabels`.

For more information about using the `DetectLabels` operation, see *Detecting objects and concepts*.


```
{

    {
    "Labels": [
        {
            "Name": "Vehicle",
            "Confidence": 99.15271759033203,
            "Instances": [],
```

```
            "Parents": [
                {
                    "Name": "Transportation"
                }
            ]
        },
        {
            "Name": "Transportation",
            "Confidence": 99.15271759033203,
            "Instances": [],
            "Parents": []
        },
        {
            "Name": "Automobile",
            "Confidence": 99.15271759033203,
            "Instances": [],
            "Parents": [
                {
                    "Name": "Vehicle"
                },
                {
                    "Name": "Transportation"
                }
            ]
        },
        {
            "Name": "Car",
            "Confidence": 99.15271759033203,
            "Instances": [
                {
                    "BoundingBox": {
                        "Width": 0.10616336017847061,
                        "Height": 0.18528179824352264,
                        "Left": 0.0037978808395564556,
                        "Top": 0.5039216876029968
                    },
                    "Confidence": 99.15271759033203
                },
                {
                    "BoundingBox": {
                        "Width": 0.2429988533258438,
                        "Height": 0.21577216684818268,
                        "Left": 0.7309805154800415,
                        "Top": 0.5251884460449219
```

```
            },
            "Confidence": 99.1286392211914
        },
        {
            "BoundingBox": {
                "Width": 0.14233611524105072,
                "Height": 0.15528248250484467,
                "Left": 0.6494812965393066,
                "Top": 0.5333095788955688
            },
            "Confidence": 98.48368072509766
        },
        {
            "BoundingBox": {
                "Width": 0.11086395382881165,
                "Height": 0.10271988064050674,
                "Left": 0.10355594009160995,
                "Top": 0.5354844927787781
            },
            "Confidence": 96.45606231689453
        },
        {
            "BoundingBox": {
                "Width": 0.06254628300666809,
                "Height": 0.053911514580249786,
                "Left": 0.46083059906959534,
                "Top": 0.5573825240135193
            },
            "Confidence": 93.65448760986328
        },
        {
            "BoundingBox": {
                "Width": 0.10105438530445099,
                "Height": 0.12226245552301407,
                "Left": 0.5743985772132874,
                "Top": 0.534368634223938
            },
            "Confidence": 93.06217193603516
        },
        {
            "BoundingBox": {
                "Width": 0.056389667093753815,
                "Height": 0.17163699865341187,
                "Left": 0.9427769780158997,
```

```
                "Top": 0.5235804319381714
            },
            "Confidence": 92.6864013671875
        },
        {
            "BoundingBox": {
                "Width": 0.06003860384225845,
                "Height": 0.06737709045410156,
                "Left": 0.22409997880458832,
                "Top": 0.5441341400146484
            },
            "Confidence": 90.4227066040039
        },
        {
            "BoundingBox": {
                "Width": 0.02848697081208229,
                "Height": 0.19150497019290924,
                "Left": 0.0,
                "Top": 0.5107086896896362
            },
            "Confidence": 86.65286254882812
        },
        {
            "BoundingBox": {
                "Width": 0.04067881405353546,
                "Height": 0.03428703173995018,
                "Left": 0.316415935754776,
                "Top": 0.5566273927688599
            },
            "Confidence": 85.36471557617188
        },
        {
            "BoundingBox": {
                "Width": 0.043411049991846085,
                "Height": 0.0893595889210701,
                "Left": 0.18293385207653046,
                "Top": 0.5394920110702515
            },
            "Confidence": 82.21705627441406
        },
        {
            "BoundingBox": {
                "Width": 0.031183116137981415,
                "Height": 0.03989990055561066,
```

```
                    "Left": 0.2853088080883026,
                    "Top": 0.5579366683959961
                },
                "Confidence": 81.0157470703125
            },
            {
                "BoundingBox": {
                    "Width": 0.031113790348172188,
                    "Height": 0.056484755128622055,
                    "Left": 0.2580395042896271,
                    "Top": 0.5504819750785828
                },
                "Confidence": 56.13441467285156
            },
            {
                "BoundingBox": {
                    "Width": 0.08586374670267105,
                    "Height": 0.08550430089235306,
                    "Left": 0.5128012895584106,
                    "Top": 0.5438792705535889
                },
                "Confidence": 52.37760925292969
            }
        ],
        "Parents": [
            {
                "Name": "Vehicle"
            },
            {
                "Name": "Transportation"
            }
        ]
    },
    {
        "Name": "Human",
        "Confidence": 98.9914321899414,
        "Instances": [],
        "Parents": []
    },
    {
        "Name": "Person",
        "Confidence": 98.9914321899414,
        "Instances": [
            {
```

```
                    "BoundingBox": {
                        "Width": 0.19360728561878204,
                        "Height": 0.2742200493812561,
                        "Left": 0.43734854459762573,
                        "Top": 0.35072067379951477
                    },
                    "Confidence": 98.9914321899414
                },
                {
                    "BoundingBox": {
                        "Width": 0.03801717236638069,
                        "Height": 0.06597328186035156,
                        "Left": 0.9155802130699158,
                        "Top": 0.5010883808135986
                    },
                    "Confidence": 85.02790832519531
                }
            ],
            "Parents": []
        }
    ],
    "LabelModelVersion": "2.0"
}


}
```

Analyzing an image loaded from a local file system

Amazon Rekognition Image operations can analyze images that are supplied as image bytes or images stored in an Amazon S3 bucket.

These topics provide examples of supplying image bytes to Amazon Rekognition Image API operations by using a file loaded from a local file system. You pass image bytes to an Amazon Rekognition API operation by using the Image input parameter. Within `Image`, you specify the `Bytes` property to pass base64-encoded image bytes.

Image bytes passed to an Amazon Rekognition API operation by using the `Bytes` input parameter must be base64 encoded. The AWS SDKs that these examples use automatically base64-encode images. You don't need to encode image bytes before calling an Amazon Rekognition API operation. For more information, see Image specifications.

In this example JSON request for `DetectLabels`, the source image bytes are passed in the `Bytes` input parameter.

```
{
    "Image": {
        "Bytes": "/9j/4AAQSk....."
    },
    "MaxLabels": 10,
    "MinConfidence": 77
}
```

The following examples use various AWS SDKs and the AWS CLI to call `DetectLabels`. For information about the `DetectLabels` operation response, see DetectLabels response.

For a client-side JavaScript example, see Using JavaScript.

To detect labels in a local image

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `DetectLabels` operation.

   Java

   The following Java example shows how to load an image from the local file system and detect labels by using the detectLabels AWS SDK operation. Change the value of `photo` to the path and file name of an image file (.jpg or .png format).

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import java.io.File;
import java.io.FileInputStream;
import java.io.InputStream;
```

```
import java.nio.ByteBuffer;
import java.util.List;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.AmazonClientException;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
import com.amazonaws.services.rekognition.model.DetectLabelsRequest;
import com.amazonaws.services.rekognition.model.DetectLabelsResult;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.Label;
import com.amazonaws.util.IOUtils;

public class DetectLabelsLocalFile {
    public static void main(String[] args) throws Exception {
     String photo="input.jpg";


        ByteBuffer imageBytes;
        try (InputStream inputStream = new FileInputStream(new File(photo))) {
            imageBytes = ByteBuffer.wrap(IOUtils.toByteArray(inputStream));
        }


        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

        DetectLabelsRequest request = new DetectLabelsRequest()
                .withImage(new Image()
                        .withBytes(imageBytes))
                .withMaxLabels(10)
                .withMinConfidence(77F);

        try {

            DetectLabelsResult result =
 rekognitionClient.detectLabels(request);
            List <Label> labels = result.getLabels();

            System.out.println("Detected labels for " + photo);
            for (Label label: labels) {
               System.out.println(label.getName() + ": " +
 label.getConfidence().toString());
            }
```

```
        } catch (AmazonRekognitionException e) {
            e.printStackTrace();
        }

    }
}
```

Python

The following AWS SDK for Python example shows how to load an image from the local file system and call the detect_labels operation. Change the value of photo to the path and file name of an image file (.jpg or .png format).

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def detect_labels_local_file(photo):


    client=boto3.client('rekognition')

    with open(photo, 'rb') as image:
        response = client.detect_labels(Image={'Bytes': image.read()})

    print('Detected labels in ' + photo)
    for label in response['Labels']:
        print (label['Name'] + ' : ' + str(label['Confidence']))

    return len(response['Labels'])

def main():
    photo='photo'

    label_count=detect_labels_local_file(photo)
    print("Labels detected: " + str(label_count))


if __name__ == "__main__":
    main()
```

.NET

The following example shows how to load an image from the local file system and detect labels by using the `DetectLabels` operation. Change the value of `photo` to the path and file name of an image file (.jpg or .png format).

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using System.IO;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class DetectLabelsLocalfile
{
    public static void Example()
    {
        String photo = "input.jpg";

        Amazon.Rekognition.Model.Image image = new
 Amazon.Rekognition.Model.Image();
        try
        {
            using (FileStream fs = new FileStream(photo, FileMode.Open,
 FileAccess.Read))
            {
                byte[] data = null;
                data = new byte[fs.Length];
                fs.Read(data, 0, (int)fs.Length);
                image.Bytes = new MemoryStream(data);
            }
        }
        catch (Exception)
        {
            Console.WriteLine("Failed to load file " + photo);
            return;
        }
```

```
        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        DetectLabelsRequest detectlabelsRequest = new DetectLabelsRequest()
        {
            Image = image,
            MaxLabels = 10,
            MinConfidence = 77F
        };

        try
        {
            DetectLabelsResponse detectLabelsResponse =
 rekognitionClient.DetectLabels(detectlabelsRequest);
            Console.WriteLine("Detected labels for " + photo);
            foreach (Label label in detectLabelsResponse.Labels)
                Console.WriteLine("{0}: {1}", label.Name, label.Confidence);
        }
        catch (Exception e)
        {
            Console.WriteLine(e.Message);
        }
    }
}
```

PHP

The following AWS SDK for PHP example shows how to load an image from the local file system and call the DetectFaces API operation. Change the value of photo to the path and file name of an image file (.jpg or .png format).

```
<?php
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    require 'vendor/autoload.php';

    use Aws\Rekognition\RekognitionClient;

    $options = [
```

```
        'region'            => 'us-west-2',
         'version'           => 'latest'
    ];

    $rekognition = new RekognitionClient($options);

    // Get local image
    $photo = 'input.jpg';
    $fp_image = fopen($photo, 'r');
    $image = fread($fp_image, filesize($photo));
    fclose($fp_image);


    // Call DetectFaces
    $result = $rekognition->DetectFaces(array(
       'Image' => array(
          'Bytes' => $image,
       ),
       'Attributes' => array('ALL')
       )
    );

    // Display info for each detected person
    print 'People: Image position and estimated age' . PHP_EOL;
    for ($n=0;$n<sizeof($result['FaceDetails']); $n++){

      print 'Position: ' . $result['FaceDetails'][$n]['BoundingBox']['Left'] . "
 "
      . $result['FaceDetails'][$n]['BoundingBox']['Top']
      . PHP_EOL
      . 'Age (low): '.$result['FaceDetails'][$n]['AgeRange']['Low']
      .  PHP_EOL
      . 'Age (high): ' . $result['FaceDetails'][$n]['AgeRange']['High']
      .  PHP_EOL . PHP_EOL;
    }
?>
```

Ruby

This example displays a list of labels that were detected in the input image. Change the value of `photo` to the path and file name of an image file (.jpg or .png format).

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
```

```
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    # gem 'aws-sdk-rekognition'
    require 'aws-sdk-rekognition'
    credentials = Aws::Credentials.new(
       ENV['AWS_ACCESS_KEY_ID'],
       ENV['AWS_SECRET_ACCESS_KEY']
    )
    client   = Aws::Rekognition::Client.new credentials: credentials
    photo = 'photo.jpg'
    path = File.expand_path(photo) # expand path relative to the current
 directory
    file = File.read(path)
    attrs = {
      image: {
        bytes: file
      },
      max_labels: 10
    }
    response = client.detect_labels attrs
    puts "Detected labels for: #{photo}"
    response.labels.each do |label|
      puts "Label:      #{label.name}"
      puts "Confidence: #{label.confidence}"
      puts "Instances:"
      label['instances'].each do |instance|
        box = instance['bounding_box']
        puts "  Bounding box:"
        puts "    Top:        #{box.top}"
        puts "    Left:       #{box.left}"
        puts "    Width:      #{box.width}"
        puts "    Height:     #{box.height}"
        puts "  Confidence: #{instance.confidence}"
      end
      puts "Parents:"
      label.parents.each do |parent|
        puts "  #{parent.name}"
      end
      puts "------------"
      puts ""
    end
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.*;

import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DetectLabels {
    public static void main(String[] args) {
        final String usage = """
            Usage: <bucketName> <sourceImage>

            Where:
                bucketName - The name of the Amazon S3 bucket where the image is
 stored
                sourceImage - The name of the image file (for example,
 pic1.png).\s
            """;

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucketName = args[0] ;
        String sourceImage = args[1] ;
```

```
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        detectImageLabels(rekClient, bucketName, sourceImage);
        rekClient.close();
    }

    /**
     * Detects the labels in an image stored in an Amazon S3 bucket using the
Amazon Rekognition service.
     *
     * @param rekClient     the Amazon Rekognition client used to make the
detection request
     * @param bucketName    the name of the Amazon S3 bucket where the image is
stored
     * @param sourceImage   the name of the image file to be analyzed
     */
    public static void detectImageLabels(RekognitionClient rekClient, String
bucketName, String sourceImage) {
        try {
            S3Object s3ObjectTarget = S3Object.builder()
                    .bucket(bucketName)
                    .name(sourceImage)
                    .build();

            Image souImage = Image.builder()
                    .s3Object(s3ObjectTarget)
                    .build();

            DetectLabelsRequest detectLabelsRequest =
DetectLabelsRequest.builder()
                    .image(souImage)
                    .maxLabels(10)
                    .build();

            DetectLabelsResponse labelsResponse =
rekClient.detectLabels(detectLabelsRequest);
            List<Label> labels = labelsResponse.labels();
            System.out.println("Detected labels for the given photo");
            for (Label label : labels) {
                System.out.println(label.name() + ": " +
label.confidence().toString());
```

```
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

Using JavaScript

The following JavaScript webpage example allows a user to choose an image and view the estimated ages of faces that are detected in the image. The estimated ages are returned by a call to DetectFaces.

The chosen image is loaded by using the JavaScript `FileReader.readAsDataURL` function, which base64-encodes the image. This is useful for displaying the image on an HTML canvas. But, it means the image bytes have to be unencoded before they're passed to an Amazon Rekognition Image operation. This example shows how to unencode the loaded image bytes. If the encoded image bytes aren't useful to you, use `FileReader.readAsArrayBuffer` instead because the loaded image isn't encoded. This means that Amazon Rekognition Image operations can be called without first unencoding the image bytes. For an example, see Using readAsArrayBuffer.

To run the JavaScript example

1. Load the example source code into an editor.
2. Get the Amazon Cognito identity pool identifier. For more information, see Getting the Amazon Cognito identity pool identifier.
3. In the AnonLog function of the example code, change `IdentityPoolIdToUse` and `RegionToUse` to the values that you noted in step 9 of Getting the Amazon Cognito identity pool identifier.
4. In the `DetectFaces` function, change `RegionToUse` to the value you used in the previous step.
5. Save the example source code as an `.html` file.
6. Load the file into your browser.
7. Choose the **Browse...** button, and choose an image that contains one or more faces. A table is shown that contains the estimated ages for each face detected in the image.

Note

The following code example uses two scripts that are no longer part of Amazon Cognito. To get these files, follow the links for aws-cognito-sdk.min.js and amazon-cognito-identity.min.js, then save the text from each as seperate `.js` files.

JavaScript example code

The following code example uses JavaScript V2. For an example in JavaScript V3, see the example in the AWS Documentation SDK examples GitHub repository.

```
<!--
Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-
rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
-->
<!DOCTYPE html>
<html>
<head>
  <script src="aws-cognito-sdk.min.js"></script>
  <script src="amazon-cognito-identity.min.js"></script>
  <script src="https://sdk.amazonaws.com/js/aws-sdk-2.16.0.min.js"></script>
  <meta charset="UTF-8">
  <title>Rekognition</title>
</head>

<body>
  <H1>Age Estimator</H1>
  <input type="file" name="fileToUpload" id="fileToUpload" accept="image/*">
  <p id="opResult"></p>
</body>
<script>

  document.getElementById("fileToUpload").addEventListener("change", function (event) {
    ProcessImage();
  }, false);

  //Calls DetectFaces API and shows estimated ages of detected faces
  function DetectFaces(imageData) {
    AWS.region = "RegionToUse";
    var rekognition = new AWS.Rekognition();
```

```
    var params = {
      Image: {
        Bytes: imageData
      },
      Attributes: [
        'ALL',
      ]
    };
    rekognition.detectFaces(params, function (err, data) {
      if (err) console.log(err, err.stack); // an error occurred
      else {
       var table = "<table><tr><th>Low</th><th>High</th></tr>";
        // show each face and build out estimated age table
        for (var i = 0; i < data.FaceDetails.length; i++) {
          table += '<tr><td>' + data.FaceDetails[i].AgeRange.Low +
            '</td><td>' + data.FaceDetails[i].AgeRange.High + '</td></tr>';
        }
        table += "</table>";
        document.getElementById("opResult").innerHTML = table;
      }
    });
  }
  //Loads selected image and unencodes image bytes for Rekognition DetectFaces API
  function ProcessImage() {
    AnonLog();
    var control = document.getElementById("fileToUpload");
    var file = control.files[0];

    // Load base64 encoded image
    var reader = new FileReader();
    reader.onload = (function (theFile) {
      return function (e) {
        var img = document.createElement('img');
        var image = null;
        img.src = e.target.result;
        var jpg = true;
        try {
          image = atob(e.target.result.split("")[1]);

        } catch (e) {
          jpg = false;
        }
        if (jpg == false) {
          try {
```

```
            image = atob(e.target.result.split("")[1]);
          } catch (e) {
            alert("Not an image file Rekognition can process");
            return;
          }
        }
        //unencode image bytes for Rekognition DetectFaces API
        var length = image.length;
        imageBytes = new ArrayBuffer(length);
        var ua = new Uint8Array(imageBytes);
        for (var i = 0; i < length; i++) {
          ua[i] = image.charCodeAt(i);
        }
        //Call Rekognition
        DetectFaces(ua);
      };
    })(file);
    reader.readAsDataURL(file);
  }
  //Provides anonymous log on to AWS services
  function AnonLog() {

    // Configure the credentials provider to use your identity pool
    AWS.config.region = 'RegionToUse'; // Region
    AWS.config.credentials = new AWS.CognitoIdentityCredentials({
      IdentityPoolId: 'IdentityPoolIdToUse',
    });
    // Make the call to obtain credentials
    AWS.config.credentials.get(function () {
      // Credentials will be available when this function is called.
      var accessKeyId = AWS.config.credentials.accessKeyId;
      var secretAccessKey = AWS.config.credentials.secretAccessKey;
      var sessionToken = AWS.config.credentials.sessionToken;
    });
  }
</script>
</html>
```

Using readAsArrayBuffer

The following code snippet is an alternative implementation of the `ProcessImage` function in the sample code, using JavaScript V2. It uses `readAsArrayBuffer` to load an image and call

DetectFaces. Because readAsArrayBuffer doesn't base64-encode the loaded file, it's not necessary to unencode the image bytes before calling an Amazon Rekognition Image operation.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-
rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

function ProcessImage() {
    AnonLog();
    var control = document.getElementById("fileToUpload");
    var file = control.files[0];

    // Load base64 encoded image for display
    var reader = new FileReader();
    reader.onload = (function (theFile) {
      return function (e) {
        //Call Rekognition
        AWS.region = "RegionToUse";
        var rekognition = new AWS.Rekognition();
        var params = {
          Image: {
          Bytes: e.target.result
        },
        Attributes: [
        'ALL',
      ]
    };
    rekognition.detectFaces(params, function (err, data) {
      if (err) console.log(err, err.stack); // an error occurred
      else {
       var table = "<table><tr><th>Low</th><th>High</th></tr>";
        // show each face and build out estimated age table
        for (var i = 0; i < data.FaceDetails.length; i++) {
          table += '<tr><td>' + data.FaceDetails[i].AgeRange.Low +
            '</td><td>' + data.FaceDetails[i].AgeRange.High + '</td></tr>';
        }
        table += "</table>";
        document.getElementById("opResult").innerHTML = table;
      }
    });

      };
    })(file);
```

```
    reader.readAsArrayBuffer(file);
  }
```

Getting the Amazon Cognito identity pool identifier

For simplicity, the example uses an anonymous Amazon Cognito identity pool to provide unauthenticated access to the Amazon Rekognition Image API. This might be suitable for your needs. For example, you can use unauthenticated access to provide free, or trial, access to your website before users sign up. To provide authenticated access, use an Amazon Cognito user pool. For more information, see Amazon Cognito User Pool.

The following procedure shows how to create an identity pool that enables access to unauthenticated identities, and how to get the identity pool identifier that's needed in the example code.

To get the identity pool identifier

1. Open the Amazon Cognito console.
2. Choose **Create new identity pool**.
3. For **Identity pool name***, type a name for your identity pool.
4. In **Unauthenticated identities**, choose **Enable access to unauthenticated identities**.
5. Choose **Create Pool**.
6. Choose **View Details**, and note the role name for unauthenticated identities.
7. Choose **Allow**.
8. In **Platform**, choose **JavaScript**.
9. In **Get AWS Credentials**, note the values of `AWS.config.region` and `IdentityPooldId` that are shown in the code snippet.
10. Open the IAM console at https://console.aws.amazon.com/iam/.
11. In the navigation pane, choose **Roles**.
12. Choose the role name that you noted in step 6.
13. In the **Permissions** tab, choose **Attach Policies**.
14. Choose **AmazonRekognitionReadOnlyAccess**.
15. Choose **Attach Policy**.

Displaying bounding boxes

Amazon Rekognition Image operations can return bounding boxes coordinates for items that are detected in images. For example, the DetectFaces operation returns a bounding box (BoundingBox) for each face detected in an image. You can use the bounding box coordinates to display a box around detected items. For example, the following image shows a bounding box surrounding a face.

A `BoundingBox` has the following properties:

- Height – The height of the bounding box as a ratio of the overall image height.
- Left – The left coordinate of the bounding box as a ratio of overall image width.
- Top – The top coordinate of the bounding box as a ratio of overall image height.
- Width – The width of the bounding box as a ratio of the overall image width.

Each BoundingBox property has a value between 0 and 1. Each property value is a ratio of the overall image width (`Left` and `Width`) or height (`Height` and `Top`). For example, if the input image is 700 x 200 pixels, and the top-left coordinate of the bounding box is 350 x 50 pixels, the API returns a `Left` value of 0.5 (350/700) and a `Top` value of 0.25 (50/200).

The following diagram shows the range of an image that each bounding box property covers.

To display the bounding box with the correct location and size, you have to multiply the BoundingBox values by the image width or height (depending on the value you want) to get the pixel values. You use the pixel values to display the bounding box. For example, the pixel dimensions of the previous image are 608 width x 588 height. The bounding box values for the face are:

```
BoundingBox.Left: 0.3922065
BoundingBox.Top: 0.15567766
BoundingBox.Width: 0.284666
BoundingBox.Height: 0.2930403
```

The location of the face bounding box in pixels is calculated as follows:

```
Left coordinate = BoundingBox.Left (0.3922065) * image width (608) = 238

Top coordinate = BoundingBox.Top (0.15567766) * image height (588) = 91

Face width = BoundingBox.Width (0.284666) * image width (608) = 173

Face height = BoundingBox.Height (0.2930403) * image height (588) = 172
```

You use these values to display a bounding box around the face.

> **Note**
>
> An image can be orientated in various ways. Your application might need to rotate the image to display it with the correction orientation. Bounding box coordinates are affected

by the orientation of the image. You might need to translate the coordinates before you can display a bounding box at the right location. For more information, see Getting image orientation and bounding box coordinates.

The following examples show how to display a bounding box around faces that are detected by calling DetectFaces. The examples assume that the images are oriented to 0 degrees. The examples also show how to download the image from an Amazon S3 bucket.

To display a bounding box

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following examples to call the `DetectFaces` operation.

   Java

   Change the value of `bucket` to the Amazon S3 bucket that contains the image file. Change the value of `photo` to the file name of an image file (.jpg or .png format).

```
//Loads images, detects faces and draws bounding boxes.Determines exif
 orientation, if necessary.
package com.amazonaws.samples;

//Import the basic graphics classes.
import java.awt.*;
import java.awt.image.BufferedImage;
import java.util.List;
import javax.imageio.ImageIO;
import javax.swing.*;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
```

```
import com.amazonaws.services.rekognition.model.BoundingBox;
import com.amazonaws.services.rekognition.model.DetectFacesRequest;
import com.amazonaws.services.rekognition.model.DetectFacesResult;
import com.amazonaws.services.rekognition.model.FaceDetail;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.S3Object;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3ClientBuilder;
import com.amazonaws.services.s3.model.S3ObjectInputStream;

// Calls DetectFaces and displays a bounding box around each detected image.
public class DisplayFaces extends JPanel {

    private static final long serialVersionUID = 1L;

    BufferedImage image;
    static int scale;
    DetectFacesResult result;

    public DisplayFaces(DetectFacesResult facesResult, BufferedImage bufImage)
 throws Exception {
        super();
        scale = 1; // increase to shrink image size.

        result = facesResult;
        image = bufImage;


    }
    // Draws the bounding box around the detected faces.
    public void paintComponent(Graphics g) {
        float left = 0;
        float top = 0;
        int height = image.getHeight(this);
        int width = image.getWidth(this);

        Graphics2D g2d = (Graphics2D) g; // Create a Java2D version of g.

        // Draw the image.
        g2d.drawImage(image, 0, 0, width / scale, height / scale, this);
        g2d.setColor(new Color(0, 212, 0));

        // Iterate through faces and display bounding boxes.
        List<FaceDetail> faceDetails = result.getFaceDetails();
```

```
        for (FaceDetail face : faceDetails) {

            BoundingBox box = face.getBoundingBox();
            left = width * box.getLeft();
            top = height * box.getTop();
            g2d.drawRect(Math.round(left / scale), Math.round(top / scale),
                    Math.round((width * box.getWidth()) / scale),
Math.round((height * box.getHeight())) / scale);

        }
    }


    public static void main(String arg[]) throws Exception {

        String photo = "photo.png";
        String bucket = "bucket";
        int height = 0;
        int width = 0;

        // Get the image from an S3 Bucket
        AmazonS3 s3client = AmazonS3ClientBuilder.defaultClient();

        com.amazonaws.services.s3.model.S3Object s3object =
s3client.getObject(bucket, photo);
        S3ObjectInputStream inputStream = s3object.getObjectContent();
        BufferedImage image = ImageIO.read(inputStream);
        DetectFacesRequest request = new DetectFacesRequest()
                .withImage(new Image().withS3Object(new
S3Object().withName(photo).withBucket(bucket)));

        width = image.getWidth();
        height = image.getHeight();

        // Call DetectFaces
        AmazonRekognition amazonRekognition =
AmazonRekognitionClientBuilder.defaultClient();
        DetectFacesResult result = amazonRekognition.detectFaces(request);

        //Show the bounding box info for each face.
        List<FaceDetail> faceDetails = result.getFaceDetails();
        for (FaceDetail face : faceDetails) {

            BoundingBox box = face.getBoundingBox();
```

```
            float left = width * box.getLeft();
            float top = height * box.getTop();
            System.out.println("Face:");

            System.out.println("Left: " + String.valueOf((int) left));
            System.out.println("Top: " + String.valueOf((int) top));
            System.out.println("Face Width: " + String.valueOf((int) (width *
 box.getWidth())));
            System.out.println("Face Height: " + String.valueOf((int) (height *
 box.getHeight())));
            System.out.println();

        }

        // Create frame and panel.
        JFrame frame = new JFrame("RotateImage");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        DisplayFaces panel = new DisplayFaces(result, image);
        panel.setPreferredSize(new Dimension(image.getWidth() / scale,
 image.getHeight() / scale));
        frame.setContentPane(panel);
        frame.pack();
        frame.setVisible(true);

    }
}
```

Python

Change the value of `bucket` to the Amazon S3 bucket that contains the image file. Change the value of `photo` to the file name of an image file (.jpg or .png format). Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
import boto3
import io
from PIL import Image, ImageDraw

def show_faces(photo, bucket):

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')
```

```
    # Load image from S3 bucket
    s3_connection = boto3.resource('s3')
    s3_object = s3_connection.Object(bucket, photo)
    s3_response = s3_object.get()

    stream = io.BytesIO(s3_response['Body'].read())
    image = Image.open(stream)

    # Call DetectFaces
    response = client.detect_faces(Image={'S3Object': {'Bucket': bucket, 'Name':
 photo}},
                                   Attributes=['ALL'])

    imgWidth, imgHeight = image.size
    draw = ImageDraw.Draw(image)

    # calculate and display bounding boxes for each detected face
    print('Detected faces for ' + photo)
    for faceDetail in response['FaceDetails']:
        print('The detected face is between ' + str(faceDetail['AgeRange']
['Low'])
              + ' and ' + str(faceDetail['AgeRange']['High']) + ' years old')

        box = faceDetail['BoundingBox']
        left = imgWidth * box['Left']
        top = imgHeight * box['Top']
        width = imgWidth * box['Width']
        height = imgHeight * box['Height']

        print('Left: ' + '{0:.0f}'.format(left))
        print('Top: ' + '{0:.0f}'.format(top))
        print('Face Width: ' + "{0:.0f}".format(width))
        print('Face Height: ' + "{0:.0f}".format(height))

        points = (
            (left, top),
            (left + width, top),
            (left + width, top + height),
            (left, top + height),
            (left, top)

        )
        draw.line(points, fill='#00d400', width=2)
```

```
        # Alternatively can draw rectangle. However you can't set line width.
        # draw.rectangle([left,top, left + width, top + height],
 outline='#00d400')

    image.show()

    return len(response['FaceDetails'])

def main():
    bucket = "bucket-name"
    photo = "photo-name"
    faces_count = show_faces(photo, bucket)
    print("faces detected: " + str(faces_count))

if __name__ == "__main__":
    main()
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

Note that `s3` refers to the AWS SDK Amazon Amazon S3 client and `rekClient` refers to the AWS SDK Amazon Rekognition client.

```
//snippet-start:[rekognition.java2.detect_labels.import]
import java.awt.*;
import java.awt.image.BufferedImage;
import java.io.ByteArrayInputStream;
import java.io.FileNotFoundException;
import java.io.IOException;
import java.io.InputStream;
import java.util.List;
import javax.imageio.ImageIO;
import javax.swing.*;
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.core.ResponseBytes;
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.model.Attribute;
import software.amazon.awssdk.services.rekognition.model.BoundingBox;
import software.amazon.awssdk.services.rekognition.model.DetectFacesRequest;
```

```
import software.amazon.awssdk.services.rekognition.model.DetectFacesResponse;
import software.amazon.awssdk.services.rekognition.model.FaceDetail;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.s3.S3Client;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.s3.model.GetObjectRequest;
import software.amazon.awssdk.services.s3.model.GetObjectResponse;
import software.amazon.awssdk.services.s3.model.S3Exception;
//snippet-end:[rekognition.java2.detect_labels.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class DisplayFaces extends JPanel {

    static DetectFacesResponse result;
    static BufferedImage image;
    static int scale;

    public static void main(String[] args) throws Exception {

        final String usage = "\n" +
            "Usage: " +
            "   <sourceImage> <bucketName>\n\n" +
            "Where:\n" +
            "   sourceImage - The name of the image in an Amazon S3 bucket (for
 example, people.png). \n\n" +
            "   bucketName - The name of the Amazon S3 bucket (for example,
 amzn-s3-demo-bucket). \n\n";

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String sourceImage = args[0];
        String bucketName = args[1];
```

```
        Region region = Region.US_EAST_1;
        S3Client s3 = S3Client.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        displayAllFaces(s3, rekClient, sourceImage, bucketName);
        s3.close();
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.display_faces.main]
    public static void displayAllFaces(S3Client s3,
                                       RekognitionClient rekClient,
                                       String sourceImage,
                                       String bucketName) {
        int height;
        int width;
        byte[] data = getObjectBytes (s3, bucketName, sourceImage);
        InputStream is = new ByteArrayInputStream(data);

        try {
            SdkBytes sourceBytes = SdkBytes.fromInputStream(is);
            image = ImageIO.read(sourceBytes.asInputStream());
            width = image.getWidth();
            height = image.getHeight();

            // Create an Image object for the source image
            software.amazon.awssdk.services.rekognition.model.Image souImage =
 Image.builder()
                .bytes(sourceBytes)
                .build();

            DetectFacesRequest facesRequest = DetectFacesRequest.builder()
                .attributes(Attribute.ALL)
                .image(souImage)
                .build();
```

```
            result = rekClient.detectFaces(facesRequest);

            // Show the bounding box info for each face.
            List<FaceDetail> faceDetails = result.faceDetails();
            for (FaceDetail face : faceDetails) {
                BoundingBox box = face.boundingBox();
                float left = width * box.left();
                float top = height * box.top();
                System.out.println("Face:");

                System.out.println("Left: " + (int) left);
                System.out.println("Top: " + (int) top);
                System.out.println("Face Width: " + (int) (width *
box.width()));
                System.out.println("Face Height: " + (int) (height *
box.height()));
                System.out.println();
            }

            // Create the frame and panel.
            JFrame frame = new JFrame("RotateImage");
            frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
            DisplayFaces panel = new DisplayFaces(image);
            panel.setPreferredSize(new Dimension(image.getWidth() / scale,
image.getHeight() / scale));
            frame.setContentPane(panel);
            frame.pack();
            frame.setVisible(true);

        } catch (RekognitionException | FileNotFoundException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        } catch (IOException e) {
           e.printStackTrace();
        }
    }

    public static byte[] getObjectBytes (S3Client s3, String bucketName, String
keyName) {

        try {
            GetObjectRequest objectRequest = GetObjectRequest
                .builder()
```

```
                .key(keyName)
                .bucket(bucketName)
                .build();

            ResponseBytes<GetObjectResponse> objectBytes =
s3.getObjectAsBytes(objectRequest);
            return objectBytes.asByteArray();

        } catch (S3Exception e) {
            System.err.println(e.awsErrorDetails().errorMessage());
            System.exit(1);
        }
        return null;
    }

    public DisplayFaces(BufferedImage bufImage) {
        super();
        scale = 1; // increase to shrink image size.
        image = bufImage;
    }

    // Draws the bounding box around the detected faces.
    public void paintComponent(Graphics g) {
        float left;
        float top;
        int height = image.getHeight(this);
        int width = image.getWidth(this);
        Graphics2D g2d = (Graphics2D) g; // Create a Java2D version of g.

        // Draw the image
        g2d.drawImage(image, 0, 0, width / scale, height / scale, this);
        g2d.setColor(new Color(0, 212, 0));

        // Iterate through the faces and display bounding boxes.
        List<FaceDetail> faceDetails = result.faceDetails();
        for (FaceDetail face : faceDetails) {
            BoundingBox box = face.boundingBox();
            left = width * box.left();
            top = height * box.top();
            g2d.drawRect(Math.round(left / scale), Math.round(top / scale),
                    Math.round((width * box.width()) / scale),
Math.round((height * box.height())) / scale);
        }
    }
```

```
    // snippet-end:[rekognition.java2.display_faces.main]
}
```

Getting image orientation and bounding box coordinates

Applications that use Amazon Rekognition Image commonly need to display the images that are detected by Amazon Rekognition Image operations and the boxes around detected faces. To display an image correctly in your application, you need to know the image's orientation. You might need to correct this orientation. For some .jpg files, the image's orientation is contained in the image's Exchangeable image file format (Exif) metadata.

To display a box around a face, you need the coordinates for the face's bounding box. If the box isn't oriented correctly, you might need to adjust those coordinates. Amazon Rekognition Image face detection operations return bounding box coordinates for each detected face, but it doesn't estimate coordinates for .jpg files without Exif metadata.

The following examples show how to get the bounding box coordinates for the faces detected in an image.

Use the information in this example to ensure that your images are oriented correctly and that bounding boxes are displayed in the correct location in your application.

Because the code used to rotate and display images and bounding boxes depends on the language and environment that you use, we don't explain how to display images and bounding boxes in your code, or how to get orientation information from Exif metadata.

Finding an image's orientation

To display an image correctly in your application, you might need to rotate it. The following image is oriented to 0 degrees and is displayed correctly.

However, the following image is rotated 90 degrees counterclockwise. To display it correctly, you need to find the orientation of the image and use that information in your code to rotate the image to 0 degrees.

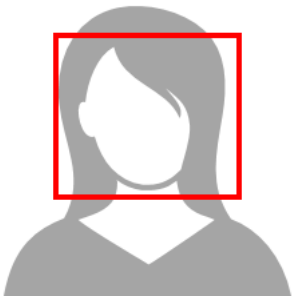
Some images in .jpg format contain orientation information in Exif metadata. If available, the Exif metadata for the image contains the orientation. In the Exif metadata, you can find the image's orientation in the `orientation` field. Although Amazon Rekognition Image identifies the presence of image orientation information in Exif metadata, it does not provide access to it. To access the Exif metadata in an image, use a third-party library or write your own code. For more information, see Exif Version 2.32.

When you know an image's orientation, you can write code to rotate and correctly display it.

Displaying bounding boxes

The Amazon Rekognition Image operations that analyze faces in an image also return the coordinates of the bounding boxes that surround the faces. For more information, see BoundingBox.

To display a bounding box around a face, similar to the box shown in the following image, in your application, use the bounding box coordinates in your code. The bounding box coordinates returned by an operation reflect the image's orientation. If you have to rotate the image to display it correctly, you might need to translate the bounding box coordinates.



Displaying bounding boxes when orientation information is present in Exif metadata

If an image's orientation is included in Exif metadata, Amazon Rekognition Image operations do the following:

- Return null in the orientation correction field in the operation's response. To rotate the image, use the orientation provided in the Exif metadata in your code.
- Return bounding box coordinates already oriented to 0 degrees. To show the bounding box in the correct position, use the coordinates that were returned. You do not need to translate them.

Example: Getting image orientation and bounding box coordinates for an image

The following examples show how to use the AWS SDK to get the Exif image orientation data and the bounding box coordinates for celebrities detected by the `RecognizeCelebrities` operation.

> **Note**
>
> Support for estimating image orientation using the the `OrientationCorrection` field has ceased as of August 2021. Any returned values for this field included in an API response will always be NULL.

Java

This example loads an image from the local file system, calls the `RecognizeCelebrities` operation, determines the height and width of the image, and calculates the bounding box coordinates of the face for the rotated image. The example does not show how to process orientation information that is stored in Exif metadata.

In the function `main`, replace the value of `photo` with the name and path of an image that is stored locally in either .png or .jpg format.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package com.amazonaws.samples;
import java.awt.image.BufferedImage;
import java.io.ByteArrayInputStream;
import java.io.ByteArrayOutputStream;
```

```
import java.io.File;
import java.io.FileInputStream;
import java.io.InputStream;
import java.nio.ByteBuffer;
import java.util.List;
import javax.imageio.ImageIO;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.RecognizeCelebritiesRequest;
import com.amazonaws.services.rekognition.model.RecognizeCelebritiesResult;
import com.amazonaws.util.IOUtils;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
import com.amazonaws.services.rekognition.model.BoundingBox;
import com.amazonaws.services.rekognition.model.Celebrity;
import com.amazonaws.services.rekognition.model.ComparedFace;

public class RotateImage {

public static void main(String[] args) throws Exception {

  String photo = "photo.png";

  //Get Rekognition client
 AmazonRekognition amazonRekognition =
 AmazonRekognitionClientBuilder.defaultClient();


  // Load image
  ByteBuffer imageBytes=null;
  BufferedImage image = null;

  try (InputStream inputStream = new FileInputStream(new File(photo))) {
     imageBytes = ByteBuffer.wrap(IOUtils.toByteArray(inputStream));

  }
  catch(Exception e)
  {
      System.out.println("Failed to load file " + photo);
      System.exit(1);
  }

  //Get image width and height
  InputStream imageBytesStream;
```

```
  imageBytesStream = new ByteArrayInputStream(imageBytes.array());

  ByteArrayOutputStream baos = new ByteArrayOutputStream();
  image=ImageIO.read(imageBytesStream);
  ImageIO.write(image, "jpg", baos);

  int height = image.getHeight();
  int width = image.getWidth();

  System.out.println("Image Information:");
  System.out.println(photo);
  System.out.println("Image Height: " + Integer.toString(height));
  System.out.println("Image Width: " + Integer.toString(width));

  //Call GetCelebrities

  try{
    RecognizeCelebritiesRequest request = new RecognizeCelebritiesRequest()
           .withImage(new Image()
              .withBytes((imageBytes)));


     RecognizeCelebritiesResult result =
 amazonRekognition.recognizeCelebrities(request);
     // The returned value of OrientationCorrection will always be null
     System.out.println("Orientation: " + result.getOrientationCorrection() +
 "\n");
     List <Celebrity> celebs = result.getCelebrityFaces();

     for (Celebrity celebrity: celebs) {
         System.out.println("Celebrity recognized: " + celebrity.getName());
         System.out.println("Celebrity ID: " + celebrity.getId());
         ComparedFace  face = celebrity.getFace()
;            ShowBoundingBoxPositions(height,
                width,
                face.getBoundingBox(),
                result.getOrientationCorrection());

           System.out.println();
      }

   } catch (AmazonRekognitionException e) {
      e.printStackTrace();
   }
```

```
}


public static void ShowBoundingBoxPositions(int imageHeight, int imageWidth,
 BoundingBox box, String rotation) {

  float left = 0;
  float top = 0;

  if(rotation==null){
      System.out.println("No estimated estimated orientation. Check Exif data.");
      return;
  }
  //Calculate face position based on image orientation.
  switch (rotation) {
     case "ROTATE_0":
        left = imageWidth * box.getLeft();
        top = imageHeight * box.getTop();
        break;
     case "ROTATE_90":
        left = imageHeight * (1 - (box.getTop() + box.getHeight()));
        top = imageWidth * box.getLeft();
        break;
     case "ROTATE_180":
        left = imageWidth - (imageWidth * (box.getLeft() + box.getWidth()));
        top = imageHeight * (1 - (box.getTop() + box.getHeight()));
        break;
     case "ROTATE_270":
        left = imageHeight * box.getTop();
        top = imageWidth * (1 - box.getLeft() - box.getWidth());
        break;
     default:
        System.out.println("No estimated orientation information. Check Exif
 data.");
        return;
  }

  //Display face location information.
  System.out.println("Left: " + String.valueOf((int) left));
  System.out.println("Top: " + String.valueOf((int) top));
  System.out.println("Face Width: " + String.valueOf((int)(imageWidth *
 box.getWidth())));
```

```
  System.out.println("Face Height: " + String.valueOf((int)(imageHeight *
 box.getHeight())));

  }
}
```

Python

This example uses the PIL/Pillow image library to get the image width and height. For more information, see Pillow. This example preserves exif metadata which you might need elsewhere in your application.

In the function `main`, replace the value of `photo` with the name and path of an image that is stored locally in either .png or .jpg format.

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-
rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
import io
from PIL import Image


# Calculate positions from from estimated rotation
def show_bounding_box_positions(imageHeight, imageWidth, box):
    left = 0
    top = 0

    print('Left: ' + '{0:.0f}'.format(left))
    print('Top: ' + '{0:.0f}'.format(top))
    print('Face Width: ' + "{0:.0f}".format(imageWidth * box['Width']))
    print('Face Height: ' + "{0:.0f}".format(imageHeight * box['Height']))


def celebrity_image_information(photo):
    client = boto3.client('rekognition')

    # Get image width and height
    image = Image.open(open(photo, 'rb'))
    width, height = image.size
```

```
    print('Image information: ')
    print(photo)
    print('Image Height: ' + str(height))
    print('Image Width: ' + str(width))

    # call detect faces and show face age and placement
    # if found, preserve exif info
    stream = io.BytesIO()
    if 'exif' in image.info:
        exif = image.info['exif']
        image.save(stream, format=image.format, exif=exif)
    else:
        image.save(stream, format=image.format)
    image_binary = stream.getvalue()

    response = client.recognize_celebrities(Image={'Bytes': image_binary})

    print()
    print('Detected celebrities for ' + photo)

    for celebrity in response['CelebrityFaces']:
        print('Name: ' + celebrity['Name'])
        print('Id: ' + celebrity['Id'])

        # Value of "orientation correction" will always be null
        if 'OrientationCorrection' in response:
            show_bounding_box_positions(height, width, celebrity['Face']
['BoundingBox'])

        print()
    return len(response['CelebrityFaces'])


def main():
    photo = 'photo'

    celebrity_count = celebrity_image_information(photo)
    print("celebrities detected: " + str(celebrity_count))


if __name__ == "__main__":
    main()
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.RecognizeCelebritiesRequest;
import software.amazon.awssdk.services.rekognition.model.Image;
import
 software.amazon.awssdk.services.rekognition.model.RecognizeCelebritiesResponse;
import software.amazon.awssdk.services.rekognition.model.Celebrity;
import software.amazon.awssdk.services.rekognition.model.ComparedFace;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.BoundingBox;
import javax.imageio.ImageIO;
import java.awt.image.BufferedImage;
import java.io.*;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-started.html
 */
public class RotateImage {
    public static void main(String[] args) {
        final String usage = """

                Usage:    <sourceImage>

                Where:
                   sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png).\s
                """;

        if (args.length != 1) {
            System.out.println(usage);
            System.exit(1);
```

```
        }

        String sourceImage = args[0];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Locating celebrities in " + sourceImage);
        recognizeAllCelebrities(rekClient, sourceImage);
        rekClient.close();
    }

    public static void recognizeAllCelebrities(RekognitionClient rekClient, String
sourceImage) {
        try {
            BufferedImage image;
            InputStream sourceStream = new FileInputStream(sourceImage);
            SdkBytes sourceBytes = SdkBytes.fromInputStream(sourceStream);

            image = ImageIO.read(sourceBytes.asInputStream());
            int height = image.getHeight();
            int width = image.getWidth();

            Image souImage = Image.builder()
                    .bytes(sourceBytes)
                    .build();

            RecognizeCelebritiesRequest request =
RecognizeCelebritiesRequest.builder()
                    .image(souImage)
                    .build();

            RecognizeCelebritiesResponse result =
rekClient.recognizeCelebrities(request);
            List<Celebrity> celebs = result.celebrityFaces();
            System.out.println(celebs.size() + " celebrity(s) were recognized.\n");
            for (Celebrity celebrity : celebs) {
                System.out.println("Celebrity recognized: " + celebrity.name());
                System.out.println("Celebrity ID: " + celebrity.id());
                ComparedFace face = celebrity.face();
                ShowBoundingBoxPositions(height,
                        width,
                        face.boundingBox(),
```

```
                        result.orientationCorrectionAsString());
            }

        } catch (RekognitionException | FileNotFoundException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        } catch (IOException e) {
            e.printStackTrace();
        }
    }

    public static void ShowBoundingBoxPositions(int imageHeight, int imageWidth,
BoundingBox box, String rotation) {
        float left;
        float top;
        if (rotation == null) {
            System.out.println("No estimated estimated orientation.");
            return;
        }

        // Calculate face position based on the image orientation.
        switch (rotation) {
            case "ROTATE_0" -> {
                left = imageWidth * box.left();
                top = imageHeight * box.top();
            }
            case "ROTATE_90" -> {
                left = imageHeight * (1 - (box.top() + box.height()));
                top = imageWidth * box.left();
            }
            case "ROTATE_180" -> {
                left = imageWidth - (imageWidth * (box.left() + box.width()));
                top = imageHeight * (1 - (box.top() + box.height()));
            }
            case "ROTATE_270" -> {
                left = imageHeight * box.top();
                top = imageWidth * (1 - box.left() - box.width());
            }
            default -> {
                System.out.println("No estimated orientation information. Check Exif
data.");
                return;
            }
        }
```

```
        System.out.println("Left: " + (int) left);
        System.out.println("Top: " + (int) top);
        System.out.println("Face Width: " + (int) (imageWidth * box.width()));
        System.out.println("Face Height: " + (int) (imageHeight * box.height()));
    }
}
```

Working with stored video analysis operations

Amazon Rekognition Video is an API that you can use to analyze videos. With Amazon Rekognition Video, you can detect labels, faces, people, celebrities, and adult (suggestive and explicit) content in videos that are stored in an Amazon Simple Storage Service (Amazon S3) bucket. You can use Amazon Rekognition Video in categories such as media/entertainment and public safety. Previously, scanning videos for objects or people would have taken many hours of error-prone viewing by a human being. Amazon Rekognition Video automates the detection of items and when they occur throughout a video.

This section covers the types of analysis that Amazon Rekognition Video can perform, an overview of the API, and examples for using Amazon Rekognition Video.

Topics

- Types of analysis
- Amazon Rekognition Video API overview
- Calling Amazon Rekognition Video operations
- Configuring Amazon Rekognition Video
- Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK)
- Analyzing a video with the AWS Command Line Interface
- Reference: Video analysis results notification
- Troubleshooting Amazon Rekognition Video

Types of analysis

You can use Amazon Rekognition Video to analyze videos for the following information:

- Video Segments

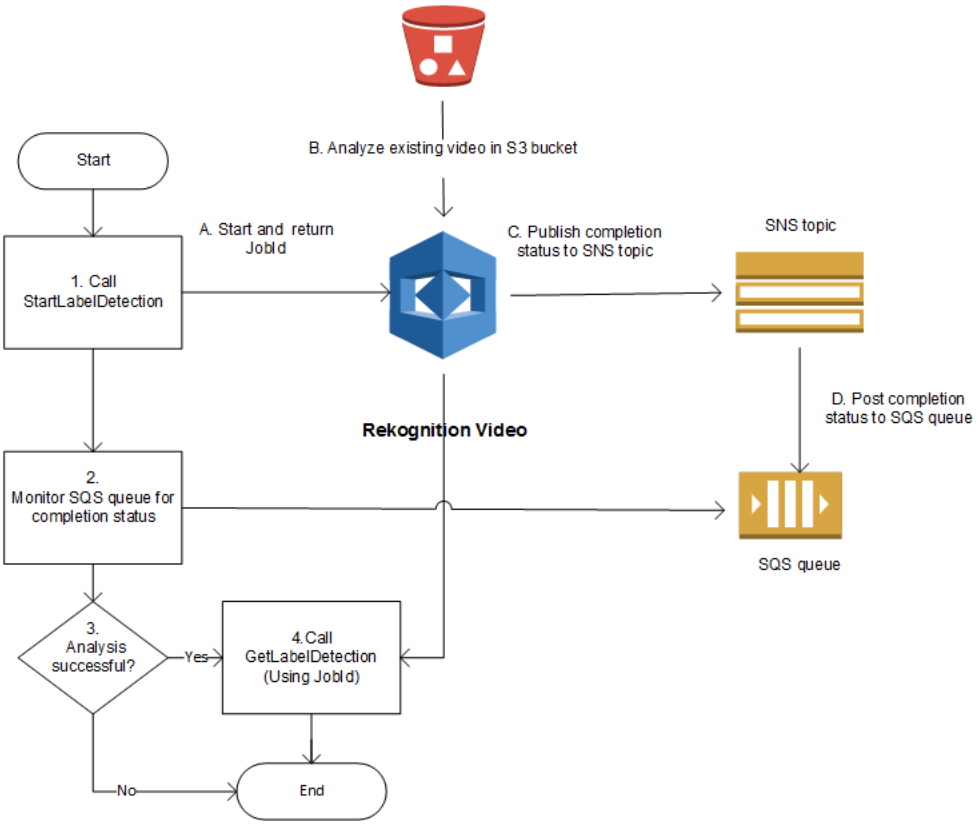
- Labels
- Suggestive and explicit adult content
- Text
- Celebrities
- Faces
- People

For more information, see How Amazon Rekognition works.

Amazon Rekognition Video API overview

Amazon Rekognition Video processes a video that's stored in an Amazon S3 bucket. The design pattern is an asynchronous set of operations. You start video analysis by calling a `Start` operation such as StartLabelDetection. The completion status of the request is published to an Amazon Simple Notification Service (Amazon SNS) topic. To get the completion status from the Amazon SNS topic, you can use an Amazon Simple Queue Service (Amazon SQS) queue or an AWS Lambda function. After you have the completion status, you call a `Get` operation, such as GetLabelDetection, to get the results of the request.

The following diagram shows the process for detecting labels in a video that's stored in an Amazon S3 bucket. In the diagram, an Amazon SQS queue gets the completion status from the Amazon SNS topic. Alternatively, you can use an AWS Lambda function.



The process is the same for other Amazon Rekognition Video operations. The following table lists the `Start` and `Get` operations for each of the non-storage Amazon Rekognition operations.

Detection	Start Operation	Get Operation
Video Segments	StartSegmentDetection	GetSegmentDetection
Labels	StartLabelDetection	GetLabelDetection
Explicit or suggestive adult content	StartContentModeration	GetContentModeration
Text	StartTextDetection	GetTextDetection
Celebrities	StartCelebrityRecognition	GetCelebrityRecognition
Faces	StartFaceDetection	GetFaceDetection
People	StartPersonTracking	GetPersonTracking

For `Get` operations other than `GetCelebrityRecognition`, Amazon Rekognition Video returns tracking information for when entities are detected throughout the input video.

For more information about using Amazon Rekognition Video, see Calling Amazon Rekognition Video operations. For an example that does video analysis by using Amazon SQS, see Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK). For AWS CLI examples, see Analyzing a video with the AWS Command Line Interface.

Video formats and storage

Amazon Rekognition operations can analyze videos that are stored in Amazon S3 buckets. For a list of all limits on video analysis operation, see *Guidelines and quotas*.

The video must be encoded using the H.264 codec. The supported file formats are MPEG-4 and MOV.

A codec is software or hardware that compresses data for faster delivery and decompresses received data into its original form. The H.264 codec is commonly used for recording, compressing, and distributing video content. A video file format can contain one or more codecs. If your MOV or MPEG-4 format video file doesn't work with Amazon Rekognition Video, check that the codec used to encode the video is H.264.

Any Amazon Rekognition Video API that analyzes audio data only supports AAC audio codecs.

The maximum file size for a stored video is 10GB.

Searching for people

You can use facial metadata that's stored in a collection to search for people in a video. For example, you can search an archived video for a specific person or for multiple people. You store facial metadata from source images in a collection by using the IndexFaces operation. You can then use StartFaceSearch to start asynchronously searching for faces in the collection. You use GetFaceSearch to get the search results. For more information, see Searching stored videos for faces. Searching for people is an example of a storage-based Amazon Rekognition operation. For more information, see Storage-based API operations.

You can also search for people in a streaming video. For more information, see Working with streaming video events.

Calling Amazon Rekognition Video operations

Amazon Rekognition Video is an asynchronous API that you can use to analyze videos that are stored in an Amazon Simple Storage Service (Amazon S3) bucket. You start the analysis of a video by calling an Amazon Rekognition Video `Start` operation, such as StartPersonTracking. Amazon Rekognition Video publishes the result of the analysis request to an Amazon Simple Notification Service (Amazon SNS) topic. You can use an Amazon Simple Queue Service (Amazon SQS) queue or an AWS Lambda function to get the completion status of the video analysis request from the Amazon SNS topic. Finally, you get the video analysis request results by calling an Amazon Rekognition `Get` operation, such as GetPersonTracking.

The information in the following sections uses label detection operations to show how Amazon Rekognition Video detects labels (objects, events, concepts, and activities) in a video that's stored in an Amazon S3 bucket. The same approach works for the other Amazon Rekognition Video operations—for example, StartFaceDetection and StartPersonTracking. The example Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK) shows how to analyze a video by using an Amazon SQS queue to get the completion status from the Amazon SNS topic. It's also used as a basis for other Amazon Rekognition Video examples, such as People pathing. For AWS CLI examples, see Analyzing a video with the AWS Command Line Interface.

Topics

- Starting video analysis
- Getting the completion status of an Amazon Rekognition Video analysis request
- Getting Amazon Rekognition Video analysis results

Starting video analysis

You start an Amazon Rekognition Video label detection request by calling StartLabelDetection. The following is an example of a JSON request that's passed by `StartLabelDetection`.

```
{
    "Video": {
        "S3Object": {
            "Bucket": "amzn-s3-demo-bucket",
            "Name": "video.mp4"
        }
    },
    "ClientRequestToken": "LabelDetectionToken",
```

```
    "MinConfidence": 50,
    "NotificationChannel": {
        "SNSTopicArn": "arn:aws:sns:us-east-1:nnnnnnnnnn:topic",
        "RoleArn": "arn:aws:iam::nnnnnnnnnn:role/roleopic"
    },
    "JobTag": "DetectingLabels"
}
```

The input parameter `Video` provides the video file name and the Amazon S3 bucket to retrieve it from. `NotificationChannel` contains the Amazon Resource Name (ARN) of the Amazon SNS topic that Amazon Rekognition Video notifies when the video analysis request finishes. The Amazon SNS topic must be in the same AWS region as the Amazon Rekognition Video endpoint that you're calling. `NotificationChannel` also contains the ARN for a role that allows Amazon Rekognition Video to publish to the Amazon SNS topic. You give Amazon Rekognition publishing permissions to your Amazon SNS topics by creating an IAM service role. For more information, see Configuring Amazon Rekognition Video.

You can also specify an optional input parameter, `JobTag`, that allows you to identify the job in the completion status that's published to the Amazon SNS topic.

To prevent accidental duplication of analysis jobs, you can optionally provide an idempotent token, `ClientRequestToken`. If you supply a value for `ClientRequestToken`, the `Start` operation returns the same `JobId` for multiple identical calls to the start operation, such as `StartLabelDetection`. A `ClientRequestToken` token has a lifetime of 7 days. After 7 days, you can reuse it. If you reuse the token during the token lifetime, the following happens:

- If you reuse the token with the same `Start` operation and the same input parameters, the same `JobId` is returned. The job is not performed again and Amazon Rekognition Video does not send a completion status to the registered Amazon SNS topic.
- If you reuse the token with the same `Start` operation and a minor input parameter change, you get an `IdempotentParameterMismatchException` (HTTP status code: 400) exception raised.
- You shoudn't reuse a token with different `Start` operations as you'll get unpredictable results from Amazon Rekognition.

The response to the `StartLabelDetection` operation is a job identifier (`JobId`). Use `JobId` to track requests and get the analysis results after Amazon Rekognition Video has published the completion status to the Amazon SNS topic. For example:

```
{"JobId":"270c1cc5e1d0ea2fbc59d97cb69a72a5495da75851976b14a1784ca90fc180e3"}
```

If you start too many jobs concurrently, calls to `StartLabelDetection` raise a `LimitExceededException` (HTTP status code: 400) until the number of concurrently running jobs is below the Amazon Rekognition service limit.

If you find that `LimitExceededException` exceptions are raised with bursts of activity, consider using an Amazon SQS queue to manage incoming requests. Contact AWS support if you find that your average number of concurrent requests cannot be managed by an Amazon SQS queue and you are still receiving `LimitExceededException` exceptions.

Getting the completion status of an Amazon Rekognition Video analysis request

Amazon Rekognition Video sends an analysis completion notification to the registered Amazon SNS topic. The notification includes the job identifier and the completion status of the operation in a JSON string. A successful video analysis request has a SUCCEEDED status. For example, the following result shows the successful processing of a label detection job.

```
{
    "JobId": "270c1cc5e1d0ea2fbc59d97cb69a72a5495da75851976b14a1nnnnnnnnnnn",
    "Status": "SUCCEEDED",
    "API": "StartLabelDetection",
    "JobTag": "DetectingLabels",
    "Timestamp": 1510865364756,
    "Video": {
        "S3ObjectName": "video.mp4",
        "S3Bucket": "amzn-s3-demo-bucket"
    }
}
```

For more information, see Reference: Video analysis results notification.

To get the status information that's published to the Amazon SNS topic by Amazon Rekognition Video, use one of the following options:

- **AWS Lambda** – You can subscribe an AWS Lambda function that you write to an Amazon SNS topic. The function is called when Amazon Rekognition notifies the Amazon SNS topic that the request has completed. Use a Lambda function if you want server-side code to process the results of a video analysis request. For example, you might want to use server-side code to annotate the video or create a report on the video contents before returning the information

to a client application. We also recommend server-side processing for large videos because the Amazon Rekognition API might return large volumes of data.

- **Amazon Simple Queue Service** – You can subscribe an Amazon SQS queue to an Amazon SNS topic. You then poll the Amazon SQS queue to retrieve the completion status that's published by Amazon Rekognition when a video analysis request completes. For more information, see Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK). Use an Amazon SQS queue if you want to call Amazon Rekognition Video operations only from a client application.

> **Important**
>
> We don't recommend getting the request completion status by repeatedly calling the Amazon Rekognition Video `Get` operation. This is because Amazon Rekognition Video throttles the `Get` operation if too many requests are made. If you're processing multiple videos concurrently, it's simpler and more efficient to monitor one SQS queue for the completion notification than to poll Amazon Rekognition Video for the status of each video individually.

Getting Amazon Rekognition Video analysis results

To get the results of a video analysis request, first ensure that the completion status that's retrieved from the Amazon SNS topic is SUCCEEDED. Then call `GetLabelDetection`, which passes the `JobId` value that's returned from `StartLabelDetection`. The request JSON is similar to the following example:

```
{
    "JobId": "270c1cc5e1d0ea2fbc59d97cb69a72a5495da75851976b14a1784ca90fc180e3",
    "MaxResults": 10,
    "SortBy": "TIMESTAMP"
}
```

JobId is the identifier for the video analysis operation. Because video analysis can generate large amounts of data, use `MaxResults` to specify the maximum number of results to return in a single Get operation. The default value for `MaxResults` is 1000. If you specify a value greater than 1000, a maximum of 1000 results is returned. If the operation doesn't return the entire set of results, a pagination token for the next page is returned in the operation response. If you have a pagination token from a previous Get request, use it with `NextToken` to get the next page of results.

> **Note**
>
> Amazon Rekognition retains the results of a video analysis operation for 7 days. You will not be able to retrieve the analysis results after this time.

The `GetLabelDetection` operation response JSON is similar to the following:


```
{
    "Labels": [
        {
            "Timestamp": 0,
            "Label": {
                "Instances": [],
                "Confidence": 60.51791763305664,
                "Parents": [],
                "Name": "Electronics"
            }
        },
        {
            "Timestamp": 0,
            "Label": {
                "Instances": [],
                "Confidence": 99.53411102294922,
                "Parents": [],
                "Name": "Human"
            }
        },
        {
            "Timestamp": 0,
            "Label": {
                "Instances": [
                    {
                        "BoundingBox": {
                            "Width": 0.11109819263219833,
                            "Top": 0.08098889887332916,
                            "Left": 0.8881205320358276,
                            "Height": 0.9073750972747803
                        },
                        "Confidence": 99.5831298828125
                    },
                    {
                        "BoundingBox": {
```

```
                            "Width": 0.1268676072359085,
                            "Top": 0.14018426835536957,
                            "Left": 0.0003282368124928324,
                            "Height": 0.7993982434272766
                        },
                        "Confidence": 99.46029663085938
                    }
                ],
                "Confidence": 99.53411102294922,
                "Parents": [],
                "Name": "Person"
            }
        },
        .
        .
        .

        {
            "Timestamp": 166,
            "Label": {
                "Instances": [],
                "Confidence": 73.6471176147461,
                "Parents": [
                    {
                        "Name": "Clothing"
                    }
                ],
                "Name": "Sleeve"
            }
        }

    ],
    "LabelModelVersion": "2.0",
    "JobStatus": "SUCCEEDED",
    "VideoMetadata": {
        "Format": "QuickTime / MOV",
        "FrameRate": 23.976024627685547,
        "Codec": "h264",
        "DurationMillis": 5005,
        "FrameHeight": 674,
        "FrameWidth": 1280
    }
}
```

The `GetLabelDetection` and `GetContentModeration` operations allow you to sort the analysis results by timestamp or by label name. You can also aggregate results by video segment or by timestamp.

You can sort the results by detection time (milliseconds from the start of the video) or alphabetically by the detected entity (object, face, celebrity, moderation label, or person). To sort by time, set the value of the `SortBy` input parameter to `TIMESTAMP`. If `SortBy` isn't specified, the default behavior is to sort by time. The preceding example is sorted by time. To sort by entity, use the `SortBy` input parameter with the value that's appropriate for the operation you're performing. For example, to sort by detected label in a call to `GetLabelDetection`, use the value `NAME`.

To aggregate results by timestamp, set the value of the `AggregateBy` parameter to `TIMESTAMPS`. To aggregate by video segment, set the value of `AggregateBy` to `SEGMENTS`. `SEGMENTS` aggregation mode will aggregate the labels over time, while `TIMESTAMPS` gives the timestamp a label was detected at, using 2 FPS sampling and per frame output (Note: This current sampling rate is subject to change, assumptions shouldn't be made about the current sampling rate). If no value is specified, the default aggregation method is `TIMESTAMPS`.

Configuring Amazon Rekognition Video

To use the Amazon Rekognition Video API with stored videos, you have to configure the user and an IAM service role to access your Amazon SNS topics. You also have to subscribe an Amazon SQS queue to your Amazon SNS topics.

> **Note**
>
> If you're using these instructions to set up the Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK) example, you don't need to do steps 3, 4, 5, and 6. The example includes code to create and configure the Amazon SNS topic and Amazon SQS queue.

The examples in this section create a new Amazon SNS topic by using the instructions that give Amazon Rekognition Video access to multiple topics. If you want to use an existing Amazon SNS topic, use Giving access to an existing Amazon SNS topic for step 3.

To configure Amazon Rekognition Video

1. Set up an AWS account to access Amazon Rekognition Video. For more information, see Step 1: Set up an AWS account and create a User.
2. Install and configure the required AWS SDK. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
3. To run the code examples in this developer guide, ensure that your chosen user has programmatic access. See Grant programmatic access for more information.

   Your user also needs at least the following permissions:

   - AmazonSQSFullAccess
   - AmazonRekognitionFullAccess
   - AmazonS3FullAccess
   - AmazonSNSFullAccess

   If you're using IAM Identity Center to authenticate, add the permissions to the permission set for your role, otherwise add the permissions to your IAM role.
4. Create an Amazon SNS topic by using the Amazon SNS console. Prepend the topic name with *AmazonRekognition*. Note the topic Amazon Resource Name (ARN). Ensure the topic is in the same region as the AWS endpoint that you are using.
5. Create an Amazon SQS standard queue by using the Amazon SQS console. Note the queue ARN.
6. Subscribe the queue to the topic you created in step 3.
7. Give permission to the Amazon SNS topic to send messages to the Amazon SQS queue.
8. Create an IAM service role to give Amazon Rekognition Video access to your Amazon SNS topics. Note the Amazon Resource Name (ARN) of the service role. For more information, see Giving access to multiple Amazon SNS topics.
9. To ensure your account is secure, you will want to limit the scope of Rekognition's access to just the resources you are using. This can be done by attaching a Trust policy to your IAM service role. For information on how to do this, see Cross-service confused deputy prevention.
10. Add the following inline policy to the user that you created in step 1:

```
{
    "Version": "2012-10-17",
```

```
    "Statement": [
        {
            "Sid": "MySid",
            "Effect": "Allow",
            "Action": "iam:PassRole",
            "Resource": "arn:Service role ARN from step 7"
        }
    ]
}
```

Give the inline policy a name of your choosing.

11. If you use a customer managed AWS Key Management Service key to encrypt the videos in your Amazon S3 bucket, add permissions to the key that allow the service role you created in step 7 to decrypt the videos. At a minimum the service role needs permission for `kms:GenerateDataKey` and `kms:Decrypt` actions. For example:

```
{
    "Sid": "Decrypt only",
    "Effect": "Allow",
    "Principal": {
        "AWS": "arn:aws:iam::111122223333:user/user from step 1"
    },
    "Action": [
        "kms:Decrypt",
        "kms:GenerateDataKey"
    ],
    "Resource": "*"
}
```

For more information, see see My Amazon S3 bucket has default encryption using a custom AWS KMS key. How can I allow users to download from and upload to the bucket? and Protecting Data Using Server-Side Encryption with KMS keys Stored in AWS Key Management Service (SSE-KMS).

12. You can now run the examples in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK) and Analyzing a video with the AWS Command Line Interface.

Giving access to multiple Amazon SNS topics

You use an IAM service role to give Amazon Rekognition Video access to Amazon SNS topics that you create. IAM provides the *Rekognition* use case for creating an Amazon Rekognition Video service role.

You can give Amazon Rekognition Video access to multiple Amazon SNS topics by using the `AmazonRekognitionServiceRole` permissions policy and prepending the topic names with *AmazonRekognition*—for example, `AmazonRekognitionMyTopicName`.

To give Amazon Rekognition Video access to multiple Amazon SNS topics

1. Create an IAM service role. Use the following information to create the IAM service role:
    1. Choose **Rekognition** for the service name.
    2. Choose **Rekognition** for the service role use case. You should see the **AmazonRekognitionServiceRole** permissions policy listed. **AmazonRekognitionServiceRole** gives Amazon Rekognition Video access to Amazon SNS topics that are prefixed with *AmazonRekognition*.
    3. Give the service role a name of your choosing.
2. Note the ARN of the service role. You need it to start video analysis operations.

Giving access to an existing Amazon SNS topic

You can create a permissions policy that allows Amazon Rekognition Video access to an existing Amazon SNS topic.

To give Amazon Rekognition Video access to an existing Amazon SNS topic

1. Create a new permissions policy with the IAM JSON policy editor, and use the following policy. Replace `topicarn` with the Amazon Resource Name (ARN) of the desired Amazon SNS topic.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "sns:Publish"
            ],
```

```
            "Resource": "topicarn"
        }
    ]
}
```

2. Create an IAM service role, or update an existing IAM service role. Use the following information to create the IAM service role:

   1. Choose **Rekognition** for the service name.
   2. Choose **Rekognition** for the service role use case.
   3. Attach the permissions policy you created in step 1.
3. Note the ARN of the service role. You need it to start video analysis operations.

Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK)

This procedure shows you how to detect labels in a video by using Amazon Rekognition Video label detection operations, a video stored in an Amazon S3 bucket, and an Amazon SNS topic. The procedure also shows how to use an Amazon SQS queue to get the completion status from the Amazon SNS topic. For more information, see Calling Amazon Rekognition Video operations. You aren't restricted to using an Amazon SQS queue. For example, you can use an AWS Lambda function to get the completion status. For more information, see Invoking Lambda functions using Amazon SNS notifications.

The example code in this procedure shows you how to do the following:

1. Create the Amazon SNS topic.
2. Create the Amazon SQS queue.
3. Give Amazon Rekognition Video permission to publish the completion status of a video analysis operation to the Amazon SNS topic.
4. Subscribe the Amazon SQS queue to the Amazon SNS topic.
5. Start the video analysis request by calling StartLabelDetection.
6. Get the completion status from the Amazon SQS queue. The example tracks the job identifier (`JobId`) that's returned in `StartLabelDetection` and only gets the results for matching job identifiers that are read from the completion status. This is an important consideration if other applications are using the same queue and topic. For simplicity, the example deletes

jobs that don't match. Consider adding them to an Amazon SQS dead-letter queue for further investigation.

7. Get and display the video analysis results by calling GetLabelDetection.

Prerequisites

The example code for this procedure is provided in Java and Python. You need to have the appropriate AWS SDK installed. For more information, see Getting started with Amazon Rekognition. The AWS account that you use must have access permissions to the Amazon Rekognition API. For more information, see Actions Defined by Amazon Rekognition.

To detect labels in a video

1. Configure user access to Amazon Rekognition Video and configure Amazon Rekognition Video access to Amazon SNS. For more information, see Configuring Amazon Rekognition Video. You don't need to do steps 3, 4, 5, and 6 because the example code creates and configures the Amazon SNS topic and Amazon SQS queue.
2. Upload an MOV or MPEG-4 format video file to an Amazon S3 Bucket. For test purposes, upload a video that's no longer than 30 seconds in length.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following code examples to detect labels in a video.

   Java

   In the function `main`:

   - Replace `roleArn` with the ARN of the IAM service role that you created in step 7 of To configure Amazon Rekognition Video.
   - Replace the values of `amzn-s3-demo-bucket` and `video` with the bucket and video file name that you specified in step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
```

```
package com.amazonaws.samples;
import com.amazonaws.auth.policy.Policy;
import com.amazonaws.auth.policy.Condition;
import com.amazonaws.auth.policy.Principal;
import com.amazonaws.auth.policy.Resource;
import com.amazonaws.auth.policy.Statement;
import com.amazonaws.auth.policy.Statement.Effect;
import com.amazonaws.auth.policy.actions.SQSActions;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.CelebrityDetail;
import com.amazonaws.services.rekognition.model.CelebrityRecognition;
import com.amazonaws.services.rekognition.model.CelebrityRecognitionSortBy;
import com.amazonaws.services.rekognition.model.ContentModerationDetection;
import com.amazonaws.services.rekognition.model.ContentModerationSortBy;
import com.amazonaws.services.rekognition.model.Face;
import com.amazonaws.services.rekognition.model.FaceDetection;
import com.amazonaws.services.rekognition.model.FaceMatch;
import com.amazonaws.services.rekognition.model.FaceSearchSortBy;
import com.amazonaws.services.rekognition.model.GetCelebrityRecognitionRequest;
import com.amazonaws.services.rekognition.model.GetCelebrityRecognitionResult;
import com.amazonaws.services.rekognition.model.GetContentModerationRequest;
import com.amazonaws.services.rekognition.model.GetContentModerationResult;
import com.amazonaws.services.rekognition.model.GetFaceDetectionRequest;
import com.amazonaws.services.rekognition.model.GetFaceDetectionResult;
import com.amazonaws.services.rekognition.model.GetFaceSearchRequest;
import com.amazonaws.services.rekognition.model.GetFaceSearchResult;
import com.amazonaws.services.rekognition.model.GetLabelDetectionRequest;
import com.amazonaws.services.rekognition.model.GetLabelDetectionResult;
import com.amazonaws.services.rekognition.model.GetPersonTrackingRequest;
import com.amazonaws.services.rekognition.model.GetPersonTrackingResult;
import com.amazonaws.services.rekognition.model.Instance;
import com.amazonaws.services.rekognition.model.Label;
import com.amazonaws.services.rekognition.model.LabelDetection;
import com.amazonaws.services.rekognition.model.LabelDetectionSortBy;
import com.amazonaws.services.rekognition.model.NotificationChannel;
import com.amazonaws.services.rekognition.model.Parent;
import com.amazonaws.services.rekognition.model.PersonDetection;
import com.amazonaws.services.rekognition.model.PersonMatch;
import com.amazonaws.services.rekognition.model.PersonTrackingSortBy;
import com.amazonaws.services.rekognition.model.S3Object;
import
 com.amazonaws.services.rekognition.model.StartCelebrityRecognitionRequest;
import com.amazonaws.services.rekognition.model.StartCelebrityRecognitionResult;
```

```
import com.amazonaws.services.rekognition.model.StartContentModerationRequest;
import com.amazonaws.services.rekognition.model.StartContentModerationResult;
import com.amazonaws.services.rekognition.model.StartFaceDetectionRequest;
import com.amazonaws.services.rekognition.model.StartFaceDetectionResult;
import com.amazonaws.services.rekognition.model.StartFaceSearchRequest;
import com.amazonaws.services.rekognition.model.StartFaceSearchResult;
import com.amazonaws.services.rekognition.model.StartLabelDetectionRequest;
import com.amazonaws.services.rekognition.model.StartLabelDetectionResult;
import com.amazonaws.services.rekognition.model.StartPersonTrackingRequest;
import com.amazonaws.services.rekognition.model.StartPersonTrackingResult;
import com.amazonaws.services.rekognition.model.Video;
import com.amazonaws.services.rekognition.model.VideoMetadata;
import com.amazonaws.services.sns.AmazonSNS;
import com.amazonaws.services.sns.AmazonSNSClientBuilder;
import com.amazonaws.services.sns.model.CreateTopicRequest;
import com.amazonaws.services.sns.model.CreateTopicResult;
import com.amazonaws.services.sqs.AmazonSQS;
import com.amazonaws.services.sqs.AmazonSQSClientBuilder;
import com.amazonaws.services.sqs.model.CreateQueueRequest;
import com.amazonaws.services.sqs.model.Message;
import com.amazonaws.services.sqs.model.QueueAttributeName;
import com.amazonaws.services.sqs.model.SetQueueAttributesRequest;
import com.fasterxml.jackson.databind.JsonNode;
import com.fasterxml.jackson.databind.ObjectMapper;
import java.util.*;

public class VideoDetect {


    private static String sqsQueueName=null;
    private static String snsTopicName=null;
    private static String snsTopicArn = null;
    private static String roleArn= null;
    private static String sqsQueueUrl = null;
    private static String sqsQueueArn = null;
    private static String startJobId = null;
    private static String bucket = null;
    private static String video = null;
    private static AmazonSQS sqs=null;
    private static AmazonSNS sns=null;
    private static AmazonRekognition rek = null;

    private static NotificationChannel channel= new NotificationChannel()
            .withSNSTopicArn(snsTopicArn)
```

```
            .withRoleArn(roleArn);


    public static void main(String[] args) throws Exception {

        video = "";
        bucket = "";
        roleArn= "";

        sns = AmazonSNSClientBuilder.defaultClient();
        sqs= AmazonSQSClientBuilder.defaultClient();
        rek = AmazonRekognitionClientBuilder.defaultClient();

        CreateTopicandQueue();

        //=================================================

        StartLabelDetection(bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetLabelDetectionResults();

       //=================================================


        DeleteTopicandQueue();
        System.out.println("Done!");

    }


    static boolean GetSQSMessageSuccess() throws Exception
    {
     boolean success=false;


        System.out.println("Waiting for job: " + startJobId);
        //Poll queue for messages
        List<Message> messages=null;
        int dotLine=0;
        boolean jobFound=false;

        //loop until the job status is published. Ignore other messages in
queue.
```

```
        do{
            messages = sqs.receiveMessage(sqsQueueUrl).getMessages();
            if (dotLine++<40){
                System.out.print(".");
            }else{
                System.out.println();
                dotLine=0;
            }

            if (!messages.isEmpty()) {
                //Loop through messages received.
                for (Message message: messages) {
                    String notification = message.getBody();

                    // Get status and job id from notification.
                    ObjectMapper mapper = new ObjectMapper();
                    JsonNode jsonMessageTree = mapper.readTree(notification);
                    JsonNode messageBodyText = jsonMessageTree.get("Message");
                    ObjectMapper operationResultMapper = new ObjectMapper();
                    JsonNode jsonResultTree =
operationResultMapper.readTree(messageBodyText.textValue());
                    JsonNode operationJobId = jsonResultTree.get("JobId");
                    JsonNode operationStatus = jsonResultTree.get("Status");
                    System.out.println("Job found was " + operationJobId);
                    // Found job. Get the results and display.
                    if(operationJobId.asText().equals(startJobId)){
                        jobFound=true;
                        System.out.println("Job id: " + operationJobId );
                        System.out.println("Status : " +
operationStatus.toString());
                        if (operationStatus.asText().equals("SUCCEEDED")){
                         success=true;
                        }
                        else{
                            System.out.println("Video analysis failed");
                        }


sqs.deleteMessage(sqsQueueUrl,message.getReceiptHandle());
                    }

                    else{
                        System.out.println("Job received was not job " +
startJobId);
```

```
                        //Delete unknown message. Consider moving message to
dead letter queue

sqs.deleteMessage(sqsQueueUrl,message.getReceiptHandle());
                    }
                }
            }
            else {
                Thread.sleep(5000);
            }
        } while (!jobFound);

        System.out.println("Finished processing video");
        return success;
    }


    private static void StartLabelDetection(String bucket, String video) throws
Exception{

        NotificationChannel channel= new NotificationChannel()
                .withSNSTopicArn(snsTopicArn)
                .withRoleArn(roleArn);


        StartLabelDetectionRequest req = new StartLabelDetectionRequest()
                .withVideo(new Video()
                        .withS3Object(new S3Object()
                                .withBucket(bucket)
                                .withName(video)))
                .withMinConfidence(50F)
                .withJobTag("DetectingLabels")
                .withNotificationChannel(channel);

        StartLabelDetectionResult startLabelDetectionResult =
rek.startLabelDetection(req);
        startJobId=startLabelDetectionResult.getJobId();

    }

    private static void GetLabelDetectionResults() throws Exception{

        int maxResults=10;
        String paginationToken=null;
```

```
        GetLabelDetectionResult labelDetectionResult=null;

        do {
            if (labelDetectionResult !=null){
                paginationToken = labelDetectionResult.getNextToken();
            }

            GetLabelDetectionRequest labelDetectionRequest= new
GetLabelDetectionRequest()
                    .withJobId(startJobId)
                    .withSortBy(LabelDetectionSortBy.TIMESTAMP)
                    .withMaxResults(maxResults)
                    .withNextToken(paginationToken);


            labelDetectionResult = rek.getLabelDetection(labelDetectionRequest);

            VideoMetadata videoMetaData=labelDetectionResult.getVideoMetadata();

            System.out.println("Format: " + videoMetaData.getFormat());
            System.out.println("Codec: " + videoMetaData.getCodec());
            System.out.println("Duration: " +
videoMetaData.getDurationMillis());
            System.out.println("FrameRate: " + videoMetaData.getFrameRate());


            //Show labels, confidence and detection times
            List<LabelDetection> detectedLabels=
labelDetectionResult.getLabels();

            for (LabelDetection detectedLabel: detectedLabels) {
                long seconds=detectedLabel.getTimestamp();
                Label label=detectedLabel.getLabel();
                System.out.println("Millisecond: " + Long.toString(seconds) + "
");

                System.out.println("   Label:" + label.getName());
                System.out.println("   Confidence:" +
detectedLabel.getLabel().getConfidence().toString());

                List<Instance> instances = label.getInstances();
                System.out.println("   Instances of " + label.getName());
                if (instances.isEmpty()) {
                    System.out.println("        " + "None");
```

```
                } else {
                    for (Instance instance : instances) {
                        System.out.println("        Confidence: " +
instance.getConfidence().toString());
                        System.out.println("        Bounding box: " +
instance.getBoundingBox().toString());
                    }
                }
                System.out.println("   Parent labels for " + label.getName() +
":");
                List<Parent> parents = label.getParents();
                if (parents.isEmpty()) {
                    System.out.println("        None");
                } else {
                    for (Parent parent : parents) {
                        System.out.println("        " + parent.getName());
                    }
                }
                System.out.println();
            }
        } while (labelDetectionResult !=null &&
labelDetectionResult.getNextToken() != null);

    }

    // Creates an SNS topic and SQS queue. The queue is subscribed to the
topic.
    static void CreateTopicandQueue()
    {
        //create a new SNS topic
        snsTopicName="AmazonRekognitionTopic" +
Long.toString(System.currentTimeMillis());
        CreateTopicRequest createTopicRequest = new
CreateTopicRequest(snsTopicName);
        CreateTopicResult createTopicResult =
sns.createTopic(createTopicRequest);
        snsTopicArn=createTopicResult.getTopicArn();

        //Create a new SQS Queue
        sqsQueueName="AmazonRekognitionQueue" +
Long.toString(System.currentTimeMillis());
        final CreateQueueRequest createQueueRequest = new
CreateQueueRequest(sqsQueueName);
        sqsQueueUrl = sqs.createQueue(createQueueRequest).getQueueUrl();
```

```
        sqsQueueArn = sqs.getQueueAttributes(sqsQueueUrl,
 Arrays.asList("QueueArn")).getAttributes().get("QueueArn");

        //Subscribe SQS queue to SNS topic
        String sqsSubscriptionArn = sns.subscribe(snsTopicArn, "sqs",
 sqsQueueArn).getSubscriptionArn();

        // Authorize queue
          Policy policy = new Policy().withStatements(
                  new Statement(Effect.Allow)
                  .withPrincipals(Principal.AllUsers)
                  .withActions(SQSActions.SendMessage)
                  .withResources(new Resource(sqsQueueArn))
                  .withConditions(new
 Condition().withType("ArnEquals").withConditionKey("aws:SourceArn").withValues(snsTopic
                  );


          Map queueAttributes = new HashMap();
          queueAttributes.put(QueueAttributeName.Policy.toString(),
 policy.toJson());
          sqs.setQueueAttributes(new SetQueueAttributesRequest(sqsQueueUrl,
 queueAttributes));


         System.out.println("Topic arn: " + snsTopicArn);
         System.out.println("Queue arn: " + sqsQueueArn);
         System.out.println("Queue url: " + sqsQueueUrl);
         System.out.println("Queue sub arn: " + sqsSubscriptionArn );
     }
    static void DeleteTopicandQueue()
    {
        if (sqs !=null) {
            sqs.deleteQueue(sqsQueueUrl);
            System.out.println("SQS queue deleted");
        }

        if (sns!=null) {
            sns.deleteTopic(snsTopicArn);
            System.out.println("SNS topic deleted");
        }
    }
}
```

Python

In the function `main`:

- Replace `roleArn` with the ARN of the IAM service role that you created in step 7 of To configure Amazon Rekognition Video.
- Replace the values of `amzn-s3-demo-bucket` and `video` with the bucket and video file name that you specified in step 2.
- Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.
- You can also include filtration criteria in the settings paramter. For example, you can use a `LabelsInclusionFilter` or a `LabelsExclusionFilter` alongside a list of desired values. In the code below, you can uncomment the `Features` and `Settings` section and provide your own values to limit the returned results to just the labels your are interested in.
- In the call to `GetLabelDetection`, you can provide values for the `SortBy` and `AggregateBy` arguments. To sort by time, set the value of the `SortBy` input parameter to `TIMESTAMP`. To sort by entity, use the `SortBy` input parameter with the value that's appropriate for the operation you're performing. To aggregate results by timestamp, set the value of the `AggregateBy` parameter to `TIMESTAMPS`. To aggregate by video segment, use `SEGMENTS`.

```
## Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
import json
import sys
import time

class VideoDetect:

    jobId = ''

    roleArn = ''
    bucket = ''
    video = ''
```

```
    startJobId = ''

    sqsQueueUrl = ''
    snsTopicArn = ''
    processType = ''

    def __init__(self, role, bucket, video, client, rek, sqs, sns):
        self.roleArn = role
        self.bucket = bucket
        self.video = video
        self.client = client
        self.rek = rek
        self.sqs = sqs
        self.sns = sns

    def GetSQSMessageSuccess(self):

        jobFound = False
        succeeded = False

        dotLine = 0
        while jobFound == False:
            sqsResponse = self.sqs.receive_message(QueueUrl=self.sqsQueueUrl,
MessageAttributeNames=['ALL'],
                                                   MaxNumberOfMessages=10)

            if sqsResponse:

                if 'Messages' not in sqsResponse:
                    if dotLine < 40:
                        print('.', end='')
                        dotLine = dotLine + 1
                    else:
                        print()
                        dotLine = 0
                    sys.stdout.flush()
                    time.sleep(5)
                    continue

                for message in sqsResponse['Messages']:
                    notification = json.loads(message['Body'])
                    rekMessage = json.loads(notification['Message'])
                    print(rekMessage['JobId'])
                    print(rekMessage['Status'])
```

```
                    if rekMessage['JobId'] == self.startJobId:
                        print('Matching Job Found:' + rekMessage['JobId'])
                        jobFound = True
                        if (rekMessage['Status'] == 'SUCCEEDED'):
                            succeeded = True

                        self.sqs.delete_message(QueueUrl=self.sqsQueueUrl,

ReceiptHandle=message['ReceiptHandle'])
                    else:
                        print("Job didn't match:" +
                              str(rekMessage['JobId']) + ' : ' +
self.startJobId)
                    # Delete the unknown message. Consider sending to dead
letter queue
                    self.sqs.delete_message(QueueUrl=self.sqsQueueUrl,

ReceiptHandle=message['ReceiptHandle'])

        return succeeded

    def StartLabelDetection(self):
        response = self.rek.start_label_detection(Video={'S3Object': {'Bucket':
self.bucket, 'Name': self.video}},

NotificationChannel={'RoleArn': self.roleArn,

'SNSTopicArn': self.snsTopicArn},
                                                  MinConfidence=90,
                                                  # Filtration options,
uncomment and add desired labels to filter returned labels
                                                  # Features=['GENERAL_LABELS'],
                                                  # Settings={
                                                  # 'GeneralLabels': {
                                                  # 'LabelInclusionFilters':
['Clothing']
                                                  # }}
                                                   )

        self.startJobId = response['JobId']
        print('Start Job Id: ' + self.startJobId)

    def GetLabelDetectionResults(self):
        maxResults = 10
```

```
        paginationToken = ''
        finished = False

        while finished == False:
            response = self.rek.get_label_detection(JobId=self.startJobId,
                                                    MaxResults=maxResults,
                                                    NextToken=paginationToken,
                                                    SortBy='TIMESTAMP',
                                                    AggregateBy="TIMESTAMPS")

            print('Codec: ' + response['VideoMetadata']['Codec'])
            print('Duration: ' + str(response['VideoMetadata']
['DurationMillis']))
            print('Format: ' + response['VideoMetadata']['Format'])
            print('Frame rate: ' + str(response['VideoMetadata']['FrameRate']))
            print()

            for labelDetection in response['Labels']:
                label = labelDetection['Label']

                print("Timestamp: " + str(labelDetection['Timestamp']))
                print("   Label: " + label['Name'])
                print("   Confidence: " + str(label['Confidence']))
                print("   Instances:")
                for instance in label['Instances']:
                    print("      Confidence: " + str(instance['Confidence']))
                    print("      Bounding box")
                    print("        Top: " + str(instance['BoundingBox']['Top']))
                    print("        Left: " + str(instance['BoundingBox']
['Left']))
                    print("        Width: " + str(instance['BoundingBox']
['Width']))
                    print("        Height: " + str(instance['BoundingBox']
['Height']))
                    print()
                print()

                print("Parents:")
                for parent in label['Parents']:
                    print("   " + parent['Name'])

                print("Aliases:")
                for alias in label['Aliases']:
                    print("   " + alias['Name'])
```

```
                print("Categories:")
                for category in label['Categories']:
                    print("   " + category['Name'])
                print("----------")
                print()

                if 'NextToken' in response:
                    paginationToken = response['NextToken']
                else:
                    finished = True

    def CreateTopicandQueue(self):

        millis = str(int(round(time.time() * 1000)))

        # Create SNS topic

        snsTopicName = "AmazonRekognitionExample" + millis

        topicResponse = self.sns.create_topic(Name=snsTopicName)
        self.snsTopicArn = topicResponse['TopicArn']

        # create SQS queue
        sqsQueueName = "AmazonRekognitionQueue" + millis
        self.sqs.create_queue(QueueName=sqsQueueName)
        self.sqsQueueUrl = self.sqs.get_queue_url(QueueName=sqsQueueName)
['QueueUrl']

        attribs = self.sqs.get_queue_attributes(QueueUrl=self.sqsQueueUrl,
                                                AttributeNames=['QueueArn'])
['Attributes']

        sqsQueueArn = attribs['QueueArn']

        # Subscribe SQS queue to SNS topic
        self.sns.subscribe(
            TopicArn=self.snsTopicArn,
            Protocol='sqs',
            Endpoint=sqsQueueArn)

        # Authorize SNS to write SQS queue
        policy = """{{
  "Version":"2012-10-17",
```

```
  "Statement":[
    {{
      "Sid":"MyPolicy",
      "Effect":"Allow",
      "Principal" : {{"AWS" : "*"}},
      "Action":"SQS:SendMessage",
      "Resource": "{}",
      "Condition":{{
        "ArnEquals":{{
          "aws:SourceArn": "{}"
        }}
      }}
    }}
  ]
}}""".format(sqsQueueArn, self.snsTopicArn)

        response = self.sqs.set_queue_attributes(
            QueueUrl=self.sqsQueueUrl,
            Attributes={
                'Policy': policy
            })

    def DeleteTopicandQueue(self):
        self.sqs.delete_queue(QueueUrl=self.sqsQueueUrl)
        self.sns.delete_topic(TopicArn=self.snsTopicArn)

def main():

    roleArn = 'role-arn'
    bucket = 'bucket-name'
    video = 'video-name'

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')
    rek = boto3.client('rekognition')
    sqs = boto3.client('sqs')
    sns = boto3.client('sns')

    analyzer = VideoDetect(roleArn, bucket, video, client, rek, sqs, sns)
    analyzer.CreateTopicandQueue()

    analyzer.StartLabelDetection()
    if analyzer.GetSQSMessageSuccess() == True:
        analyzer.GetLabelDetectionResults()
```

```
    analyzer.DeleteTopicandQueue()

if __name__ == "__main__":
    main()
```

Node.Js

In the following sample code:

- Replace the value of `REGION` with the name of your account's operating region.
- Replace the value of `amzn-s3-demo-bucket` with the name of the Amazon S3 bucket containing your video file.
- Replace the value of `videoName` with the name of the video file in your Amazon S3 bucket.
- Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.
- Replace `roleArn` with the ARN of the IAM service role that you created in step 7 of [To configure Amazon Rekognition Video].

```
import { CreateQueueCommand, GetQueueAttributesCommand, GetQueueUrlCommand,
  SetQueueAttributesCommand, DeleteQueueCommand, ReceiveMessageCommand,
 DeleteMessageCommand } from  "@aws-sdk/client-sqs";
import {CreateTopicCommand, SubscribeCommand, DeleteTopicCommand } from "@aws-
sdk/client-sns";
import  { SQSClient } from "@aws-sdk/client-sqs";
import  { SNSClient } from "@aws-sdk/client-sns";
import  { RekognitionClient, StartLabelDetectionCommand,
 GetLabelDetectionCommand } from "@aws-sdk/client-rekognition";
import { stdout } from "process";
import {fromIni} from '@aws-sdk/credential-providers';

// Set the AWS Region.
const REGION = "region-name"; //e.g. "us-east-1"
const profileName = "profile-name"
// Create SNS service object.
const sqsClient = new SQSClient({ region: REGION,
  credentials: fromIni({profile: profileName,}), });
const snsClient = new SNSClient({ region: REGION,
  credentials: fromIni({profile: profileName,}), });
```

```
const rekClient = new RekognitionClient({region: REGION,
  credentials: fromIni({profile: profileName,}),
});

// Set bucket and video variables
const bucket = "bucket-name";
const videoName = "video-name";
const roleArn = "role-arn"
var startJobId = ""

var ts = Date.now();
const snsTopicName = "AmazonRekognitionExample" + ts;
const snsTopicParams = {Name: snsTopicName}
const sqsQueueName = "AmazonRekognitionQueue-" + ts;

// Set the parameters
const sqsParams = {
  QueueName: sqsQueueName, //SQS_QUEUE_URL
  Attributes: {
    DelaySeconds: "60", // Number of seconds delay.
    MessageRetentionPeriod: "86400", // Number of seconds delay.
  },
};

const createTopicandQueue = async () => {
  try {
    // Create SNS topic
    const topicResponse = await snsClient.send(new
 CreateTopicCommand(snsTopicParams));
    const topicArn = topicResponse.TopicArn
    console.log("Success", topicResponse);
    // Create SQS Queue
    const sqsResponse = await sqsClient.send(new
 CreateQueueCommand(sqsParams));
    console.log("Success", sqsResponse);
    const sqsQueueCommand = await sqsClient.send(new
 GetQueueUrlCommand({QueueName: sqsQueueName}))
    const sqsQueueUrl = sqsQueueCommand.QueueUrl
    const attribsResponse = await sqsClient.send(new
 GetQueueAttributesCommand({QueueUrl: sqsQueueUrl, AttributeNames:
 ['QueueArn']}))
    const attribs = attribsResponse.Attributes
    console.log(attribs)
    const queueArn = attribs.QueueArn
```

```
    // subscribe SQS queue to SNS topic
    const subscribed = await snsClient.send(new SubscribeCommand({TopicArn:
 topicArn, Protocol:'sqs', Endpoint: queueArn}))
    const policy = {
      Version: "2012-10-17",
      Statement: [
        {
          Sid: "MyPolicy",
          Effect: "Allow",
          Principal: {AWS: "*"},
          Action: "SQS:SendMessage",
          Resource: queueArn,
          Condition: {
            ArnEquals: {
              'aws:SourceArn': topicArn
            }
          }
        }
      ]
    };

    const response = sqsClient.send(new SetQueueAttributesCommand({QueueUrl:
 sqsQueueUrl, Attributes: {Policy: JSON.stringify(policy)}}))
    console.log(response)
    console.log(sqsQueueUrl, topicArn)
    return [sqsQueueUrl, topicArn]

  } catch (err) {
    console.log("Error", err);
  }
};

const startLabelDetection = async (roleArn, snsTopicArn) => {
  try {
    //Initiate label detection and update value of startJobId with returned Job
 ID
   const labelDetectionResponse = await rekClient.send(new
 StartLabelDetectionCommand({Video:{S3Object:{Bucket:bucket, Name:videoName}},
      NotificationChannel:{RoleArn: roleArn, SNSTopicArn: snsTopicArn}}));
      startJobId = labelDetectionResponse.JobId
      console.log(`JobID: ${startJobId}`)
      return startJobId
  } catch (err) {
    console.log("Error", err);
```

```
  }
};

const getLabelDetectionResults = async(startJobId) => {
  console.log("Retrieving Label Detection results")
  // Set max results, paginationToken and finished will be updated depending on
 response values
  var maxResults = 10
  var paginationToken = ''
  var finished = false

  // Begin retrieving label detection results
  while (finished == false){
    var response = await rekClient.send(new GetLabelDetectionCommand({JobId:
 startJobId, MaxResults: maxResults,
      NextToken: paginationToken, SortBy:'TIMESTAMP'}))
      // Log metadata
      console.log(`Codec: ${response.VideoMetadata.Codec}`)
      console.log(`Duration: ${response.VideoMetadata.DurationMillis}`)
      console.log(`Format: ${response.VideoMetadata.Format}`)
      console.log(`Frame Rate: ${response.VideoMetadata.FrameRate}`)
      console.log()
      // For every detected label, log label, confidence, bounding box, and
 timestamp
      response.Labels.forEach(labelDetection => {
        var label = labelDetection.Label
        console.log(`Timestamp: ${labelDetection.Timestamp}`)
        console.log(`Label: ${label.Name}`)
        console.log(`Confidence: ${label.Confidence}`)
        console.log("Instances:")
        label.Instances.forEach(instance =>{
          console.log(`Confidence: ${instance.Confidence}`)
          console.log("Bounding Box:")
          console.log(`Top: ${instance.Confidence}`)
          console.log(`Left: ${instance.Confidence}`)
          console.log(`Width: ${instance.Confidence}`)
          console.log(`Height: ${instance.Confidence}`)
          console.log()
        })
      console.log()
      // Log parent if found
      console.log("   Parents:")
      label.Parents.forEach(parent =>{
        console.log(`    ${parent.Name}`)
```

```
      })
      console.log()
      // Searh for pagination token, if found, set variable to next token
      if (String(response).includes("NextToken")){
        paginationToken = response.NextToken

      }else{
        finished = true
      }

      })
  }
}

// Checks for status of job completion
const getSQSMessageSuccess = async(sqsQueueUrl, startJobId) => {
  try {
    // Set job found and success status to false initially
    var jobFound = false
    var succeeded = false
    var dotLine = 0
    // while not found, continue to poll for response
    while (jobFound == false){
      var sqsReceivedResponse = await sqsClient.send(new
 ReceiveMessageCommand({QueueUrl:sqsQueueUrl,
        MaxNumberOfMessages:'ALL', MaxNumberOfMessages:10}));
      if (sqsReceivedResponse){
        var responseString = JSON.stringify(sqsReceivedResponse)
        if (!responseString.includes('Body')){
          if (dotLine < 40) {
            console.log('.')
            dotLine = dotLine + 1
          }else {
            console.log('')
            dotLine = 0
          };
          stdout.write('', () => {
            console.log('');
          });
          await new Promise(resolve => setTimeout(resolve, 5000));
          continue
        }
      }
```

```
      // Once job found, log Job ID and return true if status is succeeded
      for (var message of sqsReceivedResponse.Messages){
        console.log("Retrieved messages:")
        var notification = JSON.parse(message.Body)
        var rekMessage = JSON.parse(notification.Message)
        var messageJobId = rekMessage.JobId
        if (String(rekMessage.JobId).includes(String(startJobId))){
          console.log('Matching job found:')
          console.log(rekMessage.JobId)
          jobFound = true
          console.log(rekMessage.Status)
          if (String(rekMessage.Status).includes(String("SUCCEEDED"))){
            succeeded = true
            console.log("Job processing succeeded.")
            var sqsDeleteMessage = await sqsClient.send(new
 DeleteMessageCommand({QueueUrl:sqsQueueUrl,
 ReceiptHandle:message.ReceiptHandle}));
          }
        }else{
          console.log("Provided Job ID did not match returned ID.")
          var sqsDeleteMessage = await sqsClient.send(new
 DeleteMessageCommand({QueueUrl:sqsQueueUrl,
 ReceiptHandle:message.ReceiptHandle}));
        }
      }
    }
  return succeeded
  } catch(err) {
    console.log("Error", err);
  }
};

// Start label detection job, sent status notification, check for success
 status
// Retrieve results if status is "SUCEEDED", delete notification queue and
 topic
const runLabelDetectionAndGetResults = async () => {
  try {
    const sqsAndTopic = await createTopicandQueue();
    const startLabelDetectionRes = await startLabelDetection(roleArn,
 sqsAndTopic[1]);
    const getSQSMessageStatus = await getSQSMessageSuccess(sqsAndTopic[0],
 startLabelDetectionRes)
    console.log(getSQSMessageSuccess)
```

```
    if (getSQSMessageSuccess){
      console.log("Retrieving results:")
      const results = await getLabelDetectionResults(startLabelDetectionRes)
    }
    const deleteQueue = await sqsClient.send(new DeleteQueueCommand({QueueUrl:
 sqsAndTopic[0]}));
    const deleteTopic = await snsClient.send(new DeleteTopicCommand({TopicArn:
 sqsAndTopic[1]}));
    console.log("Successfully deleted.")
  } catch (err) {
    console.log("Error", err);
  }
};

runLabelDetectionAndGetResults()
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import com.fasterxml.jackson.core.JsonProcessingException;
import com.fasterxml.jackson.databind.JsonMappingException;
import com.fasterxml.jackson.databind.JsonNode;
import com.fasterxml.jackson.databind.ObjectMapper;
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.StartLabelDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartLabelDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetLabelDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetLabelDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.LabelDetectionSortBy;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.LabelDetection;
```

```
import software.amazon.awssdk.services.rekognition.model.Label;
import software.amazon.awssdk.services.rekognition.model.Instance;
import software.amazon.awssdk.services.rekognition.model.Parent;
import software.amazon.awssdk.services.sqs.SqsClient;
import software.amazon.awssdk.services.sqs.model.Message;
import software.amazon.awssdk.services.sqs.model.ReceiveMessageRequest;
import software.amazon.awssdk.services.sqs.model.DeleteMessageRequest;
import java.util.List;
//snippet-end:[rekognition.java2.recognize_video_detect.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class VideoDetect {

 private static String startJobId ="";
 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <bucket> <video> <queueUrl> <topicArn> <roleArn>\n\n" +
         "Where:\n" +
         "   bucket - The name of the bucket in which the video is located (for
 example, (for example, amzn-s3-demo-bucket). \n\n"+
         "   video - The name of the video (for example, people.mp4). \n\n" +
         "   queueUrl- The URL of a SQS queue. \n\n" +
         "   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic. \n\n" +
         "   roleArn - The ARN of the AWS Identity and Access Management (IAM)
 role to use. \n\n" ;

     if (args.length != 5) {
         System.out.println(usage);
         System.exit(1);
     }

     String bucket = args[0];
     String video = args[1];
```

```
    String queueUrl = args[2];
    String topicArn = args[3];
    String roleArn = args[4];
    Region region = Region.US_WEST_2;
    RekognitionClient rekClient = RekognitionClient.builder()
        .region(region)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    SqsClient sqs = SqsClient.builder()
        .region(Region.US_WEST_2)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    NotificationChannel channel = NotificationChannel.builder()
        .snsTopicArn(topicArn)
        .roleArn(roleArn)
        .build();

    startLabels(rekClient, channel, bucket, video);
    getLabelJob(rekClient, sqs,  queueUrl);
    System.out.println("This example is done!");
    sqs.close();
    rekClient.close();
}

// snippet-start:[rekognition.java2.recognize_video_detect.main]
public static void startLabels(RekognitionClient rekClient,
                               NotificationChannel channel,
                               String bucket,
                               String video) {
    try {
        S3Object s3Obj = S3Object.builder()
            .bucket(bucket)
            .name(video)
            .build();

        Video vidOb = Video.builder()
            .s3Object(s3Obj)
            .build();

        StartLabelDetectionRequest labelDetectionRequest =
StartLabelDetectionRequest.builder()
            .jobTag("DetectingLabels")
```

```
            .notificationChannel(channel)
            .video(vidOb)
            .minConfidence(50F)
            .build();

        StartLabelDetectionResponse labelDetectionResponse =
rekClient.startLabelDetection(labelDetectionRequest);
        startJobId = labelDetectionResponse.jobId();

        boolean ans = true;
        String status = "";
        int yy = 0;
        while (ans) {

            GetLabelDetectionRequest detectionRequest =
GetLabelDetectionRequest.builder()
                .jobId(startJobId)
                .maxResults(10)
                .build();

            GetLabelDetectionResponse result =
rekClient.getLabelDetection(detectionRequest);
            status = result.jobStatusAsString();

            if (status.compareTo("SUCCEEDED") == 0)
                ans = false;
            else
                System.out.println(yy +" status is: "+status);

            Thread.sleep(1000);
            yy++;
        }

        System.out.println(startJobId +" status is: "+status);

    } catch(RekognitionException | InterruptedException e) {
        e.getMessage();
        System.exit(1);
    }
}

public static void getLabelJob(RekognitionClient rekClient, SqsClient sqs,
String queueUrl) {
```

```
    List<Message> messages;
    ReceiveMessageRequest messageRequest = ReceiveMessageRequest.builder()
        .queueUrl(queueUrl)
        .build();

    try {
        messages = sqs.receiveMessage(messageRequest).messages();

        if (!messages.isEmpty()) {
            for (Message message: messages) {
                String notification = message.body();

                // Get the status and job id from the notification
                ObjectMapper mapper = new ObjectMapper();
                JsonNode jsonMessageTree = mapper.readTree(notification);
                JsonNode messageBodyText = jsonMessageTree.get("Message");
                ObjectMapper operationResultMapper = new ObjectMapper();
                JsonNode jsonResultTree =
operationResultMapper.readTree(messageBodyText.textValue());
                JsonNode operationJobId = jsonResultTree.get("JobId");
                JsonNode operationStatus = jsonResultTree.get("Status");
                System.out.println("Job found in JSON is " + operationJobId);

                DeleteMessageRequest deleteMessageRequest =
DeleteMessageRequest.builder()
                    .queueUrl(queueUrl)
                    .build();

                String jobId = operationJobId.textValue();
                if (startJobId.compareTo(jobId)==0) {
                    System.out.println("Job id: " + operationJobId );
                    System.out.println("Status : " +
operationStatus.toString());

                    if (operationStatus.asText().equals("SUCCEEDED"))
                        GetResultsLabels(rekClient);
                    else
                        System.out.println("Video analysis failed");

                    sqs.deleteMessage(deleteMessageRequest);
                }

                else{
```

```
                    System.out.println("Job received was not job " +
startJobId);
                    sqs.deleteMessage(deleteMessageRequest);
                }
            }
        }

    } catch(RekognitionException e) {
        e.getMessage();
        System.exit(1);
    } catch (JsonMappingException e) {
        e.printStackTrace();
    } catch (JsonProcessingException e) {
        e.printStackTrace();
    }
}

// Gets the job results by calling GetLabelDetection
private static void GetResultsLabels(RekognitionClient rekClient) {

    int maxResults=10;
    String paginationToken=null;
    GetLabelDetectionResponse labelDetectionResult=null;

    try {
        do {
            if (labelDetectionResult !=null)
                paginationToken = labelDetectionResult.nextToken();


            GetLabelDetectionRequest labelDetectionRequest=
GetLabelDetectionRequest.builder()
                .jobId(startJobId)
                .sortBy(LabelDetectionSortBy.TIMESTAMP)
                .maxResults(maxResults)
                .nextToken(paginationToken)
                .build();

            labelDetectionResult =
rekClient.getLabelDetection(labelDetectionRequest);
            VideoMetadata videoMetaData=labelDetectionResult.videoMetadata();
            System.out.println("Format: " + videoMetaData.format());
            System.out.println("Codec: " + videoMetaData.codec());
            System.out.println("Duration: " + videoMetaData.durationMillis());
```

```
            System.out.println("FrameRate: " + videoMetaData.frameRate());

            List<LabelDetection> detectedLabels= labelDetectionResult.labels();
            for (LabelDetection detectedLabel: detectedLabels) {
                long seconds=detectedLabel.timestamp();
                Label label=detectedLabel.label();
                System.out.println("Millisecond: " + seconds + " ");

                System.out.println("   Label:" + label.name());
                System.out.println("   Confidence:" +
detectedLabel.label().confidence().toString());

                List<Instance> instances = label.instances();
                System.out.println("   Instances of " + label.name());

                if (instances.isEmpty()) {
                    System.out.println("        " + "None");
                } else {
                    for (Instance instance : instances) {
                        System.out.println("        Confidence: " +
instance.confidence().toString());
                        System.out.println("        Bounding box: " +
instance.boundingBox().toString());
                    }
                }
                System.out.println("   Parent labels for " + label.name() +
":");
                List<Parent> parents = label.parents();

                if (parents.isEmpty()) {
                    System.out.println("        None");
                } else {
                    for (Parent parent : parents) {
                        System.out.println("   " + parent.name());
                    }
                }
                System.out.println();
            }
        } while (labelDetectionResult !=null &&
labelDetectionResult.nextToken() != null);

    } catch(RekognitionException e) {
        e.getMessage();
        System.exit(1);
```

```
        }
    }
    // snippet-end:[rekognition.java2.recognize_video_detect.main]
}
```

4. Build and run the code. The operation might take a while to finish. After it's finished, a list of the labels detected in the video is displayed. For more information, see Detecting labels in a video.

Analyzing a video with the AWS Command Line Interface

You can use the AWS Command Line Interface (AWS CLI) to call Amazon Rekognition Video operations. The design pattern is the same as using the Amazon Rekognition Video API with the AWS SDK for Java or other AWS SDKs. For more information, see Amazon Rekognition Video API overview. The following procedures show how to use the AWS CLI to detect labels in a video.

You start detecting labels in a video by calling `start-label-detection`. When Amazon Rekognition finishes analyzing the video, the completion status is sent to the Amazon SNS topic that's specified in the `--notification-channel` parameter of `start-label-detection`. You can get the completion status by subscribing an Amazon Simple Queue Service (Amazon SQS) queue to the Amazon SNS topic. You then poll receive-message to get the completion status from the Amazon SQS queue.

When calling `StartLabelDetection`, you can filter your results by providing filtration arguments to the `LabelsInclusionFilter` and/or `LabelsExclusionFilter` arguments. For more information, see Detecting labels in a video .

The completion status notification is a JSON structure within the `receive-message` response. You need to extract the JSON from the response. For information about the completion status JSON, see Reference: Video analysis results notification. If the value of the `Status` field of the completed status JSON is SUCCEEDED, you can get the results of the video analysis request by calling `get-label-detection`. When calling `GetLabelDetection`, you can sort and aggregate the returned results using the `SortBy` and `AggregateBy` arguments.

The following procedures don't include code to poll the Amazon SQS queue. Also, they don't include code to parse the JSON that's returned from the Amazon SQS queue. For an example in Java, see Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).

Prerequisites

To run this procedure, you need to have the AWS CLI installed. For more information, see Getting started with Amazon Rekognition. The AWS account that you use must have access permissions to the Amazon Rekognition API. For more information, Actions Defined by Amazon Rekognition.

To configure Amazon Rekognition Video and upload a video

1. Configure user access to Amazon Rekognition Video and configure Amazon Rekognition Video access to Amazon SNS. For more information, see Configuring Amazon Rekognition Video.
2. Upload an MOV or MPEG-4 format video file to your S3 bucket. While developing and testing, we suggest using short videos no longer than 30 seconds in length.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

To detect labels in a video

1. Run the following AWS CLI command to start detecting labels in a video.

```
aws rekognition start-label-detection --video '{"S3Object":{"Bucket":"amzn-s3-demo-
bucket","Name":"video-name"}}' \
 --notification-channel '{"SNSTopicArn":"TopicARN","RoleArn":"RoleARN"}' \
--region region-name  \
--features GENERAL_LABELS \
--profile profile-name \
--settings "{"GeneralLabels":{"LabelInclusionFilters":["Car"]}}
```

   Update the following values:

   - Change `amzn-s3-demo-bucket` and `videofile` to the Amazon S3 bucket name and file name that you specified in step 2.
   - Change `us-east-1` to the AWS region that you're using.
   - Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.
   - Change `TopicARN` to the ARN of the Amazon SNS topic you created in step 3 of Configuring Amazon Rekognition Video.

- Change `RoleARN` to the ARN of the IAM service role you created in step 7 of Configuring Amazon Rekognition Video.
- If required, you can specify the `endpoint-url`. The AWS CLI should automatically determine the proper endpoint URL based on the provided region. However, if you are using an endpoint from your private VPC, you may need to specify the `endpoint-url`. The AWS Service Endpoints resource lists the syntax for specifying endpoint urls and the names and codes for each region.
- You can also include filtration criteria in the settings paramter. For example, you can use a `LabelsInclusionFilter` or a `LabelsExclusionFilter` alongside a list of desired values.

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see below:

```
aws rekognition start-label-detection --video "{\"S3Object\":{\"Bucket\":\"amzn-s3-
demo-bucket",\"Name\":\"video-name\"}}" --notification-channel "{\"SNSTopicArn\":
\"TopicARN\",\"RoleArn\":\"RoleARN\"}" \
--region us-east-1 --features GENERAL_LABELS --settings "{\"GeneralLabels\":
{\"LabelInclusionFilters\":[\"Car\"]}}" --profile profile-name
```

2. Note the value of `JobId` in the response. The response looks similar to the following JSON example.

```
{
    "JobId": "547089ce5b9a8a0e7831afa655f42e5d7b5c838553f1a584bf350ennnnnnnnnn"
}
```

3. Write code to poll the Amazon SQS queue for the completion status JSON (by using receive-message).
4. Write code to extract the `Status` field from the completion status JSON.
5. If the value of `Status` is SUCCEEDED, run the following AWS CLI command to show the label detection results.

```
aws rekognition get-label-detection  --job-id JobId \
```

```
--region us-east-1 --sort-by TIMESTAMP aggregate-by TIMESTAMPS
```

Update the following values:

- Change `JobId` to match the job identifier that you noted in step 2.
- Change `Endpoint` and `us-east-1` to the AWS endpoint and region that you're using.

The results look similar to the following example JSON:

```
{
    "Labels": [
        {
            "Timestamp": 0,
            "Label": {
                "Confidence": 99.03720092773438,
                "Name": "Speech"
            }
        },
        {
            "Timestamp": 0,
            "Label": {
                "Confidence": 71.6698989868164,
                "Name": "Pumpkin"
            }
        },
        {
            "Timestamp": 0,
            "Label": {
                "Confidence": 71.6698989868164,
                "Name": "Squash"
            }
        },
        {
            "Timestamp": 0,
            "Label": {
                "Confidence": 71.6698989868164,
                "Name": "Vegetable"
            }
        }, .......
```

Reference: Video analysis results notification

Amazon Rekognition publishes the results of an Amazon Rekognition Video analysis request, including completion status, to an Amazon Simple Notification Service (Amazon SNS) topic. To get the notification from an Amazon SNS topic, use an Amazon Simple Queue Service queue or an AWS Lambda function. For more information, see the section called "Calling Amazon Rekognition Video operations". For an example, see Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).

The payload is in the following JSON format:

```
{
  "JobId": "String",
  "Status": "String",
  "API": "String",
  "JobTag": "String",
  "Timestamp": Number,
  "Video": {
    "S3ObjectName": "String",
    "S3Bucket": "String"
  }
}
```

Name	Description
JobId	The job identifier. Matches a job identifier that's returned from a `Start` operation, such as StartPersonTracking.
Status	The status of the job. Valid values are SUCCEEDED, FAILED, or ERROR.
API	The Amazon Rekognition Video operation used to analyze the input video.
JobTag	Identifier for the job. You specify `JobTag` in a call to Start operation, such as StartLabelDetection.

Name	Description
Timestamp	The Unix time stamp for when the job finished.
Video	Details about the video that was processed . Includes the file name and the Amazon S3 bucket that the file is stored in.

The following is an example of a successful notification that was sent to an Amazon SNS topic.

```
{
  "JobId": "6de014b0-2121-4bf0-9e31-856a18719e22",
  "Status": "SUCCEEDED",
  "API": "LABEL_DETECTION",
  "Message": "",
  "Timestamp": 1502230160926,
  "Video": {
    "S3ObjectName": "video.mpg",
    "S3Bucket": "amzn-s3-demo-bucket"
  }
}
```

Troubleshooting Amazon Rekognition Video

The following covers troubleshooting information for working with Amazon Rekognition Video and stored videos.

I never receive the completion status that's sent to the Amazon SNS topic

Amazon Rekognition Video publishes status information to an Amazon SNS topic when video analysis completes. Typically, you get the completion status message by subscribing to the topic with an Amazon SQS queue or Lambda function. To help your investigation, subscribe to the Amazon SNS topic by email so you receive the messages that are sent to your Amazon SNS topic in your email inbox. For more information, see Subscribing to an Amazon SNS topic.

If you don't receive the message in your application, consider the following:

- Verify that the analysis has completed. Check the `JobStatus` value in the Get operation response (`GetLabelDetection`, for example). If the value is `IN_PROGRESS`, the analysis isn't complete, and the completion status hasn't yet been published to the Amazon SNS topic.
- Verify that you have an IAM service role that gives Amazon Rekognition Video permissions to publish to your Amazon SNS topics. For more information, see Configuring Amazon Rekognition Video.
- Confirm that the IAM service role that you're using can publish to the Amazon SNS topic by using role credentials and that your service role's permissions are securely scoped to the resources you are using. Carry out the following steps:
  - Get the user Amazon Resource Name (ARN):

    ```
    aws sts get-caller-identity --profile RekognitionUser
    ```

  - Add the user ARN to the role trust relationship. For more information, see Modifying a role. The following example trust policy specifies the user's role credentials and restricts the service role's permissions to just the resources you are using (for more information on securely limiting the scope of a service role's permissions, see Cross-service confused deputy prevention):

    ```
    {
      "Version": "2012-10-17",
      "Statement": [
        {
          "Effect": "Allow",
          "Principal": {
            "Service": "rekognition.amazonaws.com",
            "AWS": "arn:User ARN"
          },
          "Action": "sts:AssumeRole",
          "Condition": {
          "StringEquals": {
                        "aws:SourceAccount": "Account ID"
                    },
           "StringLike": {
                        "aws:SourceArn":
     "arn:aws:rekognition:region:111122223333:streamprocessor/*"
                    }
          }
        }
      ]
    }
    ```

- Assume the role: `aws sts assume-role --role-arn arn:Role ARN --role-session-name SessionName --profile RekognitionUser`
- Publish to the Amazon SNS topic: `aws sns publish --topic-arn arn:Topic ARN --message "Hello World!" --region us-east-1 --profile RekognitionUser`

If the AWS CLI command works, you receive the message (in your email inbox, if you've subscribed to the topic by email). If you don't receive the message:

- Check that you've configured Amazon Rekognition Video. For more information, see Configuring Amazon Rekognition Video.
- Check the other tips for this troubleshooting question.

- Check that you're using the correct Amazon SNS topic:
  - If you use an IAM service role to give Amazon Rekognition Video access to a single Amazon SNS topic, check that you've given permissions to the correct Amazon SNS topic. For more information, see Giving access to an existing Amazon SNS topic.
  - If you use an IAM service role to give Amazon Rekognition Video access to multiple SNS topics, verify that you're using the correct topic and that the topic name is prepended with *AmazonRekognition*. For more information, see Giving access to multiple Amazon SNS topics.
  - If you use an AWS Lambda function, confirm that your Lambda function is subscribed to the correct Amazon SNS topic. For more information, see Fanout to Lambda functions.
- If you subscribe an Amazon SQS queue to your Amazon SNS topic, confirm that your Amazon SNS topic has permissions to send messages to the Amazon SQS queue. For more information, see Give permission to the Amazon SNS topic to send messages to the Amazon SQS queue.

I need additional help troubleshooting the Amazon SNS topic

You can use AWS X-Ray with Amazon SNS to trace and analyze the messages that travel through your application. For more information, see Amazon SNS and AWS X-Ray.

For additional help, you can post your question to the Amazon Rekognition forum or consider signing up for AWS technical support.

Working with streaming video events

You can use Amazon Rekognition Video to detect and recognize faces or detect objects in streaming video. Amazon Rekognition Video uses Amazon Kinesis Video Streams to receive and process a video stream. You create a stream processor with parameters that show what you want

the stream processor to detect from the video stream. Rekognition sends label detection results from streaming video events as Amazon SNS and Amazon S3 notifications. Rekognition outputs face search results to a Kinesis data stream.

Face search stream processors use `FaceSearchSettings` to search for faces from a collection. For more information about how to implement face search stream processors to analyze faces in streaming video, see the section called "Searching faces in a collection in streaming video".

Label detection stream processors use `ConnectedHomeSettings` to search for people, packages, and pets in streaming video events. For more information about how to implement label detection stream processors, see the section called "Detecting labels in streaming video events".

Overview of Amazon Rekognition Video stream processor operations

You start analyzing a streaming video by starting an Amazon Rekognition Video stream processor and streaming video into Amazon Rekognition Video. An Amazon Rekognition Video stream processor allows you to start, stop, and manage stream processors. You create a stream processor by calling CreateStreamProcessor. The request parameters for creating a face search stream processor include the Amazon Resource Names (ARNs) for the Kinesis video stream, the Kinesis data stream, and the identifier for the collection that's used to recognize faces in the streaming video. The request parameters for creating a security monitoring stream processor include the Amazon Resource Names (ARNs) for the Kinesis video stream and the Amazon SNS topic, the types of objects you want to detect in the video stream, and information for an Amazon S3 bucket for the output results. You also include a name that you specify for the stream processor.

You start processing a video by calling the StartStreamProcessor operation. To get status information for a stream processor, call DescribeStreamProcessor. Other operations you can call are TagResource to tag a stream processor and DeleteStreamProcessor to delete a stream processor. If you are using a face search stream processor, you can also use StopStreamProcessor to stop a stream processor. To get a list of stream processors in your account, call ListStreamProcessors.

After the stream processor starts running, you stream the video into Amazon Rekognition Video through the Kinesis video stream that you specified in `CreateStreamProcessor`. You can use the Kinesis Video Streams SDK PutMedia operation to deliver video into the Kinesis video stream. For an example, see PutMedia API Example.

For information about how your application can consume Amazon Rekognition Video analysis results from a face search stream processor, see Reading streaming video analysis results.

Add tags to a new stream processor

You can identify, organize, search for, and filter Amazon Rekognition stream processors by using tags. Each tag is a label consisting of a user-defined key and value.

You can add tags to a stream processor as you create it using the `CreateStreamProcessor` operation. Specify one or more tags in the `Tags` array input parameter. The following is a JSON example for the `CreateStreamProcessor` request with tags.

```
{
       "Name": "streamProcessorForCam",
       "Input": {
              "KinesisVideoStream": {
                     "Arn": "arn:aws:kinesisvideo:us-east-1:nnnnnnnnnnnn:stream/
inputVideo"
              }
       },
       "Output": {
              "KinesisDataStream": {
                     "Arn": "arn:aws:kinesis:us-east-1:nnnnnnnnnnnn:stream/outputData"
              }
       },
       "RoleArn": "arn:aws:iam::nnnnnnnnnnn:role/roleWithKinesisPermission",
       "Settings": {
              "FaceSearch": {
                     "CollectionId": "collection-with-100-faces",
                     "FaceMatchThreshold": 85.5
              },
              "Tags": {
      "Dept": "Engineering",
        "Name": "Ana Silva Carolina",
        "Role": "Developer"
       }
}
```

Add tags to an existing stream processor

You can identify, organize, search for, and filter Amazon Rekognition stream processors by using tags. Each tag is a label consisting of a user-defined key and value.

To add one or more tags to an existing stream processor, use the `TagResource` operation. Specify the stream processor's Amazon Resource Name (ARN) (`ResourceArn`) and the tags (`Tags`) that you want to add. The following example shows how to add two tags.

```
aws rekognition tag-resource --resource-arn resource-arn \
               --tags '{"key1":"value1","key2":"value2"}'
```

> **Note**
>
> If you do not know the stream processor's Amazon Resource Name, you can use the `DescribeStreamProcessor` operation.

List tags in a stream processor

You can identify, organize, search for, and filter Amazon Rekognition stream processors by using tags. Each tag is a label consisting of a user-defined key and value.

To list the tags attached to a stream processor, use the `ListTagsForResource` operation and specify the ARN of the stream processor (`ResourceArn`). The response is a map of tag keys and values that are attached to the specified stream processor.

```
aws rekognition list-tags-for-resource --resource-arn resource-arn
```

The output displays a list of tags attached to the stream processor:

```
{
    "Tags": {
        "Dept": "Engineering",
        "Name": "Ana Silva Carolina",
        "Role": "Developer"
    }
}
```

Delete tags from a stream processor

You can identify, organize, search for, and filter Amazon Rekognition stream processors by using tags. Each tag is a label consisting of a user-defined key and value.

To remove one or more tags from a stream processor, use the `UntagResource` operation. Specify the ARN of the model (`ResourceArn`) and the tag keys (`Tag-Keys`) that you want to remove.

```
aws rekognition untag-resource --resource-arn resource-arn \
                --tag-keys '["key1","key2"]'
```

Alternatively, you can specify tag-keys in this format:

```
--tag-keys key1,key2
```

Error handling

This section describes runtime errors and how to handle them. It also describes error messages and codes that are specific to Amazon Rekognition.

Topics

- Error components
- Error messages and codes
- Error handling in your application

Error components

When your program sends a request, Amazon Rekognition attempts to process it. If the request is successful, Amazon Rekognition returns an HTTP success status code (`200 OK`), along with the results from the requested operation.

If the request is unsuccessful, Amazon Rekognition returns an error. Each error has three components:

- An HTTP status code (such as `400`).
- An exception name (such as `InvalidS3ObjectException`).

- An error message (such as `Unable to get object metadata from S3. Check object key, region and/or access permissions.`).

The AWS SDKs take care of propagating errors to your application, so that you can take appropriate action. For example, in a Java program, you can write `try-catch` logic to handle a `ResourceNotFoundException`.

If you're not using an AWS SDK, you need to parse the content of the low-level response from Amazon Rekognition. The following is an example of such a response:

```
HTTP/1.1 400 Bad Request
Content-Type: application/x-amz-json-1.1
Date: Sat, 25 May 2019 00:28:25 GMT
x-amzn-RequestId: 03507c9b-7e84-11e9-9ad1-854a4567eb71
Content-Length: 222
Connection: keep-alive

{"__type":"InvalidS3ObjectException","Code":"InvalidS3ObjectException","Logref":"5022229e-7e48-
 to get object metadata from S3. Check object key, region and/or access permissions."}
```

Error messages and codes

The following is a list of exceptions that Amazon Rekognition returns, grouped by HTTP status code. If *OK to retry?* is *Yes*, you can submit the same request again. If *OK to retry?* is *No*, you need to fix the problem on the client side before you submit a new request.

HTTP status code 400

An HTTP `400` status code indicates a problem with your request. Some examples of problems are authentication failure, required parameters that are missing, or exceeding an operation's provisioned throughput. You have to fix the issue in your application before submitting the request again.

AccessDeniedException

Message: *An error occurred (AccessDeniedException) when calling the <Operation> operation: User: <User ARN> is not authorized to perform: <Operation> on resource: <Resource ARN>.*

You aren't authorized to perform the action. Use the Amazon Resource Name (ARN) of an authorized user or IAM role to perform the operation.

OK to retry? No

GroupFacesInProgressException

Message: *Failed to schedule GroupFaces job. There is an existing group faces job for this collection.*

Retry the operation after the existing job finishes.

OK to retry? No

IdempotentParameterMismatchException

Message: *The ClientRequestToken: <Token> you have supplied is already in use.*

A ClientRequestToken input parameter was reused with an operation, but at least one of the other input parameters is different from the previous call to the operation.

OK to retry? No

ImageTooLargeException

Message: *Image size is too large.*

The input image size exceeds the allowed limit. If you are calling DetectProtectiveEquipment, the image size or resolution exceeds the allowed limit. For more information, see Guidelines and quotas in Amazon Rekognition.

OK to retry? No

InvalidImageFormatException

Message: *Request has invalid image format.*

The provided image format isn't supported. Use a supported image format (.JPEG and .PNG). For more information, see Guidelines and quotas in Amazon Rekognition.

OK to retry? No

InvalidPaginationTokenException

Messages

- *Invalid Token*
- *Invalid Pagination Token*

The pagination token in the request isn't valid. The token might have expired.

OK to retry? No

InvalidParameterException

Message: *Request has invalid parameters.*

An input parameter violated a constraint. Validate your parameters before calling the API operation again.

OK to retry? No

InvalidS3ObjectException

Messages:

- *Request has invalid S3 object.*
- *Unable to get object metadata from S3. Check object key, region and/or access permissions.*

Amazon Rekognition is unable to access the S3 object that was specified in the request. For more information, see Configure Access to S3: AWS S3 Managing Access. For troubleshooting information, see Troubleshooting Amazon S3.

OK to retry? No

LimitExceededException

Messages:

- *Stream processor limit exceeded for account, limit - <Current Limit>.*
- *<Number of Open Jobs> open Jobs for User <User ARN> Maximum limit: <Maximum Limit>*

An Amazon Rekognition service limit was exceeded. For example, if you start too many Amazon Rekognition Video jobs concurrently, calls to start operations, such as `StartLabelDetection`, raise a `LimitExceededException` exception (HTTP status code: 400) until the number of concurrently running jobs is below the Amazon Rekognition service limit.

OK to retry? No

ProvisionedThroughputExceededException

Messages:

- *Provisioned Rate exceeded.*
- *S3 download limit exceeded.*

The number of requests exceeded your throughput limit. For more information, see Amazon Rekognition Service Limits.

To request a limit increase, follow the instructions at the section called "Create a case to change TPS quotas".

OK to retry? Yes

ResourceAlreadyExistsException

Message: *The collection id: <Collection Id> already exists.*

A collection with the specified ID already exists.

OK to retry? No

ResourceInUseException

Messages:

- *Stream processor name already in use.*
- *Specified resource is in use.*
- *Processor not available for stopping stream.*
- *Cannot delete stream processor.*

Retry when the resource is available.

OK to retry? No

ResourceNotFoundException

Message: Various messages depending on the API call.

The specified resource doesn't exist.

OK to retry? No

ThrottlingException

Message: *Slow down; sudden increase in rate of requests.*

Your rate of request increase is too fast. Slow down your request rate and gradually increase it. We recommend that you back off exponentially and retry. By default, the AWS SDKs use automatic retry logic and exponential backoff. For more information, see Error Retries and Exponential Backoff in AWS and Exponential Backoff and Jitter.

OK to retry? Yes

VideoTooLargeException

Message: *Video size in bytes: <Video Size> is more than the maximum limit of: <Max Size> bytes.*

The file size or duration of the supplied media is too large. For more information, see Guidelines and quotas in Amazon Rekognition.

OK to retry? No

HTTP status code 5xx

An HTTP 5xx status code indicates a problem that must be resolved by AWS. This might be a transient error. If it is, you can retry your request until it succeeds. Otherwise, go to the AWS Service Health Dashboard to see if there are any operational issues with the service.

InternalServerError (HTTP 500)

Message: *Internal server error*

Amazon Rekognition experienced a service issue. Try your call again. You should back off exponentially and retry. By default, the AWS SDKs use automatic retry logic and exponential backoff. For more information, see Error Retries and Exponential Backoff in AWS and Exponential Backoff and Jitter.

OK to retry? Yes

ThrottlingException (HTTP 500)

Message: *Service Unavailable*

Amazon Rekognition is temporarily unable to process the request. Try your call again. We recommend that you back off exponentially and retry. By default, the AWS SDKs use automatic retry logic and exponential backoff. For more information, see Error Retries and Exponential Backoff in AWS and Exponential Backoff and Jitter.

OK to retry? Yes

Error handling in your application

For your application to run smoothly, you need to add logic to catch errors and respond to them. Typical approaches include using `try-catch` blocks or `if-then` statements.

The AWS SDKs perform their own retries and error checking. If you encounter an error while using one of the AWS SDKs, the error code and description can help you troubleshoot it.

You should also see a `Request ID` in the response. The `Request ID` can be helpful if you need to work with AWS Support to diagnose an issue.

The following Java code snippet attempts to detect objects in an image and performs rudimentary error handling. (In this case, it informs the user that the request failed.)

```
try {
    DetectLabelsResult result = rekognitionClient.detectLabels(request);
    List <Label> labels = result.getLabels();

    System.out.println("Detected labels for " + photo);
    for (Label label: labels) {
        System.out.println(label.getName() + ": " + label.getConfidence().toString());
    }
}
catch(AmazonRekognitionException e) {
    System.err.println("Could not complete operation");
    System.err.println("Error Message:  " + e.getMessage());
    System.err.println("HTTP Status:    " + e.getStatusCode());
    System.err.println("AWS Error Code: " + e.getErrorCode());
    System.err.println("Error Type:     " + e.getErrorType());
    System.err.println("Request ID:     " + e.getRequestId());
```

```
}
catch (AmazonClientException ace) {
    System.err.println("Internal error occurred communicating with Rekognition");
    System.out.println("Error Message:  " + ace.getMessage());
}
```

In this code snippet, the `try-catch` construct handles two different kinds of exceptions:

- `AmazonRekognitionException` –This exception occurs if the client request was correctly transmitted to Amazon Rekognition, but Amazon Rekognition couldn't process the request and returned an error response instead.
- `AmazonClientException` – This exception occurs if the client couldn't get a response from a service, or if the client couldn't parse the response from a service.

Using Amazon Rekognition as a FedRAMP authorized service

The AWS FedRAMP compliance program includes Amazon Rekognition as a FedRAMP-authorized service. If you're a federal or commercial customer, you can use the service to process and store sensitive workloads in the AWS US East and US West Regions, with data up to the moderate-impact level. You can use the service for sensitive workloads in the AWS GovCloud (US) Region's authorization boundary, with data up to the high-impact level. For more information about FedRAMP compliance, see AWS FedRAMP Compliance.

To be FedRAMP compliant, you can use a Federal Information Processing Standard (FIPS) endpoint. This gives you access to FIPS 140-2 validated cryptographic modules when you're working with sensitive information. For more information about FIPS endpoints, see FIPS 140-2 Overview.

You can use the AWS Command Line Interface (AWS CLI) or one of the AWS SDKs to specify the endpoint that is used by Amazon Rekognition.

For endpoints that can be used with Amazon Rekognition, see Amazon Rekognition Regions and Endpoints.

The following are examples from the Listing Collections topic in the *Amazon Rekognition Developer Guide*. They are modified to specify the Region and FIPS endpoint through which Amazon Rekognition is accessed.

Java

For Java, use the `withEndpointConfiguration` method when you construct the Amazon Rekognition client. This example shows the collections you have that use the FIPS endpoint in the US East (N.Virginia) Region:

```
//Copyright 2019 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-
rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;

import java.util.List;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.ListCollectionsRequest;
import com.amazonaws.services.rekognition.model.ListCollectionsResult;

public class ListCollections {

   public static void main(String[] args) throws Exception {


      AmazonRekognition amazonRekognition =
 AmazonRekognitionClientBuilder.standard()
         .withEndpointConfiguration(new
 AwsClientBuilder.EndpointConfiguration("https://rekognition-fips.us-
east-1.amazonaws.com","us-east-1"))
         .build();


      System.out.println("Listing collections");
      int limit = 10;
      ListCollectionsResult listCollectionsResult = null;
      String paginationToken = null;
      do {
         if (listCollectionsResult != null) {
            paginationToken = listCollectionsResult.getNextToken();
         }
         ListCollectionsRequest listCollectionsRequest = new
 ListCollectionsRequest()
                 .withMaxResults(limit)
```

```
                .withNextToken(paginationToken);

 listCollectionsResult=amazonRekognition.listCollections(listCollectionsRequest);

         List < String > collectionIds = listCollectionsResult.getCollectionIds();
         for (String resultId: collectionIds) {
            System.out.println(resultId);
         }
      } while (listCollectionsResult != null &&
 listCollectionsResult.getNextToken() !=
         null);

   }
}
```

AWS CLI

For the AWS CLI, use the `--endpoint-url` argument to specify the endpoint through which Amazon Rekognition is accessed. This example shows the collections you have that use the FIPS endpoint in the US East (Ohio) Region:

```
aws rekognition list-collections --endpoint-url https://rekognition-fips.us-
east-2.amazonaws.com --region us-east-2
```

Python

For Python, use the `endpoint_url` argument in the boto3.client function. Set it to the endpoint that you want to specify. This example shows the collections you have that use the FIPS endpoint in the US West (Oregon) Region:

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-
rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def list_collections():

    max_results=2

    client=boto3.client('rekognition', endpoint_url='https://rekognition-fips.us-
west-2.amazonaws.com', region_name='us-west-2')
```

```
    #Display all the collections
    print('Displaying collections...')
    response=client.list_collections(MaxResults=max_results)
    collection_count=0
    done=False

    while done==False:
        collections=response['CollectionIds']

        for collection in collections:
            print (collection)
            collection_count+=1
        if 'NextToken' in response:
            nextToken=response['NextToken']

 response=client.list_collections(NextToken=nextToken,MaxResults=max_results)

        else:
            done=True

    return collection_count

def main():

    collection_count=list_collections()
    print("collections: " + str(collection_count))
if __name__ == "__main__":
    main()
```

Best practices for sensors, input images, and videos

This section contains best practice information for using Amazon Rekognition. These best practices will help you get optimal performance out of the operations you invoke. If you are struggling to get the expected results from an operation, ensure you are following the best practices documented here.

For information regarding the latency of image operations, see the following:

- the section called “Amazon Rekognition Image operation latency”

Facial comparision and faces search operations require you to follow specific best practices to find faces in an image. These requirements have also been documented in the following link:

- the section called “Recommendations for facial comparison input images”
- the section called “Recomendations for searching faces in a collection”

The following sections cover how to set up your camera for each type of media Amazon Rekognition is capable of analyzing:

- the section called “Recommendations for camera setup (image and video)”
- the section called “Recommendations for camera setup (stored and streaming video)”
- the section called “Recommendations for camera setup (streaming video)”

The Face Liveness operations also have their own best practices that should be followed to get the best performance from the Liveness check tool:

- the section called “Recommendations for Usage of Face Liveness”

Amazon Rekognition Image operation latency

To ensure the lowest possible latency for Amazon Rekognition Image operations, consider the following:

- The Region for the Amazon S3 bucket that contains your images must match the Region you use for Amazon Rekognition Image API operations.

- Calling an Amazon Rekognition Image operation with image bytes is faster than uploading the image to an Amazon S3 bucket and then referencing the uploaded image in an Amazon Rekognition Image operation. Consider this approach if you are uploading images to Amazon Rekognition Image for near real-time processing. For example, images uploaded from an IP camera or images uploaded through a web portal.
- If the image is already in an Amazon S3 bucket, referencing it in an Amazon Rekognition Image operation is probably faster than passing image bytes to the operation.

Recommendations for facial comparison input images

The models used for face comparison operations are designed to work for a wide variety of poses, facial expressions, age ranges, rotations, lighting conditions, and sizes. We recommend that you use the following guidelines when choosing reference photos for CompareFaces or for adding faces to a collection using IndexFaces.

General recommendations for input images for face operations

- Use images that are bright and sharp. Avoid using images that may be blurry due to subject and camera motion as much as possible. DetectFaces can be used to determine the brightness and sharpness of a face.
- For the purposes of gaze detection, it's recommended that you upload the original image at original size and quality.
- Use an image with a face that is within the recommended range of angles. The pitch should be less than 30 degrees face down and less than 45 degrees face up. The yaw should be less than 45 degrees in either direction. There is no restriction on the roll.
- Use an image of a face with both eyes open and visible.
- Use an image of a face that is not obscured or tightly cropped. The image should contain the full head and shoulders of the person. It should not be cropped to the face bounding box.
- Avoid items that block the face, such as headbands and masks.
- Use an image of a face that occupies a large proportion of the image. Images where the face occupies a larger portion of the image are matched with greater accuracy.
- Ensure that images are sufficiently large in terms of resolution. Amazon Rekognition can recognize faces as small as 50 x 50 pixels in image resolutions up to 1920 x 1080. Higher-resolution images require a larger minimum face size. Faces larger than the minimum size provide a more accurate set of facial comparison results.

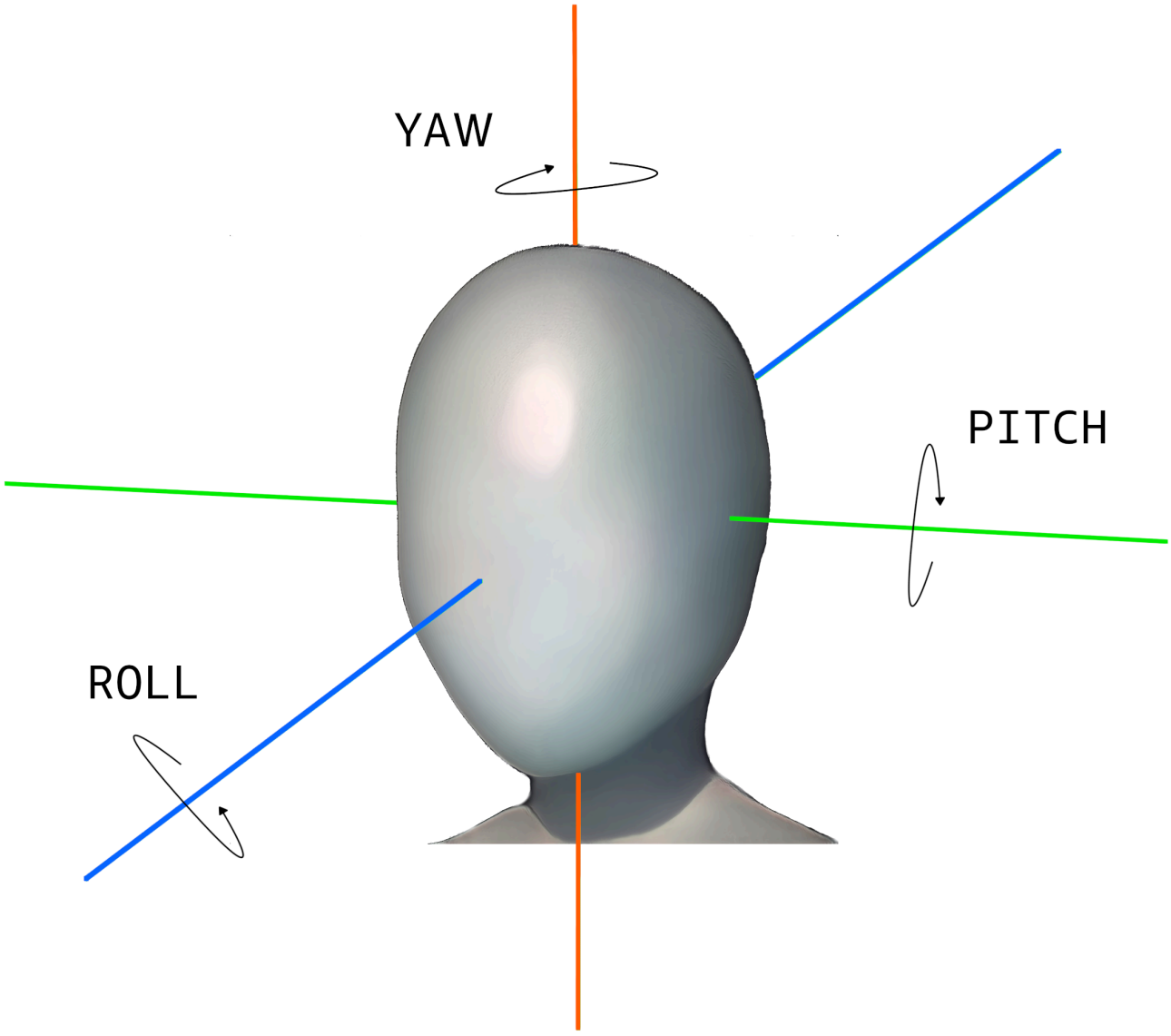
- Use color images.
- Use images with flat lighting on the face, as opposed to varied lighting such as shadows.
- Use images that have sufficient contrast with the background. A high-contrast monochrome background works well.
- Use images of faces with neutral facial expressions with mouth closed and little to no smile for applications that require high precision.

Recomendations for searching faces in a collection

- When searching for faces in a collection, ensure that recent face images are indexed.
- When creating a collection using `IndexFaces`, use multiple face images of an individual with different pitches and yaws (within the recommended range of angles). We recommend that at least five images of the person are indexed—straight on, face turned left with a yaw of 45 degrees or less, face turned right with a yaw of 45 degrees or less, face tilted down with a pitch of 30 degrees or less, and face tilted up with a pitch of 45 degrees or less. If you want to track that these face instances belong to the same individual, consider using the external image ID attribute if there is only one face in the image being indexed. For example, five images of John Doe can be tracked in the collection with external image IDs as `John_Doe_1.jpg, … John_Doe_5.jpg`.

Recommendations for camera setup (image and video)

The following recommendations are in addition to Recommendations for facial comparison input images.



- Image Resolution – There is no minimum requirement for image resolution, as long as the face resolution is 50 x 50 pixels for images with a total resolution up to 1920 x 1080. Higher-resolution images require a larger minimum face size.

> **Note**
>
> The preceding recommendation is based on the native resolution of the camera. Generating a high-resolution image from a low-resolution image does not produce the

results needed for face search (due to artifacts generated by the up-sampling of the image).

- Camera Angle – There are three measurements for camera angle—pitch, roll, and yaw.
  - Pitch – We recommend a pitch of less than 30 degrees when the camera is facing down and less than 45 degrees when the camera is facing up.
  - Roll – There isn't a minimum requirement for this parameter. Amazon Rekognition can handle any amount of roll.
  - Yaw – We recommend a yaw of less than 45 degrees in either direction.

  The face angle along any axis that is captured by the camera is a combination of both the camera angle facing the scene and the angle at which the subject's head is in the scene. For example, if the camera is 30 degrees facing down and the person has their head down a further 30 degrees, the actual face pitch as seen by the camera is 60 degrees. In this case, Amazon Rekognition would not be able to recognize the face. We recommend setting up cameras such that the camera angles are based on the assumption that people are generally looking into the camera with the overall pitch (combination of face and camera) at 30 degrees or less.
- Camera Zoom – The recommended minimum face resolution of 50 x 50 pixels should drive this camera setting. We recommend using the zoom setting of a camera so that the desired faces are at a resolution no less than 50 x 50 pixels.
- Camera Height – The recommended camera pitch should drive this parameter.

Recommendations for camera setup (stored and streaming video)

The following recommendations are in addition to Recommendations for camera setup (image and video).

- The codec should be h.264 encoded.
- The recommended frame rate is 30 fps. (It should not be less than 5 fps.)
- The recommended encoder bitrate is 3 Mbps. (It should not be less than 1.5 Mbps.)
- Frame Rate vs. Frame Resolution – If the encoder bitrate is a constraint, we recommend favoring a higher frame resolution over a higher frame rate for better face search results. This ensures that Amazon Rekognition gets the best quality frame within the allocated bitrate. However, there is a downside to this. Because of the low frame rate, the camera misses fast motion in a

scene. It's important to understand the trade-offs between these two parameters for a given setup. For example, if the maximum possible bitrate is 1.5 Mbps, a camera can capture 1080p at 5 fps or 720p at 15 fps. The choice between the two is application dependent, as long as the recommended face resolution of 50 x 50 pixels is met.

Recommendations for camera setup (streaming video)

The following recommendation is in addition to Recommendations for camera setup (stored and streaming video).

An additional constraint with streaming applications is internet bandwidth. For live video, Amazon Rekognition only accepts Amazon Kinesis Video Streams as an input. You should understand the dependency between the encoder bitrate and the available network bandwidth. Available bandwidth should, at a minimum, support the same bitrate that the camera is using to encode the live stream. This ensures that whatever the camera captures is relayed through Amazon Kinesis Video Streams. If the available bandwidth is less than the encoder bitrate, Amazon Kinesis Video Streams drops bits based on the network bandwidth. This results in low video quality.

A typical streaming setup involves connecting multiple cameras to a network hub that relays the streams. In this case, the bandwidth should accommodate the cumulative sum of the streams coming from all cameras connected to the hub. For example, if the hub is connected to five cameras encoding at 1.5 Mbps, the available network bandwidth should be at least 7.5 Mbps. To ensure that there are no dropped packets, you should consider keeping the network bandwidth higher than 7.5 Mbps to accommodate for jitters due to dropped connections between a camera and the hub. The actual value depends on the reliability of the internal network.

Recommendations for Usage of Face Liveness

We recommend the following best practices when using Rekognition Face Liveness:

- Users should complete the Face Liveness check in environments that aren’t too dark or too bright and have fairly uniform lighting.
- Users should increase their display screen's brightness to its maximum level when making checks on web browsers. Mobile Native SDKs adjust the display brightness automatically.
- Choose a confidence score threshold that reflects the nature of your use case. For use cases with greater security concerns, use a high threshold.

- Regularly run human review checks on audit images to make sure that spoof attacks are mitigated at the confidence threshold you set.
- Offer an alternative face liveness verification path to your users if they are photo-sensitive or do not want to verify their face liveness using Rekognition.
- Do not send or display the liveness check score on the user application. Only send a pass or fail signal.
- Allow only five failed liveness checks in three minutes from a single device. After five fails, timeout the user for 30–60 minutes. If the pattern is seen 3–5 times repeatedly, block the user device from making additional calls.
- Implement the get-ready screen in your workflow so that users can more easily pass the Face Liveness checks.
- You are responsible for providing legally adequate privacy notices to, and obtaining any necessary consent from, your End Users for the processing, storage, use, and transfer of content by Face Liveness.

Detecting objects and concepts

This section provides information for detecting labels in images and videos with Amazon Rekognition Image and Amazon Rekognition Video.

A label or a tag is an object or concept (including scenes and actions) found in an image or video based on its contents. For example, an image of people on a tropical beach may contain labels such as Palm Tree (object), Beach (scene), Running (action), and Outdoors (concept).

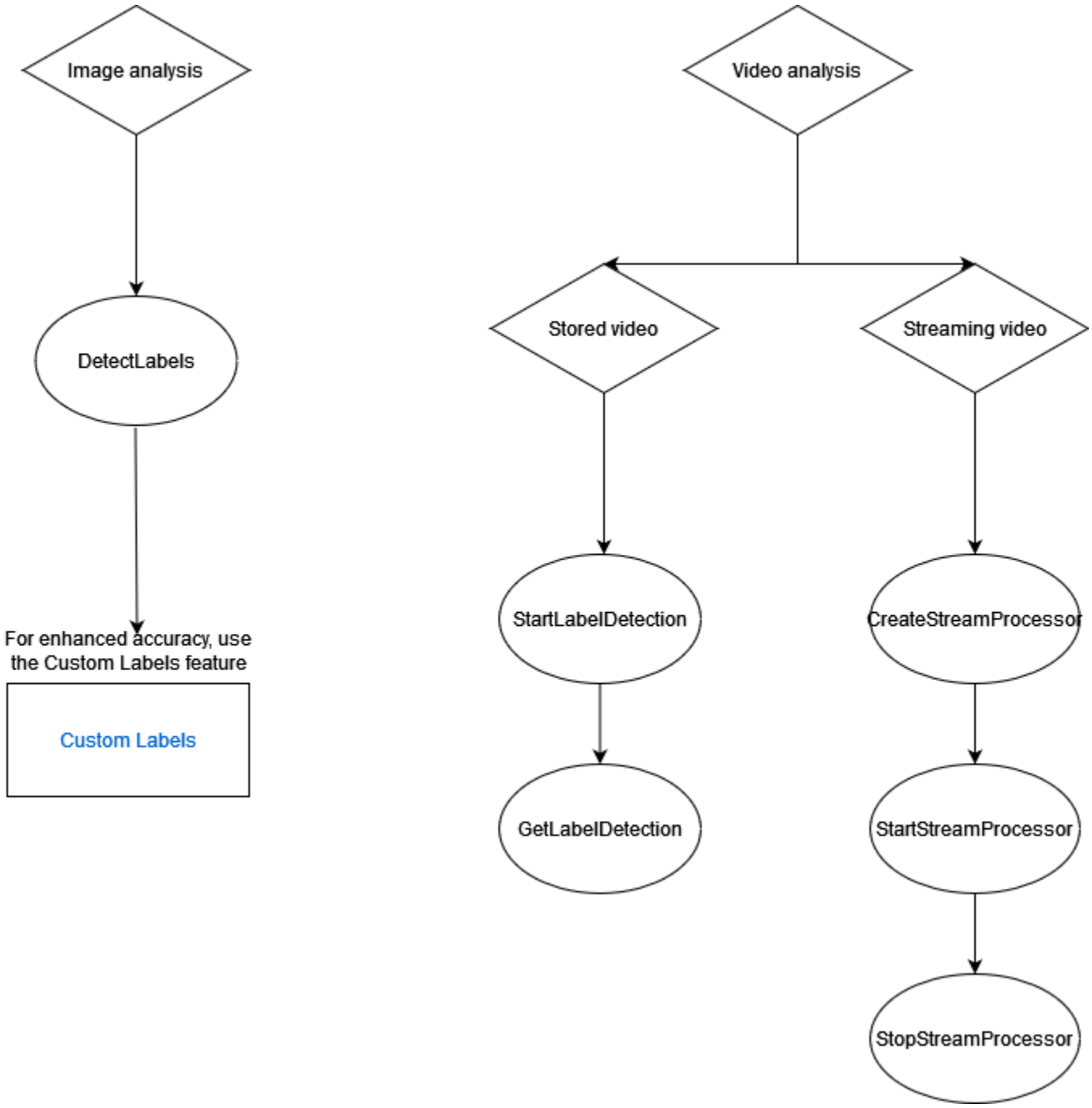
Labels supported by Rekognition label detection operations

- To download the latest list of labels and object bounding boxes supported by Amazon Rekognition, click here.
- To download the previous list of labels and object bounding boxes, click here.

> **Note**
>
> Amazon Rekognition makes gender binary (man, woman, girl, etc.) predictions based on the physical appearance of a person in a particular image. This kind of prediction is not designed to categorize a person's gender identity, and you shouldn't use Amazon Rekognition to make such a determination. For example, a male actor wearing a long-haired wig and earrings for a role might be predicted as female.
> Using Amazon Rekognition to make gender binary predictions is best suited for use cases where aggregate gender distribution statistics need to be analyzed without identifying specific users. For example, the percentage of users who are women compared to men on a social media platform.
> We don't recommend using gender binary predictions to make decisions that impact an individual's rights, privacy, or access to services.

Amazon Rekognition returns labels in English. You can use Amazon Translate to translate English labels into other languages.

The following diagram shows shows the order for calling operations, depending on your goals for using the Amazon Rekognition Image or Amazon Rekognition Video operations:



Label Response Objects

Bounding Boxes

Amazon Rekognition Image and Amazon Rekognition Video can return the bounding box for common object labels such as cars, furniture, apparel or pets. Bounding box information isn't returned for less common object labels. You can use bounding boxes to find the exact locations

of objects in an image, count instances of detected objects, or to measure an object's size using bounding box dimensions.

For example, in the following image, Amazon Rekognition Image is able to detect the presence of a person, a skateboard, parked cars and other information. Amazon Rekognition Image also returns the bounding box for a detected person, and other detected objects such as cars and wheels.

Confidence Score

Amazon Rekognition Video and Amazon Rekognition Image provide a percentage score for how much confidence Amazon Rekognition has in the accuracy of each detected label.

Parents

Amazon Rekognition Image and Amazon Rekognition Video use a hierarchical taxonomy of ancestor labels to categorize labels. For example, a person walking across a road might be detected as a *Pedestrian*. The parent label for *Pedestrian* is *Person*. Both of these labels are returned in the response. All ancestor labels are returned and a given label contains a list of its parent and other

ancestor labels. For example, grandparent and great grandparent labels, if they exist. You can use parent labels to build groups of related labels and to allow querying of similar labels in one or more images. For example, a query for all *Vehicles* might return a car from one image and a motor bike from another.

Categories

Amazon Rekognition Image and Amazon Rekognition Video return information on label categories. Labels are part of categories that group individual labels together based on common functions and contexts, such as ‘Vehicles and Automotive’ and ‘Food and Beverage’. A label category can be a subcategory of a parent category.

Aliases

In addition to returning labels, Amazon Rekognition Image and Amazon Rekognition Video returns any aliases associated with the label. Aliases are labels with the same meaning or labels that are visually interchangeable with the primary label returned. For example, ‘Cell Phone’ is an alias of ‘Mobile Phone’.

In previous versions, Amazon Rekognition Image returned aliases like 'Cell Phone' in the same list of primary label names that contained 'Mobile Phone'. Amazon Rekognition Image now returns 'Cell Phone' in a field called "aliases" and 'Mobile Phone' in the list of primary label names. If your appliction relies on the structures returned by a previous version of Rekognition, you may need to transform the current response returned by the image or video label detection operations into the previous response structure, where all labels and aliases are returned as primary labels.

If you need to transform the current response from the DetectLabels API (for label detection in images) into the previous response structure, see the code example in Transforming the DetectLabels response.

If you need to transform the current response from the GetLabelDetection API (for label detection in stored videos) into the previous response structure, see the code example in Transforming the GetLabelDetection Response.

Image Properties

Amazon Rekognition Image returns information about image quality (sharpness, brightness, and contrast) for the entire image. Sharpness and brightness are also returned for the foreground and

background of the image. Image Properties can also be used to detect dominant colors of the entire image, foreground, background, and objects with bounding boxes.

The following is an example of the ImageProperties data contained in the response of a DetectLabels operation for the proceeding image:

Image Properties	Dominant Colors Examples and Pixel Percentage	Image Quality
Entire Image	Hex code #808080, RGB (128, 128, 128), 15.72	Brightness: 76.08 Sharpness: 89.72 Contrast: 88.42
	Hex code #000000, RGB (0, 0, 0), 15.10	
	Hex code #696969, RGB (105, 105, 105), 14.02	
	Hex code #8fbc8f, RGB (143, 188, 143), 12.70	
	Hex code #5f9ea0, RGB (95, 158, 160), 11.92	
Foreground	Hex code #8fbc8f, RGB (143, 188, 143), 30.18	Brightness: 79.48 Sharpness: 93.47
	Hex code #5f9ea0, RGB (95, 158, 160), 24.29	
	Hex code #000000, RGB (0, 0, 0), 12.02	
	Hex code #2f4f4f, RGB (47, 79, 79), 9.20	
	Hex code #696969, RGB (105, 105, 105), 8.95	
Background	Hex code #808080, RGB (128, 128, 128), 21.16	Brightness: 74.42 Sharpness: 87.84
	Hex code #2f4f4f, RGB (47, 79, 79), 14.61	
	Hex code #000000, RGB (0, 0, 0), 14.23	
	Hex code #696969, RGB (105, 105, 105), 13.19	
	Hex code #ffebcd, RGB (255, 235, 205), 12.80	
Car (example of objects with bounding boxes)	Hex code #5f9ea0, RGB (95, 158, 160), 29.18	Not applicable
	Hex code #8fbc8f, RGB (143, 188, 143), 14.39	
	Hex code #000000, RGB (0, 0, 0), 11.76	
	Hex code #808080, RGB (128, 128, 128), 11.38	
	Hex code #2f4f4f, RGB (47, 79, 79), 9.44	

Image Properties isn't available for Amazon Rekognition Video.

Model Version

Amazon Rekognition Image and Amazon Rekognition Video both return the version of the label detection model used to detect labels in an image or stored video.

Inclusion and Exclusion Filters

You can filter the results returned by Amazon Rekognition Image and Amazon Rekognition Video label detection operations. Filter results by providing filtration criteria for labels and categories. Label filters can be inclusive or exclusive.

See Detecting labels in an image for more information regarding filtration of results obtained with `DetectLabels`.

See Detecting labels in a video for more information regarding filtration of results obtained by `GetLabelDetection`.

Sorting and Aggregating Results

Results obtained from certain Amazon Rekognition Video operations can be sorted and aggregated according to timestamps and video segments. When retrieving the results of a Label Detection or Content Moderation job, with `GetLabelDetection` or `GetContentModeration` respectively, you can use the `SortBy` and `AggregateBy` arguments to specify how you want your results returned. You can use `SortBy` with `TIMESTAMP` or `NAME` (Label names), and use `TIMESTAMPS` or `SEGMENTS` with the AggregateBy argument.

Detecting labels in an image

You can use the DetectLabels operation to detect labels (objects and concepts) in an image and retrieve information about an image's properties. Image properties include attributes like the color of the foreground and background and the image's sharpness, brightness, and contrast. You can retrieve just the labels in an image, just the properties of the image, or both. For an example, see Analyzing images stored in an Amazon S3 bucket.

The following examples use various AWS SDKs and the AWS CLI to call `DetectLabels`. For information about the `DetectLabels` operation response, see DetectLabels response.

To detect labels in an image

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Upload an image that contains one or more objects—such as trees, houses, and boat—to your S3 bucket. The image must be in *.jpg* or *.png* format.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following examples to call the `DetectLabels` operation.

Java

This example displays a list of labels that were detected in the input image. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in step 2.

```
package com.amazonaws.samples;
import java.util.List;

import com.amazonaws.services.rekognition.model.BoundingBox;
import com.amazonaws.services.rekognition.model.DetectLabelsRequest;
import com.amazonaws.services.rekognition.model.DetectLabelsResult;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.Instance;
import com.amazonaws.services.rekognition.model.Label;
import com.amazonaws.services.rekognition.model.Parent;
import com.amazonaws.services.rekognition.model.S3Object;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;

public class DetectLabels {

    public static void main(String[] args) throws Exception {

        String photo = "photo";
        String bucket = "bucket";

        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

        DetectLabelsRequest request = new DetectLabelsRequest()
                .withImage(new Image().withS3Object(new
 S3Object().withName(photo).withBucket(bucket)))
                .withMaxLabels(10).withMinConfidence(75F);

        try {
            DetectLabelsResult result = rekognitionClient.detectLabels(request);
            List<Label> labels = result.getLabels();

            System.out.println("Detected labels for " + photo + "\n");
```

```
            for (Label label : labels) {
                System.out.println("Label: " + label.getName());
                System.out.println("Confidence: " +
 label.getConfidence().toString() + "\n");

                List<Instance> instances = label.getInstances();
                System.out.println("Instances of " + label.getName());
                if (instances.isEmpty()) {
                    System.out.println("  " + "None");
                } else {
                    for (Instance instance : instances) {
                        System.out.println("  Confidence: " +
 instance.getConfidence().toString());
                        System.out.println("  Bounding box: " +
 instance.getBoundingBox().toString());
                    }
                }
                System.out.println("Parent labels for " + label.getName() +
 ":");
                List<Parent> parents = label.getParents();
                if (parents.isEmpty()) {
                    System.out.println("  None");
                } else {
                    for (Parent parent : parents) {
                        System.out.println("  " + parent.getName());
                    }
                }
                System.out.println("--------------------");
                System.out.println();

            }
        } catch (AmazonRekognitionException e) {
            e.printStackTrace();
        }
    }
}
```

AWS CLI

This example displays the JSON output from the `detect-labels` CLI operation. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2. Replace the value of `profile-name` with the name of your developer profile.

```
aws rekognition detect-labels --image '{ "S3Object": { "Bucket": "bucket-name",
 "Name": "file-name" } }' \
--features GENERAL_LABELS IMAGE_PROPERTIES \
--settings '{"ImageProperties": {"MaxDominantColors":1}, {"GeneralLabels":
{"LabelInclusionFilters":["Cat"]}}}' \
--profile profile-name \
--region us-east-1
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
aws rekognition detect-labels --image "{\"S3Object\":{\"Bucket\":\"bucket-name
\",\"Name\":\"file-name\"}}" --features GENERAL_LABELS IMAGE_PROPERTIES \
--settings "{\"GeneralLabels\":{\"LabelInclusionFilters\":[\"Car\"]}}" --profile
 profile-name --region us-east-1
```

Python

This example displays the labels that were detected in the input image. In the function `main`, replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def detect_labels(photo, bucket):

     session = boto3.Session(profile_name='profile-name')
     client = session.client('rekognition')

     response = client.detect_labels(Image={'S3Object':
{'Bucket':bucket,'Name':photo}},
     MaxLabels=10,
```

```
    # Uncomment to use image properties and filtration settings
    #Features=["GENERAL_LABELS", "IMAGE_PROPERTIES"],
    #Settings={"GeneralLabels": {"LabelInclusionFilters":["Cat"]},
    # "ImageProperties": {"MaxDominantColors":10}}
    )

    print('Detected labels for ' + photo)
    print()
    for label in response['Labels']:
        print("Label: " + label['Name'])
        print("Confidence: " + str(label['Confidence']))
        print("Instances:")

        for instance in label['Instances']:
            print(" Bounding box")
            print(" Top: " + str(instance['BoundingBox']['Top']))
            print(" Left: " + str(instance['BoundingBox']['Left']))
            print(" Width: " + str(instance['BoundingBox']['Width']))
            print(" Height: " + str(instance['BoundingBox']['Height']))
            print(" Confidence: " + str(instance['Confidence']))
            print()

        print("Parents:")
        for parent in label['Parents']:
           print(" " + parent['Name'])

        print("Aliases:")
        for alias in label['Aliases']:
            print(" " + alias['Name'])

            print("Categories:")
        for category in label['Categories']:
            print(" " + category['Name'])
            print("----------")
            print()

    if "ImageProperties" in str(response):
        print("Background:")
        print(response["ImageProperties"]["Background"])
        print()
        print("Foreground:")
        print(response["ImageProperties"]["Foreground"])
        print()
        print("Quality:")
```

```
         print(response["ImageProperties"]["Quality"])
         print()

     return len(response['Labels'])

def main():
    photo = 'photo-name'
    bucket = 'amzn-s3-demo-bucket'
    label_count = detect_labels(photo, bucket)
    print("Labels detected: " + str(label_count))

if __name__ == "__main__":
    main()
```

.NET

This example displays a list of labels that were detected in the input image. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class DetectLabels
{
    public static void Example()
    {
        String photo = "input.jpg";
        String bucket = "amzn-s3-demo-bucket";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        DetectLabelsRequest detectlabelsRequest = new DetectLabelsRequest()
        {
            Image = new Image()
            {
                S3Object = new S3Object()
```

```
                {
                    Name = photo,
                    Bucket = bucket
                },
            },
            MaxLabels = 10,
            MinConfidence = 75F
        };

        try
        {
            DetectLabelsResponse detectLabelsResponse =
 rekognitionClient.DetectLabels(detectlabelsRequest);
            Console.WriteLine("Detected labels for " + photo);
            foreach (Label label in detectLabelsResponse.Labels)
                Console.WriteLine("{0}: {1}", label.Name, label.Confidence);
        }
        catch (Exception e)
        {
            Console.WriteLine(e.Message);
        }
    }
}
```

Ruby

This example displays a list of labels that were detected in the input image. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2.

```
  # Add to your Gemfile
  # gem 'aws-sdk-rekognition'
  require 'aws-sdk-rekognition'
  credentials = Aws::Credentials.new(
     ENV['AWS_ACCESS_KEY_ID'],
     ENV['AWS_SECRET_ACCESS_KEY']
  )
  bucket = 'bucket' # the bucket name without s3://
  photo  = 'photo' # the name of file
  client   = Aws::Rekognition::Client.new credentials: credentials
  attrs = {
```

```
    image: {
      s3_object: {
        bucket: bucket,
        name: photo
      },
    },
    max_labels: 10
  }
response = client.detect_labels attrs
puts "Detected labels for: #{photo}"
response.labels.each do |label|
  puts "Label:      #{label.name}"
  puts "Confidence: #{label.confidence}"
  puts "Instances:"
  label['instances'].each do |instance|
    box = instance['bounding_box']
    puts "  Bounding box:"
    puts "    Top:        #{box.top}"
    puts "    Left:       #{box.left}"
    puts "    Width:      #{box.width}"
    puts "    Height:     #{box.height}"
    puts "  Confidence: #{instance.confidence}"
  end
  puts "Parents:"
  label.parents.each do |parent|
    puts "  #{parent.name}"
  end
  puts "------------"
  puts ""
end
```

Node.js

This example displays a list of labels that were detected in the input image. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

If you are using TypeScript definitions, you may need to use `import AWS from 'aws-sdk'` instead of `const AWS = require('aws-sdk')`, in order to run the program with Node.js. You can consult the AWS SDK for Javascript for more details. Depending on

how you have your configurations set up, you also may need to specify your region with `AWS.config.update({region:region});`.

```
// Load the SDK
var AWS = require('aws-sdk');
const bucket = 'bucket-name' // the bucketname without s3://
const photo  = 'image-name' // the name of file

var credentials = new AWS.SharedIniFileCredentials({profile: 'profile-name'});
AWS.config.credentials = credentials;
AWS.config.update({region:'region-name'});

const client = new AWS.Rekognition();
const params = {
  Image: {
    S3Object: {
      Bucket: bucket,
      Name: photo
    },
  },
  MaxLabels: 10
}
client.detectLabels(params, function(err, response) {
  if (err) {
    console.log(err, err.stack); // if an error occurred
  } else {
    console.log(`Detected labels for: ${photo}`)
    response.Labels.forEach(label => {
      console.log(`Label:      ${label.Name}`)
      console.log(`Confidence: ${label.Confidence}`)
      console.log("Instances:")
      label.Instances.forEach(instance => {
        let box = instance.BoundingBox
        console.log("  Bounding box:")
        console.log(`    Top:        ${box.Top}`)
        console.log(`    Left:       ${box.Left}`)
        console.log(`    Width:      ${box.Width}`)
        console.log(`    Height:     ${box.Height}`)
        console.log(`  Confidence: ${instance.Confidence}`)
      })
      console.log("Parents:")
```

```
      label.Parents.forEach(parent => {
        console.log(`  ${parent.Name}`)
      })
      console.log("------------")
      console.log("")
    }) // for response.labels
  } // if
});
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.detect_labels.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.DetectLabelsRequest;
import software.amazon.awssdk.services.rekognition.model.DetectLabelsResponse;
import software.amazon.awssdk.services.rekognition.model.Label;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import java.util.List;

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class DetectLabels {

    public static void main(String[] args) {

        final String usage = "\n" +
            "Usage: " +
```

```
            "   <bucket> <image>\n\n" +
            "Where:\n" +
            "   bucket - The name of the Amazon S3 bucket that contains the
 image (for example, ,ImageBucket)." +
            "   image - The name of the image located in the Amazon S3 bucket
 (for example, Lake.png). \n\n";

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String image = args[1];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        getLabelsfromImage(rekClient, bucket, image);
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.detect_labels_s3.main]
    public static void getLabelsfromImage(RekognitionClient rekClient, String
 bucket, String image) {

        try {
            S3Object s3Object = S3Object.builder()
                .bucket(bucket)
                .name(image)
                .build() ;

            Image myImage = Image.builder()
                .s3Object(s3Object)
                .build();

            DetectLabelsRequest detectLabelsRequest =
 DetectLabelsRequest.builder()
                .image(myImage)
                .maxLabels(10)
                .build();
```

```
            DetectLabelsResponse labelsResponse =
 rekClient.detectLabels(detectLabelsRequest);
            List<Label> labels = labelsResponse.labels();
            System.out.println("Detected labels for the given photo");
            for (Label label: labels) {
                System.out.println(label.name() + ": " +
 label.confidence().toString());
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
 // snippet-end:[rekognition.java2.detect_labels.main]
}
```

DetectLabels operation request

The input to `DetectLabel` is an image. In this example JSON input, the source image is loaded from an Amazon S3 Bucket. `MaxLabels` is the maximum number of labels to return in the response. `MinConfidence` is the minimum confidence that Amazon Rekognition Image must have in the accuracy of the detected label for it to be returned in the response.

Features lets you specify one or more features of the image that you want returned, allowing you to select `GENERAL_LABELS` and `IMAGE_PROPERTIES`. Including `GENERAL_LABELS` will return the labels detected in the input image, while including `IMAGE_PROPERTIES` will allow you to access image color and quality.

Settings lets you filter the returned items for both the `GENERAL_LABELS` and `IMAGE_PROPERTIES` features. For labels you can use inclusive and exclusive filters. You can also filter by label specific, individual labels or by label category:

- LabelInclusionFilters - Allows you to specify which labels you want included in the response.
- LabelExclusionFilters - Allows you to specify which labels you want excluded from the response.
- LabelCategoryInclusionFilters - Allows you to specify which label categories you want included in the response.

- LabelCategoryExclusionFilters - Allows you to specify which label categories you want excluded from the response.

You can also combine inclusive and exclusive filters according to your needs, excluding some labels or categories and including others.

`IMAGE_PROPERTIES` refer to an image's dominant colors and quality attributes such as sharpness, brightness, and contrast. When detecting `IMAGE_PROPERTIES` you can specify the maximum number of dominant colors to return (default is 10) by using the `MaxDominantColors` parameter.

```
{
    "Image": {
        "S3Object": {
            "Bucket": "bucket",
            "Name": "input.jpg"
        }
    },
    "MaxLabels": 10,
    "MinConfidence": 75,
    "Features": [ "GENERAL_LABELS", "IMAGE_PROPERTIES" ],
    "Settings": {
        "GeneralLabels": {
            "LabelInclusionFilters": [<Label(s)>],
            "LabelExclusionFilters": [<Label(s)>],
            "LabelCategoryInclusionFilters": [<Category Name(s)>],
            "LabelCategoryExclusionFilters": [<Category Name(s)>]
        },
        "ImageProperties": {
            "MaxDominantColors":10
        }
    }
}
```

DetectLabels response

The response from `DetectLabels` is an array of labels detected in the image and the level of confidence by which they were detected.

The following is an example response from `DetectLabels`. The sample response below contains a variety of attributes returned for GENERAL_LABELS, including:

- Name - The name of the detected label. In this example, the operation detected an object with the label Mobile Phone.
- Confidence - Each label has an associated level of confidence. In this example, the confidence for the label was 99.36%.
- Parents - The ancestor labels for a detected label. In this example, the label Mobile Phone has one parent label named Phone.
- Aliases - Information about possible Aliases for the label. In this example, the Mobile Phone label has a possible alias of Cell Phone.
- Categories - The label category that the detected label belongs to. In this example, it is Technology and Computing.

The response for common object labels includes bounding box information for the location of the label on the input image. For example, the Person label has an instances array containing two bounding boxes. These are the locations of two people detected in the image.

The response also includes attributes regarding IMAGE_PROPERTIES. The attributes presented by the IMAGE_PROPERTIES feature are:

- Quality - Information about the Sharpness, Brightness, and Contrast of the input image, scored between 0 to 100. Quality is reported for the entire image and for the background and foreground of the image, if available. However, Contrast is only reported for the entire image while Sharpness and Brightness are also reported for Background and Foreground.
- Dominant Color - An array of the dominant colors in the image. Each dominant color is described with a simplified color name, a CSS color palette, RGB values, and a hex code.
- Foreground - Information about the dominant Colors, Sharpness and Brightness of the input image's foreground.
- Background - Information about the dominant Colors, Sharpness and Brightness of the input image's background.

When GENERAL_LABELS and IMAGE_PROPERTIES are used together as input parameters, Amazon Rekognition Image will also return the dominant colors of objects with bounding boxes.

The field `LabelModelVersion` contains the version number of the detection model used by `DetectLabels`.

```
{
```

```
    "Labels": [
         {
             "Name": "Mobile Phone",
             "Parents": [
               {
                 "Name": "Phone"
               }
             ],
             "Aliases": [
               {
                 "Name": "Cell Phone"
               }
             ],
             "Categories": [
               {
                 "Name": "Technology and Computing"
               }
             ],
             "Confidence": 99.9364013671875,
             "Instances": [
                 {
                     "BoundingBox": {
                         "Width": 0.26779675483703613,
                         "Height": 0.8562285900115967,
                         "Left": 0.3604024350643158,
                         "Top": 0.09245597571134567,
                     }
                     "Confidence": 99.9364013671875,
                     "DominantColors": [
                     {
                 "Red": 120,
                 "Green": 137,
                 "Blue": 132,
                 "HexCode": "3A7432",
                 "SimplifiedColor": "red",
                 "CssColor": "fuscia",
                 "PixelPercentage": 40.10
                     }
                         ],
                 }
             ]
         }
     ],
```

```
    "ImageProperties": {
        "Quality": {
            "Brightness": 40,
            "Sharpness": 40,
            "Contrast": 24,
        },
        "DominantColors": [
            {
                "Red": 120,
                "Green": 137,
                "Blue": 132,
                "HexCode": "3A7432",
                "SimplifiedColor": "red",
                "CssColor": "fuscia",
                "PixelPercentage": 40.10
            }
        ],
        "Foreground": {
            "Quality": {
                "Brightness": 40,
                "Sharpness": 40,
            },
            "DominantColors": [
                {
                    "Red": 200,
                    "Green": 137,
                    "Blue": 132,
                    "HexCode": "3A7432",
                    "CSSColor": "",
                    "SimplifiedColor": "red",
                    "PixelPercentage": 30.70
                }
            ],
        }
        "Background": {
            "Quality": {
                "Brightness": 40,
                "Sharpness": 40,
            },
            "DominantColors": [
                {
                    "Red": 200,
                    "Green": 137,
                    "Blue": 132,
```

```
                    "HexCode": "3A7432",
                    "CSSColor": "",
                    "SimplifiedColor": "Red",
                    "PixelPercentage": 10.20
                }
            ],
        },
    },
    "LabelModelVersion": "3.0"
}
```

Transforming the DetectLabels response

When using the DetectLabels API, you might need the response structure to mimic the older API response structure, where both primary labels and aliases were contained in the same list.

The following is an example of the current API response from DetectLabels:

```
"Labels": [
        {
            "Name": "Mobile Phone",
            "Confidence": 99.99717712402344,
            "Instances": [],
            "Parents": [
                {
                "Name": "Phone"
                }
             ],
            "Aliases": [
                {
                "Name": "Cell Phone"
                }
             ]
        }
 ]
```

The following example shows the previous response from the DetectLabels API:

```
"Labels": [
        {
            "Name": "Mobile Phone",
            "Confidence": 99.99717712402344,
```

```
            "Instances": [],
            "Parents": [
                {
                "Name": "Phone"
                }
             ]
        },
        {
            "Name": "Cell Phone",
            "Confidence": 99.99717712402344,
            "Instances": [],
            "Parents": [
                {
                "Name": "Phone"
                }
             ]
        },
]
```

If needed, you can transform the current response to follow the format of the older response. You can use the following sample code to transform the latest API response to the previous API response structure:

Python

The following code sample demonstrates how to transform the current response from the DetectLabels API. In the code sample below, you can replace the value of *EXAMPLE_INFERENCE_OUTPUT* with the output of a DetectLabels operation you have run.

```
from copy import deepcopy

LABEL_KEY = "Labels"
ALIASES_KEY = "Aliases"
INSTANCE_KEY = "Instances"
NAME_KEY = "Name"

#Latest API response sample
EXAMPLE_INFERENCE_OUTPUT = {
    "Labels": [
        {
            "Name": "Mobile Phone",
            "Confidence": 97.530106,
            "Categories": [
```

```
                {
                    "Name": "Technology and Computing"
                }
            ],
            "Aliases": [
                {
                    "Name": "Cell Phone"
                }
            ],
            "Instances":[
                {
                    "BoundingBox":{
                        "Height":0.1549897,
                        "Width":0.07747964,
                        "Top":0.50858885,
                        "Left":0.00018205095
                    },
                    "Confidence":98.401276
                }
            ]
        },
        {
            "Name": "Urban",
            "Confidence": 99.99982,
            "Categories": [
                "Colors and Visual Composition"
            ]
        }
    ]
}

def expand_aliases(inferenceOutputsWithAliases):

    if LABEL_KEY in inferenceOutputsWithAliases:
        expandInferenceOutputs = []
        for primaryLabelDict in inferenceOutputsWithAliases[LABEL_KEY]:
            if ALIASES_KEY in primaryLabelDict:
                for alias in primaryLabelDict[ALIASES_KEY]:
                    aliasLabelDict = deepcopy(primaryLabelDict)
                    aliasLabelDict[NAME_KEY] = alias[NAME_KEY]
                    del aliasLabelDict[ALIASES_KEY]
                    if INSTANCE_KEY in aliasLabelDict:
                        del aliasLabelDict[INSTANCE_KEY]
                    expandInferenceOutputs.append(aliasLabelDict)
```

```
        inferenceOutputsWithAliases[LABEL_KEY].extend(expandInferenceOutputs)

    return inferenceOutputsWithAliases


if __name__ == "__main__":

    outputWithExpandAliases = expand_aliases(EXAMPLE_INFERENCE_OUTPUT)
    print(outputWithExpandAliases)
```

Below is an example of the transformed response:

```
#Output example after the transformation
{
    "Labels": [
        {
            "Name": "Mobile Phone",
            "Confidence": 97.530106,
            "Categories": [
                {
                    "Name": "Technology and Computing"
                }
            ],
            "Aliases": [
                {
                    "Name": "Cell Phone"
                }
            ],
            "Instances":[
                {
                    "BoundingBox":{
                        "Height":0.1549897,
                        "Width":0.07747964,
                        "Top":0.50858885,
                        "Left":0.00018205095
                    },
                    "Confidence":98.401276
                }
            ]
        },
        {
```

```
            "Name": "Cell Phone",
            "Confidence": 97.530106,
            "Categories": [
                {
                    "Name": "Technology and Computing"
                }
            ],
            "Instances":[]
        },
        {
            "Name": "Urban",
            "Confidence": 99.99982,
            "Categories": [
                "Colors and Visual Composition"
            ]
        }
    ]
}
```

Detecting labels in a video

Amazon Rekognition Video can detect labels (objects and concepts), and the time a label is detected, in a video. For an SDK code example, see Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK). For an AWS CLI example, see Analyzing a video with the AWS Command Line Interface.

Amazon Rekognition Video label detection is an asynchronous operation. To start the detection of labels in a video, call StartLabelDetection.

Amazon Rekognition Video publishes the completion status of the video analysis to an Amazon Simple Notification Service topic. If the video analysis is succesful, call GetLabelDetection to get the detected labels. For information about calling the video analysis API operations, see Calling Amazon Rekognition Video operations.

StartLabelDetection Request

The following example is a request for the `StartLabelDetection` operation. You provide the `StartLabelDetection` operation with a video stored in an Amazon S3 bucket. In the

example request JSON, the Amazon S3 bucket and the video name are specified, along with `MinConfidence`, `Features`, `Settings`, and `NotificationChannel`.

`MinConfidence` is the minimum confidence that Amazon Rekognition Video must have in the accuracy of the detected label, or an instance bounding box (if detected), for it to be returned in the response.

With `Features` , you can specify that you want GENERAL_LABELS returned as part of the response.

With `Settings`, you can filter the returned items for GENERAL_LABELS. For labels you can use inclusive and exclusive filters. You can also filter by label specific, individual labels or by label category:

- `LabelInclusionFilters` - Used to specify which labels you want included in the response
- `LabelExclusionFilters` - Used to specify which labels you want excluded from the response.
- `LabelCategoryInclusionFilters` - Used to specify which label categories you want included in the response.
- `LabelCategoryExclusionFilters` - Used to specify which label categories you want excluded from the response.

You can also combine inclusive and exclusive filters according to your needs, excluding some labels or categories and including others.

`NotificationChannel` is the ARN of the Amazon SNS topic you want Amazon Rekognition Video to publish the completion status of the label detection operation to. If you're using the `AmazonRekognitionServiceRole` permissions policy, then the Amazon SNS topic must have a topic name that begins with Rekognition.

The following is a sample `StartLabelDetection` request in JSON form, including filters:

```
{
    "ClientRequestToken": "5a6e690e-c750-460a-9d59-c992e0ec8638",
    "JobTag": "5a6e690e-c750-460a-9d59-c992e0ec8638",
    "Video": {
        "S3Object": {
            "Bucket": "bucket",
            "Name": "video.mp4"
         }
```

```
    },
    "Features": ["GENERAL_LABELS"],
    "MinConfidence": 75,
    "Settings": {
        "GeneralLabels": {
            "LabelInclusionFilters": ["Cat", "Dog"],
            "LabelExclusionFilters": ["Tiger"],
            "LabelCategoryInclusionFilters": ["Animals and Pets"],
            "LabelCategoryExclusionFilters": ["Popular Landmark"]
        }
    },
    "NotificationChannel": {
        "RoleArn": "arn:aws:iam::012345678910:role/SNSAccessRole",
        "SNSTopicArn": "arn:aws:sns:us-east-1:012345678910:notification-topic",
    }
}
```

GetLabelDetection Operation Response

`GetLabelDetection` returns an array (`Labels`) that contains information about the labels detected in the video. The array can be sorted either by time or by the label detected when specifying the `SortBy` parameter.You can also select how response items are aggregated by using the `AggregateBy` parameter.

The following example is the JSON response of the `GetLabelDetection`. In the response, note the following:

- **Sort order** – The array of labels returned is sorted by time. To sort by label, specify `NAME` in the `SortBy` input parameter for `GetLabelDetection`. If the label appears multiple times in the video, there will be multiples instances of the (LabelDetection) element. The default sort oder is `TIMESTAMP`, while the secondary sort order is `NAME`.
- **Label information** – The `LabelDetection` array element contains a (Label) object, which in turn contains the label name and the confidence Amazon Rekognition has in the accuracy of the detected label. A `Label` object also includes a hierarchical taxonomy of labels and bounding box information for common labels. `Timestamp` is the time the label was detected, defined as the number of milliseconds elapsed since the start of the video.

  Information about any Categories or Aliases associated with a label is also returned. For results aggregated by video `SEGMENTS`, the `StartTimestampMillis`, `EndTimestampMillis`, and

`DurationMillis` structures are returned, which define the start time, end time, and duration of a segment respectively.

- **Aggregation** – Specifies how results are aggregated when returned. The default is to aggregate by `TIMESTAMPS`. You can also choose to aggregate by `SEGMENTS`, which aggregates results over a time window. If aggregating by `SEGMENTS`, information about detected instances with bounding boxes are not returned. Only labels detected during the segments are returned.
- **Paging information** – The example shows one page of label detection information. You can specify how many `LabelDetection` objects to return in the `MaxResults` input parameter for `GetLabelDetection`. If more results than `MaxResults` exist, `GetLabelDetection` returns a token (`NextToken`) used to get the next page of results. For more information, see Getting Amazon Rekognition Video analysis results.
- **Video information** – The response includes information about the video format (`VideoMetadata`) in each page of information returned by `GetLabelDetection`.

The following is a sample GetLabelDetection response in JSON form with aggregation by TIMESTAMPS:

```
{
    "JobStatus": "SUCCEEDED",
    "LabelModelVersion": "3.0",
    "Labels": [
        {
            "Timestamp": 1000,
            "Label": {
                "Name": "Car",
                "Categories": [
                  {
                    "Name": "Vehicles and Automotive"
                  }
                ],
                "Aliases": [
                  {
                    "Name": "Automobile"
                  }
                ],
                "Parents": [
                  {
                    "Name": "Vehicle"
                  }
```

```
                ],
                "Confidence": 99.9364013671875, // Classification confidence
                "Instances": [
                    {
                        "BoundingBox": {
                            "Width": 0.26779675483703613,
                            "Height": 0.8562285900115967,
                            "Left": 0.3604024350643158,
                            "Top": 0.09245597571134567
                        },
                        "Confidence": 99.9364013671875 // Detection confidence
                    }
                ]
            }
        },
        {
            "Timestamp": 1000,
            "Label": {
                "Name": "Cup",
                "Categories": [
                  {
                    "Name": "Kitchen and Dining"
                  }
                ],
                "Aliases": [
                  {
                    "Name": "Mug"
                  }
                ],
                "Parents": [],
                "Confidence": 99.9364013671875, // Classification confidence
                "Instances": [
                    {
                        "BoundingBox": {
                            "Width": 0.26779675483703613,
                            "Height": 0.8562285900115967,
                            "Left": 0.3604024350643158,
                            "Top": 0.09245597571134567
                        },
                        "Confidence": 99.9364013671875 // Detection confidence
                    }
                ]
            }
        },
```

```
        {
            "Timestamp": 2000,
            "Label": {
                "Name": "Kangaroo",
                "Categories": [
                  {
                    "Name": "Animals and Pets"
                  }
                ],
                "Aliases": [
                  {
                    "Name": "Wallaby"
                  }
                ],
                "Parents": [
                  {
                    "Name": "Mammal"
                  }
                ],
                "Confidence": 99.9364013671875,
                "Instances": [
                    {
                        "BoundingBox": {
                            "Width": 0.26779675483703613,
                            "Height": 0.8562285900115967,
                            "Left": 0.3604024350643158,
                            "Top": 0.09245597571134567,
                        },
                        "Confidence": 99.9364013671875
                    }
                ]
            }
        },
        {
            "Timestamp": 4000,
            "Label": {
                "Name": "Bicycle",
                "Categories": [
                  {
                    "Name": "Hobbies and Interests"
                  }
                ],
                "Aliases": [
                  {
```

```
                    "Name": "Bike"
                  }
                ],
                "Parents": [
                  {
                    "Name": "Vehicle"
                  }
                ],
                "Confidence": 99.9364013671875,
                "Instances": [
                    {
                        "BoundingBox": {
                            "Width": 0.26779675483703613,
                            "Height": 0.8562285900115967,
                            "Left": 0.3604024350643158,
                            "Top": 0.09245597571134567
                        },
                        "Confidence": 99.9364013671875
                    }
                ]
            }
        }
    ],
    "VideoMetadata": {
        "ColorRange": "FULL",
        "DurationMillis": 5000,
        "Format": "MP4",
        "FrameWidth": 1280,
        "FrameHeight": 720,
        "FrameRate": 24
    }
}
```

The following is a sample GetLabelDetection response in JSON form with aggregation by SEGMENTS:

```
{
    "JobStatus": "SUCCEEDED",
    "LabelModelVersion": "3.0",
    "Labels": [
        {
            "StartTimestampMillis": 225,
            "EndTimestampMillis": 3578,
```

```
            "DurationMillis": 3353,
            "Label": {
                "Name": "Car",
                "Categories": [
                  {
                    "Name": "Vehicles and Automotive"
                  }
                ],
                "Aliases": [
                  {
                    "Name": "Automobile"
                  }
                ],
                "Parents": [
                  {
                    "Name": "Vehicle"
                  }
                ],
                "Confidence": 99.9364013671875 // Maximum confidence score for Segment
mode
            }
        },
        {
            "StartTimestampMillis": 7578,
            "EndTimestampMillis": 12371,
            "DurationMillis": 4793,
            "Label": {
                "Name": "Kangaroo",
                "Categories": [
                  {
                    "Name": "Animals and Pets"
                  }
                ],
                "Aliases": [
                  {
                    "Name": "Wallaby"
                  }
                ],
                "Parents": [
                  {
                    "Name": "Mammal"
                  }
                ],
                "Confidence": 99.9364013671875
```

```
            }
        },
        {
            "StartTimestampMillis": 22225,
            "EndTimestampMillis": 22578,
            "DurationMillis": 2353,
            "Label": {
                "Name": "Bicycle",
                "Categories": [
                  {
                    "Name": "Hobbies and Interests"
                  }
                ],
                "Aliases": [
                  {
                    "Name": "Bike"
                  }
                ],
                "Parents": [
                  {
                    "Name": "Vehicle"
                  }
                ],
                "Confidence": 99.9364013671875
            }
        }
    ],
    "VideoMetadata": {
        "ColorRange": "FULL",
        "DurationMillis": 5000,
        "Format": "MP4",
        "FrameWidth": 1280,
        "FrameHeight": 720,
        "FrameRate": 24
    }
}
```


Transforming the GetLabelDetection Response

When retrieving results with the GetLabelDetection API operation, you might need the response structure to mimic the older API response structure, where both primary labels and aliases were contained in the same list.

The example JSON response found in the preceding section displays the current form of the API response from GetLabelDetection.

The following example shows the previous response from the GetLabelDetection API:


```
{
    "Labels": [
        {
            "Timestamp": 0,
            "Label": {
                "Instances": [],
                "Confidence": 60.51791763305664,
                "Parents": [],
                "Name": "Leaf"
            }
        },
        {
            "Timestamp": 0,
            "Label": {
                "Instances": [],
                "Confidence": 99.53411102294922,
                "Parents": [],
                "Name": "Human"
            }
        },
        {
            "Timestamp": 0,
            "Label": {
                "Instances": [
                    {
                        "BoundingBox": {
                            "Width": 0.11109819263219833,
                            "Top": 0.08098889887332916,
                            "Left": 0.8881205320358276,
                            "Height": 0.9073750972747803
                        },
                        "Confidence": 99.5831298828125
                    },
                    {
                        "BoundingBox": {
                            "Width": 0.1268676072359085,
                            "Top": 0.14018426835536957,
                            "Left": 0.0003282368124928324,
                            "Height": 0.7993982434272766
```

```
                        },
                        "Confidence": 99.46029663085938
                    }
                ],
                "Confidence": 99.63411102294922,
                "Parents": [],
                "Name": "Person"
            }
        },
        .
        .
        .

        {
            "Timestamp": 166,
            "Label": {
                "Instances": [],
                "Confidence": 73.6471176147461,
                "Parents": [
                    {
                        "Name": "Clothing"
                    }
                ],
                "Name": "Sleeve"
            }
        }

    ],
    "LabelModelVersion": "2.0",
    "JobStatus": "SUCCEEDED",
    "VideoMetadata": {
        "Format": "QuickTime / MOV",
        "FrameRate": 23.976024627685547,
        "Codec": "h264",
        "DurationMillis": 5005,
        "FrameHeight": 674,
        "FrameWidth": 1280
    }
}
```

If needed, you can transform the current response to follow the format of the older response. You can use the following sample code to transform the latest API response to the previous API response structure:

```
from copy import deepcopy

VIDEO_LABEL_KEY = "Labels"
LABEL_KEY = "Label"
ALIASES_KEY = "Aliases"
INSTANCE_KEY = "Instances"
NAME_KEY = "Name"

#Latest API response sample for AggregatedBy SEGMENTS
EXAMPLE_SEGMENT_OUTPUT = {
    "Labels": [
        {
            "Timestamp": 0,
            "Label":{
                "Name": "Person",
                "Confidence": 97.530106,
                "Parents": [],
                "Aliases": [
                    {
                        "Name": "Human"
                    },
                ],
                "Categories": [
                    {
                        "Name": "Person Description"
                    }
                ],
            },
            "StartTimestampMillis": 0,
            "EndTimestampMillis": 500666,
            "DurationMillis": 500666
        },
        {
            "Timestamp": 6400,
            "Label": {
                "Name": "Leaf",
                "Confidence": 89.77790069580078,
                "Parents": [
                    {
                        "Name": "Plant"
                    }
                ],
                "Aliases": [],
```

```
                "Categories": [
                    {
                        "Name": "Plants and Flowers"
                    }
                ],

            },
            "StartTimestampMillis": 6400,
            "EndTimestampMillis": 8200,
            "DurationMillis": 1800
        },
    ]
}

#Output example after the transformation for AggregatedBy SEGMENTS
EXPECTED_EXPANDED_SEGMENT_OUTPUT = {
    "Labels": [
        {
            "Timestamp": 0,
            "Label":{
                "Name": "Person",
                "Confidence": 97.530106,
                "Parents": [],
                "Aliases": [
                    {
                        "Name": "Human"
                    },
                ],
                "Categories": [
                    {
                        "Name": "Person Description"
                    }
                ],
            },
            "StartTimestampMillis": 0,
            "EndTimestampMillis": 500666,
            "DurationMillis": 500666
        },
        {
            "Timestamp": 6400,
            "Label": {
                "Name": "Leaf",
                "Confidence": 89.77790069580078,
                "Parents": [
```

```
                    {
                        "Name": "Plant"
                    }
                ],
                "Aliases": [],
                "Categories": [
                    {
                        "Name": "Plants and Flowers"
                    }
                ],

            },
            "StartTimestampMillis": 6400,
            "EndTimestampMillis": 8200,
            "DurationMillis": 1800
        },
        {
            "Timestamp": 0,
            "Label":{
                "Name": "Human",
                "Confidence": 97.530106,
                "Parents": [],
                "Categories": [
                    {
                        "Name": "Person Description"
                    }
                ],
            },
            "StartTimestampMillis": 0,
            "EndTimestampMillis": 500666,
            "DurationMillis": 500666
        },
    ]
}

#Latest API response sample for AggregatedBy TIMESTAMPS
EXAMPLE_TIMESTAMP_OUTPUT = {
    "Labels": [
        {
            "Timestamp": 0,
            "Label": {
                "Name": "Person",
                "Confidence": 97.530106,
                "Instances": [
```

```
                    {
                        "BoundingBox": {
                            "Height": 0.1549897,
                            "Width": 0.07747964,
                            "Top": 0.50858885,
                            "Left": 0.00018205095
                        },
                        "Confidence": 97.530106
                    },
                ],
                "Parents": [],
                "Aliases": [
                    {
                        "Name": "Human"
                    },
                ],
                "Categories": [
                    {
                        "Name": "Person Description"
                    }
                ],
            },
        },
        {
            "Timestamp": 6400,
            "Label": {
                "Name": "Leaf",
                "Confidence": 89.77790069580078,
                "Instances": [],
                "Parents": [
                    {
                        "Name": "Plant"
                    }
                ],
                "Aliases": [],
                "Categories": [
                    {
                        "Name": "Plants and Flowers"
                    }
                ],
            },
        },
    ]
}
```

```
#Output example after the transformation for AggregatedBy TIMESTAMPS
EXPECTED_EXPANDED_TIMESTAMP_OUTPUT = {
    "Labels": [
        {
            "Timestamp": 0,
            "Label": {
                "Name": "Person",
                "Confidence": 97.530106,
                "Instances": [
                    {
                        "BoundingBox": {
                            "Height": 0.1549897,
                            "Width": 0.07747964,
                            "Top": 0.50858885,
                            "Left": 0.00018205095
                        },
                        "Confidence": 97.530106
                    },
                ],
                "Parents": [],
                "Aliases": [
                    {
                        "Name": "Human"
                    },
                ],
                "Categories": [
                    {
                        "Name": "Person Description"
                    }
                ],
            },
        },
        {
            "Timestamp": 6400,
            "Label": {
                "Name": "Leaf",
                "Confidence": 89.77790069580078,
                "Instances": [],
                "Parents": [
                    {
                        "Name": "Plant"
                    }
                ],
```

```
                "Aliases": [],
                "Categories": [
                    {
                        "Name": "Plants and Flowers"
                    }
                ],
            },
        },
        {
            "Timestamp": 0,
            "Label": {
                "Name": "Human",
                "Confidence": 97.530106,
                "Parents": [],
                "Categories": [
                    {
                        "Name": "Person Description"
                    }
                ],
            },
        },
    ]
}

def expand_aliases(inferenceOutputsWithAliases):

    if VIDEO_LABEL_KEY in inferenceOutputsWithAliases:
        expandInferenceOutputs = []
        for segmentLabelDict in inferenceOutputsWithAliases[VIDEO_LABEL_KEY]:
            primaryLabelDict = segmentLabelDict[LABEL_KEY]
            if ALIASES_KEY in primaryLabelDict:
                for alias in primaryLabelDict[ALIASES_KEY]:
                    aliasLabelDict = deepcopy(segmentLabelDict)
                    aliasLabelDict[LABEL_KEY][NAME_KEY] = alias[NAME_KEY]
                    del aliasLabelDict[LABEL_KEY][ALIASES_KEY]
                    if INSTANCE_KEY in aliasLabelDict[LABEL_KEY]:
                        del aliasLabelDict[LABEL_KEY][INSTANCE_KEY]
                    expandInferenceOutputs.append(aliasLabelDict)

        inferenceOutputsWithAliases[VIDEO_LABEL_KEY].extend(expandInferenceOutputs)

    return inferenceOutputsWithAliases
```

```
if __name__ == "__main__":

    segmentOutputWithExpandAliases = expand_aliases(EXAMPLE_SEGMENT_OUTPUT)
    assert segmentOutputWithExpandAliases == EXPECTED_EXPANDED_SEGMENT_OUTPUT

    timestampOutputWithExpandAliases = expand_aliases(EXAMPLE_TIMESTAMP_OUTPUT)
    assert timestampOutputWithExpandAliases == EXPECTED_EXPANDED_TIMESTAMP_OUTPUT
```

Detecting labels in streaming video events

You can use Amazon Rekognition Video to detect labels in streaming video. To do this, you create a stream processor (CreateStreamProcessor) to start and manage the analysis of streaming video.

Amazon Rekognition Video uses Amazon Kinesis Video Streams to receive and process a video stream. When you create the stream processor, you choose what you want the stream processor to detect. You can choose people, packages and pets, or people and packages. The analysis results are output to your Amazon S3 bucket and in Amazon SNS notifications. Note that Amazon Rekognition Video detects the presence of a person in the video, but does not detect whether the person is a specific individual. To search for a face from a collection in a streaming video, see the section called "Searching faces in a collection in streaming video".

To use Amazon Rekognition Video with streaming video, your application requires the following:

- A Kinesis video stream for sending streaming video to Amazon Rekognition Video. For more information, see the Amazon Kinesis Video Streams Developer Guide.
- An Amazon Rekognition Video stream processor to manage the analysis of the streaming video. For more information, see Overview of Amazon Rekognition Video stream processor operations.
- An Amazon S3 bucket. Amazon Rekognition Video publishes session output to the S3 bucket. The output includes the image frame where a person or object of interest was detected for first time. You must be the owner of the S3 bucket.
- An Amazon SNS topic that Amazon Rekognition Video publishes smart alerts and an end-of-session summary to.

Topics

- Setting up your Amazon Rekognition Video and Amazon Kinesis resources
- Calling label detection operations for streaming video events

Setting up your Amazon Rekognition Video and Amazon Kinesis resources

The following procedures describe the steps that you take to provision the Kinesis video stream and other resources that are used to detect labels in a streaming video.

Prerequisites

To run this procedure, AWS SDK for Java must be installed. For more information, see Getting started with Amazon Rekognition. The AWS account that you use requires access permissions to the Amazon Rekognition API. For more information, see Actions Defined by Amazon Rekognition in the *IAM User Guide*.

To detect labels in a video stream (AWS SDK)

1. Create an Amazon S3 bucket. Note the bucket name and any key prefixes that you want to use. You use this information later.
2. Create an Amazon SNS topic. You can use it to receive notifications when an object of interest is first detected in the video stream. Note the Amazon Resource Name (ARN) for the topic. For more information, see Creating an Amazon SNS topic in the Amazon SNS developer guide.
3. Subscribe an endpoint to the Amazon SNS topic. For more information, see Subscribing to an Amazon SNS topic in the Amazon SNS developer guide.
4. Create a Kinesis video stream and note the Amazon Resource Name (ARN) of the stream.
5. If you didn't already, create an IAM service role to give Amazon Rekognition Video access to your Kinesis video streams, your S3 bucket, and your Amazon SNS topic. For more information, see Giving access for label detection stream processors.

You can then create the label detection stream processor and start the stream processor using the stream processor name that you chose.

> **Note**
>
> Start the stream processor only after you verified that you can ingest media into the Kinesis video stream.

Camera orientation and setup

Amazon Rekognition Video Streaming Video Events can support all cameras that are supported by Kinesis Video Streams. For best results, we recommend placing the camera between 0 to 45 degrees from the ground. The camera needs to be in its canonical upright position. For example, if there is a person in the frame, the person should be oriented vertically, and the head of the person should be higher in the frame than the feet.

Giving access for label detection stream processors

You use an AWS Identity and Access Management (IAM) service role to give Amazon Rekognition Video read access to Kinesis video streams. To do this, use IAM roles to give Amazon Rekognition Video access to your Amazon S3 bucket and to an Amazon SNS topic.

You can create a permissions policy that allows Amazon Rekognition Video access to an existing Amazon SNS topic, Amazon S3 bucket, and Kinesis video stream. For a step-by-step procedure using the AWS CLI, see the section called “AWS CLI commands to set up a label detection IAM role”.

To give Amazon Rekognition Video access to resources for label detection

1. Create a new permissions policy with the IAM JSON policy editor, and use the following policy. Replace `kvs-stream-name` with the name of the Kinesis video stream, `topicarn` with the Amazon Resource Name (ARN) of the Amazon SNS topic that you want to use, and `bucket-name` with the name of the Amazon S3 bucket.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "KinesisVideoPermissions",
            "Effect": "Allow",
            "Action": [
                "kinesisvideo:GetDataEndpoint",
                "kinesisvideo:GetMedia"
            ],
            "Resource": [
                "arn:aws:kinesisvideo:::stream/kvs-stream-name/*"
            ]
        },
        {
```

```
            "Sid": "SNSPermissions",
            "Effect": "Allow",
            "Action": [
                "sns:Publish"
            ],
            "Resource": [
                "arn:aws:sns:::sns-topic-name"
            ]
        },
        {
            "Sid": "S3Permissions",
            "Effect": "Allow",
            "Action": [
                "s3:PutObject"
            ],
            "Resource": [
                "arn:aws:s3:::bucket-name/*"
            ]
        }
    ]
}
```

2. Create an IAM service role, or update an existing IAM service role. Use the following information to create the IAM service role:

   1. Choose **Rekognition** for the service name.
   2. Choose **Rekognition** for the service role use case.
   3. Attach the permissions policy that you created in step 1.

3. Note the ARN of the service role. You need it to create the stream processor before you perform video analysis operations.
4. (Optional) If you use your own AWS KMS key to encrypt data sent to your S3 bucket, you must add the following statement with the IAM role. (This is the IAM role that you created for the key policy, which corresponds to the customer managed key that you want to use.)

```
            {
                        "Sid": "Allow use of the key by label detection Role",
                        "Effect": "Allow",
                        "Principal": {
```

```
                            "AWS":
 "arn:aws:iam:::role/REPLACE_WITH_LABEL_DETECTION_ROLE_CREATED"
                        },
                        "Action": [
                            "kms:Decrypt",
                            "kms:GenerateDataKey*"
                        ],
                        "Resource": "*"
            }
```

AWS CLI commands to set up a label detection IAM role

If you didn't already, set up and configure the AWS CLI with your credentials.

Enter the following commands into the AWS CLI to set up an IAM role with the necessary permissions for label detection.

1. `export IAM_ROLE_NAME=labels-test-role`
2. `export AWS_REGION=us-east-1`
3. Create a trust relationship policy file (for example, assume-role-rekognition.json) with the following content.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "",
      "Effect": "Allow",
      "Principal": {
        "Service": "rekognition.amazonaws.com"
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

4. `aws iam create-role --role-name $IAM_ROLE_NAME --assume-role-policy-document file://path-to-assume-role-rekognition.json --region $AWS_REGION`

5. `aws iam attach-role-policy --role-name $IAM_ROLE_NAME --policy-arn "arn:aws:iam::aws:policy/service-role/AmazonRekognitionServiceRole" --region $AWS_REGION`
6. If the name of your SNS topic that you want to receive notifications with doesn't start with the "AmazonRekognition" prefix, add the following policy:

   `aws iam attach-role-policy --role-name $IAM_ROLE_NAME --policy-arn "arn:aws:iam::aws:policy/AmazonSNSFullAccess" --region $AWS_REGION`
7. If you use your own AWS KMS key to encrypt data sent to your Amazon S3 bucket, update the key policy of the customer managed key that you want to use.
   a. Create a file kms_key_policy.json that contains the following content:

```
{
"Sid": "Allow use of the key by label detection Role",
"Effect": "Allow",
"Principal": {
"AWS": "arn:aws:iam:::role/REPLACE_WITH_IAM_ROLE_NAME_CREATED"
},
"Action": [
"kms:Encrypt",
"kms:GenerateDataKey*"
],
"Resource": "*"
}
```

   b. `export KMS_KEY_ID=labels-kms-key-id`. Replace KMS_KEY_ID with the KMS key ID that you created.
   c. `aws kms put-key-policy --policy-name default --key-id $KMS_KEY_ID --policy file://path-to-kms-key-policy.json`

Calling label detection operations for streaming video events

Amazon Rekognition Video can detect people or relevant objects in a streaming video and notify you when they're detected. When you create a label detection stream processor, choose what labels that you want Amazon Rekognition Video to detect. These can be people, packages and pets, or people, packages, and pets. Choose only the specific labels that you want to detect. That way,

the only relevant labels create notifications. You can configure options to determine when to store video information, and then do additional processing based on the labels that are detected in the frame.

After you set up your resources, the process to detect labels in a streaming video is as follows:

1. Create the stream processor
2. Start the stream processor
3. If an object of interest is detected, you receive an Amazon SNS notification for the first occurrence of each object of interest.
4. The stream processor stops when the time specified in `MaxDurationInSeconds` is complete.
5. You receive a final Amazon SNS notification with an event summary.
6. Amazon Rekognition Video publishes a detailed session summary to your S3 bucket.

Topics

- Creating the Amazon Rekognition Video label detection stream processor
- Starting the Amazon Rekognition Video label detection stream processor
- Analyzing label detection results

Creating the Amazon Rekognition Video label detection stream processor

Before you can analyze a streaming video, you create an Amazon Rekognition Video stream processor (CreateStreamProcessor).

If you want to create a stream processor to detect labels of interest and people, provide as input a Kinesis video stream (`Input`), Amazon S3 bucket information (`Output`), and an Amazon SNS topic ARN (`StreamProcessorNotificationChannel`). You can also provide a KMS key ID to encrypt the data sent to your S3 bucket. You specify what you want to detect in `Settings`, such as people, packages and people, or pets, people, and packages. You can also specify where in the frame that you want Amazon Rekognition to monitor with `RegionsOfInterest`. The following is a JSON example for the `CreateStreamProcessor` request.

```
{
  "DataSharingPreference": { "OptIn":TRUE
```

```
  },
  "Input": {
    "KinesisVideoStream": {
      "Arn": "arn:aws:kinesisvideo:us-east-1:nnnnnnnnnnnn:stream/muh_video_stream/
nnnnnnnnnnnn"
    }
  },
  "KmsKeyId": "muhkey",
  "Name": "muh-default_stream_processor",
  "Output": {
    "S3Destination": {
      "Bucket": "s3bucket",
      "KeyPrefix": "s3prefix"
    }
  },
  "NotificationChannel": {
    "SNSTopicArn": "arn:aws:sns:us-east-2:nnnnnnnnnnnn:MyTopic"
  },
  "RoleArn": "arn:aws:iam::nnnnnnnnn:role/Admin",
  "Settings": {
    "ConnectedHome": {
      "Labels": [
        "PET"
      ]
    "MinConfidence": 80
    }
  },
  "RegionsOfInterest": [
    {
      "BoundingBox": {
        "Top": 0.11,
        "Left": 0.22,
        "Width": 0.33,
        "Height": 0.44
      }
    },
    {
      "Polygon": [
        {
          "X": 0.11,
          "Y": 0.11
        },
        {
          "X": 0.22,
```

```
          "Y": 0.22
        },
        {
          "X": 0.33,
          "Y": 0.33
        }
      ]
    }
  ]
}
```

Note that you can change the `MinConfidence` value when you specify the `ConnectedHomeSettings` for the stream processor. `MinConfidence` is a numerical value ranging from 0 to 100 that indicates how certain the algorithm is about its predictions. For example, a notification for `person` with a confidence value of 90 means that the algorithm is absolutely certain that the person is present in the video. A confidence value of 10 indicates that there might be a person. You can set `MinConfidence` to a desired value of your choice between 0 and 100 depending on how frequently you want to be notified. For example, if you want to be notified only when Rekognition is absolutely certain there is a package in the video frame then you can set `MinConfidence` to 90.

By default, `MinConfidence` is set to 50. If you want to optimize the algorithm for higher precision, then you can set `MinConfidence` to be higher than 50. You then receive fewer notification, but each notification is more reliable. If you want to optimize the algorithm for higher recall, then you can set `MinConfidence` to be lower than 50 to receive more notifications.

Starting the Amazon Rekognition Video label detection stream processor

You start analyzing streaming video by calling StartStreamProcessor with the stream processor name that you specified in `CreateStreamProcessor`. When you run the `StartStreamProcessor` operation on a label detection stream processor, you input start and stop information to determine the processing time.

When you start the stream processor, the label detection stream processor state changes in the following ways:

1. When you call `StartStreamProcessor`, the label detection stream processor state goes from `STOPPED` or `FAILED` to `STARTING`.

2. While the label detection stream processor runs, it stays in `STARTING`.
3. When the label detection stream processor is done running, the state becomes either `STOPPED` or `FAILED`.

The `StartSelector` specifies the starting point in the Kinesis stream to start processing. You can use the KVS Producer timestamp or the KVS Fragment number. For more information, see Fragment.

> **Note**
>
> If you use the KVS Producer timestamp, you must input the time in milliseconds.

The `StopSelector` specifies when to stop processing the stream. You can specify a maximum amount of time to process the video. The default is a maximum duration of 10 seconds. Note that the actual processing time might be a bit longer than the maximum duration, depending on the size of individual KVS fragments. If the maximum duration has been reached or exceeded at the end of a fragment, the processing time stops.

The following is a JSON example for the `StartStreamProcessor` request.

```
{
   "Name": "string",
   "StartSelector": {
     "KVSStreamStartSelector": {
         "KVSProducerTimestamp": 1655930623123
      },
        "StopSelector": {
            "MaxDurationInSeconds": 11
      }
   }
}
```

If the stream processor successfully starts, an HTTP 200 response is returned. An empty JSON body is included.

Analyzing label detection results

There are three ways that Amazon Rekognition Video publishes notifications from a label detection stream processor: Amazon SNS notifications for object detection events, an Amazon SNS notification for an end-of-session summary, and a detailed Amazon S3 bucket report.

- Amazon SNS notifications for object detection events.

  If labels are detected in the video stream, you receive Amazon SNS notifications for object detection events. Amazon Rekognition publishes a notification the first time that a person or an object of interest is detected in the video stream. Notifications include information such as the type of label detected, the confidence, and a link to the hero image. They also include a cropped image of the person or object detected and a detection timestamp. The notification has the following format:

```
{"Subject": "Rekognition Stream Processing Event",
    "Message": {
        "inputInformation": {
            "kinesisVideo": {
                "streamArn": string
            }
        },
        "eventNamespace": {
            "type": "LABEL_DETECTED"
        },
        "labels": [{
            "id": string,
            "name": "PERSON" | "PET" | "PACKAGE",
            "frameImageUri": string,
            "croppedImageUri": string,
            "videoMapping": {
                "kinesisVideoMapping": {
                    "fragmentNumber": string,
                    "serverTimestamp": number,
                    "producerTimestamp": number,
                    "frameOffsetMillis": number
                }
            },
            "boundingBox": {
                "left": number,
                "top": number,
```

```
                "height": number,
                "width": number
            }
        }],
        "eventId": string,
        "tags": {
            [string]: string
        },
        "sessionId": string,
        "startStreamProcessorRequest": object
    }
}
```

- Amazon SNS end-of-session summary.

  You also receive an Amazon SNS notification when the stream processing session is finished. This notification lists the metadata for the session. This includes details such as the duration of the stream that was processed. The notification has the following format:

```
{"Subject": "Rekognition Stream Processing Event",
    "Message": {
        "inputInformation": {
            "kinesisVideo": {
                "streamArn": string,
                "processedVideoDurationMillis": number
            }
        },
        "eventNamespace": {
            "type": "STREAM_PROCESSING_COMPLETE"
        },
        "streamProcessingResults": {
            "message": string
        },
        "eventId": string,
        "tags": {
            [string]: string
        },
        "sessionId": string,
        "startStreamProcessorRequest": object
    }
}
```

- Amazon S3 bucket report.

  Amazon Rekognition Video publishes detailed inference results of a video analysis operation to the Amazon S3 bucket that's provided in the `CreateStreamProcessor` operation. These results include image frames where an object of interest or person was detected for first time.

  The frames are available in S3 in the following path: ObjectKeyPrefix/StreamProcessorName/SessionId/*`service_determined_unique_path`*. In this path, **LabelKeyPrefix** is a customer provided optional argument, **StreamProcessorName** is the name of the stream processor resource, and **SessionId** is a unique ID for the stream processing session. Replace these according to your situation.

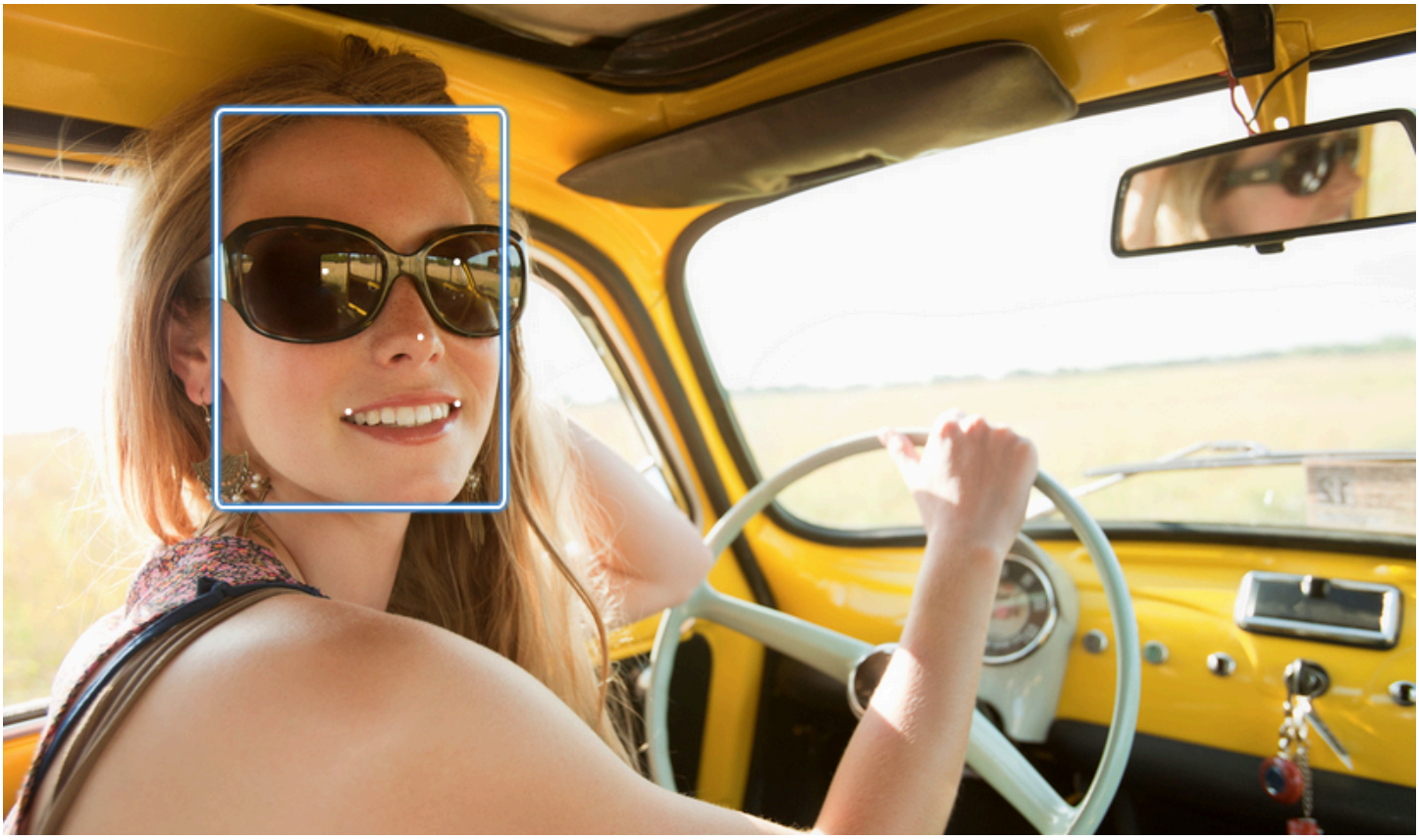
Detecting custom labels

Amazon Rekognition Custom Labels can identify the objects and scenes in images that are specific to your business needs, such as logos or engineering machine parts. For more information, see What Is Amazon Rekognition Custom Labels? in the *Amazon Rekognition Custom Labels Developer Guide*.

Detecting and analyzing faces

Amazon Rekognition provides you with APIs you can use to detect and analyze faces in images and videos. This section provides an overview of the non-storage operations for facial analysis. These operations include functionalities like detecting facial landmarks, analyzing emotions, and comparing faces.

Amazon Rekognition can identify facial landmarks (e.g., eye position), detect emotions (e.g., happiness or sadness), and other attributes (e.g., glasses presence, face occlusion). When a face is detected, the system analyzes facial attributes and returns a confidence score for each attribute.



This section contains examples for both image and video operations.

For more information about using the Rekognition's image operations, see Working with images.

For more information about using the Rekognition's video operations, see Working with stored video analysis operations.

Note that these operations are non-storage operations. You can use storage operations and Face collections to save facial metadata for faces detected in an image. Later you can search for stored

faces in both images and videos. For example, this enables searching for a specific person in a video. For more information, see Searching faces in a collection.

For more information, see the Faces section of Amazon Rekognition FAQs.

> **Note**
>
> The face detection models used by Amazon Rekognition Image and Amazon Rekognition Video don't support the detection of faces in cartoon/animated characters or non-human entities. If you want to detect cartoon characters in images or videos, we recommend using Amazon Rekognition Custom Labels. For more information, see the Amazon Rekognition Custom Labels Developer Guide.

Topics

- Overview of face detection and face comparison
- Guidelines on face attributes
- Detecting faces in an image
- Comparing faces in images
- Detecting faces in a stored video

Overview of face detection and face comparison

Amazon Rekognition provides users access to two primary machine learning applications for images containing faces: face detection and face comparison. They empower crucial features like facial analysis and identity verification, making them vital for various applications from security to personal photo organization.

Face Detection

A face detection systems address the question: "Is there a face in this picture?" Key aspects of face detection include:

- **Location and orientation**: Determines the presence, location, scale, and orientation of faces in images or video frames.
- **Face attributes**: Detects faces regardless of attributes like gender, age, or facial hair.
- **Additional Information**: Provides details on face occlusion and eye gaze direction.

Face Comparison

A face comparison systems focus on the question: "Does the face in one image match a face in another image?" Face comparison system functionalities include:

- **Face matching predictions**: Compares a face in an image against a face in a provided database to predict matches.
- **Face attribute handling**: Handles attributes to compares faces regardless of expression, facial hair, and age.

Confidence scores and missed detections

Both face detection and face comparison systems utilize confidence scores. A confidence score indicates the likelihood of predictions, such as the presence of a face or a match between faces. Higher scores indicate greater likelihood. For instance, 90% confidence suggests a higher probability of a correct detection or match than 60%.

If a face detection system doesn't properly detect a face, or provides a low confidence prediction for an actual face, this is a missed detection/false negative. If the system incorrectly predicts the presence of a face at a high confidence level, this is a false alarm/false positive.

Similarly, a facial comparison system may not match two faces which belong to the same person (missed detection/false negative) or may incorrectly predict that two faces from different people are the same person (false alarm/false positive).

Application design and threshold setting

- You can set a threshold that specifies the minimum confidence level required to return a result. Choosing appropriate confidence thresholds is essential for application design and decision-making based on the system outputs.
- Your chosen confidence level should reflect your use case. Some examples of use cases and confidence thresholds:
- - **Photo Applications**: A lower threshold (e.g., 80%) might suffice for identifying family members in photos.
  - **High-Stakes Scenarios**: In use cases where the risk of missed detection or false alarm is higher, such as security applications, the system should use a higher confidence level. In such cases, a higher threshold (e.g., 99%) is recommended for accurate facial matches.

For more information on setting and understanding confidence thresholds, see Searching faces in a collection.

Guidelines on face attributes

Here are specifics regarding how Amazon Rekognition processes and returns face attributes.

- **FaceDetail Object**: For each detected face, a FaceDetail object is returned. This FaceDetail contains data on face landmarks, quality, pose, and more.
- **Attribute Predictions**: Attributes like emotion, gender, age, and others are predicted. A confidence level is assigned for each prediction, and the predictions are returned with the respective confidence score. A 99% confidence threshold is recommended for sensitive use cases. For age estimation, the midpoint of the predicted age range offers the best approximation.

Note that gender and emotion predictions are based on physical appearance and should not be used for determining actual gender identity or emotional state. A gender binary (male/female) prediction is based on the physical appearance of a face in a particular image. It doesn't indicate a person's gender identity, and you shouldn't use Rekognition to make such a determination. We don't recommend using gender binary predictions to make decisions that impact an individual's rights, privacy, or access to services. Similarly, a prediction of an emotional doesn't indicate a person's actual internal emotional state, and you shouldn't use Rekognition to make such a determination. A person pretending to have a happy face in a picture might look happy, but might not be experiencing happiness.

Application and Use Cases

Here are some practical applications and use cases for these attributes:

- **Applications**: Attributes like Smile, Pose, and Sharpness can be utilized for selecting profile pictures or estimating demographics anonymously.
- **Common Use Cases**: Social media applications and demographic estimation at events or retail stores are typical examples.

For more detailed information about each attribute, see FaceDetail.

Detecting faces in an image

Amazon Rekognition Image provides the DetectFaces operation that looks for key facial features such as eyes, nose, and mouth to detect faces in an input image. Amazon Rekognition Image detects the 100 largest faces in an image.

You can provide the input image as an image byte array (base64-encoded image bytes), or specify an Amazon S3 object. In this procedure, you upload an image (JPEG or PNG) to your S3 bucket and specify the object key name.

To detect faces in an image

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Upload an image (that contains one or more faces) to your S3 bucket.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following examples to call `DetectFaces`.

   Java

   This example displays the estimated age range for detected faces, and lists the JSON for all detected facial attributes. Change the value of `photo` to the image file name. Change the value of `amzn-s3-demo-bucket` to the Amazon S3 bucket where the image is stored.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
```

```
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.S3Object;
import com.amazonaws.services.rekognition.model.AgeRange;
import com.amazonaws.services.rekognition.model.Attribute;
import com.amazonaws.services.rekognition.model.DetectFacesRequest;
import com.amazonaws.services.rekognition.model.DetectFacesResult;
import com.amazonaws.services.rekognition.model.FaceDetail;
import com.fasterxml.jackson.databind.ObjectMapper;
import java.util.List;


public class DetectFaces {


   public static void main(String[] args) throws Exception {

      String photo = "input.jpg";
      String bucket = "bucket";

      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();


      DetectFacesRequest request = new DetectFacesRequest()
         .withImage(new Image()
            .withS3Object(new S3Object()
               .withName(photo)
               .withBucket(bucket)))
         .withAttributes(Attribute.ALL);
      // Replace Attribute.ALL with Attribute.DEFAULT to get default values.

      try {
         DetectFacesResult result = rekognitionClient.detectFaces(request);
         List < FaceDetail > faceDetails = result.getFaceDetails();

         for (FaceDetail face: faceDetails) {
            if (request.getAttributes().contains("ALL")) {
               AgeRange ageRange = face.getAgeRange();
               System.out.println("The detected face is estimated to be between
 "
                  + ageRange.getLow().toString() + " and " +
 ageRange.getHigh().toString()
                  + " years old.");
               System.out.println("Here's the complete set of attributes:");
```

```
            } else { // non-default attributes have null values.
               System.out.println("Here's the default set of attributes:");
            }

            ObjectMapper objectMapper = new ObjectMapper();

 System.out.println(objectMapper.writerWithDefaultPrettyPrinter().writeValueAsString(fac
         }

      } catch (AmazonRekognitionException e) {
         e.printStackTrace();
      }

   }

}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import java.util.List;

//snippet-start:[rekognition.java2.detect_labels.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.DetectFacesRequest;
import software.amazon.awssdk.services.rekognition.model.DetectFacesResponse;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.Attribute;
import software.amazon.awssdk.services.rekognition.model.FaceDetail;
import software.amazon.awssdk.services.rekognition.model.AgeRange;

//snippet-end:[rekognition.java2.detect_labels.import]

public class DetectFaces {

    public static void main(String[] args) {
```

```
        final String usage = "\n" +
            "Usage: " +
            "   <bucket> <image>\n\n" +
            "Where:\n" +
            "   bucket - The name of the Amazon S3 bucket that contains the
 image (for example, ,amzn-s3-demo-bucket)." +
            "   image - The name of the image located in the Amazon S3 bucket
 (for example, Lake.png). \n\n";

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String image = args[1];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        getLabelsfromImage(rekClient, bucket, image);
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.detect_labels_s3.main]
    public static void getLabelsfromImage(RekognitionClient rekClient, String
 bucket, String image) {

        try {
            S3Object s3Object = S3Object.builder()
                .bucket(bucket)
                .name(image)
                .build() ;

            Image myImage = Image.builder()
                .s3Object(s3Object)
                .build();

            DetectFacesRequest facesRequest = DetectFacesRequest.builder()
                    .attributes(Attribute.ALL)
                    .image(myImage)
```

```
                    .build();

                DetectFacesResponse facesResponse =
 rekClient.detectFaces(facesRequest);
                List<FaceDetail> faceDetails = facesResponse.faceDetails();
                for (FaceDetail face : faceDetails) {
                    AgeRange ageRange = face.ageRange();
                    System.out.println("The detected face is estimated to be
 between "
                                    + ageRange.low().toString() + " and " +
 ageRange.high().toString()
                                    + " years old.");

                    System.out.println("There is a smile :
 "+face.smile().value().toString());
                }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
 // snippet-end:[rekognition.java2.detect_labels.main]
}
```

AWS CLI

This example displays the JSON output from the `detect-faces` AWS CLI operation. Replace `file` with the name of an image file. Replace `amzn-s3-demo-bucket` with the name of the Amazon S3 bucket that contains the image file.

```
aws rekognition detect-faces --image "{"S3Object":{"Bucket":"amzn-s3-demo-
bucket,"Name":"image-name"}}"\
                            --attributes "ALL" --profile profile-name --region
 region-name
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
aws rekognition detect-faces --image "{\"S3Object\":{\"Bucket\":\"amzn-s3-demo-
bucket\",\"Name\":\"image-name\"}}" --attributes "ALL"
--profile profile-name --region region-name
```

Python

This example displays the estimated age range and other attributes for detected faces, and lists the JSON for all detected facial attributes. Change the value of `photo` to the image file name. Change the value of `amzn-s3-demo-bucket` to the Amazon S3 bucket where the image is stored. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
import boto3
import json

def detect_faces(photo, bucket, region):

    session = boto3.Session(profile_name='profile-name',
                            region_name=region)
    client = session.client('rekognition', region_name=region)

    response = client.detect_faces(Image={'S3Object':
{'Bucket':bucket,'Name':photo}},
                                   Attributes=['ALL'])

    print('Detected faces for ' + photo)
    for faceDetail in response['FaceDetails']:
        print('The detected face is between ' + str(faceDetail['AgeRange']
['Low'])
              + ' and ' + str(faceDetail['AgeRange']['High']) + ' years old')

        print('Here are the other attributes:')
        print(json.dumps(faceDetail, indent=4, sort_keys=True))

        # Access predictions for individual face details and print them
        print("Gender: " + str(faceDetail['Gender']))
        print("Smile: " + str(faceDetail['Smile']))
        print("Eyeglasses: " + str(faceDetail['Eyeglasses']))
        print("Face Occluded: " + str(faceDetail['FaceOccluded']))
        print("Emotions: " + str(faceDetail['Emotions'][0]))
```

```
    return len(response['FaceDetails'])

def main():
    photo='photo'
    bucket='amzn-s3-demo-bucket'
    region='region'
    face_count=detect_faces(photo, bucket, region)
    print("Faces detected: " + str(face_count))

if __name__ == "__main__":
    main()
```

.NET

This example displays the estimated age range for detected faces, and lists the JSON for all detected facial attributes. Change the value of `photo` to the image file name. Change the value of `amzn-s3-demo-bucket` to the Amazon S3 bucket where the image is stored.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using System.Collections.Generic;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class DetectFaces
{
    public static void Example()
    {
        String photo = "input.jpg";
        String bucket = "amzn-s3-demo-bucket";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        DetectFacesRequest detectFacesRequest = new DetectFacesRequest()
        {
            Image = new Image()
            {
                S3Object = new S3Object()
                {
```

```
                    Name = photo,
                    Bucket = bucket
                },
            },
            // Attributes can be "ALL" or "DEFAULT".
            // "DEFAULT": BoundingBox, Confidence, Landmarks, Pose, and Quality.
            // "ALL": See https://docs.aws.amazon.com/sdkfornet/v3/apidocs/
items/Rekognition/TFaceDetail.html
            Attributes = new List<String>() { "ALL" }
        };

        try
        {
            DetectFacesResponse detectFacesResponse =
 rekognitionClient.DetectFaces(detectFacesRequest);
            bool hasAll = detectFacesRequest.Attributes.Contains("ALL");
            foreach(FaceDetail face in detectFacesResponse.FaceDetails)
            {
                Console.WriteLine("BoundingBox: top={0} left={1} width={2}
 height={3}", face.BoundingBox.Left,
                    face.BoundingBox.Top, face.BoundingBox.Width,
 face.BoundingBox.Height);
                Console.WriteLine("Confidence: {0}\nLandmarks: {1}\nPose:
 pitch={2} roll={3} yaw={4}\nQuality: {5}",
                    face.Confidence, face.Landmarks.Count, face.Pose.Pitch,
                    face.Pose.Roll, face.Pose.Yaw, face.Quality);
                if (hasAll)
                    Console.WriteLine("The detected face is estimated to be
 between " +
                        face.AgeRange.Low + " and " + face.AgeRange.High + "
 years old.");
            }
        }
        catch (Exception e)
        {
            Console.WriteLine(e.Message);
        }
    }
}
```

Ruby

This example displays the estimated age range for detected faces, and lists various facial attributes. Change the value of `photo` to the image file name. Change the value of `amzn-s3-demo-bucket` to the Amazon S3 bucket where the image is stored.

```
# Add to your Gemfile
# gem 'aws-sdk-rekognition'
require 'aws-sdk-rekognition'
credentials = Aws::Credentials.new(
   ENV['AWS_ACCESS_KEY_ID'],
   ENV['AWS_SECRET_ACCESS_KEY']
)
bucket = 'bucket' # the bucketname without s3://
photo  = 'input.jpg'# the name of file
client   = Aws::Rekognition::Client.new credentials: credentials
attrs = {
  image: {
    s3_object: {
      bucket: bucket,
      name: photo
    },
  },
  attributes: ['ALL']
}
response = client.detect_faces attrs
puts "Detected faces for: #{photo}"
response.face_details.each do |face_detail|
  low  = face_detail.age_range.low
  high = face_detail.age_range.high
  puts "The detected face is between: #{low} and #{high} years old"
  puts "All other attributes:"
  puts "  bounding_box.width:     #{face_detail.bounding_box.width}"
  puts "  bounding_box.height:    #{face_detail.bounding_box.height}"
  puts "  bounding_box.left:      #{face_detail.bounding_box.left}"
  puts "  bounding_box.top:       #{face_detail.bounding_box.top}"
  puts "  age.range.low:          #{face_detail.age_range.low}"
  puts "  age.range.high:         #{face_detail.age_range.high}"
  puts "  smile.value:            #{face_detail.smile.value}"
  puts "  smile.confidence:       #{face_detail.smile.confidence}"
```

```
    puts "  eyeglasses.value:       #{face_detail.eyeglasses.value}"
    puts "  eyeglasses.confidence:  #{face_detail.eyeglasses.confidence}"
    puts "  sunglasses.value:       #{face_detail.sunglasses.value}"
    puts "  sunglasses.confidence:  #{face_detail.sunglasses.confidence}"
    puts "  gender.value:           #{face_detail.gender.value}"
    puts "  gender.confidence:      #{face_detail.gender.confidence}"
    puts "  beard.value:            #{face_detail.beard.value}"
    puts "  beard.confidence:       #{face_detail.beard.confidence}"
    puts "  mustache.value:         #{face_detail.mustache.value}"
    puts "  mustache.confidence:    #{face_detail.mustache.confidence}"
    puts "  eyes_open.value:        #{face_detail.eyes_open.value}"
    puts "  eyes_open.confidence:   #{face_detail.eyes_open.confidence}"
    puts "  mout_open.value:        #{face_detail.mouth_open.value}"
    puts "  mout_open.confidence:   #{face_detail.mouth_open.confidence}"
    puts "  emotions[0].type:       #{face_detail.emotions[0].type}"
    puts "  emotions[0].confidence: #{face_detail.emotions[0].confidence}"
    puts "  landmarks[0].type:      #{face_detail.landmarks[0].type}"
    puts "  landmarks[0].x:         #{face_detail.landmarks[0].x}"
    puts "  landmarks[0].y:         #{face_detail.landmarks[0].y}"
    puts "  pose.roll:              #{face_detail.pose.roll}"
    puts "  pose.yaw:               #{face_detail.pose.yaw}"
    puts "  pose.pitch:             #{face_detail.pose.pitch}"
    puts "  quality.brightness:     #{face_detail.quality.brightness}"
    puts "  quality.sharpness:      #{face_detail.quality.sharpness}"
    puts "  confidence:             #{face_detail.confidence}"
    puts "------------"
    puts ""
  end
```

Node.js

This example displays the estimated age range for detected faces, and lists various facial attributes. Change the value of `photo` to the image file name. Change the value of `amzn-s3-demo-bucket` to the Amazon S3 bucket where the image is stored.

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

If you are using TypeScript definitions, you may need to use `import AWS from 'aws-sdk'` instead of `const AWS = require('aws-sdk')`, in order to run the program with Node.js. You can consult the AWS SDK for Javascript for more details. Depending on

how you have your configurations set up, you also may need to specify your region with `AWS.config.update({region:region});`.

```
// Load the SDK
var AWS = require('aws-sdk');
const bucket = 'bucket-name' // the bucketname without s3://
const photo  = 'photo-name' // the name of file

var credentials = new AWS.SharedIniFileCredentials({profile: 'profile-name'});
AWS.config.credentials = credentials;
AWS.config.update({region:'region-name'});

const client = new AWS.Rekognition();
const params = {
  Image: {
    S3Object: {
      Bucket: bucket,
      Name: photo
    },
  },
  Attributes: ['ALL']
}

client.detectFaces(params, function(err, response) {
    if (err) {
      console.log(err, err.stack); // an error occurred
    } else {
      console.log(`Detected faces for: ${photo}`)
      response.FaceDetails.forEach(data => {
        let low  = data.AgeRange.Low
        let high = data.AgeRange.High
        console.log(`The detected face is between: ${low} and ${high} years
 old`)
        console.log("All other attributes:")
        console.log(`  BoundingBox.Width:      ${data.BoundingBox.Width}`)
        console.log(`  BoundingBox.Height:     ${data.BoundingBox.Height}`)
        console.log(`  BoundingBox.Left:       ${data.BoundingBox.Left}`)
        console.log(`  BoundingBox.Top:        ${data.BoundingBox.Top}`)
        console.log(`  Age.Range.Low:          ${data.AgeRange.Low}`)
        console.log(`  Age.Range.High:         ${data.AgeRange.High}`)
        console.log(`  Smile.Value:            ${data.Smile.Value}`)
```

```
        console.log(`  Smile.Confidence:       ${data.Smile.Confidence}`)
        console.log(`  Eyeglasses.Value:       ${data.Eyeglasses.Value}`)
        console.log(`  Eyeglasses.Confidence:  ${data.Eyeglasses.Confidence}`)
        console.log(`  Sunglasses.Value:       ${data.Sunglasses.Value}`)
        console.log(`  Sunglasses.Confidence:  ${data.Sunglasses.Confidence}`)
        console.log(`  Gender.Value:           ${data.Gender.Value}`)
        console.log(`  Gender.Confidence:      ${data.Gender.Confidence}`)
        console.log(`  Beard.Value:            ${data.Beard.Value}`)
        console.log(`  Beard.Confidence:       ${data.Beard.Confidence}`)
        console.log(`  Mustache.Value:         ${data.Mustache.Value}`)
        console.log(`  Mustache.Confidence:    ${data.Mustache.Confidence}`)
        console.log(`  EyesOpen.Value:         ${data.EyesOpen.Value}`)
        console.log(`  EyesOpen.Confidence:    ${data.EyesOpen.Confidence}`)
        console.log(`  MouthOpen.Value:        ${data.MouthOpen.Value}`)
        console.log(`  MouthOpen.Confidence:   ${data.MouthOpen.Confidence}`)
        console.log(`  Emotions[0].Type:       ${data.Emotions[0].Type}`)
        console.log(`  Emotions[0].Confidence: ${data.Emotions[0].Confidence}`)
        console.log(`  Landmarks[0].Type:      ${data.Landmarks[0].Type}`)
        console.log(`  Landmarks[0].X:         ${data.Landmarks[0].X}`)
        console.log(`  Landmarks[0].Y:         ${data.Landmarks[0].Y}`)
        console.log(`  Pose.Roll:              ${data.Pose.Roll}`)
        console.log(`  Pose.Yaw:               ${data.Pose.Yaw}`)
        console.log(`  Pose.Pitch:             ${data.Pose.Pitch}`)
        console.log(`  Quality.Brightness:     ${data.Quality.Brightness}`)
        console.log(`  Quality.Sharpness:      ${data.Quality.Sharpness}`)
        console.log(`  Confidence:             ${data.Confidence}`)
        console.log("------------")
        console.log("")
      }) // for response.faceDetails
    } // if
  });
```

DetectFaces operation request

The input to `DetectFaces` is an image. In this example, the image is loaded from an Amazon S3 bucket. The `Attributes` parameter specifies that all facial attributes should be returned. For more information, see Working with images.

```
{
    "Image": {
        "S3Object": {
            "Bucket": "amzn-s3-demo-bucket",
```

```
            "Name": "input.jpg"
        }
    },
    "Attributes": [
        "ALL"
    ]
}
```

DetectFaces operation response

`DetectFaces` returns the following information for each detected face:

- **Bounding box** – The coordinates of the bounding box that surrounds the face.
- **Confidence** – The level of confidence that the bounding box contains a face.
- **Facial landmarks** – An array of facial landmarks. For each landmark (such as the left eye, right eye, and mouth), the response provides the x and y coordinates.
- **Facial attributes** – A set of facial attributes, such as whether the face is occluded, returned as a `FaceDetail` object. The set includes: AgeRange, Beard, Emotions, EyeDirection, Eyeglasses, EyesOpen, FaceOccluded, Gender, MouthOpen, Mustache, Smile, and Sunglasses. For each such attribute, the response provides a value. The value can be of different types, such as a Boolean type (whether a person is wearing sunglasses), a string (whether the person is male or female), or an angular degree value (for pitch/yaw of eye gaze directions). In addition, for most attributes, the response also provides a confidence in the detected value for the attribute. Note that while FaceOccluded and EyeDirection attributes are supported when using `DetectFaces`, they aren't supported when analyzing videos with `StartFaceDetection` and `GetFaceDetection`.
- **Quality** – Describes the brightness and the sharpness of the face. For information about ensuring the best possible face detection, see Recommendations for facial comparison input images.
- **Pose** – Describes the rotation of the face inside the image.

The request can depict an array of facial attributes you want to be returned. A `DEFAULT` subset of facial attributes - `BoundingBox`, `Confidence`, `Pose`, `Quality`, and `Landmarks` - will always be returned. You can request the return of specific facial attributes (in addition to the default list) - by using `["DEFAULT", "FACE_OCCLUDED", "EYE_DIRECTION"]` or just one attribute, like `["FACE_OCCLUDED"]`. You can request for all facial attributes by using `["ALL"]`. Requesting more attributes may increase response time.

The following is an example response of a `DetectFaces` API call:

```
{
  "FaceDetails": [
    {
      "BoundingBox": {
        "Width": 0.7919622659683228,
        "Height": 0.7510867118835449,
        "Left": 0.08881539851427078,
        "Top": 0.151064932346344
      },
      "AgeRange": {
        "Low": 18,
        "High": 26
      },
      "Smile": {
        "Value": false,
        "Confidence": 89.77348327636719
      },
      "Eyeglasses": {
        "Value": true,
        "Confidence": 99.99996948242188
      },
      "Sunglasses": {
        "Value": true,
        "Confidence": 93.65237426757812
      },
      "Gender": {
        "Value": "Female",
        "Confidence": 99.85968780517578
      },
      "Beard": {
        "Value": false,
        "Confidence": 77.52591705322266
      },
      "Mustache": {
        "Value": false,
        "Confidence": 94.48904418945312
      },
      "EyesOpen": {
        "Value": true,
        "Confidence": 98.57169342041016
      },
      "MouthOpen": {
        "Value": false,
```

```
        "Confidence": 74.33953094482422
      },
      "Emotions": [
        {
          "Type": "SAD",
          "Confidence": 65.56403350830078
        },
        {
          "Type": "CONFUSED",
          "Confidence": 31.277774810791016
        },
        {
          "Type": "DISGUSTED",
          "Confidence": 15.553778648376465
        },
        {
          "Type": "ANGRY",
          "Confidence": 8.012762069702148
        },
        {
          "Type": "SURPRISED",
          "Confidence": 7.621500015258789
        },
        {
          "Type": "FEAR",
          "Confidence": 7.243380546569824
        },
        {
          "Type": "CALM",
          "Confidence": 5.8196024894714355
        },
        {
          "Type": "HAPPY",
          "Confidence": 2.2830512523651123
        }
      ],
      "Landmarks": [
        {
          "Type": "eyeLeft",
          "X": 0.30225440859794617,
          "Y": 0.41018882393836975
        },
        {
          "Type": "eyeRight",
```

```
          "X": 0.6439348459243774,
          "Y": 0.40341562032699585
        },
        {
          "Type": "mouthLeft",
          "X": 0.343580037355423,
          "Y": 0.6951127648353577
        },
        {
          "Type": "mouthRight",
          "X": 0.6306480765342712,
          "Y": 0.6898072361946106
        },
        {
          "Type": "nose",
          "X": 0.47164231538772583,
          "Y": 0.5763645172119141
        },
        {
          "Type": "leftEyeBrowLeft",
          "X": 0.1732882857322693,
          "Y": 0.34452149271965027
        },
        {
          "Type": "leftEyeBrowRight",
          "X": 0.3655243515968323,
          "Y": 0.33231860399246216
        },
        {
          "Type": "leftEyeBrowUp",
          "X": 0.2671719491481781,
          "Y": 0.31669262051582336
        },
        {
          "Type": "rightEyeBrowLeft",
          "X": 0.5613729953765869,
          "Y": 0.32813435792922974
        },
        {
          "Type": "rightEyeBrowRight",
          "X": 0.7665090560913086,
          "Y": 0.3318614959716797
        },
        {
```

```
          "Type": "rightEyeBrowUp",
          "X": 0.6612788438796997,
          "Y": 0.3082450032234192
        },
        {
          "Type": "leftEyeLeft",
          "X": 0.2416982799768448,
          "Y": 0.4085965156555176
        },
        {
          "Type": "leftEyeRight",
          "X": 0.36943578720092773,
          "Y": 0.41230902075767517
        },
        {
          "Type": "leftEyeUp",
          "X": 0.29974061250686646,
          "Y": 0.3971870541572571
        },
        {
          "Type": "leftEyeDown",
          "X": 0.30360740423202515,
          "Y": 0.42347756028175354
        },
        {
          "Type": "rightEyeLeft",
          "X": 0.5755768418312073,
          "Y": 0.4081145226955414
        },
        {
          "Type": "rightEyeRight",
          "X": 0.7050536870956421,
          "Y": 0.39924031496047974
        },
        {
          "Type": "rightEyeUp",
          "X": 0.642906129360199,
          "Y": 0.39026668667793274
        },
        {
          "Type": "rightEyeDown",
          "X": 0.6423097848892212,
          "Y": 0.41669243574142456
        },
```

```
        {
          "Type": "noseLeft",
          "X": 0.4122826159000397,
          "Y": 0.5987403392791748
        },
        {
          "Type": "noseRight",
          "X": 0.5394935011863708,
          "Y": 0.5960900187492371
        },
        {
          "Type": "mouthUp",
          "X": 0.478581964969635,
          "Y": 0.6660456657409668
        },
        {
          "Type": "mouthDown",
          "X": 0.483366996049881,
          "Y": 0.7497162818908691
        },
        {
          "Type": "leftPupil",
          "X": 0.30225440859794617,
          "Y": 0.41018882393836975
        },
        {
          "Type": "rightPupil",
          "X": 0.6439348459243774,
          "Y": 0.40341562032699585
        },
        {
          "Type": "upperJawlineLeft",
          "X": 0.11031254380941391,
          "Y": 0.3980775475502014
        },
        {
          "Type": "midJawlineLeft",
          "X": 0.19301874935626984,
          "Y": 0.7034031748771667
        },
        {
          "Type": "chinBottom",
          "X": 0.4939905107021332,
          "Y": 0.8877836465835571
```

```
        },
        {
          "Type": "midJawlineRight",
          "X": 0.7990140914916992,
          "Y": 0.6899225115776062
        },
        {
          "Type": "upperJawlineRight",
          "X": 0.8548634648323059,
          "Y": 0.38160091638565063
        }
      ],
      "Pose": {
        "Roll": -5.83309268951416,
        "Yaw": -2.4244730472564697,
        "Pitch": 2.6216139793395996
      },
      "Quality": {
        "Brightness": 96.16363525390625,
        "Sharpness": 95.51618957519531
      },
      "Confidence": 99.99872589111328,
      "FaceOccluded": {
        "Value": true,
        "Confidence": 99.99726104736328
      },
      "EyeDirection": {
        "Yaw": 16.299732,
        "Pitch": -6.407457,
        "Confidence": 99.968704
      }
    }
  ],
  "ResponseMetadata": {
    "RequestId": "8bf02607-70b7-4f20-be55-473fe1bba9a2",
    "HTTPStatusCode": 200,
    "HTTPHeaders": {
      "x-amzn-requestid": "8bf02607-70b7-4f20-be55-473fe1bba9a2",
      "content-type": "application/x-amz-json-1.1",
      "content-length": "3409",
      "date": "Wed, 26 Apr 2023 20:18:50 GMT"
    },
    "RetryAttempts": 0
  }
```

```
}
```

Note the following:

- The `Pose` data describes the rotation of the face detected. You can use the combination of the `BoundingBox` and `Pose` data to draw the bounding box around faces that your application displays.
- The `Quality` describes the brightness and the sharpness of the face. You might find this useful to compare faces across images and find the best face.
- The preceding response shows all facial `landmarks` the service can detect, all facial attributes and emotions. To get all of these in the response, you must specify the `attributes` parameter with value `ALL`. By default, the `DetectFaces` API returns only the following five facial attributes: `BoundingBox`, `Confidence`, `Pose`, `Quality` and `landmarks`. The default landmarks returned are: `eyeLeft`, `eyeRight`, `nose`, `mouthLeft`, and `mouthRight`.

Comparing faces in images

With Rekognition you can compare faces between two images using the CompareFaces operation. This feature is useful for applications like identity verification or photo matching.

CompareFaces compares a face in the *source* image with each face in the *target* image. Images are passed to CompareFaces as either:

- A base64-encoded representation of an image.
- Amazon S3 objects.

Face Detection vs Face Comparison

Face comparison is different from face detection. Face detection (which uses DetectFaces) only identifies the presence and location of faces in an image or video. In contrast, face comparison involves comparing a detected face in a source image to faces in a target image to find matches.

Similarity thresholds

Use the `similarityThreshold` parameter to define the minimum confidence level for matches to be included in the response. By default, only faces with a similarity score of greater than or equal to 80% are returned in the response.

> **Note**
>
> `CompareFaces` uses machine learning algorithms, which are probabilistic. A false negative is an incorrect prediction that a face in the target image has a low similarity confidence score when compared to the face in the source image. To reduce the probability of false negatives, we recommend that you compare the target image against multiple source images. If you plan to use `CompareFaces` to make a decision that impacts an individual's rights, privacy, or access to services, we recommend that you pass the result to a human for review and further validation before taking action.

The following code examples demonstrate how to use the CompareFaces operations for various AWS SDKs. In the AWS CLI example, you upload two JPEG images to your Amazon S3 bucket and specify the object key name. In the other examples, you load two files from the local file system and input them as image byte arrays.

To compare faces

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` (AWS CLI example only) permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following example code to call the `CompareFaces` operation.

   Java

   This example displays information about matching faces in source and target images that are loaded from the local file system.

   Replace the values of `sourceImage` and `targetImage` with the path and file name of the source and target images.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
```

```
package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.BoundingBox;
import com.amazonaws.services.rekognition.model.CompareFacesMatch;
import com.amazonaws.services.rekognition.model.CompareFacesRequest;
import com.amazonaws.services.rekognition.model.CompareFacesResult;
import com.amazonaws.services.rekognition.model.ComparedFace;
import java.util.List;
import java.io.File;
import java.io.FileInputStream;
import java.io.InputStream;
import java.nio.ByteBuffer;
import com.amazonaws.util.IOUtils;

public class CompareFaces {

   public static void main(String[] args) throws Exception{
       Float similarityThreshold = 70F;
       String sourceImage = "source.jpg";
       String targetImage = "target.jpg";
       ByteBuffer sourceImageBytes=null;
       ByteBuffer targetImageBytes=null;

       AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

       //Load source and target images and create input parameters
       try (InputStream inputStream = new FileInputStream(new
 File(sourceImage))) {
          sourceImageBytes = ByteBuffer.wrap(IOUtils.toByteArray(inputStream));
       }
       catch(Exception e)
       {
           System.out.println("Failed to load source image " + sourceImage);
           System.exit(1);
       }
       try (InputStream inputStream = new FileInputStream(new
 File(targetImage))) {
           targetImageBytes =
 ByteBuffer.wrap(IOUtils.toByteArray(inputStream));
       }
```

```
        catch(Exception e)
        {
            System.out.println("Failed to load target images: " + targetImage);
            System.exit(1);
        }

        Image source=new Image()
             .withBytes(sourceImageBytes);
        Image target=new Image()
             .withBytes(targetImageBytes);

        CompareFacesRequest request = new CompareFacesRequest()
                .withSourceImage(source)
                .withTargetImage(target)
                .withSimilarityThreshold(similarityThreshold);

        // Call operation
        CompareFacesResult
 compareFacesResult=rekognitionClient.compareFaces(request);


        // Display results
        List <CompareFacesMatch> faceDetails =
 compareFacesResult.getFaceMatches();
        for (CompareFacesMatch match: faceDetails){
          ComparedFace face= match.getFace();
          BoundingBox position = face.getBoundingBox();
          System.out.println("Face at " + position.getLeft().toString()
                + " " + position.getTop()
                + " matches with " + match.getSimilarity().toString()
                + "% confidence.");

        }
        List<ComparedFace> uncompared = compareFacesResult.getUnmatchedFaces();

        System.out.println("There was " + uncompared.size()
             + " face(s) that did not match");
    }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import java.util.List;

import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.BoundingBox;
import software.amazon.awssdk.services.rekognition.model.CompareFacesMatch;
import software.amazon.awssdk.services.rekognition.model.CompareFacesRequest;
import software.amazon.awssdk.services.rekognition.model.CompareFacesResponse;
import software.amazon.awssdk.services.rekognition.model.ComparedFace;
import software.amazon.awssdk.core.SdkBytes;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;

// snippet-end:[rekognition.java2.detect_faces.import]

/**
 * Before running this Java V2 code example, set up your development
 environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class CompareFaces {

    public static void main(String[] args) {

        final String usage = "\n" +
            "Usage: " +
            "   <pathSource> <pathTarget>\n\n" +
            "Where:\n" +
            "   pathSource - The path to the source image (for example, C:\\AWS\
\pic1.png). \n " +
```

```
            "   pathTarget - The path to the target image (for example, C:\\AWS\
\pic2.png). \n\n";

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        Float similarityThreshold = 70F;
        String sourceImage = args[0];
        String targetImage = args[1];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        compareTwoFaces(rekClient, similarityThreshold, sourceImage,
 targetImage);
        rekClient.close();
   }

    // snippet-start:[rekognition.java2.compare_faces.main]
    public static void compareTwoFaces(RekognitionClient rekClient, Float
 similarityThreshold, String sourceImage, String targetImage) {
        try {
            InputStream sourceStream = new FileInputStream(sourceImage);
            InputStream tarStream = new FileInputStream(targetImage);
            SdkBytes sourceBytes = SdkBytes.fromInputStream(sourceStream);
            SdkBytes targetBytes = SdkBytes.fromInputStream(tarStream);

            // Create an Image object for the source image.
            Image souImage = Image.builder()
                .bytes(sourceBytes)
                .build();

            Image tarImage = Image.builder()
                .bytes(targetBytes)
                .build();

            CompareFacesRequest facesRequest = CompareFacesRequest.builder()
                .sourceImage(souImage)
                .targetImage(tarImage)
```

```
                .similarityThreshold(similarityThreshold)
                .build();

            // Compare the two images.
            CompareFacesResponse compareFacesResult =
 rekClient.compareFaces(facesRequest);
            List<CompareFacesMatch> faceDetails =
 compareFacesResult.faceMatches();
            for (CompareFacesMatch match: faceDetails){
                ComparedFace face= match.face();
                BoundingBox position = face.boundingBox();
                System.out.println("Face at " + position.left().toString()
                        + " " + position.top()
                        + " matches with " + face.confidence().toString()
                        + "% confidence.");

            }
            List<ComparedFace> uncompared = compareFacesResult.unmatchedFaces();
            System.out.println("There was " + uncompared.size() + " face(s) that
 did not match");
            System.out.println("Source image rotation: " +
 compareFacesResult.sourceImageOrientationCorrection());
            System.out.println("target image rotation: " +
 compareFacesResult.targetImageOrientationCorrection());

        } catch(RekognitionException | FileNotFoundException e) {
            System.out.println("Failed to load source image " + sourceImage);
            System.exit(1);
        }
    }
    // snippet-end:[rekognition.java2.compare_faces.main]
}
```

AWS CLI

This example displays the JSON output from the `compare-faces` AWS CLI operation.

Replace `amzn-s3-demo-bucket` with the name of the Amazon S3 bucket that contains the source and target images. Replace `source.jpg` and `target.jpg` with the file names for the source and target images.

```
aws rekognition compare-faces --target-image \
"{"S3Object":{"Bucket":"amzn-s3-demo-bucket","Name":"image-name"}}" \
```

```
--source-image "{"S3Object":{"Bucket":"amzn-s3-demo-bucket","Name":"image-
name"}}"
--profile profile-name
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
aws rekognition compare-faces --target-image "{\"S3Object\":{\"Bucket\":\"amzn-
s3-demo-bucket\",\"Name\":\"image-name\"}}" \
--source-image "{\"S3Object\":{\"Bucket\":\"amzn-s3-demo-bucket\",\"Name\":
\"image-name\"}}" --profile profile-name
```

Python

This example displays information about matching faces in source and target images that are loaded from the local file system.

Replace the values of `source_file` and `target_file` with the path and file name of the source and target images. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def compare_faces(sourceFile, targetFile):

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')

    imageSource = open(sourceFile, 'rb')
    imageTarget = open(targetFile, 'rb')

    response = client.compare_faces(SimilarityThreshold=80,
                                    SourceImage={'Bytes': imageSource.read()},
                                    TargetImage={'Bytes': imageTarget.read()})
```

```
    for faceMatch in response['FaceMatches']:
        position = faceMatch['Face']['BoundingBox']
        similarity = str(faceMatch['Similarity'])
        print('The face at ' +
              str(position['Left']) + ' ' +
              str(position['Top']) +
              ' matches with ' + similarity + '% confidence')

    imageSource.close()
    imageTarget.close()
    return len(response['FaceMatches'])

def main():
    source_file = 'source-file-name'
    target_file = 'target-file-name'
    face_matches = compare_faces(source_file, target_file)
    print("Face matches: " + str(face_matches))

if __name__ == "__main__":
    main()
```

.NET

This example displays information about matching faces in source and target images that are loaded from the local file system.

Replace the values of `sourceImage` and `targetImage` with the path and file name of the source and target images.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using System.IO;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class CompareFaces
{
    public static void Example()
    {
```

```
        float similarityThreshold = 70F;
        String sourceImage = "source.jpg";
        String targetImage = "target.jpg";

        AmazonRekognitionClient rekognitionClient = new
AmazonRekognitionClient();

        Amazon.Rekognition.Model.Image imageSource = new
Amazon.Rekognition.Model.Image();
        try
        {
            using (FileStream fs = new FileStream(sourceImage, FileMode.Open,
FileAccess.Read))
            {
                byte[] data = new byte[fs.Length];
                fs.Read(data, 0, (int)fs.Length);
                imageSource.Bytes = new MemoryStream(data);
            }
        }
        catch (Exception)
        {
            Console.WriteLine("Failed to load source image: " + sourceImage);
            return;
        }

        Amazon.Rekognition.Model.Image imageTarget = new
Amazon.Rekognition.Model.Image();
        try
        {
            using (FileStream fs = new FileStream(targetImage, FileMode.Open,
FileAccess.Read))
            {
                byte[] data = new byte[fs.Length];
                data = new byte[fs.Length];
                fs.Read(data, 0, (int)fs.Length);
                imageTarget.Bytes = new MemoryStream(data);
            }
        }
        catch (Exception)
        {
            Console.WriteLine("Failed to load target image: " + targetImage);
            return;
        }
```

```
        CompareFacesRequest compareFacesRequest = new CompareFacesRequest()
        {
            SourceImage = imageSource,
            TargetImage = imageTarget,
            SimilarityThreshold = similarityThreshold
        };

        // Call operation
        CompareFacesResponse compareFacesResponse =
 rekognitionClient.CompareFaces(compareFacesRequest);

        // Display results
        foreach(CompareFacesMatch match in compareFacesResponse.FaceMatches)
        {
            ComparedFace face = match.Face;
            BoundingBox position = face.BoundingBox;
            Console.WriteLine("Face at " + position.Left
                  + " " + position.Top
                  + " matches with " + match.Similarity
                  + "% confidence.");
        }

        Console.WriteLine("There was " +
 compareFacesResponse.UnmatchedFaces.Count + " face(s) that did not match");

    }
}
```

Ruby

This example displays information about matching faces in source and target images that are loaded from the local file system.

Replace the values of `photo_source` and `photo_target` with the path and file name of the source and target images.

```
 # Add to your Gemfile
  # gem 'aws-sdk-rekognition'
  require 'aws-sdk-rekognition'
  credentials = Aws::Credentials.new(
     ENV['AWS_ACCESS_KEY_ID'],
     ENV['AWS_SECRET_ACCESS_KEY']
  )
```

```
  bucket        = 'bucket' # the bucketname without s3://
  photo_source  = 'source.jpg'
  photo_target  = 'target.jpg'
  client   = Aws::Rekognition::Client.new credentials: credentials
  attrs = {
    source_image: {
      s3_object: {
        bucket: bucket,
        name: photo_source
      },
    },
    target_image: {
      s3_object: {
        bucket: bucket,
        name: photo_target
      },
    },
    similarity_threshold: 70
  }
  response = client.compare_faces attrs
  response.face_matches.each do |face_match|
    position   = face_match.face.bounding_box
    similarity = face_match.similarity
    puts "The face at: #{position.left}, #{position.top} matches with
#{similarity} % confidence"
  end
```

Node.js

This example displays information about matching faces in source and target images that are loaded from the local file system.

Replace the values of `photo_source` and `photo_target` with the path and file name of the source and target images. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
// Load the SDK
var AWS = require('aws-sdk');
const bucket = 'bucket-name' // the bucket name without s3://
const photo_source  = 'photo-source-name' // path and the name of file
const photo_target = 'photo-target-name'

var credentials = new AWS.SharedIniFileCredentials({profile: 'profile-name'});
```

```
AWS.config.credentials = credentials;
AWS.config.update({region:'region-name'});

const client = new AWS.Rekognition();
   const params = {
     SourceImage: {
       S3Object: {
         Bucket: bucket,
         Name: photo_source
       },
     },
     TargetImage: {
       S3Object: {
         Bucket: bucket,
         Name: photo_target
       },
     },
     SimilarityThreshold: 70
   }
   client.compareFaces(params, function(err, response) {
     if (err) {
       console.log(err, err.stack); // an error occurred
     } else {
       response.FaceMatches.forEach(data => {
         let position   = data.Face.BoundingBox
         let similarity = data.Similarity
         console.log(`The face at: ${position.Left}, ${position.Top} matches
 with ${similarity} % confidence`)
       }) // for response.faceDetails
     } // if
   });
```

CompareFaces operation request

The input to `CompareFaces` is an image. In this example, the source and target images are loaded from the local file system. The `SimilarityThreshold` input parameter specifies the minimum confidence that compared faces must match to be included in the response. For more information, see Working with images.

```
{
    "SourceImage": {
        "Bytes": "/9j/4AAQSk2Q==..."
```

```
    },
    "TargetImage": {
        "Bytes": "/9j/4O1Q==..."
    },
    "SimilarityThreshold": 70
}
```

CompareFaces operation response

The response includes:

- An array of face matches: A list of matched faces with similarity scores and metadata for each matching face. If multiple faces match, the `faceMatches`

  array includes all of the face matches.
- Face match details: Each matched face also provides a bounding box, confidence value, landmark locations, and similarity score.
- A list of unmatched faces: The response also includes faces from the target image that didn't match the source image face. Includes a bounding box for each unmatched face.
- Source face information: Includes information about the face from the source image that was used for comparison, including the bounding box and confidence value.

The example shows that one face match was found in the target image. For that face match, it provides a bounding box and a confidence value (the level of confidence that Amazon Rekognition has that the bounding box contains a face). The similarity score of 99.99 indicates how similar the faces are. The example also shows one face that Amazon Rekognition found in the target image that didn't match the face that was analyzed in the source image.

```
{
    "FaceMatches": [{
        "Face": {
            "BoundingBox": {
                "Width": 0.5521978139877319,
                "Top": 0.1203877404332161,
                "Left": 0.23626373708248138,
                "Height": 0.3126954436302185
            },
            "Confidence": 99.98751068115234,
            "Pose": {
```

```
                "Yaw": -82.36799621582031,
                "Roll": -62.13221740722656,
                "Pitch": 0.8652129173278809
            },
            "Quality": {
                "Sharpness": 99.99880981445312,
                "Brightness": 54.49755096435547
            },
            "Landmarks": [{
                    "Y": 0.2996366024017334,
                    "X": 0.41685718297958374,
                    "Type": "eyeLeft"
                },
                {
                    "Y": 0.2658946216106415,
                    "X": 0.4414493441581726,
                    "Type": "eyeRight"
                },
                {
                    "Y": 0.3465650677680969,
                    "X": 0.48636093735694885,
                    "Type": "nose"
                },
                {
                    "Y": 0.30935320258140564,
                    "X": 0.6251809000968933,
                    "Type": "mouthLeft"
                },
                {
                    "Y": 0.26942989230155945,
                    "X": 0.6454493403434753,
                    "Type": "mouthRight"
                }
            ]
        },
        "Similarity": 100.0
    }],
    "SourceImageOrientationCorrection": "ROTATE_90",
    "TargetImageOrientationCorrection": "ROTATE_90",
    "UnmatchedFaces": [{
        "BoundingBox": {
            "Width": 0.4890109896659851,
            "Top": 0.6566604375839233,
            "Left": 0.10989011079072952,
```

```
            "Height": 0.278298944234848
        },
        "Confidence": 99.99992370605469,
        "Pose": {
            "Yaw": 51.51519012451172,
            "Roll": -110.32493591308594,
            "Pitch": -2.322134017944336
        },
        "Quality": {
            "Sharpness": 99.99671173095703,
            "Brightness": 57.23163986206055
        },
        "Landmarks": [{
                "Y": 0.8288310766220093,
                "X": 0.3133862614631653,
                "Type": "eyeLeft"
            },
            {
                "Y": 0.7632885575294495,
                "X": 0.28091415762901306,
                "Type": "eyeRight"
            },
            {
                "Y": 0.7417283654212952,
                "X": 0.3631140887737274,
                "Type": "nose"
            },
            {
                "Y": 0.8081989884376526,
                "X": 0.4856561422348022 5,
                "Type": "mouthLeft"
            },
            {
                "Y": 0.7548204660415649,
                "X": 0.46090251207351685,
                "Type": "mouthRight"
            }
        ]
    }],
    "SourceImageFace": {
        "BoundingBox": {
            "Width": 0.5521978139877319,
            "Top": 0.1203877404332161,
            "Left": 0.23626373708248138,
```

```
            "Height": 0.3126954436302185
        },
        "Confidence": 99.98751068115234
    }
}
```

Detecting faces in a stored video

Amazon Rekognition Video can detect faces in videos that are stored in an Amazon S3 bucket and provide information such as:

- The time or times faces are detected in a video.
- The location of faces in the video frame at the time they were detected.
- Facial landmarks such as the position of the left eye.
- Additional attributes as explained on the the section called "Guidelines on face attributes" page.

Amazon Rekognition Video face detection in stored videos is an asynchronous operation. To start the detection of faces in videos, call StartFaceDetection. Amazon Rekognition Video publishes the completion status of the video analysis to an Amazon Simple Notification Service (Amazon SNS) topic. If the video analysis is successful, you can call GetFaceDetection to get the results of the video analysis. For more information about starting video analysis and getting the results, see Calling Amazon Rekognition Video operations.

This procedure expands on the code in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), which uses an Amazon Simple Queue Service (Amazon SQS) queue to get the completion status of a video analysis request.

To detect faces in a video stored in an Amazon S3 bucket (SDK)

1. Perform Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).
2. Add the following code to the class `VideoDetect` that you created in step 1.

   AWS CLI

   - In the following code sample, change `amzn-s3-demo-bucket` and `video-name` to the Amazon S3 bucket name and file name that you specified in step 2.
   - Change `region-name` to the AWS region that you're using. Replace the value of `profile_name` with the name of your developer profile.

- Change `TopicARN` to the ARN of the Amazon SNS topic you created in step 3 of Configuring Amazon Rekognition Video.
- Change `RoleARN` to the ARN of the IAM service role you created in step 7 of Configuring Amazon Rekognition Video.

```
aws rekognition start-face-detection --video "{"S3Object":{"Bucket":"amzn-s3-
demo-bucket","Name":"Video-Name"}}" --notification-channel
"{"SNSTopicArn":"Topic-ARN","RoleArn":"Role-ARN"}" --region region-name --
profile profile-name
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
aws rekognition start-face-detection --video "{\"S3Object\":{\"Bucket\":\"amzn-
s3-demo-bucket\",\"Name\":\"Video-Name\"}}" --notification-channel
"{\"SNSTopicArn\":\"Topic-ARN\",\"RoleArn\":\"Role-ARN\"}" --region region-name
 --profile profile-name
```

After running the `StartFaceDetection` operation and getting the job ID number, run the following `GetFaceDetection` operation and provide the job ID number:

```
aws rekognition get-face-detection --job-id job-id-number  --profile profile-
name
```

Java

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
```

```
private static void StartFaceDetection(String bucket, String video) throws
 Exception{

    NotificationChannel channel= new NotificationChannel()
            .withSNSTopicArn(snsTopicArn)
            .withRoleArn(roleArn);

    StartFaceDetectionRequest req = new StartFaceDetectionRequest()
            .withVideo(new Video()
                    .withS3Object(new S3Object()
                        .withBucket(bucket)
                        .withName(video)))
            .withNotificationChannel(channel);



    StartFaceDetectionResult startLabelDetectionResult =
 rek.startFaceDetection(req);
    startJobId=startLabelDetectionResult.getJobId();

}

private static void GetFaceDetectionResults() throws Exception{

    int maxResults=10;
    String paginationToken=null;
    GetFaceDetectionResult faceDetectionResult=null;

    do{
        if (faceDetectionResult !=null){
            paginationToken = faceDetectionResult.getNextToken();
        }

        faceDetectionResult = rek.getFaceDetection(new
 GetFaceDetectionRequest()
             .withJobId(startJobId)
             .withNextToken(paginationToken)
             .withMaxResults(maxResults));

        VideoMetadata videoMetaData=faceDetectionResult.getVideoMetadata();

        System.out.println("Format: " + videoMetaData.getFormat());
        System.out.println("Codec: " + videoMetaData.getCodec());
        System.out.println("Duration: " + videoMetaData.getDurationMillis());
```

```
        System.out.println("FrameRate: " + videoMetaData.getFrameRate());


        //Show faces, confidence and detection times
        List<FaceDetection> faces= faceDetectionResult.getFaces();

        for (FaceDetection face: faces) {
            long seconds=face.getTimestamp()/1000;
            System.out.print("Sec: " + Long.toString(seconds) + " ");
            System.out.println(face.getFace().toString());
            System.out.println();
        }
    } while (faceDetectionResult !=null && faceDetectionResult.getNextToken() !=
 null);


}
```

In the function `main`, replace the lines:

```
        StartLabelDetection(amzn-s3-demo-bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetLabelDetectionResults();
```

with:

```
        StartFaceDetection(amzn-s3-demo-bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetFaceDetectionResults();
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.recognize_video_faces.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
```

```
import software.amazon.awssdk.services.rekognition.model.*;
import java.util.List;
//snippet-end:[rekognition.java2.recognize_video_faces.import]


/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class VideoDetectFaces {

 private static String startJobId ="";
 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <bucket> <video> <topicArn> <roleArn>\n\n" +
         "Where:\n" +
         "   bucket - The name of the bucket in which the video is located (for
 example, (for example, amzn-s3-demo-bucket). \n\n"+
         "   video - The name of video (for example, people.mp4). \n\n" +
         "   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic. \n\n" +
         "   roleArn - The ARN of the AWS Identity and Access Management (IAM)
 role to use. \n\n" ;

     if (args.length != 4) {
         System.out.println(usage);
         System.exit(1);
     }

     String bucket = args[0];
     String video = args[1];
     String topicArn = args[2];
     String roleArn = args[3];

     Region region = Region.US_EAST_1;
     RekognitionClient rekClient = RekognitionClient.builder()
         .region(region)
```

```
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    NotificationChannel channel = NotificationChannel.builder()
        .snsTopicArn(topicArn)
        .roleArn(roleArn)
        .build();

    StartFaceDetection(rekClient, channel, bucket, video);
    GetFaceResults(rekClient);
    System.out.println("This example is done!");
    rekClient.close();
}

// snippet-start:[rekognition.java2.recognize_video_faces.main]
public static void StartFaceDetection(RekognitionClient rekClient,
                                       NotificationChannel channel,
                                       String bucket,
                                       String video) {

    try {
        S3Object s3Obj = S3Object.builder()
            .bucket(bucket)
            .name(video)
            .build();

        Video vidOb = Video.builder()
            .s3Object(s3Obj)
            .build();

        StartFaceDetectionRequest  faceDetectionRequest =
StartFaceDetectionRequest.builder()
            .jobTag("Faces")
            .faceAttributes(FaceAttributes.ALL)
            .notificationChannel(channel)
            .video(vidOb)
            .build();

        StartFaceDetectionResponse startLabelDetectionResult =
rekClient.startFaceDetection(faceDetectionRequest);
        startJobId=startLabelDetectionResult.jobId();

    } catch(RekognitionException e) {
        System.out.println(e.getMessage());
```

```
        System.exit(1);
    }
}

public static void GetFaceResults(RekognitionClient rekClient) {

    try {
        String paginationToken=null;
        GetFaceDetectionResponse faceDetectionResponse=null;
        boolean finished = false;
        String status;
        int yy=0 ;

        do{
            if (faceDetectionResponse !=null)
                paginationToken = faceDetectionResponse.nextToken();

            GetFaceDetectionRequest recognitionRequest =
GetFaceDetectionRequest.builder()
                .jobId(startJobId)
                .nextToken(paginationToken)
                .maxResults(10)
                .build();

            // Wait until the job succeeds
            while (!finished) {

                faceDetectionResponse =
rekClient.getFaceDetection(recognitionRequest);
                status = faceDetectionResponse.jobStatusAsString();

                if (status.compareTo("SUCCEEDED") == 0)
                    finished = true;
                else {
                    System.out.println(yy + " status is: " + status);
                    Thread.sleep(1000);
                }
                yy++;
            }

            finished = false;

            // Proceed when the job is done - otherwise VideoMetadata is null
            VideoMetadata videoMetaData=faceDetectionResponse.videoMetadata();
```

```
            System.out.println("Format: " + videoMetaData.format());
            System.out.println("Codec: " + videoMetaData.codec());
            System.out.println("Duration: " + videoMetaData.durationMillis());
            System.out.println("FrameRate: " + videoMetaData.frameRate());
            System.out.println("Job");

            // Show face information
            List<FaceDetection> faces= faceDetectionResponse.faces();

            for (FaceDetection face: faces) {
                String age = face.face().ageRange().toString();
                String smile = face.face().smile().toString();
                System.out.println("The detected face is estimated to be"
                            + age + " years old.");
                System.out.println("There is a smile : "+smile);
            }

        } while (faceDetectionResponse !=null &&
 faceDetectionResponse.nextToken() != null);

    } catch(RekognitionException | InterruptedException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
 }
 // snippet-end:[rekognition.java2.recognize_video_faces.main]
}
```

Python

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    # ============== Faces===============
    def StartFaceDetection(self):
        response=self.rek.start_face_detection(Video={'S3Object': {'Bucket':
 self.bucket, 'Name': self.video}},
            NotificationChannel={'RoleArn': self.roleArn, 'SNSTopicArn':
 self.snsTopicArn})

        self.startJobId=response['JobId']
        print('Start Job Id: ' + self.startJobId)
```

```
    def GetFaceDetectionResults(self):
        maxResults = 10
        paginationToken = ''
        finished = False

        while finished == False:
            response = self.rek.get_face_detection(JobId=self.startJobId,
                                            MaxResults=maxResults,
                                            NextToken=paginationToken)

            print('Codec: ' + response['VideoMetadata']['Codec'])
            print('Duration: ' + str(response['VideoMetadata']
['DurationMillis']))
            print('Format: ' + response['VideoMetadata']['Format'])
            print('Frame rate: ' + str(response['VideoMetadata']['FrameRate']))
            print()

            for faceDetection in response['Faces']:
                print('Face: ' + str(faceDetection['Face']))
                print('Confidence: ' + str(faceDetection['Face']['Confidence']))
                print('Timestamp: ' + str(faceDetection['Timestamp']))
                print()

            if 'NextToken' in response:
                paginationToken = response['NextToken']
            else:
                finished = True
```

In the function `main`, replace the lines:

```
    analyzer.StartLabelDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetLabelDetectionResults()
```

with:

```
    analyzer.StartFaceDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetFaceDetectionResults()
```

> **Note**
>
> If you've already run a video example other than Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), the function name to replace is different.

3. Run the code. Information about the faces that were detected in the video is shown.

GetFaceDetection operation response

`GetFaceDetection` returns an array (`Faces`) that contains information about the faces detected in the video. An array element, FaceDetection, exists for each time a face is detected in the video. The array elements returned are sorted by time, in milliseconds since the start of the video.

The following example is a partial JSON response from `GetFaceDetection`. In the response, note the following:

- **Bounding box** – The coordinates of the bounding box that surrounds the face.
- **Confidence** – The level of confidence that the bounding box contains a face.
- **Facial landmarks** – An array of facial landmarks. For each landmark (such as the left eye, right eye, and mouth), the response provides the `x` and `y` coordinates.
- **Face attributes** – A set of facial attributes, which includes: AgeRange, Beard, Emotions, Eyeglasses, EyesOpen, Gender, MouthOpen, Mustache, Smile, and Sunglasses. The value can be of different types, such as a Boolean type (whether a person is wearing sunglasses) or a string (whether the person is male or female). In addition, for most attributes, the response also provides a confidence in the detected value for the attribute. Note that while FaceOccluded and EyeDirection attributes are supported when using `DetectFaces`, they aren't supported when analyzing videos with `StartFaceDetection` and `GetFaceDetection`.
- **Timestamp** – The time that the face was detected in the video.
- **Paging information** – The example shows one page of face detection information. You can specify how many person elements to return in the `MaxResults` input parameter for `GetFaceDetection`. If more results than `MaxResults` exist, `GetFaceDetection` returns a token (`NextToken`) that's used to get the next page of results. For more information, see Getting Amazon Rekognition Video analysis results.
- **Video information** – The response includes information about the video format (`VideoMetadata`) in each page of information that's returned by `GetFaceDetection`.

- **Quality** – Describes the brightness and the sharpness of the face.
- **Pose** – Describes the rotation of the face.


```
{
    "Faces": [
        {
            "Face": {
                "BoundingBox": {
                    "Height": 0.23000000417232513,
                    "Left": 0.42500001192092896,
                    "Top": 0.16333332657814026,
                    "Width": 0.12937499582767487
                },
                "Confidence": 99.97504425048828,
                "Landmarks": [
                    {
                        "Type": "eyeLeft",
                        "X": 0.46415066719055176,
                        "Y": 0.2572723925113678
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.5068183541297913,
                        "Y": 0.23705792427062988
                    },
                    {
                        "Type": "nose",
                        "X": 0.49765899777412415,
                        "Y": 0.28383663296699524
                    },
                    {
                        "Type": "mouthLeft",
                        "X": 0.487221896648407,
                        "Y": 0.3452930748462677
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.5142884850502014,
                        "Y": 0.33167609572410583
                    }
                ],
                "Pose": {
```

```
                    "Pitch": 15.966927528381348,
                    "Roll": -15.547388076782227,
                    "Yaw": 11.34195613861084
                },
                "Quality": {
                    "Brightness": 44.80223083496094,
                    "Sharpness": 99.95819854736328
                }
            },
            "Timestamp": 0
        },
        {
            "Face": {
                "BoundingBox": {
                    "Height": 0.20000000298023224,
                    "Left": 0.029999999329447746,
                    "Top": 0.2199999988079071,
                    "Width": 0.11249999701976776
                },
                "Confidence": 99.85971069335938,
                "Landmarks": [
                    {
                        "Type": "eyeLeft",
                        "X": 0.06842322647571564,
                        "Y": 0.3010137975215912
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.10543643683195114,
                        "Y": 0.29697132110595703
                    },
                    {
                        "Type": "nose",
                        "X": 0.09569807350635529,
                        "Y": 0.33701086044311523
                    },
                    {
                        "Type": "mouthLeft",
                        "X": 0.0732642263174057,
                        "Y": 0.3757539987564087
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.10589495301246643,
```

```
                    "Y": 0.3722417950630188
                }
            ],
            "Pose": {
                "Pitch": -0.5589138865470886,
                "Roll": -5.1093974113464355,
                "Yaw": 18.69594955444336
            },
            "Quality": {
                "Brightness": 43.052337646484375,
                "Sharpness": 99.68138885498047
            }
        },
        "Timestamp": 0
    },
    {
        "Face": {
            "BoundingBox": {
                "Height": 0.2177777737379074,
                "Left": 0.7593749761581421,
                "Top": 0.13333334028720856,
                "Width": 0.12250000238418579
            },
            "Confidence": 99.63436889648438,
            "Landmarks": [
                {
                    "Type": "eyeLeft",
                    "X": 0.8005779385566711,
                    "Y": 0.20915353298187256
                },
                {
                    "Type": "eyeRight",
                    "X": 0.8391435146331787,
                    "Y": 0.21049551665782928
                },
                {
                    "Type": "nose",
                    "X": 0.8191410899162292,
                    "Y": 0.2523227035999298
                },
                {
                    "Type": "mouthLeft",
                    "X": 0.8093273043632507,
                    "Y": 0.29053622484207153
```

```
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.8366993069648743,
                        "Y": 0.29101791977882385
                    }
                ],
                "Pose": {
                    "Pitch": 3.165884017944336,
                    "Roll": 1.4182015657424927,
                    "Yaw": -11.151537895202637
                },
                "Quality": {
                    "Brightness": 28.910892486572266,
                    "Sharpness": 97.61507415771484
                }
            },
            "Timestamp": 0
        }.......

    ],
    "JobStatus": "SUCCEEDED",
    "NextToken": "i7fj5XPV/
fwviXqz0eag9Ow332Jd5G8ZGWf7hooirD/6V1qFmjKFOQZ6QPWUiqv29HbyuhMNqQ==",
    "VideoMetadata": {
        "Codec": "h264",
        "DurationMillis": 67301,
        "FileExtension": "mp4",
        "Format": "QuickTime / MOV",
        "FrameHeight": 1080,
        "FrameRate": 29.970029830932617,
        "FrameWidth": 1920
    }
}
```

Searching faces in a collection

Amazon Rekognition lets you use an input face to search for matches in a collection of stored faces. You start by storing information about detected faces in server-side containers called "collections". Collections store both individual faces and users (several faces of the same person). Individual faces are stored as face vectors, a mathematical representation of the face (not an actual image of the face). Different images of the same person can be used to create and store multiple face vectors in the same collection. You can then aggregate multiple face vectors of the same person to create a user vector. User vectors can offer higher face search accuracy with more robust depictions, containing varying degrees of lighting, sharpness, pose, appearance, etc.

Once you've created a collection you can use an input face to search for matching user vectors or face vectors in a collection. Searching against user vectors can significantly improve accuracy compared to searching against individual face vectors. You can use faces detected in images, stored videos, and streaming videos to search against stored face vectors. You can use faces detected in images to search against stored user vectors.

To store face information, you'll need to do the following:

1. Create a Collection - To store facial information, you must first create (CreateCollection) a face collection in one of the AWS Regions in your account. You specify this face collection when you call the `IndexFaces` operation.
2. Index Faces - The IndexFaces operation detects face(s) in an image, extracts, and stores the face vector(s) in the collection. You can use this operation to detect faces in an image and persist information about facial features that are detected into a collection. This is an example of a *storage-based* API operation because the service stores the face vector information on the server.

To create a user and associate multiple face vectors with a user, you'll need to do the following:

1. Create a User - You must first create a user with CreateUser. You can improve face matching accuracy by aggregating multiple face vectors of the same person into a user vector. You can associate up to 100 face vectors with a user vector.
2. Associate Faces - After creating the user, you can add existing face vectors to that user with the AssociateFaces operation. Face vectors must reside in the same collection as a user vector in order to be associated to that user vector.

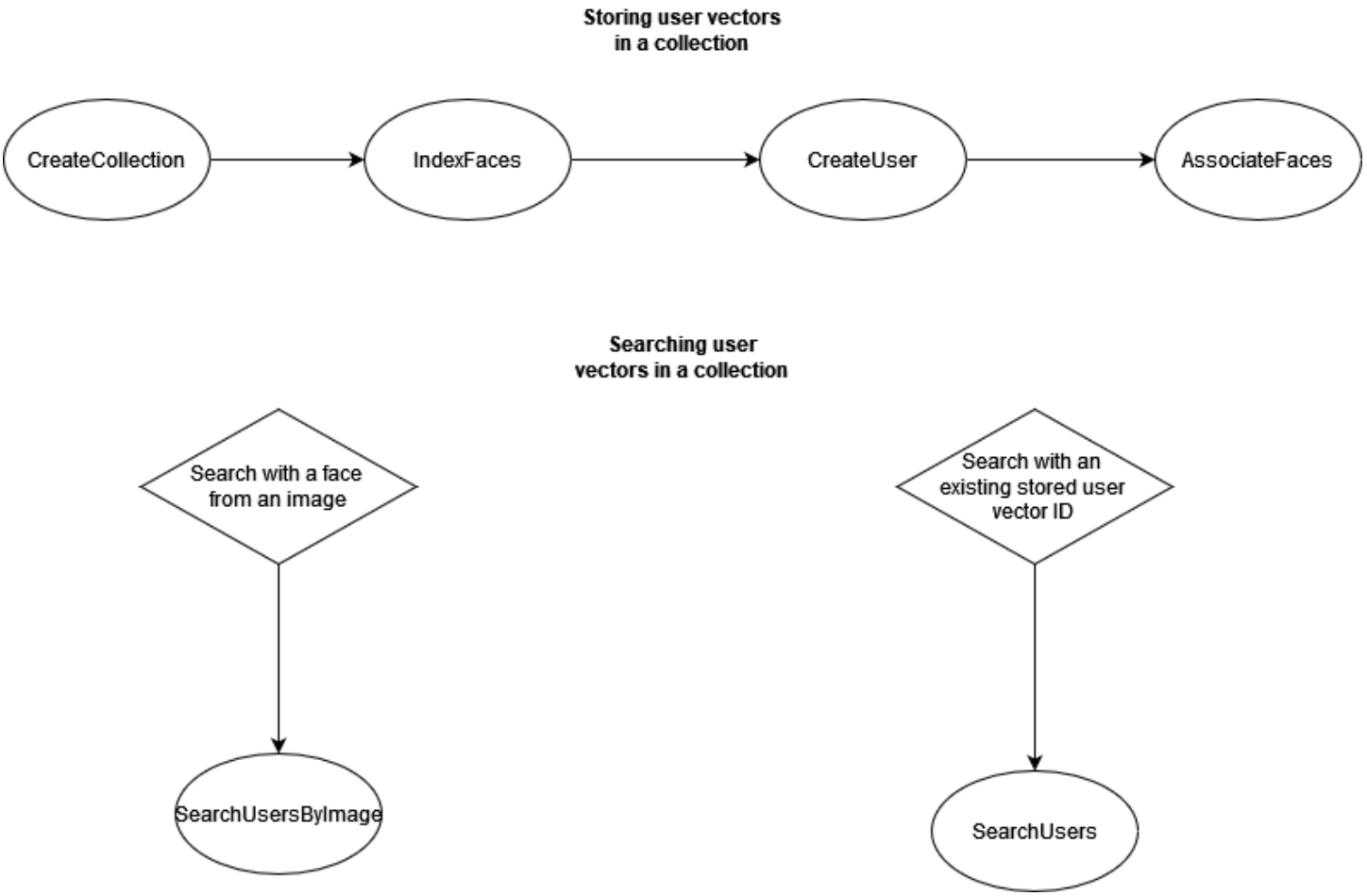
After creating a collection and storing face and user vectors, you can use the following operations to search for face matches:

- SearchFacesByImage - To search against stored individual faces with a face from an image.
- SearchFaces - To search against stored individual faces with a supplied face ID.
- SearchUsers - To search against stored users with a supplied face ID or user ID.
- SearchUsersByImage - To search against stored users with a face from an image.
- StartFaceSearch - To search for faces in a stored video.
- CreateStreamProcessor - To search for faces in a streaming video.

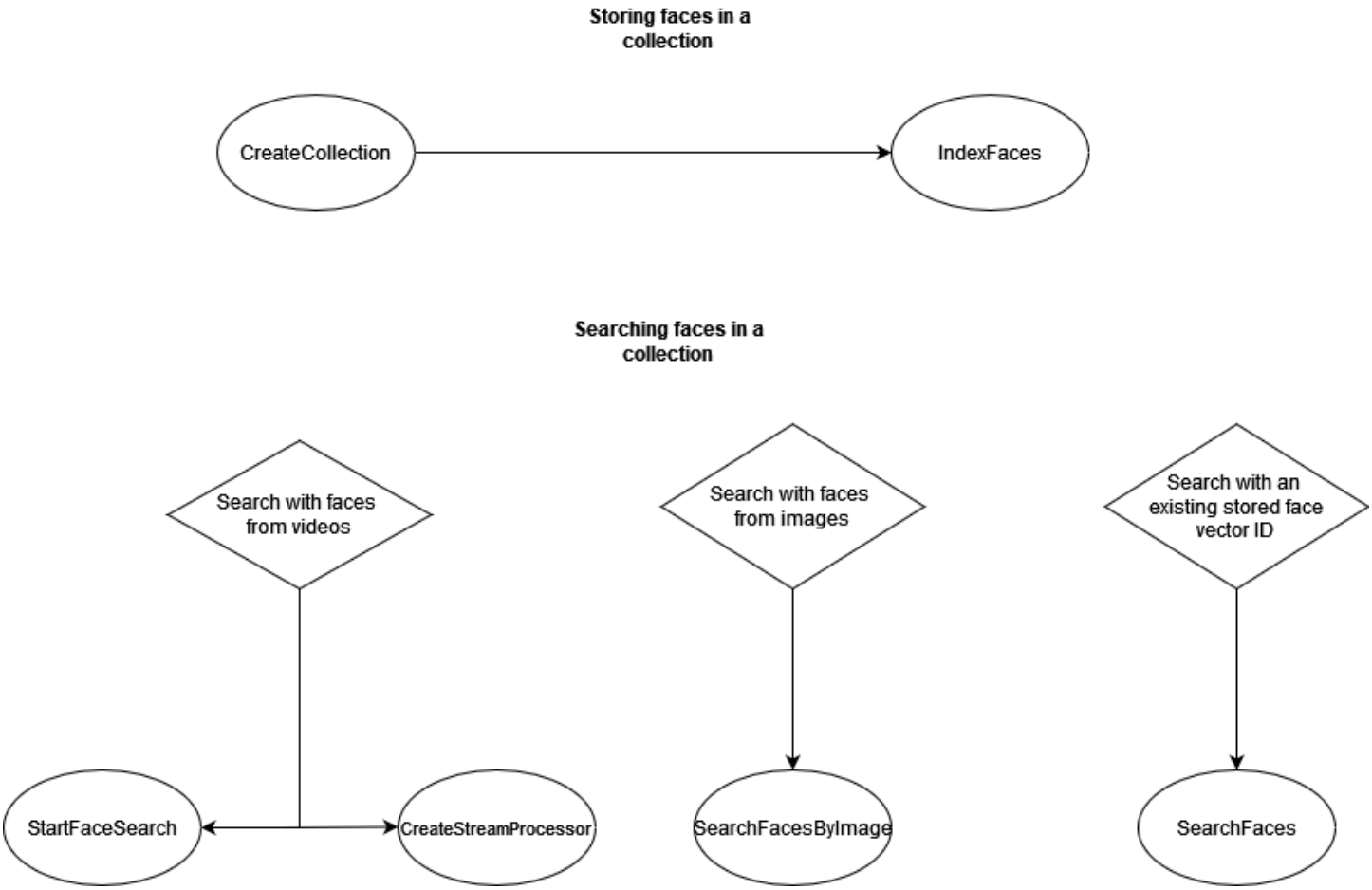
> **Note**
>
> Collections store face vectors, which are mathematical representations of faces. Collections do not store images of faces.

The following diagrams shows the order for calling operations, based on your goals for using collections:

For maximum accuracy matching with User Vectors:



For high accuracy matching with individual Face Vectors:



You can use collections in a variety of scenarios. For example, you might create a face collection which stores detected faces from scanned employee badge images and government issued IDs by using the `IndexFaces` and `AssociateFaces` operations. When an employee enters the building, an image of the employee's face is captured and sent to the `SearchUsersByImage` operation. If the face match produces a sufficiently high similarity score (say 99%), you can authenticate the employee.

Managing face collections, faces, and users

The face collection is the resource used by Amazon Rekognition for containing information related to faces and users. You use various Rekognition API operations to manage the collection itself, as well as any faces or face vectors stored in the collection.

Managing a collection

The face collection is the primary Amazon Rekognition resource, and each face collection you create has a unique Amazon Resource Name (ARN). You create each face collection in a specific

AWS Region in your account. When a collection is created, it's associated with the most recent version of the face detection model. For more information, see Understanding model versioning.

You can perform the following management operations on a collection:

- Create a collection with CreateCollection. For more information, see Creating a collection.
- List the available collections with ListCollections. For more information, see Listing collections.
- Describe a collection with DescribeCollection. For more information, see Describing a collection.
- Delete a collection with DeleteCollection. For more information, see Deleting a collection.

Managing faces in a collection

After you create a face collection, you can store faces in it. Amazon Rekognition provides the following operations for managing faces in a collection:

- The IndexFaces operation detects faces in the input image (JPEG or PNG), and adds them to the specified face collection. A unique face ID is returned for each face that's detected in the image. After you persist faces, you can search the face collection for face matches. For more information, see Adding faces to a collection.
- The ListFaces operation lists the faces in a collection. For more information, see Adding faces to a collection.
- The DeleteFaces operation deletes faces from a collection. For more information, see Deleting faces from a collection.

Managing users in a collection

After you store multiple face vectors from the same person, you can improve accuracy by associating all of those face vectors into one user vector. You can use the following operations to manage your users:

- CreateUser - Operation creates a new user in a collection with a provided unique user ID.
- AssociateUsers - Add 1 - 100 unique face IDs to a user ID. After you associate at least one face ID to a user, you can search for matches against that user in your collection.
- ListUsers - Lists the users in a collection.
- DeleteUsers - Deletes a user from a collection with the provided user ID.

- DisassociateFaces - Removes one or more face IDs from a user.

Using similarity thresholds for associating and matching faces

Similarity thresholds are used for both associating and matching faces. What follows is guidance for using similarity thresholds for both use cases.

Using similarity thresholds for associating faces

When associating faces using the AssociateFaces operation, it's important to ensure that faces being associated with a user are all from the same person. To help, the `UserMatchThreshold` parameter specifies the minimum user match confidence required for the new face to be associated with a `UserID` containing at least one `FaceID` already. This helps ensures that the `FaceIds` are associated with the right `UserID`. The value ranges from 0-100 and the default value is 75.

Using similarity thresholds to match faces

We allow you to control the results of all search operations (CompareFaces, SearchFaces, SearchFacesByImage, SearchUsers, SearchUsersByImage) by providing a similarity threshold as an input parameter.

`FaceMatchThreshold`, is the similarity threshold input attribute for `SearchFaces` and `SearchFacesByImage`, and it controls how many results are returned based on the similarity to the face being matched. The similarity threshold attribute for `SearchUsers` and `SearchUsersByImage` is `UserMatchThreshold`, and it controls how many results are returned based on the similarity to the user vector being matched. The threshold attribute is `SimilarityThreshold` for `CompareFaces`.

Responses with a `Similarity` response attribute value that's lower than the threshold aren't returned. This threshold is important to calibrate for your use case, because it can determine how many false positives are included in your match results. This controls the recall of your search results—the lower the threshold, the higher the recall.

All machine learning systems are probabilistic. You should use your judgment in setting the right similarity threshold, depending on your use case. For example, if you're looking to build a photos app to identify similar-looking family members, you might choose a lower threshold (such as 80%). On the other hand, for many law enforcement use cases, we recommend using a high threshold value of 99% or above to reduce accidental misidentification.

In addition to `FaceMatchThreshold` and `UserMatchThreshold`, you can use the `Similarity` response attribute as a means to reduce accidental misidentification. For instance, you can choose to use a low threshold (like 80%) to return more results. Then you can use the response attribute Similarity (percentage of similarity) to narrow the choice and filter for the right responses in your application. Again, using a higher similarity (such as 99% and above) reduces the risk of misidentification.

Guidance for indexing faces in common scenarios

The following is guidance for using `IndexFaces` in common scenarios.

Critical or public safety applications

- Call IndexFaces with images which contain only one face in each image and associate the returned Face ID with the identifier for the subject of the image.
- You can use DetectFaces ahead of indexing to verify there is only one face in the image. If more than one face is detected, re-submit the image after review and with only one face present. This prevents inadvertently indexing multiple faces and associating them with the same person.

Photo sharing and social media applications

- You should call `IndexFaces` without restrictions on images that contain multiple faces in use cases such as family albums. In such cases, you need to identify each person in every photo and use that information to group photos by the people present in them.

General usage

- Index multiple different images of the same person, particularly with different face attributes (facial poses, facial hair, etc), create a user, and associate the different faces to that user to improve matching quality.
- Include a review process so that failed matches can be indexed with the correct face identifier to improve subsequent face matching ability.
- For information about image quality, see Recommendations for facial comparison input images.

Searching for faces and users within a collection

After you create a face collection and store face vectors and/or user vectors, you can search a face collection for face matches. With Amazon Rekognition, you can search for faces in a collection that match:

- A supplied face ID (SearchFaces). For more information, see Searching for a face with a face ID.
- The largest face in a supplied image (SearchFacesByImage). For more information, see Searching for a face with an image.
- Faces in a stored video. For more information, see Searching stored videos for faces.
- Faces in a streaming video. For more information, see Working with streaming video events.

You can use the `CompareFaces` operation to compare a face in a source image with faces in the target image. The scope of this comparison is limited to the faces that are detected in the target image. For more information, see Comparing faces in images.

The various Search operations seen in the following list compare a face (identified either by a `FaceId` or an input image) with all faces stored in a given face collection:

- SearchFaces
- SearchFacesByImage
- SearchUsers
- SearchUsersByImage

Use cases that involve public safety

In addition to the recommendations listed in Best practices for sensors, input images, and videos and Guidance for indexing faces in common scenarios, you should use the following best practices when deploying face detection and comparison systems in use cases that involve public safety. First, you should use confidence thresholds of 99% or higher to reduce errors and false positives. Second, you should involve human reviewers to verify results received from a face detection or comparison system, and you should not make decisions based on system output without additional human review. Face detection and comparison systems should serve as a tool to help narrow the field and allow humans to expeditiously review and consider options. Third, we recommend that you should be transparent about the use of face detection and comparison systems in these use cases, including, wherever possible, informing end users and subjects about the use of these

systems, obtaining consent for such use, and providing a mechanism where end users and subjects can provide feedback to improve the system.

If you are a law enforcement agency that is using the Amazon Rekognition face comparison feature in connection with criminal investigations, you must follow the requirements listed in the AWS Service Terms. This includes the following.

- Have appropriately trained humans review all decisions to take action that might impact a person's civil liberties or equivalent human rights.
- Train personnel on responsible use of facial recognition systems.
- Provide public disclosures of your use of facial recognition systems.
- Don't use Amazon Rekognition for sustained surveillance of a person without independent review or exigent circumstances.

In all cases, facial comparison matches should be viewed in the context of other compelling evidence, and shouldn't be used as the sole determinant for taking action. However, if facial comparison is used for non-law-enforcement scenarios (for example, for unlocking a phone or authenticating an employee's identity to access a secure, private office building), these decisions wouldn't require a manual audit because they wouldn't impact a person's civil liberties or equivalent human rights.

If you're planning to use a face detection or face comparison system for use cases that involve public safety you should employ the best practices mentioned previously. In addition, you should consult published resources on the use of face comparison. This includes the Face Recognition Policy Development Template For Use In Criminal Intelligence and Investigative Activities provided by the Bureau of Justice Assistance of the Department of Justice. The template provides several facial comparison and biometric-related resources and is designed to provide law enforcement and public safety agencies with a framework for developing face comparison policies that comply with applicable laws, reduce privacy risks, and establish entity accountability and oversight. Additional resources include Best Privacy Practices for Commercial Use of Facial Recognition by the National Telecommunications and Information Administration and Best Practices for Common Uses of Facial Recognition by the staff of the Federal Trade Commission. Other resources may be developed and published in the future, and you should continuously educate yourself on this important topic.

As a reminder, you must comply with all applicable laws in their use of AWS services, and you may not use any AWS service in a manner that violates the rights of others or may be harmful to others.

This means that you may not use AWS services for public safety use cases in a way that illegally discriminates against a person or violates a person's due process, privacy, or civil liberties. You should obtain appropriate legal advice as necessary to review any legal requirements or questions regarding your use case.

Using Amazon Rekognition to help public safety

Amazon Rekognition can help in public safety and law enforcement scenarios—such as finding lost children, combating human trafficking, or preventing crimes. In public safety and law enforcement scenarios, consider the following:

- Use Amazon Rekognition as the first step in finding possible matches. The responses from Amazon Rekognition face operations allow you to quickly get a set of potential matches for further consideration.
- Don't use Amazon Rekognition responses to make autonomous decisions for scenarios that require analysis by a human. If you are a law enforcement agency using Amazon Rekognition to assist in identifying a person in connection with a criminal investigation, and actions will be taken based on the identification that could impact that person's civil liberties or equivalent human rights, the decision to take action must be made by an appropriately trained person based on their independent examination of the identification evidence.
- Use a 99% similarity threshold for scenarios where highly accurate face similarity matches are necessary. An example of this is authenticating access to a building.
- When civil rights are a concern, such as use cases involving law enforcement, use confidence thresholds of 99% or higher and employ human review of facial comparison predictions to ensure that a person's civil rights aren't violated.
- Use a similarity threshold lower than 99% for scenarios that benefit from a larger set of potential matches. An example of this is finding missing persons. If necessary, you can use the Similarity response attribute to determine how similar potential matches are to the person you want to recognize.
- Have a plan for false-positive face matches that are returned by Amazon Rekognition. For example, improve matching by using multiple images of the same person when you build the index with the IndexFaces operation. For more information, see Guidance for indexing faces in common scenarios.

In other use cases (such as social media), we recommend you use your best judgement to assess if the Amazon Rekognition results need human review. Also, depending on your application's requirements, the similarity threshold can be lower.

Creating a collection

You can use the CreateCollection operation to create a collection.

For more information, see Managing a collection.

To create a collection (SDK)

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `CreateCollection` operation.

   Java

   The following example creates a collection and displays its Amazon Resource Name (ARN).

   Change the value of `collectionId` to the name of the collection you want to create.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.CreateCollectionRequest;
import com.amazonaws.services.rekognition.model.CreateCollectionResult;


public class CreateCollection {

   public static void main(String[] args) throws Exception {
```

```
      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();


      String collectionId = "MyCollection";
            System.out.println("Creating collection: " +
         collectionId );

        CreateCollectionRequest request = new CreateCollectionRequest()
                    .withCollectionId(collectionId);

      CreateCollectionResult createCollectionResult =
 rekognitionClient.createCollection(request);
      System.out.println("CollectionArn : " +
         createCollectionResult.getCollectionArn());
      System.out.println("Status code : " +
         createCollectionResult.getStatusCode().toString());

   }

}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
//snippet-start:[rekognition.java2.create_collection.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.CreateCollectionResponse;
import
 software.amazon.awssdk.services.rekognition.model.CreateCollectionRequest;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
```

```
//snippet-end:[rekognition.java2.create_collection.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class CreateCollection {

 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <collectionName> \n\n" +
         "Where:\n" +
         "   collectionName - The name of the collection. \n\n";

     if (args.length != 1) {
         System.out.println(usage);
         System.exit(1);
     }

     String collectionId = args[0];
     Region region = Region.US_EAST_1;
     RekognitionClient rekClient = RekognitionClient.builder()
         .region(region)
         .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
         .build();

     System.out.println("Creating collection: " +collectionId);
     createMyCollection(rekClient, collectionId );
     rekClient.close();
 }

 // snippet-start:[rekognition.java2.create_collection.main]
 public static void createMyCollection(RekognitionClient rekClient,String
 collectionId ) {

     try {
```

```
        CreateCollectionRequest collectionRequest =
CreateCollectionRequest.builder()
            .collectionId(collectionId)
            .build();

        CreateCollectionResponse collectionResponse =
rekClient.createCollection(collectionRequest);
        System.out.println("CollectionArn: " +
collectionResponse.collectionArn());
        System.out.println("Status code: " +
collectionResponse.statusCode().toString());

    } catch(RekognitionException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
}
// snippet-end:[rekognition.java2.create_collection.main]
```

AWS CLI

This AWS CLI command displays the JSON output for the `create-collection` CLI operation.

Replace the value of `collection-id` with the name of the collection you want to create.

Replace the value of `profile_name` with the name of your developer profile.

```
aws rekognition create-collection --profile profile-name --collection-id
 "collection-name"
```

Python

The following example creates a collection and displays its Amazon Resource Name (ARN).

Change the value of `collection_id` to the name of collection you want to create. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
```

```
import boto3

def create_collection(collection_id):
    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')

    # Create a collection
    print('Creating collection:' + collection_id)
    response = client.create_collection(CollectionId=collection_id)
    print('Collection ARN: ' + response['CollectionArn'])
    print('Status code: ' + str(response['StatusCode']))
    print('Done...')

def main():
    collection_id = "collection-id"
    create_collection(collection_id)

if __name__ == "__main__":
    main()
```

.NET

The following example creates a collection and displays its Amazon Resource Name (ARN).

Change the value of `collectionId` to the name of collection you want to create.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class CreateCollection
{
    public static void Example()
    {
        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        String collectionId = "MyCollection";
```

```
        Console.WriteLine("Creating collection: " + collectionId);

        CreateCollectionRequest createCollectionRequest = new
 CreateCollectionRequest()
        {
            CollectionId = collectionId
        };

        CreateCollectionResponse createCollectionResponse =
 rekognitionClient.CreateCollection(createCollectionRequest);
        Console.WriteLine("CollectionArn : " +
 createCollectionResponse.CollectionArn);
        Console.WriteLine("Status code : " +
 createCollectionResponse.StatusCode);

    }
}
```

Node.JS

In the following example, replace the value of `region` with the name of the region associated with your account and replace the value of `collectionName` with the desired name of your collection.

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import { CreateCollectionCommand} from  "@aws-sdk/client-rekognition";
import  { RekognitionClient } from "@aws-sdk/client-rekognition";
import {fromIni} from '@aws-sdk/credential-providers';

// Set the AWS Region.
const REGION = "region-name"; //e.g. "us-east-1"
// Set the profile name
const profileName = "profile-name"
// Name the collection
const collectionName = "collection-name"
const rekogClient = new RekognitionClient({region: REGION,
  credentials: fromIni({profile: profileName,}),
```

```
});

const createCollection = async (collectionName) => {
    try {
       console.log(`Creating collection: ${collectionName}`)
       const data = await rekogClient.send(new
 CreateCollectionCommand({CollectionId: collectionName}));
       console.log("Collection ARN:")
       console.log(data.CollectionARN)
       console.log("Status Code:")
       console.log(String(data.StatusCode))
       console.log("Success.",  data);
       return data;
    } catch (err) {
      console.log("Error", err.stack);
    }
  };

 createCollection(collectionName)
```

CreateCollection operation request

The input to `CreationCollection` is the name of the collection that you want to create.

```
{
    "CollectionId": "MyCollection"
}
```

CreateCollection operation response

Amazon Rekognition creates the collection and returns the Amazon Resource Name (ARN) of the newly created collection.

```
{
   "CollectionArn": "aws:rekognition:us-east-1:acct-id:collection/examplecollection",
   "StatusCode": 200
}
```

Tagging collections

You can identify, organize, search for, and filter Amazon Rekognition collections by using tags. Each tag is a label consisting of a user-defined key and value.

You can also use tags to control access for a collection by using Identity and Access Management (IAM). For more information, see Controlling access to AWS resources using resource tags.

Topics

- Add tags to a new collection
- Add tags to an existing collection
- List tags in a collection
- Delete tags from a collection

Add tags to a new collection

You can add tags to a collection as you create it using the `CreateCollection` operation. Specify one or more tags in the `Tags` array input parameter.

AWS CLI

Replace the value of `profile_name` with the name of your developer profile.

```
aws rekognition create-collection --collection-id "collection-name" --tags
 "{"key1":"value1","key2":"value2"}" --profile profile-name
```

For Windows devices:

```
aws rekognition create-collection --collection-id "collection-name" --tags
 "{\"key1\":\"value1\",\"key2\":\"value2\"}" --profile profile-name
```

Python

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
import boto3

def create_collection(collection_id):
    client = boto3.client('rekognition')

    # Create a collection
    print('Creating collection:' + collection_id)
    response = client.create_collection(CollectionId=collection_id)
    print('Collection ARN: ' + response['CollectionArn'])
    print('Status code: ' + str(response['StatusCode']))
    print('Done...')

def main():
    collection_id = 'NewCollectionName'
    create_collection(collection_id)

if __name__ == "__main__":
    main()
```

Add tags to an existing collection

To add one or more tags to an existing collection, use the `TagResource` operation. Specify the collection's Amazon Resource Name (ARN) (`ResourceArn`) and the tags (`Tags`) that you want to add. The following example shows how to add two tags.

AWS CLI

Replace the value of `profile_name` with the name of your developer profile.

```
aws rekognition tag-resource --resource-arn collection-arn --tags
 "{"key1":"value1","key2":"value2"}" --profile profile-name
```

For Windows devices:

```
aws rekognition tag-resource --resource-arn collection-arn --tags "{\"key1\":
\"value1\",\"key2\":\"value2\"}" --profile profile-name
```

Python

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def create_tag(collection_id):
    session = boto3.Session(profile_name='default')
    client = session.client('rekognition')
    response = client.tag_resource(ResourceArn=collection_id,
                                   Tags={
                                       "KeyName": "ValueName"
                                   })
    print(response)
    if "'HTTPStatusCode': 200" in str(response):
        print("Success!!")

def main():
    collection_arn = "collection-arn"
    create_tag(collection_arn)

if __name__ == "__main__":
    main()
```

Note

If you do not know the collection's Amazon Resource Name, you can use the `DescribeCollection` operation.

List tags in a collection

To list the tags attached to a collection, use the `ListTagsForResource` operation and specify the ARN of the collection (`ResourceArn`). The response is a map of tag keys and values that are attached to the specified collection.

AWS CLI

Replace the value of `profile_name` with the name of your developer profile.

```
aws rekognition list-tags-for-resource --resource-arn resource-arn --profile
 profile-name
```

Python

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
import boto3

def list_tags():
    client = boto3.client('rekognition')
    response =
 client.list_tags_for_resource(ResourceArn="arn:aws:rekognition:region-
name:5498347593847598:collection/NewCollectionName")
    print(response)

def main():
    list_tags()

if __name__ == "__main__":
    main()
```

The output displays a list of tags attached to the collection:

```
                {
    "Tags": {
        "Dept": "Engineering",
        "Name": "Ana Silva Carolina",
        "Role": "Developer"
    }
}
```

Delete tags from a collection

To remove one or more tags from a collection, use the `UntagResource` operation. Specify the ARN of the model (`ResourceArn`) and the tag keys (`Tag-Keys`) that you want to remove.

AWS CLI

Replace the value of `profile_name` with the name of your developer profile.

```
aws rekognition untag-resource --resource-arn resource-arn --profile profile-name --
tag-keys "key1" "key2"
```

Alternatively, you can specify tag-keys in this format:

```
--tag-keys key1,key2
```

Python

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
import boto3

def list_tags():
    client = boto3.client('rekognition')
    response = client.untag_resource(ResourceArn="arn:aws:rekognition:region-
name:5498347593847598:collection/NewCollectionName", TagKeys=['KeyName'])
    print(response)

def main():
    list_tags()

if __name__ == "__main__":
    main()
```

Listing collections

You can use the ListCollections operation to list the collections in the region that you are using.

For more information, see Managing a collection.

To list collections (SDK)

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following examples to call the `ListCollections` operation.

   Java

   The following example lists the collections in the current region.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;

import java.util.List;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.ListCollectionsRequest;
import com.amazonaws.services.rekognition.model.ListCollectionsResult;

public class ListCollections {

   public static void main(String[] args) throws Exception {


      AmazonRekognition amazonRekognition =
 AmazonRekognitionClientBuilder.defaultClient();


      System.out.println("Listing collections");
      int limit = 10;
      ListCollectionsResult listCollectionsResult = null;
      String paginationToken = null;
      do {
         if (listCollectionsResult != null) {
            paginationToken = listCollectionsResult.getNextToken();
```

```
        }
        ListCollectionsRequest listCollectionsRequest = new
 ListCollectionsRequest()
                .withMaxResults(limit)
                .withNextToken(paginationToken);

 listCollectionsResult=amazonRekognition.listCollections(listCollectionsRequest);

        List < String > collectionIds =
 listCollectionsResult.getCollectionIds();
        for (String resultId: collectionIds) {
           System.out.println(resultId);
        }
     } while (listCollectionsResult != null &&
 listCollectionsResult.getNextToken() !=
        null);

   }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.list_collections.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.ListCollectionsRequest;
import
 software.amazon.awssdk.services.rekognition.model.ListCollectionsResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import java.util.List;
//snippet-end:[rekognition.java2.list_collections.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
```

```
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class ListCollections {

 public static void main(String[] args) {

     Region region = Region.US_EAST_1;
     RekognitionClient rekClient = RekognitionClient.builder()
         .region(region)
         .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
         .build();

     System.out.println("Listing collections");
     listAllCollections(rekClient);
     rekClient.close();
 }

 // snippet-start:[rekognition.java2.list_collections.main]
 public static void listAllCollections(RekognitionClient rekClient) {
     try {
         ListCollectionsRequest listCollectionsRequest =
 ListCollectionsRequest.builder()
             .maxResults(10)
             .build();

         ListCollectionsResponse response =
 rekClient.listCollections(listCollectionsRequest);
         List<String> collectionIds = response.collectionIds();
         for (String resultId : collectionIds) {
             System.out.println(resultId);
         }

     } catch (RekognitionException e) {
         System.out.println(e.getMessage());
         System.exit(1);
     }
 }
 // snippet-end:[rekognition.java2.list_collections.main]
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `list-collections` CLI operation. Replace the value of `profile_name` with the name of your developer profile.

```
aws rekognition list-collections --profile profile-name
```

Python

The following example lists the collections in the current region.

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def list_collections():

    max_results=2

    client=boto3.client('rekognition')

    #Display all the collections
    print('Displaying collections...')
    response=client.list_collections(MaxResults=max_results)
    collection_count=0
    done=False

    while done==False:
        collections=response['CollectionIds']

        for collection in collections:
            print (collection)
            collection_count+=1
        if 'NextToken' in response:
            nextToken=response['NextToken']

 response=client.list_collections(NextToken=nextToken,MaxResults=max_results)
```

```
        else:
            done=True

    return collection_count

def main():

    collection_count=list_collections()
    print("collections: " + str(collection_count))
if __name__ == "__main__":
    main()
```

.NET

The following example lists the collections in the current region.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class ListCollections
{
    public static void Example()
    {
        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        Console.WriteLine("Listing collections");
        int limit = 10;

        ListCollectionsResponse listCollectionsResponse = null;
        String paginationToken = null;
        do
        {
            if (listCollectionsResponse != null)
                paginationToken = listCollectionsResponse.NextToken;
```

```
            ListCollectionsRequest listCollectionsRequest = new
 ListCollectionsRequest()
            {
                MaxResults = limit,
                NextToken = paginationToken
            };

            listCollectionsResponse =
 rekognitionClient.ListCollections(listCollectionsRequest);

            foreach (String resultId in listCollectionsResponse.CollectionIds)
                Console.WriteLine(resultId);
        } while (listCollectionsResponse != null &&
 listCollectionsResponse.NextToken != null);
    }
}
```

Node.js

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import { ListCollectionsCommand } from  "@aws-sdk/client-rekognition";
import  { RekognitionClient } from "@aws-sdk/client-rekognition";
import {fromIni} from '@aws-sdk/credential-providers';

// Set the AWS Region.
const REGION = "region-name"; //e.g. "us-east-1"
// Set the profile name
const profileName = "profile-name"
// Name the collection
const rekogClient = new RekognitionClient({region: REGION,
  credentials: fromIni({profile: profileName,}),
});

const listCollection = async () => {
  var max_results = 10
  console.log("Displaying collections:")
```

```
  var response = await rekogClient.send(new ListCollectionsCommand({MaxResults:
 max_results}))
  var collection_count = 0
  var done = false
  while (done == false){
      var collections = response.CollectionIds
      collections.forEach(collection => {
          console.log(collection)
          collection_count += 1
      });
      return collection_count
  }
}

var collect_list = await listCollection()
console.log(collect_list)
```

ListCollections operation request

The input to `ListCollections` is the maximum number of collections to be returned.

```
{
    "MaxResults": 2
}
```

If the response has more collections than are requested by `MaxResults`, a token is returned that you can use to get the next set of results, in a subsequent call to `ListCollections`. For example:

```
{
    "NextToken": "MGYZLAHX1T5a....",
    "MaxResults": 2
}
```

ListCollections operation response

Amazon Rekognition returns an array of collections (`CollectionIds`). A separate array (`FaceModelVersions`) provides the version of the face model used to analyze faces in each collection. For example, in the following JSON response, the collection `MyCollection` analyzes faces by using version 2.0 of the face model. The collection `AnotherCollection` uses version 3.0 of the face model. For more information, see Understanding model versioning.

`NextToken` is the token that's used to get the next set of results, in a subsequent call to `ListCollections`.

```
{
    "CollectionIds": [
        "MyCollection",
        "AnotherCollection"
    ],
    "FaceModelVersions": [
        "2.0",
        "3.0"
    ],
    "NextToken": "MGYZLAHX1T5a...."
}
```

Describing a collection

You can use the DescribeCollection operation to get the following information about a collection:

- The number of faces that are indexed into the collection.
- The version of the model being used with the collection. For more information, see the section called “Understanding model versioning”.
- The Amazon Resource Name (ARN) of the collection.
- The creation date and time of the collection.

To describe a collection (SDK)

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `DescribeCollection` operation.

   Java

   This example describes a collection.

Change the value `collectionId` to the ID of the desired collection.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package com.amazonaws.samples;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.DescribeCollectionRequest;
import com.amazonaws.services.rekognition.model.DescribeCollectionResult;


public class DescribeCollection {

   public static void main(String[] args) throws Exception {

      String collectionId = "CollectionID";

      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();


      System.out.println("Describing collection: " +
         collectionId );


        DescribeCollectionRequest request = new DescribeCollectionRequest()
                    .withCollectionId(collectionId);

      DescribeCollectionResult describeCollectionResult =
 rekognitionClient.describeCollection(request);
      System.out.println("Collection Arn : " +
         describeCollectionResult.getCollectionARN());
      System.out.println("Face count : " +
         describeCollectionResult.getFaceCount().toString());
      System.out.println("Face model version : " +
         describeCollectionResult.getFaceModelVersion());
      System.out.println("Created : " +
         describeCollectionResult.getCreationTimestamp().toString());

   }
```

```
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.DescribeCollectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.DescribeCollectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
//snippet-end:[rekognition.java2.describe_collection.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class DescribeCollection {

 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <collectionName>\n\n" +
         "Where:\n" +
         "   collectionName - The name of the Amazon Rekognition collection. \n
\n";

     if (args.length != 1) {
         System.out.println(usage);
         System.exit(1);
```

```
        }

        String collectionName = args[0];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
            .build();

        describeColl(rekClient, collectionName);
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.describe_collection.main]
    public static void describeColl(RekognitionClient rekClient, String
    collectionName) {

        try {
            DescribeCollectionRequest describeCollectionRequest =
    DescribeCollectionRequest.builder()
                .collectionId(collectionName)
                .build();

            DescribeCollectionResponse describeCollectionResponse =
    rekClient.describeCollection(describeCollectionRequest);
            System.out.println("Collection Arn : " +
    describeCollectionResponse.collectionARN());
            System.out.println("Created : " +
    describeCollectionResponse.creationTimestamp().toString());

        } catch(RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
    // snippet-end:[rekognition.java2.describe_collection.main]
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `describe-collection` CLI operation. Change the value of `collection-id` to the ID of the desired collection. Replace

the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
aws rekognition describe-collection --collection-id collection-name --profile
 profile-name
```

Python

This example describes a collection.

Change the value `collection_id` to the ID of the desired collection. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
from botocore.exceptions import ClientError

def describe_collection(collection_id):

    print('Attempting to describe collection ' + collection_id)

    session = boto3.Session(profile_name='default')
    client = session.client('rekognition')

    try:
    response = client.describe_collection(CollectionId=collection_id)
    print("Collection Arn: " + response['CollectionARN'])
    print("Face Count: " + str(response['FaceCount']))
    print("Face Model Version: " + response['FaceModelVersion'])
    print("Timestamp: " + str(response['CreationTimestamp']))

    except ClientError as e:
    if e.response['Error']['Code'] == 'ResourceNotFoundException':
    print('The collection ' + collection_id + ' was not found ')
    else:
    print('Error other than Not Found occurred: ' + e.response['Error']
['Message'])
```

```
    print('Done...')

def main():
    collection_id = 'collection-name'
    describe_collection(collection_id)

if __name__ == "__main__":
    main()
```

.NET

This example describes a collection.

Change the value `collectionId` to the ID of the desired collection.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class DescribeCollection
{
    public static void Example()
    {
        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        String collectionId = "CollectionID";
        Console.WriteLine("Describing collection: " + collectionId);

        DescribeCollectionRequest describeCollectionRequest = new
 DescribeCollectionRequest()
        {
            CollectionId = collectionId
        };

        DescribeCollectionResponse describeCollectionResponse =
 rekognitionClient.DescribeCollection(describeCollectionRequest);
```

```
        Console.WriteLine("Collection ARN: " +
 describeCollectionResponse.CollectionARN);
        Console.WriteLine("Face count: " +
 describeCollectionResponse.FaceCount);
        Console.WriteLine("Face model version: " +
 describeCollectionResponse.FaceModelVersion);
        Console.WriteLine("Created: " +
 describeCollectionResponse.CreationTimestamp);
    }
}
```

Node.js

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import { DescribeCollectionCommand } from  "@aws-sdk/client-rekognition";
import  { RekognitionClient } from "@aws-sdk/client-rekognition";
import {fromIni} from '@aws-sdk/credential-providers';

// Set the AWS Region.
const REGION = "region-name"; //e.g. "us-east-1"
// Set the profile name
const profileName = "profile-name"
// Name the collection
const rekogClient = new RekognitionClient({region: REGION,
  credentials: fromIni({profile: profileName,}),
});

// Name the collection
const collection_name = "collection-name"

const describeCollection = async (collectionName) => {
  try {
     console.log(`Attempting to describe collection named - ${collectionName}`)
     var response = await rekogClient.send(new
 DescribeCollectionCommand({CollectionId: collectionName}))
     console.log('Collection Arn:')
     console.log(response.CollectionARN)
     console.log('Face Count:')
     console.log(response.FaceCount)
     console.log('Face Model Version:')
```

```
      console.log(response.FaceModelVersion)
      console.log('Timestamp:')
      console.log(response.CreationTimestamp)
      return response; // For unit tests.
    } catch (err) {
      console.log("Error", err.stack);
    }
};

describeCollection(collection_name)
```

DescribeCollection operation request

The input to `DescribeCollection` is the ID of the desired collection, as shown in the following JSON example.

```
{
    "CollectionId": "MyCollection"
}
```

DescribeCollection operation response

The response includes:

- The number of faces that are indexed into the collection, `FaceCount`.
- The version of the face model being used with the collection, `FaceModelVersion`. For more information, see the section called “Understanding model versioning”.
- The collection Amazon Resource Name, `CollectionARN`.
- The creation time and date of the collection, `CreationTimestamp`. The value of `CreationTimestamp` is the number of milliseconds since the Unix epoch time until the creation of the collection. The Unix epoch time is 00:00:00 Coordinated Universal Time (UTC), Thursday, 1 January 1970. For more information, see Unix Time.

```
{
    "CollectionARN": "arn:aws:rekognition:us-east-1:nnnnnnnnnnn:collection/
MyCollection",
    "CreationTimestamp": 1.533422155042E9,
    "FaceCount": 200,
```

```
    "UserCount" : 20,
    "FaceModelVersion": "1.0"
}
```

Deleting a collection

You can use the DeleteCollection operation to delete a collection.

For more information, see Managing a collection.

To delete a collection (SDK)

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `DeleteCollection` operation.

   Java

   This example deletes a collection.

   Change the value `collectionId` to the collection that you want to delete.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.DeleteCollectionRequest;
import com.amazonaws.services.rekognition.model.DeleteCollectionResult;


public class DeleteCollection {

   public static void main(String[] args) throws Exception {
```

```
      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

      String collectionId = "MyCollection";

      System.out.println("Deleting collections");

      DeleteCollectionRequest request = new DeleteCollectionRequest()
         .withCollectionId(collectionId);
      DeleteCollectionResult deleteCollectionResult =
 rekognitionClient.deleteCollection(request);

      System.out.println(collectionId + ": " +
 deleteCollectionResult.getStatusCode()
         .toString());

   }

}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
// snippet-start:[rekognition.java2.delete_collection.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.DeleteCollectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.DeleteCollectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
// snippet-end:[rekognition.java2.delete_collection.import]

/**
 * Before running this Java V2 code example, set up your development
 environment, including your credentials.
```

```
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DeleteCollection {

    public static void main(String[] args) {

        final String usage = "\n" +
            "Usage: " +
            "   <collectionId> \n\n" +
            "Where:\n" +
            "   collectionId - The id of the collection to delete. \n\n";

        if (args.length != 1) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        System.out.println("Deleting collection: " + collectionId);
        deleteMyCollection(rekClient, collectionId);
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.delete_collection.main]
    public static void deleteMyCollection(RekognitionClient rekClient,String
 collectionId ) {

        try {
            DeleteCollectionRequest deleteCollectionRequest =
 DeleteCollectionRequest.builder()
                .collectionId(collectionId)
                .build();
```

```
            DeleteCollectionResponse deleteCollectionResponse =
 rekClient.deleteCollection(deleteCollectionRequest);
            System.out.println(collectionId + ": " +
 deleteCollectionResponse.statusCode().toString());

        } catch(RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
    // snippet-end:[rekognition.java2.delete_collection.main]
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `delete-collection` CLI operation. Replace the value of `collection-id` with the name of the collection that you want to delete. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
aws rekognition delete-collection --collection-id collection-name --profile
 profile-name
```

Python

This example deletes a collection.

Change the value `collection_id` to the collection that you want to delete. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
from botocore.exceptions import ClientError

def delete_collection(collection_id):

    print('Attempting to delete collection ' + collection_id)
    session = boto3.Session(profile_name='default')
```

```
    client = session.client('rekognition')

    status_code = 0

    try:
        response = client.delete_collection(CollectionId=collection_id)
        status_code = response['StatusCode']

    except ClientError as e:
        if e.response['Error']['Code'] == 'ResourceNotFoundException':
            print('The collection ' + collection_id + ' was not found ')
        else:
            print('Error other than Not Found occurred: ' + e.response['Error']
['Message'])
        status_code = e.response['ResponseMetadata']['HTTPStatusCode']
    return (status_code)

def main():

    collection_id = 'collection-name'
    status_code = delete_collection(collection_id)
    print('Status code: ' + str(status_code))

if __name__ == "__main__":
    main()
```

.NET

This example deletes a collection.

Change the value `collectionId` to the collection that you want to delete.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class DeleteCollection
{
```

```
    public static void Example()
    {
        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        String collectionId = "MyCollection";
        Console.WriteLine("Deleting collection: " + collectionId);

        DeleteCollectionRequest deleteCollectionRequest = new
 DeleteCollectionRequest()
        {
            CollectionId = collectionId
        };

        DeleteCollectionResponse deleteCollectionResponse =
 rekognitionClient.DeleteCollection(deleteCollectionRequest);
        Console.WriteLine(collectionId + ": " +
 deleteCollectionResponse.StatusCode);
    }
}
```

Node.js

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import { DeleteCollectionCommand } from  "@aws-sdk/client-rekognition";
import  { RekognitionClient } from "@aws-sdk/client-rekognition";
import {fromIni} from '@aws-sdk/credential-providers';

// Set the AWS Region.
const REGION = "region-name"; //e.g. "us-east-1"
// Set the profile name
const profileName = "profile-name"
// Name the collection
const rekogClient = new RekognitionClient({region: REGION,
  credentials: fromIni({profile: profileName,}),
});
```

```
// Name the collection
const collection_name = "collection-name"

const deleteCollection = async (collectionName) => {
    try {
       console.log(`Attempting to delete collection named - ${collectionName}`)
       var response = await rekogClient.send(new
 DeleteCollectionCommand({CollectionId: collectionName}))
       var status_code = response.StatusCode
       if (status_code = 200){
           console.log("Collection successfully deleted.")
       }
       return response; // For unit tests.
    } catch (err) {
      console.log("Error", err.stack);
    }
  };

deleteCollection(collection_name)
```

DeleteCollection operation request

The input to `DeleteCollection` is the ID of the collection to be deleted, as shown in the following JSON example.

```
{
    "CollectionId": "MyCollection"
}
```

DeleteCollection operation response

The `DeleteCollection` response contains an HTTP status code that indicates the success or failure of the operation. `200` is returned if the collection is successfully deleted.

```
{"StatusCode":200}
```

Adding faces to a collection

You can use the IndexFaces operation to detect faces in an image and add them to a collection. For each face detected, Amazon Rekognition extracts facial features and stores the feature information

in a database. In addition, the command stores metadata for each face that's detected in the specified face collection. Amazon Rekognition doesn't store the actual image bytes.

For information about providing suitable faces for indexing, see Recommendations for facial comparison input images.

For each face, the `IndexFaces` operation persists the following information:

- **Multidimensional facial features** – `IndexFaces` uses facial analysis to extract multidimensional information about the facial features and stores the information in the face collection. You can't access this information directly. However, Amazon Rekognition uses this information when it searches a face collection for face matches.

- **Metadata** – The metadata for each face includes a bounding box, confidence level (that the bounding box contains a face), IDs assigned by Amazon Rekognition (face ID and image ID), and an external image ID (if you provided it) in the request. This information is returned to you in response to the `IndexFaces` API call. For an example, see the `face` element in the following example response.

  The service returns this metadata in response to the following API calls:

  - `ListFaces`
  - Search faces operations – The responses for SearchFaces and SearchFacesByImage return the confidence in the match for each matching face, along with this metadata of the matched face.

The number of faces indexed by `IndexFaces` depends on the version of the face detection model that's associated with the input collection. For more information, see Understanding model versioning.

Information about indexed faces is returned in an array of FaceRecord objects.

You might want to associate indexed faces with the image they were detected in. For example, you might want to maintain a client-side index of images and faces in the images. To associate faces with an image, specify an image ID in the `ExternalImageId` request parameter. The image ID can be the file name or another ID that you create.

In addition to the preceding information that the API persists in the face collection, the API also returns face details that aren't persisted in the collection. (See the `faceDetail` element in the following example response).

> **Note**
>
> `DetectFaces` returns the same information, so you don't need to call both `DetectFaces` and `IndexFaces` for the same image.

Filtering faces

The IndexFaces operation enables you to filter the faces that are indexed from an image. With `IndexFaces` you can specify a maximum number of faces to index, or you can choose to only index faces detected with a high quality.

You can specify the maximum number of faces that are indexed by `IndexFaces` by using the `MaxFaces` input parameter. This is useful when you want to index the largest faces in an image and don't want to index smaller faces, such as faces of people standing in the background.

By default, `IndexFaces` chooses a quality bar that's used to filter out faces. You can use the `QualityFilter` input parameter to explicitly set the quality bar. The values are:

- `AUTO` — Amazon Rekognition chooses the quality bar that's used to filter out faces (default value).
- `LOW` — All except the lowest quality faces are indexed.
- `MEDIUM`
- `HIGH` — Only the highest quality faces are indexed.
- `NONE` - No faces are filtered out based on quality.

`IndexFaces` filters faces for the following reasons:

- The face is too small compared to the image dimensions.
- The face is too blurry.
- The image is too dark.
- The face has an extreme pose.

- The face doesn't have enough detail to be suitable for face search.

> **Note**
>
> To use quality filtering, you need a collection that's associated with version 3, or higher, of the face model. To get the version of the face model associated with a collection, call DescribeCollection.

Information about faces that aren't indexed by `IndexFaces` is returned in an array of UnindexedFace objects. The `Reasons` array contains a list of reasons why a face isn't indexed. For example, a value of `EXCEEDS_MAX_FACES` is a face that's not indexed because the number of faces specified by `MaxFaces` has already been detected.

For more information, see Managing faces in a collection.

To add faces to a collection (SDK)

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Upload an image (containing one or more faces) to your Amazon S3 bucket.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following examples to call the `IndexFaces` operation.

   Java

   This example displays the face identifiers for faces added to the collection.

   Change the value of `collectionId` to the name of the collection that you want to add a face to. Replace the values of `bucket` and `photo` with the names of the Amazon S3

bucket and image that you used in step 2. The `.withMaxFaces(1)` parameter restricts the number of indexed faces to 1. Remove or change its value to suit your needs.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.FaceRecord;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.IndexFacesRequest;
import com.amazonaws.services.rekognition.model.IndexFacesResult;
import com.amazonaws.services.rekognition.model.QualityFilter;
import com.amazonaws.services.rekognition.model.S3Object;
import com.amazonaws.services.rekognition.model.UnindexedFace;
import java.util.List;

public class AddFacesToCollection {
    public static final String collectionId = "MyCollection";
    public static final String bucket = "bucket";
    public static final String photo = "input.jpg";

    public static void main(String[] args) throws Exception {

        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

        Image image = new Image()
                .withS3Object(new S3Object()
                .withBucket(bucket)
                .withName(photo));

        IndexFacesRequest indexFacesRequest = new IndexFacesRequest()
                .withImage(image)
                .withQualityFilter(QualityFilter.AUTO)
                .withMaxFaces(1)
                .withCollectionId(collectionId)
                .withExternalImageId(photo)
                .withDetectionAttributes("DEFAULT");
```

```
        IndexFacesResult indexFacesResult =
 rekognitionClient.indexFaces(indexFacesRequest);

        System.out.println("Results for " + photo);
        System.out.println("Faces indexed:");
        List<FaceRecord> faceRecords = indexFacesResult.getFaceRecords();
        for (FaceRecord faceRecord : faceRecords) {
            System.out.println("  Face ID: " +
 faceRecord.getFace().getFaceId());
            System.out.println("  Location:" +
 faceRecord.getFaceDetail().getBoundingBox().toString());
        }

        List<UnindexedFace> unindexedFaces =
 indexFacesResult.getUnindexedFaces();
        System.out.println("Faces not indexed:");
        for (UnindexedFace unindexedFace : unindexedFaces) {
            System.out.println("  Location:" +
 unindexedFace.getFaceDetail().getBoundingBox().toString());
            System.out.println("  Reasons:");
            for (String reason : unindexedFace.getReasons()) {
                System.out.println("   " + reason);
            }
        }
    }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.add_faces_collection.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.IndexFacesResponse;
import software.amazon.awssdk.services.rekognition.model.IndexFacesRequest;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.QualityFilter;
import software.amazon.awssdk.services.rekognition.model.Attribute;
import software.amazon.awssdk.services.rekognition.model.FaceRecord;
```

```
import software.amazon.awssdk.services.rekognition.model.UnindexedFace;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.Reason;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;
//snippet-end:[rekognition.java2.add_faces_collection.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class AddFacesToCollection {

 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "    <collectionId> <sourceImage>\n\n" +
         "Where:\n" +
         "    collectionName - The name of the collection.\n" +
         "    sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png). \n\n";

     if (args.length != 2) {
         System.out.println(usage);
         System.exit(1);
     }

     String collectionId = args[0];
     String sourceImage = args[1];
     Region region = Region.US_EAST_1;
     RekognitionClient rekClient = RekognitionClient.builder()
         .region(region)
         .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
         .build();

     addToCollection(rekClient, collectionId, sourceImage);
```

```
    rekClient.close();
}

// snippet-start:[rekognition.java2.add_faces_collection.main]
public static void addToCollection(RekognitionClient rekClient, String
collectionId, String sourceImage) {

    try {
        InputStream sourceStream = new FileInputStream(sourceImage);
        SdkBytes sourceBytes = SdkBytes.fromInputStream(sourceStream);
        Image souImage = Image.builder()
            .bytes(sourceBytes)
            .build();

        IndexFacesRequest facesRequest = IndexFacesRequest.builder()
            .collectionId(collectionId)
            .image(souImage)
            .maxFaces(1)
            .qualityFilter(QualityFilter.AUTO)
            .detectionAttributes(Attribute.DEFAULT)
            .build();

        IndexFacesResponse facesResponse = rekClient.indexFaces(facesRequest);
        System.out.println("Results for the image");
        System.out.println("\n Faces indexed:");
        List<FaceRecord> faceRecords = facesResponse.faceRecords();
        for (FaceRecord faceRecord : faceRecords) {
            System.out.println("  Face ID: " + faceRecord.face().faceId());
            System.out.println("  Location:" +
faceRecord.faceDetail().boundingBox().toString());
        }

        List<UnindexedFace> unindexedFaces = facesResponse.unindexedFaces();
        System.out.println("Faces not indexed:");
        for (UnindexedFace unindexedFace : unindexedFaces) {
            System.out.println("  Location:" +
unindexedFace.faceDetail().boundingBox().toString());
            System.out.println("  Reasons:");
            for (Reason reason : unindexedFace.reasons()) {
                System.out.println("Reason:  " + reason);
            }
        }

    } catch (RekognitionException | FileNotFoundException e) {
```

```
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
    // snippet-end:[rekognition.java2.add_faces_collection.main]
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `index-faces` CLI operation.

Replace the value of `collection-id` with the name of the collection you want the face to be stored in. Replace the values of `Bucket` and `Name` with the Amazon S3 bucket and image file that you used in step 2. The `max-faces` parameter restricts the number of indexed faces to 1. Remove or change its value to suit your needs. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
aws rekognition index-faces --image '{"S3Object":{"Bucket":"bucket-
name","Name":"file-name"}}' --collection-id "collection-id" \
                                --max-faces 1 --quality-filter "AUTO" --
detection-attributes "ALL" \
                                --external-image-id "example-image.jpg" --
profile profile-name
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
aws rekognition index-faces --image "{\"S3Object\":{\"Bucket\":\"bucket-name\",
\"Name\":\"image-name\"}}" \
--collection-id "collection-id" --max-faces 1 --quality-filter "AUTO" --
detection-attributes "ALL" \
--external-image-id "example-image.jpg" --profile profile-name
```

Python

This example displays the face identifiers for faces added to the collection.

Change the value of `collectionId` to the name of the collection that you want to add a face to. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in step 2. The `MaxFaces` input parameter restricts the number of indexed faces to 1. Remove or change its value to suit your needs. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def add_faces_to_collection(bucket, photo, collection_id):

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')

    response = client.index_faces(CollectionId=collection_id,
                                  Image={'S3Object': {'Bucket': bucket, 'Name':
 photo}},
                                  ExternalImageId=photo,
                                  MaxFaces=1,
                                  QualityFilter="AUTO",
                                  DetectionAttributes=['ALL'])

    print('Results for ' + photo)
    print('Faces indexed:')
    for faceRecord in response['FaceRecords']:
        print('  Face ID: ' + faceRecord['Face']['FaceId'])
        print('  Location: {}'.format(faceRecord['Face']['BoundingBox']))

    print('Faces not indexed:')
    for unindexedFace in response['UnindexedFaces']:
        print(' Location: {}'.format(unindexedFace['FaceDetail']
['BoundingBox']))
        print(' Reasons:')
        for reason in unindexedFace['Reasons']:
            print('   ' + reason)
    return len(response['FaceRecords'])

def main():
```

```
    bucket = 'amzn-s3-demo-bucket'
    collection_id = 'collection-id'
    photo = 'photo-name'

    indexed_faces_count = add_faces_to_collection(bucket, photo, collection_id)
    print("Faces indexed count: " + str(indexed_faces_count))

if __name__ == "__main__":
    main()
```

.NET

This example displays the face identifiers for faces added to the collection.

Change the value of `collectionId` to the name of the collection that you want to add a face to. Replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using System.Collections.Generic;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class AddFaces
{
    public static void Example()
    {
        String collectionId = "MyCollection";
        String bucket = "amzn-s3-demo-bucket";
        String photo = "input.jpg";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        Image image = new Image()
        {
            S3Object = new S3Object()
            {
                Bucket = bucket,
```

```
                Name = photo
            }
        };

        IndexFacesRequest indexFacesRequest = new IndexFacesRequest()
        {
            Image = image,
            CollectionId = collectionId,
            ExternalImageId = photo,
            DetectionAttributes = new List<String>(){ "ALL" }
        };

        IndexFacesResponse indexFacesResponse =
 rekognitionClient.IndexFaces(indexFacesRequest);

        Console.WriteLine(photo + " added");
        foreach (FaceRecord faceRecord in indexFacesResponse.FaceRecords)
            Console.WriteLine("Face detected: Faceid is " +
               faceRecord.Face.FaceId);
    }
}
```

IndexFaces operation request

The input to `IndexFaces` is the image to be indexed and the collection to add the face or faces to.

```
{
    "CollectionId": "MyCollection",
    "Image": {
        "S3Object": {
            "Bucket": "bucket",
            "Name": "input.jpg"
        }
    },
    "ExternalImageId": "input.jpg",
    "DetectionAttributes": [
        "DEFAULT"
    ],
    "MaxFaces": 1,
    "QualityFilter": "AUTO"
}
```

IndexFaces operation response

`IndexFaces` returns information about the faces that were detected in the image. For example, the following JSON response includes the default detection attributes for faces detected in the input image. The example also shows faces not indexed because the value of the `MaxFaces` input parameter has been exceeded — the `Reasons` array contains *EXCEEDS_MAX_FACES*. If a face is not indexed for quality reasons, `Reasons` contains values such as *LOW_SHARPNESS* or *LOW_BRIGHTNESS*. For more information, see UnindexedFace.


```
{
    "FaceModelVersion": "3.0",
    "FaceRecords": [
        {
            "Face": {
                "BoundingBox": {
                    "Height": 0.3247932195663452,
                    "Left": 0.5055555701255798,
                    "Top": 0.2743072211742401,
                    "Width": 0.21444444358348846
                },
                "Confidence": 99.99998474121094,
                "ExternalImageId": "input.jpg",
                "FaceId": "b86e2392-9da1-459b-af68-49118dc16f87",
                "ImageId": "09f43d92-02b6-5cea-8fbd-9f187db2050d"
            },
            "FaceDetail": {
                "BoundingBox": {
                    "Height": 0.3247932195663452,
                    "Left": 0.5055555701255798,
                    "Top": 0.2743072211742401,
                    "Width": 0.21444444358348846
                },
                "Confidence": 99.99998474121094,
                "Landmarks": [
                    {
                        "Type": "eyeLeft",
                        "X": 0.5751981735229492,
                        "Y": 0.4010535478591919
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.6511467099189758,
```

```
                        "Y": 0.4017036259174347
                    },
                    {
                        "Type": "nose",
                        "X": 0.6314528584480286,
                        "Y": 0.4710812568664551
                    },
                    {
                        "Type": "mouthLeft",
                        "X": 0.5879443287849426,
                        "Y": 0.5171778798103333
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.6444502472877502,
                        "Y": 0.5164633989334106
                    }
                ],
                "Pose": {
                    "Pitch": -10.313642501831055,
                    "Roll": -1.0316886901855469,
                    "Yaw": 18.079818725585938
                },
                "Quality": {
                    "Brightness": 71.2919921875,
                    "Sharpness": 78.74752044677734
                }
            }
        }
    ],
    "OrientationCorrection": "",
    "UnindexedFaces": [
        {
            "FaceDetail": {
                "BoundingBox": {
                    "Height": 0.1329464465379715,
                    "Left": 0.5611110925674438,
                    "Top": 0.6832437515258789,
                    "Width": 0.08777777850627899
                },
                "Confidence": 92.37225341796875,
                "Landmarks": [
                    {
                        "Type": "eyeLeft",
```

```
                        "X": 0.5796897411346436,
                        "Y": 0.7452847957611084
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.6078574657440186,
                        "Y": 0.742687463760376
                    },
                    {
                        "Type": "nose",
                        "X": 0.597953200340271,
                        "Y": 0.7620673179626465
                    },
                    {
                        "Type": "mouthLeft",
                        "X": 0.5884202122688293,
                        "Y": 0.7920381426811218
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.60627681016922,
                        "Y": 0.7919750809669495
                    }
                ],
                "Pose": {
                    "Pitch": 15.658954620361328,
                    "Roll": -4.583454608917236,
                    "Yaw": 10.558992385864258
                },
                "Quality": {
                    "Brightness": 42.54612350463867,
                    "Sharpness": 86.93206024169922
                }
            },
            "Reasons": [
                "EXCEEDS_MAX_FACES"
            ]
        }
    ]
}
```

To get all facial information, specify 'ALL' for the `DetectionAttributes` request parameter. For example, in the following example response, note the additional information in the `faceDetail` element, which isn't persisted on the server:

- 25 facial landmarks (compared to only five in the preceding example)
- Ten facial attributes (eyeglasses, beard, occlusion, eye gaze direction, and so on)
- Emotions (see the `emotion` element)

The `face` element provides metadata that's persisted on the server.

`FaceModelVersion` is the version of the face model that's associated with the collection. For more information, see Understanding model versioning.

`OrientationCorrection` is the estimated orientation of the image. Orientation correction information is not returned if you are using a version of the face detection model that is greater than version 3. For more information, see Getting image orientation and bounding box coordinates.

The following sample response shows the returned JSON when specifying ["ALL"]:


```
{
    "FaceModelVersion": "3.0",
    "FaceRecords": [
        {
            "Face": {
                "BoundingBox": {
                    "Height": 0.06333333253860474,
                    "Left": 0.17185185849666595,
                    "Top": 0.7366666793823242,
                    "Width": 0.11061728745698929
                },
                "Confidence": 99.99999237060547,
                "ExternalImageId": "input.jpg",
                "FaceId": "578e2e1b-d0b0-493c-aa39-ba476a421a34",
                "ImageId": "9ba38e68-35b6-5509-9d2e-fcffa75d1653"
            },
            "FaceDetail": {
                "AgeRange": {
                    "High": 25,
                    "Low": 15
                },
```

```
                "Beard": {
                    "Confidence": 99.98077392578125,
                    "Value": false
                },
                "BoundingBox": {
                    "Height": 0.06333333253860474,
                    "Left": 0.17185185849666595,
                    "Top": 0.7366666793823242,
                    "Width": 0.11061728745698929
                },
                "Confidence": 99.99999237060547,
                "Emotions": [
                    {
                        "Confidence": 95.40877532958984,
                        "Type": "HAPPY"
                    },
                    {
                        "Confidence": 6.6088080406188965,
                        "Type": "CALM"
                    },
                    {
                        "Confidence": 0.7385611534118652,
                        "Type": "SAD"
                    }
                ],
                 "EyeDirection": {
                    "yaw": 16.299732,
                    "pitch": -6.407457,
                    "confidence": 99.968704
                              }
                "Eyeglasses": {
                    "Confidence": 99.96795654296875,
                    "Value": false
                },
                "EyesOpen": {
                    "Confidence": 64.0671157836914,
                    "Value": true
                },
                "Gender": {
                    "Confidence": 100,
                    "Value": "Female"
                },
                "Landmarks": [
                    {
```

```
                        "Type": "eyeLeft",
                        "X": 0.21361233294010162,
                        "Y": 0.757106363773346
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.2518567442893982,
                        "Y": 0.7599404454231262
                    },
                    {
                        "Type": "nose",
                        "X": 0.2262365221977234,
                        "Y": 0.7711842060089111
                    },
                    {
                        "Type": "mouthLeft",
                        "X": 0.2050037682056427,
                        "Y": 0.7801263332366943
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.2430567592382431,
                        "Y": 0.7836716771125793
                    },
                    {
                        "Type": "leftPupil",
                        "X": 0.2161938101053238,
                        "Y": 0.756662905216217
                    },
                    {
                        "Type": "rightPupil",
                        "X": 0.2523181438446045,
                        "Y": 0.7603650689125061
                    },
                    {
                        "Type": "leftEyeBrowLeft",
                        "X": 0.20066319406032562,
                        "Y": 0.7501518130302429
                    },
                    {
                        "Type": "leftEyeBrowUp",
                        "X": 0.2130996286869049,
                        "Y": 0.7480520606040955
                    },
```

```
                    {
                        "Type": "leftEyeBrowRight",
                        "X": 0.22584207355976105,
                        "Y": 0.7504606246948242
                    },
                    {
                        "Type": "rightEyeBrowLeft",
                        "X": 0.24509544670581818,
                        "Y": 0.7526801824569702
                    },
                    {
                        "Type": "rightEyeBrowUp",
                        "X": 0.2582615911960602,
                        "Y": 0.7516844868659973
                    },
                    {
                        "Type": "rightEyeBrowRight",
                        "X": 0.26881539821624756,
                        "Y": 0.7554477453231812
                    },
                    {
                        "Type": "leftEyeLeft",
                        "X": 0.20624476671218872,
                        "Y": 0.7568746209144592
                    },
                    {
                        "Type": "leftEyeRight",
                        "X": 0.22105035185813904,
                        "Y": 0.7582521438598633
                    },
                    {
                        "Type": "leftEyeUp",
                        "X": 0.21401576697826385,
                        "Y": 0.7553104162216187
                    },
                    {
                        "Type": "leftEyeDown",
                        "X": 0.21317370235919952,
                        "Y": 0.7584449648857117
                    },
                    {
                        "Type": "rightEyeLeft",
                        "X": 0.24393919110298157,
                        "Y": 0.7600628137588501
```

```
                    },
                    {
                        "Type": "rightEyeRight",
                        "X": 0.2598416209220886,
                        "Y": 0.7605880498886108
                    },
                    {
                        "Type": "rightEyeUp",
                        "X": 0.2519053518772125,
                        "Y": 0.7582084536552429
                    },
                    {
                        "Type": "rightEyeDown",
                        "X": 0.25177454948425293,
                        "Y": 0.7612871527671814
                    },
                    {
                        "Type": "noseLeft",
                        "X": 0.2185886949300766,
                        "Y": 0.774715781211853
                    },
                    {
                        "Type": "noseRight",
                        "X": 0.23328955471515656,
                        "Y": 0.7759330868721008
                    },
                    {
                        "Type": "mouthUp",
                        "X": 0.22446128726005554,
                        "Y": 0.7805567383766174
                    },
                    {
                        "Type": "mouthDown",
                        "X": 0.22087252140045166,
                        "Y": 0.7891407608985901
                    }
                ],
                "MouthOpen": {
                    "Confidence": 95.87068939208984,
                    "Value": false
                },
                "Mustache": {
                    "Confidence": 99.9828109741211,
                    "Value": false
```

```
                },
                "Pose": {
                    "Pitch": -0.9409101605415344,
                    "Roll": 7.233824253082275,
                    "Yaw": -2.3602254390716553
                },
                "Quality": {
                    "Brightness": 32.01998519897461,
                    "Sharpness": 93.67259216308594
                },
                "Smile": {
                    "Confidence": 86.7142105102539,
                    "Value": true
                },
                "Sunglasses": {
                    "Confidence": 97.38925170898438,
                    "Value": false
                }
            }
        }
    ],
    "OrientationCorrection": "ROTATE_0"
    "UnindexedFaces": []
}
```

Listing faces and associated users in a collection

You can use the ListFaces operation to list faces and their associated users in a collection.

For more information, see Managing faces in a collection.

To list faces in a collection (SDK)

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `ListFaces` operation.

Java

This example displays a list of faces in a collection.

Change the value of `collectionId` to the desired collection.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.Face;
import com.amazonaws.services.rekognition.model.ListFacesRequest;
import com.amazonaws.services.rekognition.model.ListFacesResult;
import java.util.List;
import com.fasterxml.jackson.databind.ObjectMapper;



public class ListFacesInCollection {
    public static final String collectionId = "MyCollection";

   public static void main(String[] args) throws Exception {

      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

      ObjectMapper objectMapper = new ObjectMapper();

      ListFacesResult listFacesResult = null;
      System.out.println("Faces in collection " + collectionId);

      String paginationToken = null;
      do {
         if (listFacesResult != null) {
            paginationToken = listFacesResult.getNextToken();
         }

         ListFacesRequest listFacesRequest = new ListFacesRequest()
                 .withCollectionId(collectionId)
                 .withMaxResults(1)
```

```
                .withNextToken(paginationToken);

        listFacesResult =  rekognitionClient.listFaces(listFacesRequest);
        List < Face > faces = listFacesResult.getFaces();
        for (Face face: faces) {
           System.out.println(objectMapper.writerWithDefaultPrettyPrinter()
              .writeValueAsString(face));
        }
     } while (listFacesResult != null && listFacesResult.getNextToken() !=
        null);
   }

}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
// snippet-start:[rekognition.java2.list_faces_collection.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.Face;
import software.amazon.awssdk.services.rekognition.model.ListFacesRequest;
import software.amazon.awssdk.services.rekognition.model.ListFacesResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import java.util.List;
// snippet-end:[rekognition.java2.list_faces_collection.import]

/**
 * Before running this Java V2 code example, set up your development
 environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class ListFacesInCollection {

    public static void main(String[] args) {
```

```
        final String usage = "\n" +
            "Usage: " +
            "   <collectionId>\n\n" +
            "Where:\n" +
            "   collectionId - The name of the collection. \n\n";

        if (args.length < 1) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        System.out.println("Faces in collection " + collectionId);
        listFacesCollection(rekClient, collectionId) ;
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.list_faces_collection.main]
    public static void listFacesCollection(RekognitionClient rekClient, String
 collectionId ) {
        try {
            ListFacesRequest facesRequest = ListFacesRequest.builder()
                .collectionId(collectionId)
                .maxResults(10)
                .build();

            ListFacesResponse facesResponse = rekClient.listFaces(facesRequest);
            List<Face> faces = facesResponse.faces();
            for (Face face: faces) {
                System.out.println("Confidence level there is a face:
 "+face.confidence());
                System.out.println("The face Id value is "+face.faceId());
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
```

```
            System.exit(1);
        }
      }
    // snippet-end:[rekognition.java2.list_faces_collection.main]
  }
```

AWS CLI

This AWS CLI command displays the JSON output for the `list-faces` CLI operation. Replace the value of `collection-id` with the name of the collection you want to list. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
aws rekognition list-faces --collection-id "collection-id"  --profile profile-
name
```

Python

This example displays a list of faces in a collection.

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def list_faces_in_collection(collection_id):
    maxResults = 2
    faces_count = 0
    tokens = True

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')
    response = client.list_faces(CollectionId=collection_id,
                                 MaxResults=maxResults)

    print('Faces in collection ' + collection_id)

    while tokens:
```

```
        faces = response['Faces']

        for face in faces:
            print(face)
            faces_count += 1
        if 'NextToken' in response:
            nextToken = response['NextToken']
            response = client.list_faces(CollectionId=collection_id,
                                         NextToken=nextToken,
 MaxResults=maxResults)
        else:
            tokens = False
    return faces_count

def main():
    collection_id = 'collection-id'
    faces_count = list_faces_in_collection(collection_id)
    print("faces count: " + str(faces_count))

if __name__ == "__main__":
    main()
```

.NET

This example displays a list of faces in a collection.

Change the value of `collectionId` to the desired collection.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class ListFaces
{
    public static void Example()
    {
        String collectionId = "MyCollection";
```

```
        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        ListFacesResponse listFacesResponse = null;
        Console.WriteLine("Faces in collection " + collectionId);

        String paginationToken = null;
        do
        {
            if (listFacesResponse != null)
                paginationToken = listFacesResponse.NextToken;

            ListFacesRequest listFacesRequest = new ListFacesRequest()
            {
                CollectionId = collectionId,
                MaxResults = 1,
                NextToken = paginationToken
            };

            listFacesResponse = rekognitionClient.ListFaces(listFacesRequest);
            foreach(Face face in listFacesResponse.Faces)
                Console.WriteLine(face.FaceId);
        } while (listFacesResponse != null && !
String.IsNullOrEmpty(listFacesResponse.NextToken));
    }
}
```

ListFaces operation request

The input to `ListFaces` is the ID of the collection that you want to list faces for. `MaxResults` is the maximum number of faces to return. ListFaces also takes in a list of face IDs to filter the results with, and a user ID provided to list only faces associated with the given user.

```
{
    "CollectionId": "MyCollection",
    "MaxResults": 1
}
```

If the response has more faces than are requested by `MaxResults`, a token is returned that you can use to get the next set of results, in a subsequent call to `ListFaces`. For example:

```
{
    "CollectionId": "MyCollection",
    "NextToken": "sm+5ythT3aeEVIR4WA....",
    "MaxResults": 1
}
```

ListFaces operation response

The response from `ListFaces` is information about the face metadata that's stored in the specified collection.

- **FaceModelVersion** – The version of the face model that's associated with the collection. For more information, see Understanding model versioning.
- **Faces** – Information about the faces in the collection. This includes information about BoundingBox, confidence, image identifiers, and the face ID. For more information, see Face.
- **NextToken** – The token that's used to get the next set of results.

```
{
    "FaceModelVersion": "6.0",
    "Faces": [
        {
            "Confidence": 99.76940155029297,
            "IndexFacesModelVersion": "6.0",
            "UserId": "demoUser2",
            "ImageId": "56a0ca74-1c83-39dd-b363-051a64168a65",
            "BoundingBox": {
                "Width": 0.03177810087800026,
                "Top": 0.36568498611450195,
                "Left": 0.3453829884529114,
                "Height": 0.056759100407361984
            },
            "FaceId": "c92265d4-5f9c-43af-a58e-12be0ce02bc3"
        },
        {
            "BoundingBox": {
                "Width": 0.03254450112581253,
                "Top": 0.6080359816551208,
                "Left": 0.5160620212554932,
                "Height": 0.06347999721765518
            },
```

```
            "IndexFacesModelVersion": "6.0",
            "FaceId": "851cb847-dccc-4fea-9309-9f4805967855",
            "Confidence": 99.94369506835938,
            "ImageId": "a8aed589-ceec-35f7-9c04-82e0b546b024"
        },
        {
            "BoundingBox": {
                "Width": 0.03094629943370819,
                "Top": 0.4218429923057556,
                "Left": 0.6513839960098267,
                "Height": 0.05266290158033371
            },
            "IndexFacesModelVersion": "6.0",
            "FaceId": "c0eb3b65-24a0-41e1-b23a-1908b1aaeac1",
            "Confidence": 99.82969665527344,
            "ImageId": "56a0ca74-1c83-39dd-b363-051a64168a65"
        }
    ]
}
```

Deleting faces from a collection

You can use the DeleteFaces operation to delete faces from a collection. For more information, see Managing faces in a collection.

To delete faces from a collection

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following examples to call the `DeleteFaces` operation.

   Java

   This example deletes a single face from a collection.

Change the value of `collectionId` to the collection that contains the face that you want to delete. Change the value of `faces` to the ID of the face that you want to delete. To delete multiple faces, add the face IDs to the `faces` array.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.DeleteFacesRequest;
import com.amazonaws.services.rekognition.model.DeleteFacesResult;

import java.util.List;


public class DeleteFacesFromCollection {
   public static final String collectionId = "MyCollection";
   public static final String faces[] = {"xxxxxxxx-xxxx-xxxx-xxxx-
xxxxxxxxxxxx"};

   public static void main(String[] args) throws Exception {

      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();


      DeleteFacesRequest deleteFacesRequest = new DeleteFacesRequest()
              .withCollectionId(collectionId)
              .withFaceIds(faces);

      DeleteFacesResult
 deleteFacesResult=rekognitionClient.deleteFaces(deleteFacesRequest);


      List < String > faceRecords = deleteFacesResult.getDeletedFaces();
      System.out.println(Integer.toString(faceRecords.size()) + " face(s)
 deleted:");
      for (String face: faceRecords) {
         System.out.println("FaceID: " + face);
      }
```

```
    }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.DeleteFacesRequest;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
// snippet-end:[rekognition.java2.delete_faces_collection.import]

/**
 * Before running this Java V2 code example, set up your development
 environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DeleteFacesFromCollection {
    public static void main(String[] args) {

        final String usage = "\n" +
            "Usage: " +
            "   <collectionId> <faceId> \n\n" +
            "Where:\n" +
            "   collectionId - The id of the collection from which faces are
 deleted. \n\n" +
            "   faceId - The id of the face to delete. \n\n";

        if (args.length != 1) {
            System.out.println(usage);
```

```
            System.exit(1);
        }

        String collectionId = args[0];
        String faceId = args[1];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        System.out.println("Deleting collection: " + collectionId);
        deleteFacesCollection(rekClient, collectionId, faceId);
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.delete_faces_collection.main]
    public static void deleteFacesCollection(RekognitionClient rekClient,
                                             String collectionId,
                                             String faceId) {

        try {
            DeleteFacesRequest deleteFacesRequest = DeleteFacesRequest.builder()
                .collectionId(collectionId)
                .faceIds(faceId)
                .build();

            rekClient.deleteFaces(deleteFacesRequest);
            System.out.println("The face was deleted from the collection.");

        } catch(RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
    // snippet-end:[rekognition.java2.delete_faces_collection.main]
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `delete-faces` CLI operation. Replace the value of `collection-id` with the name of the collection that contains the

face you want to delete. Replace the value of `face-ids` with an array of face IDs that you want to delete. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
aws rekognition delete-faces --collection-id "collection-id" --face-ids "faceid"
 --profile profile-name
```

Python

This example deletes a single face from a collection.

Change the value of `collectionId` to the collection that contains the face that you want to delete. Change the value of `faces` to the ID of the face that you want to delete. To delete multiple faces, add the face IDs to the `faces` array. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def delete_faces_from_collection(collection_id, faces):

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')
    response = client.delete_faces(CollectionId=collection_id,
                                   FaceIds=faces)

    print(str(len(response['DeletedFaces'])) + ' faces deleted:')
    for faceId in response['DeletedFaces']:
        print(faceId)
    return len(response['DeletedFaces'])


def main():
    collection_id = 'collection-id'
    faces = []
    faces.append("xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx")

    faces_count = delete_faces_from_collection(collection_id, faces)
```

```
    print("deleted faces count: " + str(faces_count))

if __name__ == "__main__":
    main()
```

.NET

This example deletes a single face from a collection.

Change the value of `collectionId` to the collection that contains the face that you want to delete. Change the value of `faces` to the ID of the face that you want to delete. To delete multiple faces, add the face IDs to the `faces` list.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using System.Collections.Generic;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class DeleteFaces
{
    public static void Example()
    {
        String collectionId = "MyCollection";
        List<String> faces = new List<String>() { "xxxxxxxx-xxxx-xxxx-xxxx-
xxxxxxxxxxxx" };

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        DeleteFacesRequest deleteFacesRequest = new DeleteFacesRequest()
        {
            CollectionId = collectionId,
            FaceIds = faces
        };

        DeleteFacesResponse deleteFacesResponse =
 rekognitionClient.DeleteFaces(deleteFacesRequest);
        foreach (String face in deleteFacesResponse.DeletedFaces)
            Console.WriteLine("FaceID: " + face);
```

```
    }
}
```

DeleteFaces operation request

The input to `DeleteFaces` is the ID of the collection that contains the faces, and an array of face IDs for the faces to be deleted.

```
{
    "CollectionId": "MyCollection",
    "FaceIds": [
        "daf29cac-f910-41e9-851f-6eeb0e08f973"
    ]
}
```

DeleteFaces operation response

The `DeleteFaces` response contains an array of face IDs for the faces that were deleted.

```
{
    "DeletedFaces": [
        "daf29cac-f910-41e9-851f-6eeb0e08f973"
    ]
}
```

If the face IDs provided in the input are currently associated with an User, they will be returned as part of UnsuccessfulFaceDeletions with valid reasons.

```
{
   "DeletedFaces": [
        "daf29cac-f910-41e9-851f-6eeb0e08f973"
    ],
     "UnsuccessfulFaceDeletions" : [
        {
           "FaceId" : "0b683aed-a0f1-48b2-9b5e-139e9cc2a757",
           "UserId" : "demoUser1",
           "Reason" : ["ASSOCIATED_TO_AN_EXISTING_USER"]
        }
     ]
```

```
}
```

Creating a user

You can use the CreateUser operation to create a new user in a collection using a unique user ID you provide. You can then associate multiple faces with the newly created user.

To create a user (SDK)

1. If you haven't already:
   a. Create or update an IAM user account with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `CreateUser` operation.

   Java

   This Java code example creates a user.

```
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.CreateUserRequest;
import com.amazonaws.services.rekognition.model.CreateUserResult;


public class CreateUser {

    public static void main(String[] args) throws Exception {


        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

        //Replace collectionId and userId with the name of the user that you
 want to create in that target collection.

        String collectionId = "MyCollection";
        String userId = "demoUser";
        System.out.println("Creating new user: " +
```

```
                userId);

        CreateUserRequest request = new CreateUserRequest()
                .withCollectionId(collectionId)
                .withUserId(userId);

        rekognitionClient.createUser(request);
    }

}
```

AWS CLI

This AWS CLI command creates a user, using the `create-user` CLI operation.

```
aws rekognition create-user --user-id user-id --collection-id collection-name --
region region-name
--client-request-token request-token
```

Python

This Python code example creates a user.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
from botocore.exceptions import ClientError
import logging

logger = logging.getLogger(__name__)
session = boto3.Session(profile_name='profile-name')
client = session.client('rekognition')

def create_user(collection_id, user_id):
    """
    Creates a new User within a collection specified by CollectionId.
    Takes UserId as a parameter, which is a user provided ID which
    should be unique within the collection.

    :param collection_id: The ID of the collection where the indexed faces will
 be stored at.
```

```
    :param user_id: ID for the UserID to be created. This ID needs to be unique
 within the collection.

    :return: The indexFaces response
    """
    try:
        logger.info(f'Creating user: {collection_id}, {user_id}')
        client.create_user(
            CollectionId=collection_id,
            UserId=user_id
        )
    except ClientError:
        logger.exception(f'Failed to create user with given user id:
 {user_id}')
        raise

def main():
    collection_id = "collection-id"
    user_id = "user-id"
    create_user(collection_id, user_id)

if __name__ == "__main__":
    main()
```

Go

This Go code example uses the AWS Go SDK V2 and it creates a user.

```
package main

import (
 "context"
 "fmt"
 "log"

 "github.com/aws/aws-sdk-go-v2/aws"
 "github.com/aws/aws-sdk-go-v2/config"
 "github.com/aws/aws-sdk-go-v2/service/rekognition"
)

func main() {
 // Load the AWS SDK configuration
```

```
 cfg, err := config.LoadDefaultConfig(context.TODO(), config.WithRegion("us-
west-2"))
 if err != nil {
  log.Fatalf("Failed to load configuration: %v", err)
 }

 // Create a Rekognition client
 client := rekognition.NewFromConfig(cfg)

 // Set up the input parameters
 input := &rekognition.CreateUserInput{
  CollectionId: aws.String("my-new-collection"), // Replace with your collection
 ID
  UserId:       aws.String("user12345678910"),   // Replace with desired user ID
 }

 // Call the CreateUser operation
 result, err := client.CreateUser(context.TODO(), input)
 if err != nil {
  log.Fatalf("Failed to create user: %v", err)
 }

 // Print out the results
 fmt.Printf("User created successfully:\n")

}
```

Deleting a user

You can use the DeleteUser operation to delete a user from a collection, based on the provided UserID. Note that any faces that associated with the UserID are disassociated from the UserID before the specified UserID is deleted.

To delete a user (SDK)

1. If you haven't already:

   a. Create or update an IAM user account with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following examples to call the `DeleteUser` operation.

Java

This Java code example deletes a user.

```
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.DeleteUserRequest;
import com.amazonaws.services.rekognition.model.DeleteUserResult;


public class DeleteUser {

    public static void main(String[] args) throws Exception {


        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

        //Replace collectionId and userId with the name of the user that you
 want to delete from that target collection.

        String collectionId = "MyCollection";
        String userId = "demoUser";
        System.out.println("Deleting existing user: " +
                userId);

        DeleteUserRequest request = new DeleteUserRequest()
                .withCollectionId(collectionId)
                .withUserId(userId);

        rekognitionClient.deleteUser(request);
    }

}
```

AWS CLI

This AWS CLI command deletes a user, using the `create-user` CLI operation.

```
aws rekognition delete-user --collection-id MyCollection
--user-id user-id --collection-id collection-name --region region-name
```

Python

This Python code example deletes a user.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
from botocore.exceptions import ClientError
import logging

logger = logging.getLogger(__name__)
session = boto3.Session(profile_name='profile-name')
client = session.client('rekognition')

def delete_user(collection_id, user_id):
        """
        Delete the user from the given collection

        :param collection_id: The ID of the collection where user is stored.
        :param user_id: The ID of the user in the collection to delete.
        """
        logger.info(f'Deleting user: {collection_id}, {user_id}')
        try:
            client.delete_user(
                CollectionId=collection_id,
                UserId=user_id
            )
        except ClientError:
            logger.exception(f'Failed to delete user with given user id:
 {user_id}')
            raise

def main():
    collection_id = "collection-id"
    user_id = "user-id"
    delete_user(collection_id, user_id)
```

```
if __name__ == "__main__":
    main()
```

Associating faces to a user

You can use the AssociateFaces operation to associate multiple individual faces with a single user. In order to associate a face with a user, you must first create a collection and a user. Note that the face vectors must reside in the same collection where the user vector resides.

To associate faces (SDK)

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `AssociateFaces` operation.

   Java

   This Java code example associates a face with a user.

```
import java.util.Arrays;
import java.util.List;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.AssociateFacesRequest;
import com.amazonaws.services.rekognition.model.AssociateFacesResult;


public class AssociateFaces {

    public static void main(String[] args) throws Exception {


        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();
```

```
        /* Replace the below configurations to allow you successfully run the
 example

           @collectionId: The collection where user and faces are stored
           @userId: The user which faces will get associated to
           @faceIds: The list of face IDs that will get associated to the given
 user
           @userMatchThreshold: Minimum User match confidence required for the
 face to
                                be associated with a User that has at least one
 faceID already associated
         */

        String collectionId = "MyCollection";
        String userId = "demoUser";
        String faceId1 = "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx";
        String faceId2 = "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx";
        List<String> faceIds = Arrays.asList(faceid1,faceid2);

        float userMatchThreshold = 0f;
        System.out.println("Associating faces to the existing user: " +
                userId);

        AssociateFacesRequest request = new AssociateFacesRequest()
                .withCollectionId(collectionId)
                .withUserId(userId)
                .withFaceIds(faceIds)
                .withUserMatchThreshold(userMatchThreshold);

        AssociateFacesResult result = rekognitionClient.associateFaces(request);

        System.out.println("Successful face associations: " +
 result.getAssociatedFaces().size());
        System.out.println("Unsuccessful face associations: " +
 result.getUnsuccessfulFaceAssociations().size());
    }

}
```

AWS CLI

This AWS CLI command associates a face with a user, using the `associate-faces` CLI operation.

```
aws rekognition associate-faces --user-id user-id --face-ids face-id-1 face-id-2
--collection-id collection-name
--region region-name
```

Python

This Python code example associates a face with a user.

```
from botocore.exceptions import ClientError
import boto3
import logging

logger = logging.getLogger(__name__)
session = boto3.Session(profile_name='profile-name')
client = session.client('rekognition')

def associate_faces(collection_id, user_id, face_ids):
    """
    Associate stored faces within collection to the given user

    :param collection_id: The ID of the collection where user and faces are
 stored.
    :param user_id: The ID of the user that we want to associate faces to
    :param face_ids: The list of face IDs to be associated to the given user

    :return: response of AssociateFaces API
    """
    logger.info(f'Associating faces to user: {user_id}, {face_ids}')
    try:
        response = client.associate_faces(
            CollectionId=collection_id,
            UserId=user_id,
            FaceIds=face_ids
        )
        print(f'- associated {len(response["AssociatedFaces"])} faces')
    except ClientError:
        logger.exception("Failed to associate faces to the given user")
        raise
    else:
        print(response)
        return response
```

```
def main():
    face_ids = ["faceId1", "faceId2"]
    collection_id = "collection-id"
    user_id = "user-id"
    associate_faces(collection_id, user_id, face_ids)

if __name__ == "__main__":
    main()
```

AssociateFaces operation response

The response for `AssociateFaces` includes the `UserStatus`, which is the status of the disassociation request, as well as a list of `FaceIds` to be associated. A list of `UnsuccessfulFaceAssociations` is also returned. After submitting a request to `AssociateFaces`, the operation may take a minute or so to complete.

For this reason, the UserStatus is returned, which can have the following values:

- CREATED - Denotes that the 'User' is created successfully and no faces are associated to it currently. 'User' will be in this state before any successful 'AssociateFaces' call is made.
- UPDATING - Denotes that the 'User' is being updated to reflect the newly associated/disassociated faces and will become ACTIVE in few seconds. Search results may contain 'User' in this state and customers can choose to ignore them from the returned results.
- ACTIVE - Denotes that the **'User'** is updated to reflect all associated/disassociated faces and is in a searchable state.

```
{
    "UnsuccessfulFaceAssociations": [
        {
            "Reasons": [
                "LOW_MATCH_CONFIDENCE"
            ],
            "FaceId": "f5817d37-94f6-0000-bfee-1a2b3c4d5e6f",
            "Confidence": 0.9375374913215637
        },
        {
            "Reasons": [
                "ASSOCIATED_TO_A_DIFFERENT_IDENTITY"
            ],
```

```
            "FaceId": "851cb847-dccc-1111-bfee-1a2b3c4d5e6f",
            "UserId": "demoUser2"
        }
    ],
    "UserStatus": "UPDATING",
    "AssociatedFaces": [
        {
            "FaceId": "35ebbb41-7f67-2222-bfee-1a2b3c4d5e6f"
        }
    ]
}
```

Disassociating faces from a user

You can use the DisassociateFaces operation to remove the association between a user ID and a face ID.

To disassociate faces (SDK)

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `DisassociateFaces` operation.

   Java

   This Java example removes the association between a FaceID and a UserID with the `DisassociateFaces` operation.

```
import java.util.Arrays;
import java.util.List;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.DisassociateFacesRequest;
import com.amazonaws.services.rekognition.model.DisassociateFacesResult;
```

```
public class DisassociateFaces {

    public static void main(String[] args) throws Exception {


        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

        /* Replace the below configurations to allow you successfully run the
 example

           @collectionId: The collection where user and faces are stored
           @userId: The user which faces will get disassociated from
           @faceIds: The list of face IDs that will get disassociated from the
 given user
         */

        String collectionId = "MyCollection";
        String userId = "demoUser";
        String faceId1 = "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx";
        String faceId2 = "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx";
        List<String> faceIds = Arrays.asList(faceid1,faceid2);

        System.out.println("Disassociating faces from existing user: " +
                userId);

        DisassociateFacesRequest request = new DisassociateFacesRequest()
                .withCollectionId(collectionId)
                .withUserId(userId)
                .withFaceIds(faceIds)

        DisassociateFacesResult result =
 rekognitionClient.disassociateFaces(request);

        System.out.println("Successful face disassociations: " +
 result.getDisassociatedFaces().size());
        System.out.println("Unsuccessful face disassociations: " +
 result.getUnsuccessfulFaceDisassociations().size());
    }

}
```

AWS CLI

This AWS CLI command removes the association between a FaceID and a UserID with the `DisassociateFaces` operation.

```
aws rekognition disassociate-faces --face-ids list-of-face-ids
--user-id user-id --collection-id collection-name --region region-name
```

Python

The following example removes the association between a FaceID and a UserID with the `DisassociateFaces` operation.

```
from botocore.exceptions import ClientError
import boto3
import logging

logger = logging.getLogger(__name__)
session = boto3.Session(profile_name='profile-name')
client = session.client('rekognition')

def disassociate_faces(collection_id, user_id, face_ids):
    """
    Disassociate stored faces within collection to the given user

    :param collection_id: The ID of the collection where user and faces are
 stored.
    :param user_id: The ID of the user that we want to disassociate faces from
    :param face_ids: The list of face IDs to be disassociated from the given
 user

    :return: response of AssociateFaces API
    """
    logger.info(f'Disssociating faces from user: {user_id}, {face_ids}')
    try:
        response = client.disassociate_faces(
            CollectionId=collection_id,
            UserId=user_id,
            FaceIds=face_ids
        )
        print(f'- disassociated {len(response["DisassociatedFaces"])} faces')
    except ClientError:
```

```
        logger.exception("Failed to disassociate faces from the given user")
        raise
    else:
        print(response)
        return response

def main():
    face_ids = ["faceId1", "faceId2"]
    collection_id = "collection-id"
    user_id = "user-id"
    disassociate_faces(collection_id, user_id, face_ids)

if __name__ == "__main__":
    main()
```

DisassociateFaces operation response

The response for `DisassociateFaces` includes the `UserStatus`, which is the status of the disassociation request, as well as a list of `FaceIds` to be unassociated. A list of `UnsuccessfulFaceDisassociations` is also returned. After submitting a request to DisassociateFaces, the operation may take a minute or so to complete. For this reason, the UserStatus is returned, which can have the following values:

- CREATED - Denotes that the 'User' is created successfully and no faces are associated to it currently. 'User' will be in this state before any successful 'AssociateFaces' call is made.
- UPDATING - Denotes that the 'User' is being updated to reflect the newly associated/disassociated faces and will become ACTIVE in few seconds. Search results may contain 'User' in this state and customers can choose to ignore them from the returned results.
- ACTIVE - Denotes that the **'User'** is updated to reflect all associated/disassociated faces and is in a searchable state.

```
{
    "UserStatus": "UPDATING",
    "DisassociatedFaces": [
        {
            "FaceId": "c92265d4-5f9c-43af-a58e-12be0ce02bc3"
        }
    ],
    "UnsuccessfulFaceDisassociations": [
```

```
        {
            "Reasons": [
                "ASSOCIATED_TO_A_DIFFERENT_IDENTITY"
            ],
            "FaceId": "f5817d37-94f6-4335-bfee-6cf79a3d806e",
            "UserId": "demoUser1"
        }
    ]
}
```

Listing users in a collection

You can use the ListUsers operation to list UserIds and the UserStatus. To see the FaceIDs that are associated with a UserID, use the ListFaces operation.

To list users (SDK)

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `ListUsers` operation.

   Java

   This Java example lists the users in a collection using the `ListUsers` operation.

```
import java.util.List;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.ListUsersRequest;
import com.amazonaws.services.rekognition.model.ListUsersResult;
import com.amazonaws.services.rekognition.model.User;

public class ListUsers {

    public static void main(String[] args) throws Exception {
```

```
        AmazonRekognition amazonRekognition =
 AmazonRekognitionClientBuilder.defaultClient();


        System.out.println("Listing users");
        int limit = 10;
        ListUsersResult listUsersResult = null;
        String paginationToken = null;
        do {
            if (listUsersResult != null) {
                paginationToken = listUsersResult.getNextToken();
            }
            ListUsersRequest request = new ListUsersRequest()
                    .withCollectionId(collectionId)
                    .withMaxResults(limit)
                    .withNextToken(paginationToken);
            listUsersResult = amazonRekognition.listUsers(request);

            List<User> users = listUsersResult.getUsers();
            for (User currentUser: users) {
                System.out.println(currentUser.getUserId() + " : " +
 currentUser.getUserStatus());
            }
        } while (listUsersResult.getNextToken() != null);
    }
}
```

AWS CLI

This AWS CLI command lists the users in a collection with the `ListUsers` operation.

```
aws rekognition list-users --collection-id collection-id --max-results number-
of-max-results
```

Python

The following example lists the users in a collection with the `ListUsers` operation.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
```

```
from botocore.exceptions import ClientError
import logging
from pprint import pprint

logger = logging.getLogger(__name__)
session = boto3.Session(profile_name='profile-name')
client = session.client('rekognition')


def list_users(collection_id):
    """
    List all users from the given collection

    :param collection_id: The ID of the collection where user is stored.

    :return: response that contains list of Users found within given collection
    """
    logger.info(f'Listing the users in collection: {collection_id}')
    try:
        response = client.list_users(
            CollectionId=collection_id
        )
        pprint(response["Users"])
    except ClientError:
        logger.exception(f'Failed to list all user from given collection:
 {collection_id}')
        raise
    else:
        return response

def main():
    collection_id = "collection-id"
    list_users(collection_id)

if __name__ == "__main__":
    main()
```

ListUsers operation response

The response for a request to ListUsers includes a list of the `Users` in the collection along with the `UsedId` and `UserStatus` of the User.

```
{
    "NextToken": "B1asJT3bAb/ttuGgPFV8BZoBZyGQzlUHXbuTNLh48a6enU7kXKw43hpOwizW7LOk/
Gk7Em09lznoq6+FcDCcSq2olrn7A98BLkt5keu+ZRVRUTyrXtT6J7Hmp
+ieQ2an6Zu0qzPfcdPeaJ9eAxG2d0WNrzJgi5hvmjoiSTTfKX3MQz1sduWQkvAAs4hZfhZoKFahFlqWofshCXa/
FHAAY3PL1PjxXbkNeSSMq8V7i1MlKCdrPVykCv9MokpPt7jtNvKPEZGUhxgBTFMxNWLEcFnzAiCWDg91dFy/
LalshPjXA9UVc5Gx9vIJNQ/
eO3cQRghAkCT3FOAiXsLAnA015ODTomZpWWVpqB21wKpI3LYmfAVFrDPGzpbTVlRmLsJm41bkmnBBBw9+DHz1Jn7zW
+qc5Fs3yaHu0f51Xg==",
    "Users": [
        {
            "UserId": "demoUser4",
            "UserStatus": "CREATED"
        },
        {
            "UserId": "demoUser2",
            "UserStatus": "CREATED"
        }
    ]
}
```


Searching for a face with a face ID

You can use the SearchFaces operation to search for users in a collection that match the largest face in a supplied image.

The face ID is returned in the IndexFaces operation response when the face is detected and added to a collection. For more information, see Managing faces in a collection.

To search for a face in a collection using its face ID (SDK)

1. If you haven't already:
    a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
    b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `SearchFaces` operation.

Java

This example displays information about faces that match a face identified by its ID.

Change the value of `collectionID` to the collection that contains the required face. Change the value of `faceId` to the identifier of the face you want to find.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.fasterxml.jackson.databind.ObjectMapper;
import com.amazonaws.services.rekognition.model.FaceMatch;
import com.amazonaws.services.rekognition.model.SearchFacesRequest;
import com.amazonaws.services.rekognition.model.SearchFacesResult;
import java.util.List;


  public class SearchFaceMatchingIdCollection {
      public static final String collectionId = "MyCollection";
      public static final String faceId = "xxxxxxxx-xxxx-xxxx-xxxx-
xxxxxxxxxxxx";

    public static void main(String[] args) throws Exception {

        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

        ObjectMapper objectMapper = new ObjectMapper();
      // Search collection for faces matching the face id.

      SearchFacesRequest searchFacesRequest = new SearchFacesRequest()
              .withCollectionId(collectionId)
              .withFaceId(faceId)
              .withFaceMatchThreshold(70F)
              .withMaxFaces(2);

       SearchFacesResult searchFacesByIdResult =
               rekognitionClient.searchFaces(searchFacesRequest);
```

```
       System.out.println("Face matching faceId " + faceId);
      List < FaceMatch > faceImageMatches =
 searchFacesByIdResult.getFaceMatches();
      for (FaceMatch face: faceImageMatches) {
         System.out.println(objectMapper.writerWithDefaultPrettyPrinter()
                 .writeValueAsString(face));

         System.out.println();
      }
    }

}
```

Run the example code. Information about matching faces is displayed.

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
// snippet-start:[rekognition.java2.match_faces_collection.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.SearchFacesRequest;
import software.amazon.awssdk.services.rekognition.model.SearchFacesResponse;
import software.amazon.awssdk.services.rekognition.model.FaceMatch;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import java.util.List;
// snippet-end:[rekognition.java2.match_faces_collection.import]

/**
 * Before running this Java V2 code example, set up your development
 environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
```

```
public class SearchFaceMatchingIdCollection {

    public static void main(String[] args) {

        final String usage = "\n" +
            "Usage: " +
            "   <collectionId> <sourceImage>\n\n" +
            "Where:\n" +
            "   collectionId - The id of the collection.  \n" +
            "   sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png). \n\n";

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        String faceId = args[1];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        System.out.println("Searching for a face in a collections");
        searchFacebyId(rekClient, collectionId, faceId ) ;
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.match_faces_collection.main]
    public static void searchFacebyId(RekognitionClient rekClient,String
 collectionId, String faceId) {

        try {
            SearchFacesRequest searchFacesRequest = SearchFacesRequest.builder()
                .collectionId(collectionId)
                .faceId(faceId)
                .faceMatchThreshold(70F)
                .maxFaces(2)
                .build();
```

```
            SearchFacesResponse imageResponse =
 rekClient.searchFaces(searchFacesRequest) ;
            System.out.println("Faces matching in the collection");
            List<FaceMatch> faceImageMatches = imageResponse.faceMatches();
            for (FaceMatch face: faceImageMatches) {
                System.out.println("The similarity level is
 "+face.similarity());
                System.out.println();
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
    // snippet-end:[rekognition.java2.match_faces_collection.main]
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `search-faces` CLI operation. Replace the value of `face-id` with the face identifier that you want to search for, and replace the value of `collection-id` with the collection you want to search in. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
aws rekognition search-faces --face-id face-id --collection-id "collection-id"
 --profile profile-name
```

Python

This example displays information about faces that match a face identified by its ID.

Change the value of `collectionID` to the collection that contains the required face. Change the value of `faceId` to the identifier of the face you want to find. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
```

```
import boto3

def search_face_in_collection(face_id, collection_id):
    threshold = 90
    max_faces = 2

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')

    response = client.search_faces(CollectionId=collection_id,
                                   FaceId=face_id,
                                   FaceMatchThreshold=threshold,
                                   MaxFaces=max_faces)

    face_matches = response['FaceMatches']
    print('Matching faces')
    for match in face_matches:
        print('FaceId:' + match['Face']['FaceId'])
        print('Similarity: ' + "{:.2f}".format(match['Similarity']) + "%")

    return len(face_matches)

def main():
    face_id = 'xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx'
    collection_id = 'collection-id'

    faces = []
    faces.append(face_id)

    faces_count = search_face_in_collection(face_id, collection_id)
    print("faces found: " + str(faces_count))

if __name__ == "__main__":
    main()
```

.NET

This example displays information about faces that match a face identified by its ID.

Change the value of `collectionID` to the collection that contains the required face. Change the value of `faceId` to the identifier of the face that you want to find.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class SearchFacesMatchingId
{
    public static void Example()
    {
        String collectionId = "MyCollection";
        String faceId = "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        // Search collection for faces matching the face id.

        SearchFacesRequest searchFacesRequest = new SearchFacesRequest()
        {
            CollectionId = collectionId,
            FaceId = faceId,
            FaceMatchThreshold = 70F,
            MaxFaces = 2
        };

        SearchFacesResponse searchFacesResponse =
 rekognitionClient.SearchFaces(searchFacesRequest);

        Console.WriteLine("Face matching faceId " + faceId);

        Console.WriteLine("Matche(s): ");
        foreach (FaceMatch face in searchFacesResponse.FaceMatches)
            Console.WriteLine("FaceId: " + face.Face.FaceId + ", Similarity: " +
 face.Similarity);
    }
}
```

Run the example code. Information about matching faces is displayed.

SearchFaces operation request

Given a face ID (each face stored in the face collection has a face ID), `SearchFaces` searches the specified face collection for similar faces. The response doesn't include the face you are searching for. It includes only similar faces. By default, `SearchFaces` returns faces for which the algorithm detects similarity of greater than 80%. The similarity indicates how closely the face matches with the input face. Optionally, you can use `FaceMatchThreshold` to specify a different value.

```
{
    "CollectionId": "MyCollection",
    "FaceId": "0b683aed-a0f1-48b2-9b5e-139e9cc2a757",
    "MaxFaces": 2,
    "FaceMatchThreshold": 99
}
```

SearchFaces operation response

The operation returns an array of face matches that were found and the face ID you provided as input.

```
{
    "SearchedFaceId": "7ecf8c19-5274-5917-9c91-1db9ae0449e2",
    "FaceMatches": [ list of face matches found ]
}
```

For each face match that was found, the response includes similarity and face metadata, as shown in the following example response:

```
{
   ...
    "FaceMatches": [
        {
            "Similarity": 100.0,
            "Face": {
                "BoundingBox": {
                    "Width": 0.6154,
                    "Top": 0.2442,
                    "Left": 0.1765,
                    "Height": 0.4692
                },
```

```
                "FaceId": "84de1c86-5059-53f2-a432-34ebb704615d",
                "Confidence": 99.9997,
                "ImageId": "d38ebf91-1a11-58fc-ba42-f978b3f32f60"
            }
        },
        {
            "Similarity": 84.6859,
            "Face": {
                "BoundingBox": {
                    "Width": 0.2044,
                    "Top": 0.2254,
                    "Left": 0.4622,
                    "Height": 0.3119
                },
                "FaceId": "6fc892c7-5739-50da-a0d7-80cc92c0ba54",
                "Confidence": 99.9981,
                "ImageId": "5d913eaf-cf7f-5e09-8c8f-cb1bdea8e6aa"
            }
        }
    ]
}
```


Searching for a face with an image

You can use the SearchFacesByImage operation to search for faces in a collection that match the largest face in a supplied image.

For more information, see Searching for faces and users within a collection.

To search for a face in a collection using an image (SDK)

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Upload an image (that contains one or more faces) to your S3 bucket.

For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following examples to call the `SearchFacesByImage` operation.

   Java

   This example displays information about faces that match the largest face in an image. The code example specifies both the `FaceMatchThreshold` and `MaxFaces` parameters to limit the results that are returned in the response.

   In the following example, change the following: change the value of `collectionId` to the collection you want to search, change the value of `bucket` to the bucket containing the input image, and change the value of `photo` to the input image.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.FaceMatch;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.S3Object;
import com.amazonaws.services.rekognition.model.SearchFacesByImageRequest;
import com.amazonaws.services.rekognition.model.SearchFacesByImageResult;
import java.util.List;
import com.fasterxml.jackson.databind.ObjectMapper;


public class SearchFaceMatchingImageCollection {
    public static final String collectionId = "MyCollection";
    public static final String bucket = "bucket";
    public static final String photo = "input.jpg";

    public static void main(String[] args) throws Exception {

       AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

      ObjectMapper objectMapper = new ObjectMapper();
```

```
       // Get an image object from S3 bucket.
      Image image=new Image()
              .withS3Object(new S3Object()
                      .withBucket(bucket)
                      .withName(photo));

      // Search collection for faces similar to the largest face in the image.
      SearchFacesByImageRequest searchFacesByImageRequest = new
 SearchFacesByImageRequest()
              .withCollectionId(collectionId)
              .withImage(image)
              .withFaceMatchThreshold(70F)
              .withMaxFaces(2);

       SearchFacesByImageResult searchFacesByImageResult =
               rekognitionClient.searchFacesByImage(searchFacesByImageRequest);

       System.out.println("Faces matching largest face in image from" + photo);
      List < FaceMatch > faceImageMatches =
 searchFacesByImageResult.getFaceMatches();
      for (FaceMatch face: faceImageMatches) {
          System.out.println(objectMapper.writerWithDefaultPrettyPrinter()
                  .writeValueAsString(face));
         System.out.println();
      }
   }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
// snippet-start:[rekognition.java2.search_faces_collection.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
```

```
import
 software.amazon.awssdk.services.rekognition.model.SearchFacesByImageRequest;
import software.amazon.awssdk.services.rekognition.model.Image;
import
 software.amazon.awssdk.services.rekognition.model.SearchFacesByImageResponse;
import software.amazon.awssdk.services.rekognition.model.FaceMatch;
import java.io.File;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;
// snippet-end:[rekognition.java2.search_faces_collection.import]

/**
 * Before running this Java V2 code example, set up your development
 environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class SearchFaceMatchingImageCollection {

    public static void main(String[] args) {

        final String usage = "\n" +
            "Usage: " +
            "   <collectionId> <sourceImage>\n\n" +
            "Where:\n" +
            "   collectionId - The id of the collection.  \n" +
            "   sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png). \n\n";

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        String sourceImage = args[1];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
```

```
            .credentialsProvider(ProfileCredentialsProvider.create("profile-
name"))
            .build();

        System.out.println("Searching for a face in a collections");
        searchFaceInCollection(rekClient, collectionId, sourceImage ) ;
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.search_faces_collection.main]
    public static void searchFaceInCollection(RekognitionClient rekClient,String
 collectionId, String sourceImage) {

        try {
            InputStream sourceStream = new FileInputStream(new
 File(sourceImage));
            SdkBytes sourceBytes = SdkBytes.fromInputStream(sourceStream);
            Image souImage = Image.builder()
                .bytes(sourceBytes)
                .build();

            SearchFacesByImageRequest facesByImageRequest =
 SearchFacesByImageRequest.builder()
                .image(souImage)
                .maxFaces(10)
                .faceMatchThreshold(70F)
                .collectionId(collectionId)
                .build();

            SearchFacesByImageResponse imageResponse =
 rekClient.searchFacesByImage(facesByImageRequest) ;
            System.out.println("Faces matching in the collection");
            List<FaceMatch> faceImageMatches = imageResponse.faceMatches();
            for (FaceMatch face: faceImageMatches) {
                System.out.println("The similarity level is
 "+face.similarity());
                System.out.println();
            }

        } catch (RekognitionException | FileNotFoundException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
```

```
    // snippet-end:[rekognition.java2.search_faces_collection.main]
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `search-faces-by-image` CLI operation. Replace the value of `Bucket` with the S3 bucket that you used in step 2. Replace the value of `Name` with the image file name that you used in step 2. Replace the value of `collection-id` with the collection you want to search in. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
aws rekognition search-faces-by-image --image '{"S3Object":{"Bucket":"bucket-
name","Name":"image-name"}}' \
--collection-id "collection-id" --profile profile-name
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
aws rekognition search-faces-by-image --image "{\"S3Object\":{\"Bucket\":
\"bucket-name\",\"Name\":\"image-name\"}}" \
--collection-id "collection-id" --profile profile-name
```

Python

This example displays information about faces that match the largest face in an image. The code example specifies both the `FaceMatchThreshold` and `MaxFaces` parameters to limit the results that are returned in the response.

In the following example, change the following: change the value of `collectionId` to the collection you want to search, and replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in Step 2. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

if __name__ == "__main__":

    bucket='amzn-s3-demo-bucket'
    collectionId='MyCollection'
    fileName='input.jpg'
    threshold = 70
    maxFaces=2

    client=boto3.client('rekognition')


    response=client.search_faces_by_image(CollectionId=collectionId,
                                Image={'S3Object':
{'Bucket':bucket,'Name':fileName}},
                                FaceMatchThreshold=threshold,
                                MaxFaces=maxFaces)


    faceMatches=response['FaceMatches']
    print ('Matching faces')
    for match in faceMatches:
            print ('FaceId:' + match['Face']['FaceId'])
            print ('Similarity: ' + "{:.2f}".format(match['Similarity']) + "%")
            print
```

.NET

This example displays information about faces that match the largest face in an image. The code example specifies both the `FaceMatchThreshold` and `MaxFaces` parameters to limit the results that are returned in the response.

In the following example, change the following: change the value of `collectionId` to the collection you want to search, and replace the values of `bucket` and `photo` with the names of the Amazon S3 bucket and image that you used in step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class SearchFacesMatchingImage
{
    public static void Example()
    {
        String collectionId = "MyCollection";
        String bucket = "amzn-s3-demo-bucket";
        String photo = "input.jpg";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        // Get an image object from S3 bucket.
        Image image = new Image()
        {
            S3Object = new S3Object()
            {
                Bucket = bucket,
                Name = photo
            }
        };

        SearchFacesByImageRequest searchFacesByImageRequest = new
 SearchFacesByImageRequest()
        {
            CollectionId = collectionId,
            Image = image,
            FaceMatchThreshold = 70F,
            MaxFaces = 2
        };

        SearchFacesByImageResponse searchFacesByImageResponse =
 rekognitionClient.SearchFacesByImage(searchFacesByImageRequest);

        Console.WriteLine("Faces matching largest face in image from " + photo);
        foreach (FaceMatch face in searchFacesByImageResponse.FaceMatches)
```

```
            Console.WriteLine("FaceId: " + face.Face.FaceId + ", Similarity: " +
 face.Similarity);
    }
}
```

SearchFacesByImage operation request

The input parameters to `SearchFacesImageByImage` are the collection to search in and the source image location. In this example, the source image is stored in an Amazon S3 bucket (`S3Object`). Also specified are the maximum number of faces to return (`Maxfaces`) and the minimum confidence that must be matched for a face to be returned (`FaceMatchThreshold`).

```
{
    "CollectionId": "MyCollection",
    "Image": {
        "S3Object": {
            "Bucket": "bucket",
            "Name": "input.jpg"
        }
    },
    "MaxFaces": 2,
    "FaceMatchThreshold": 99
}
```

SearchFacesByImage operation response

Given an input image (.jpeg or .png), the operation first detects the face in the input image, and then searches the specified face collection for similar faces.

> **Note**
>
> If the service detects multiple faces in the input image, it uses the largest face that's detected for searching the face collection.

The operation returns an array of face matches that were found, and information about the input face. This includes information such as the bounding box, along with the confidence value, which indicates the level of confidence that the bounding box contains a face.

By default, SearchFacesByImage returns faces for which the algorithm detects similarity of greater than 80%. The similarity indicates how closely the face matches with the input face. Optionally, you can use FaceMatchThreshold to specify a different value. For each face match found, the response includes similarity and face metadata, as shown in the following example response:


```
{
    "FaceMatches": [
        {
            "Face": {
                "BoundingBox": {
                    "Height": 0.06333330273628235,
                    "Left": 0.1718519926071167,
                    "Top": 0.7366669774055481,
                    "Width": 0.11061699688434601
                },
                "Confidence": 100,
                "ExternalImageId": "input.jpg",
                "FaceId": "578e2e1b-d0b0-493c-aa39-ba476a421a34",
                "ImageId": "9ba38e68-35b6-5509-9d2e-fcffa75d1653"
            },
            "Similarity": 99.9764175415039
        }
    ],
    "FaceModelVersion": "3.0",
    "SearchedFaceBoundingBox": {
        "Height": 0.06333333253860474,
        "Left": 0.17185185849666595,
        "Top": 0.7366666793823242,
        "Width": 0.11061728745698929
    },
    "SearchedFaceConfidence": 99.99999237060547
}
```


Searching for users (face ID/ user ID)

You can use the SearchUsers operation to to search for users in a specified collection that match a supplied face ID or user ID. The operation lists the returned UserIds ranked by the highest similarity score above the requested UserMatchThreshold. The user ID is created in the CreateUsers operation. For more information, see Managing users in a collection.

To search users (SDK)

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following examples to call the `SearchUsers` operation.

   Java

   This Java example searchers the users in a collection using the `SearchUsers` operation.

```
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.UserMatch;
import com.amazonaws.services.rekognition.model.SearchUsersRequest;
import com.amazonaws.services.rekognition.model.SearchUsersResult;
import com.amazonaws.services.rekognition.model.UserMatch;

public class SearchUsers {
    //Replace collectionId and faceId with the values you want to use.

    public static final String collectionId = "MyCollection";
    public static final String faceId = "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx";

    public static final String userd = 'demo-user';

    public static void main(String[] args) throws Exception {

        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

        // Search collection for faces matching the user id.
        SearchUsersRequest request = new SearchUsersRequest()
                .withCollectionId(collectionId)
                .withUserId(userId);

        SearchUsersResult result =
                rekognitionClient.searchUsers(request);
```

```
        System.out.println("Printing first search result with matched user and
similarity score");
        for (UserMatch match: result.getUserMatches()) {
            System.out.println(match.getUser().getUserId() + " with similarity
score " + match.getSimilarity());
        }

        // Search collection for faces matching the face id.
        SearchUsersRequest request1 = new SearchUsersRequest()
                .withCollectionId(collectionId)
                .withFaceId(faceId);

        SearchUsersResult result1 =
                rekognitionClient.searchUsers(request1);

        System.out.println("Printing second search result with matched user and
similarity score");
        for (UserMatch match: result1.getUserMatches()) {
            System.out.println(match.getUser().getUserId() + " with similarity
score " + match.getSimilarity());
        }
    }
```

AWS CLI

This AWS CLI command searches the users in a collection with the `SearchUsers` operation.

```
aws rekognition search-users --face-id face-id --collection-id collection-id --
region region-name
```

Python

The following example searches the users in a collection with the `SearchUsers` operation.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
from botocore.exceptions import ClientError
import logging
```

```
logger = logging.getLogger(__name__)
session = boto3.Session(profile_name='profile-name')
client = session.client('rekognition')

def search_users_by_face_id(collection_id, face_id):
    """
    SearchUsers operation with face ID provided as the search source

    :param collection_id: The ID of the collection where user and faces are
 stored.
    :param face_id: The ID of the face in the collection to search for.

    :return: response of SearchUsers API
    """
    logger.info(f'Searching for users using a face-id: {face_id}')
    try:
        response = client.search_users(
            CollectionId=collection_id,
            FaceId=face_id
        )
        print(f'- found {len(response["UserMatches"])} matches')
        print([f'- {x["User"]["UserId"]} - {x["Similarity"]}%' for x in
 response["UserMatches"]])
    except ClientError:
        logger.exception(f'Failed to perform SearchUsers with given face id:
 {face_id}')
        raise
    else:
        print(response)
        return response

def search_users_by_user_id(collection_id, user_id):
    """
    SearchUsers operation with user ID provided as the search source

    :param collection_id: The ID of the collection where user and faces are
 stored.
    :param user_id: The ID of the user in the collection to search for.

    :return: response of SearchUsers API
    """
    logger.info(f'Searching for users using a user-id: {user_id}')
    try:
```

```
        response = client.search_users(
            CollectionId=collection_id,
            UserId=user_id
        )
        print(f'- found {len(response["UserMatches"])} matches')
        print([f'- {x["User"]["UserId"]} - {x["Similarity"]}%' for x in
 response["UserMatches"]])
    except ClientError:
        logger.exception(f'Failed to perform SearchUsers with given face id:
 {user_id}')
        raise
    else:
        print(response)
        return response

def main():
    collection_id = "collection-id"
    user_id = "user-id"
    face_id = "face_id"
    search_users_by_face_id(collection_id, face_id)
    search_users_by_user_id(collection_id, user_id)

if __name__ == "__main__":
    main()
```

SearchUsers operation request

Given a FaceID or UserID, SearchUsers searches the specified CollectionID for user matches. By default, SearchUsers returns UserIDs for which the similarity score is greater than 80%. The similarity indicates how closely the UserID matches the provided FaceID or UserID. If multiple UserIDs are returned, they are listed in order of highest similarity score to lowest. Optionally, you can use the UserMatchThreshold to specify a different value. For more information, see Managing users in a collection.

The following is an example of a SearchUsers request using `UserId`:

```
{
   "CollectionId": "MyCollection",
   "UserId": "demoUser1",
   "MaxUsers": 2,
```

```
   "UserMatchThreshold": 99
}
```

The following is an example of a SearchUsers request using `FaceId`:

```
{
    "CollectionId": "MyCollection",
    "FaceId": "bff43c40-cfa7-4b94-bed8-8a08b2205107",
    "MaxUsers": 2,
    "UserMatchThreshold": 99
}
```

SearchUsers operation response

If searching with a `FaceId`, the response for SearchUsers includes the `FaceId` for the `SearchedFace`, as well as a list of `UserMatches` and the `UserId` and `UserStatus` for each User.

```
{
    "SearchedFace": {
        "FaceId": "bff43c40-cfa7-4b94-bed8-8a08b2205107"
    },
    "UserMatches": [
        {
            "User": {
                "UserId": "demoUser1",
                "UserStatus": "ACTIVE"
            },
            "Similarity": 100.0
        },
        {
            "User": {
                "UserId": "demoUser2",
                "UserStatus": "ACTIVE"
            },
            "Similarity": 99.97946166992188
        }
    ],
    "FaceModelVersion": "6"
```

```
}
```

If searching with a `UserId`, the response for SearchUsers includes the `UserId` for the `SearchedUser`, in addition to the other response elements.

```
{
    "SearchedUser": {
        "UserId": "demoUser1"
    },
    "UserMatches": [
        {
            "User": {
                "UserId": "demoUser2",
                "UserStatus": "ACTIVE"
            },
            "Similarity": 99.97946166992188
        }
    ],
    "FaceModelVersion": "6"
}
```

Searching for users (image)

`SearchUsersByImage`searches the specified CollectionID for users in a collection that match the largest face detected in a supplied image. By default, SearchUsersByImage returns UserIDs for which the similarity score is greater than 80%. The similarity indicates how closely the UserID matches the largest face detected in the supplied image. If multiple UserIDs are returned, they are listed in order of highest similarity score to lowest. Optionally, you can use the UserMatchThreshold to specify a different value. For more information, see the section called "Managing users in a collection".

To search users by image (SDK)

1. If you haven't already:

a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following examples to call the `SearchUsersByImage` operation.

Java

This Java example searchers the users in a collection based off an inpute image, using the `SearchUsersByImage` operation.

```
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.S3Object;
import com.amazonaws.services.rekognition.model.SearchUsersByImageRequest;
import com.amazonaws.services.rekognition.model.SearchUsersByImageResult;
import com.amazonaws.services.rekognition.model.UserMatch;


public class SearchUsersByImage {
    //Replace bucket, collectionId and photo with your values.
    public static final String collectionId = "MyCollection";
    public static final String s3Bucket = "bucket";
    public static final String s3PhotoFileKey = "input.jpg";

    public static void main(String[] args) throws Exception {

        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();


        // Get an image object from S3 bucket.
        Image image = new Image()
                .withS3Object(new S3Object()
                        .withBucket(s3Bucket)
                        .withName(s3PhotoFileKey));

        // Search collection for users similar to the largest face in the image.
        SearchUsersByImageRequest request = new SearchUsersByImageRequest()
                .withCollectionId(collectionId)
```

```
                .withImage(image)
                .withUserMatchThreshold(70F)
                .withMaxUsers(2);

        SearchUsersByImageResult result =
                rekognitionClient.searchUsersByImage(request);

        System.out.println("Printing search result with matched user and
 similarity score");
        for (UserMatch match: result.getUserMatches()) {
            System.out.println(match.getUser().getUserId() + " with similarity
 score " + match.getSimilarity());
        }
    }
}
```

AWS CLI

This AWS CLI command searches the users in a collection based on an input image, with the `SearchUsersByImage` operation.

```
aws rekognition search-users-by-image --image '{"S3Object":
{"Bucket":"s3BucketName","Name":"file-name"}}' --collection-id MyCollectionId --
region region-name
```

Python

The following example searches the users in a collection based on an input image, with the `SearchUsersByImage` operation.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
from botocore.exceptions import ClientError
import logging
import os

logger = logging.getLogger(__name__)
session = boto3.Session(profile_name='profile-name')
client = session.client('rekognition')
```

```
def load_image(file_name):
    """
    helper function to load the image for indexFaces call from local disk

    :param image_file_name: The image file location that will be used by
 indexFaces call.
    :return: The Image in bytes
    """
    print(f'- loading image: {file_name}')
    with open(file_name, 'rb') as file:
        return {'Bytes': file.read()}

def search_users_by_image(collection_id, image_file):
    """
    SearchUsersByImage operation with user ID provided as the search source

    :param collection_id: The ID of the collection where user and faces are
 stored.
    :param image_file: The image that contains the reference face to search
 for.

    :return: response of SearchUsersByImage API
    """
    logger.info(f'Searching for users using an image: {image_file}')
    try:
        response = client.search_users_by_image(
            CollectionId=collection_id,
            Image=load_image(image_file)
        )
        print(f'- found {len(response["UserMatches"])} matches')
        print([f'- {x["User"]["UserId"]} - {x["Similarity"]}%' for x in
 response["UserMatches"]])
    except ClientError:
        logger.exception(f'Failed to perform SearchUsersByImage with given
 image: {image_file}')
        raise
    else:
        print(response)
        return response

def main():
    collection_id = "collection-id"
    IMAGE_SEARCH_SOURCE = os.getcwd() + '/image_path'
```

```
    search_users_by_image(collection_id, IMAGE_SEARCH_SOURCE)

if __name__ == "__main__":
    main()
```

SearchUsersByImage operation request

The request for `SearchUsersByImage` includes the the collection to search in and the source image location. In this example, the source image is stored in an Amazon S3 bucket (`S3Object`). Also specified are the maximum number of users to return (`MaxUsers`) and the minimum confidence that must be matched for a user to be returned (`UserMatchThreshold`).

```
{
    "CollectionId": "MyCollection",
    "Image": {
        "S3Object": {
            "Bucket": "bucket",
            "Name": "input.jpg"
        }
    },
    "MaxUsers": 2,
    "UserMatchThreshold": 99
}
```

SearchUsersByImage operation response

The response for `SearchUsersByImage` includes a `FaceDetail` object for the `SearchedFace`, as well as a list of UserMatches with the `UserId`, `Similarity`, and `UserStatus` for each. If the input image contained more than one face, a list of UnsearchedFaces will be also returned.

```
{
    "SearchedFace": {
        "FaceDetail": {
            "BoundingBox": {
                "Width": 0.23692893981933594,
                "Top": 0.19235000014305115,
                "Left": 0.39177176356315613,
```

```
                "Height": 0.5437348484992981
            }
        }
    },
    "UserMatches": [
        {
            "User": {
                "UserId": "demoUser1",
                "UserStatus": "ACTIVE"
            },
            "Similarity": 100.0
        },
        {
            "User": {
                "UserId": "demoUser2",
                "UserStatus": "ACTIVE"
            },
            "Similarity": 99.97946166992188
        }
    ],
    "FaceModelVersion": "6",
    "UnsearchedFaces": [
        {
            "FaceDetails": {
                "BoundingBox": {
                    "Width": 0.031677018851041794,
                    "Top": 0.5593535900115967,
                    "Left": 0.6102562546730042,
                    "Height": 0.0682177022099495
                }
            },
            "Reasons": [
                "FACE_NOT_LARGEST"
            ]
        },
        {
            "FaceDetails": {
                "BoundingBox": {
                    "Width": 0.03254449740052223,
                    "Top": 0.6080358028411865,
                    "Left": 0.516062319278717,
                    "Height": 0.06347997486591339
                }
            },
```

```
            "Reasons": [
                "FACE_NOT_LARGEST"
            ]
        }
    ]
}
```

Searching stored videos for faces

You can search a collection for faces that match faces of people who are detected in a stored video or a streaming video. This section covers searching for faces in a stored video. For information about searching for faces in a streaming video, see Working with streaming video events.

The faces that you search for must first be indexed into a collection by using IndexFaces. For more information, see Adding faces to a collection.

Amazon Rekognition Video face searching follows the same asynchronous workflow as other Amazon Rekognition Video operations that analyze videos stored in an Amazon S3 bucket. To start searching for faces in a stored video, call StartFaceSearch and provide the ID of the collection that you want to search. Amazon Rekognition Video publishes the completion status of the video analysis to an Amazon Simple Notification Service (Amazon SNS) topic. If the video analysis is successful, call GetFaceSearch to get the search results. For more information about starting video analysis and getting the results, see Calling Amazon Rekognition Video operations.

The following procedure shows how to search a collection for faces that match the faces of people who are detected in a video. The procedure also shows how to get the tracking data for people who are matched in the video. The procedure expands on the code in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), which uses an Amazon Simple Queue Service (Amazon SQS) queue to get the completion status of a video analysis request.

To search a video for matching faces (SDK)

1. Create a collection.
2. Index a face into the collection.
3. Perform Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).
4. Add the following code to the class `VideoDetect` that you created in step 3.

Java

```
   //Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
   //PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

      //Face collection search in video
 ======================================================================
      private static void StartFaceSearchCollection(String bucket, String
 video, String collection) throws Exception{

       NotificationChannel channel= new NotificationChannel()
               .withSNSTopicArn(snsTopicArn)
               .withRoleArn(roleArn);

       StartFaceSearchRequest req = new StartFaceSearchRequest()
               .withCollectionId(collection)
               .withVideo(new Video()
                       .withS3Object(new S3Object()
                               .withBucket(bucket)
                               .withName(video)))
               .withNotificationChannel(channel);



       StartFaceSearchResult startPersonCollectionSearchResult =
 rek.startFaceSearch(req);
       startJobId=startPersonCollectionSearchResult.getJobId();

   }

   //Face collection search in video
 ======================================================================
   private static void GetFaceSearchCollectionResults() throws Exception{

      GetFaceSearchResult faceSearchResult=null;
      int maxResults=10;
      String paginationToken=null;

      do {

          if (faceSearchResult !=null){
              paginationToken = faceSearchResult.getNextToken();
```

```
            }


            faceSearchResult  = rek.getFaceSearch(
                    new GetFaceSearchRequest()
                    .withJobId(startJobId)
                    .withMaxResults(maxResults)
                    .withNextToken(paginationToken)
                    .withSortBy(FaceSearchSortBy.TIMESTAMP)
                    );


            VideoMetadata videoMetaData=faceSearchResult.getVideoMetadata();

            System.out.println("Format: " + videoMetaData.getFormat());
            System.out.println("Codec: " + videoMetaData.getCodec());
            System.out.println("Duration: " +
videoMetaData.getDurationMillis());
            System.out.println("FrameRate: " + videoMetaData.getFrameRate());
            System.out.println();


            //Show search results
            List<PersonMatch> matches=
                    faceSearchResult.getPersons();

            for (PersonMatch match: matches) {
                long milliSeconds=match.getTimestamp();
                System.out.print("Timestamp: " + Long.toString(milliSeconds));
                System.out.println(" Person number: " +
match.getPerson().getIndex());
                List <FaceMatch> faceMatches = match.getFaceMatches();
                if (faceMatches != null) {
                    System.out.println("Matches in collection...");
                    for (FaceMatch faceMatch: faceMatches){
                        Face face=faceMatch.getFace();
                        System.out.println("Face Id: "+ face.getFaceId());
                        System.out.println("Similarity: " +
faceMatch.getSimilarity().toString());
                        System.out.println();
                    }
                }
                System.out.println();
            }
```

```
            System.out.println();

        } while (faceSearchResult !=null && faceSearchResult.getNextToken() !=
 null);

    }
```

In the function `main`, replace the lines:

```
        StartLabelDetection(bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetLabelDetectionResults();
```

with:

```
        String collection="collection";
        StartFaceSearchCollection(bucket, video, collection);

        if (GetSQSMessageSuccess()==true)
         GetFaceSearchCollectionResults();
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.*;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
```

```
 */
public class VideoDetectFaces {
    private static String startJobId = "";

    public static void main(String[] args) {
        final String usage = """

                Usage:    <bucket> <video> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of video (for example, people.mp4).\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
                   roleArn - The ARN of the AWS Identity and Access Management
 (IAM) role to use.\s
                """;

        if (args.length != 4) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
        String topicArn = args[2];
        String roleArn = args[3];

        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
                .roleArn(roleArn)
                .build();

        startFaceDetection(rekClient, channel, bucket, video);
        getFaceResults(rekClient);
        System.out.println("This example is done!");
        rekClient.close();
    }
```

```
   public static void startFaceDetection(RekognitionClient rekClient,
           NotificationChannel channel,
           String bucket,
           String video) {
       try {
           S3Object s3Obj = S3Object.builder()
                   .bucket(bucket)
                   .name(video)
                   .build();

           Video vidOb = Video.builder()
                   .s3Object(s3Obj)
                   .build();

           StartFaceDetectionRequest faceDetectionRequest =
StartFaceDetectionRequest.builder()
                   .jobTag("Faces")
                   .faceAttributes(FaceAttributes.ALL)
                   .notificationChannel(channel)
                   .video(vidOb)
                   .build();

           StartFaceDetectionResponse startLabelDetectionResult =
rekClient.startFaceDetection(faceDetectionRequest);
           startJobId = startLabelDetectionResult.jobId();

       } catch (RekognitionException e) {
           System.out.println(e.getMessage());
           System.exit(1);
       }
   }

   public static void getFaceResults(RekognitionClient rekClient) {
       try {
           String paginationToken = null;
           GetFaceDetectionResponse faceDetectionResponse = null;
           boolean finished = false;
           String status;
           int yy = 0;

           do {
               if (faceDetectionResponse != null)
                   paginationToken = faceDetectionResponse.nextToken();
```

```
                GetFaceDetectionRequest recognitionRequest =
GetFaceDetectionRequest.builder()
                        .jobId(startJobId)
                        .nextToken(paginationToken)
                        .maxResults(10)
                        .build();

                // Wait until the job succeeds.
                while (!finished) {

                    faceDetectionResponse =
rekClient.getFaceDetection(recognitionRequest);
                    status = faceDetectionResponse.jobStatusAsString();

                    if (status.compareTo("SUCCEEDED") == 0)
                        finished = true;
                    else {
                        System.out.println(yy + " status is: " + status);
                        Thread.sleep(1000);
                    }
                    yy++;
                }

                finished = false;

                // Proceed when the job is done - otherwise VideoMetadata is
null.
                VideoMetadata videoMetaData =
faceDetectionResponse.videoMetadata();
                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());
                System.out.println("Job");

                // Show face information.
                List<FaceDetection> faces = faceDetectionResponse.faces();
                for (FaceDetection face : faces) {
                    String age = face.face().ageRange().toString();
                    String smile = face.face().smile().toString();
                    System.out.println("The detected face is estimated to be"
                            + age + " years old.");
```

```
                    System.out.println("There is a smile : " + smile);
                }

            } while (faceDetectionResponse != null &&
 faceDetectionResponse.nextToken() != null);

        } catch (RekognitionException | InterruptedException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

Python

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    # ============== Face Search ===============
    def StartFaceSearchCollection(self,collection):
        response = self.rek.start_face_search(Video={'S3Object':
{'Bucket':self.bucket,'Name':self.video}},
            CollectionId=collection,
            NotificationChannel={'RoleArn':self.roleArn,
 'SNSTopicArn':self.snsTopicArn})

        self.startJobId=response['JobId']

        print('Start Job Id: ' + self.startJobId)


    def GetFaceSearchCollectionResults(self):
        maxResults = 10
        paginationToken = ''

        finished = False

        while finished == False:
            response = self.rek.get_face_search(JobId=self.startJobId,
                                        MaxResults=maxResults,
                                        NextToken=paginationToken)
```

```
            print(response['VideoMetadata']['Codec'])
            print(str(response['VideoMetadata']['DurationMillis']))
            print(response['VideoMetadata']['Format'])
            print(response['VideoMetadata']['FrameRate'])

            for personMatch in response['Persons']:
                print('Person Index: ' + str(personMatch['Person']['Index']))
                print('Timestamp: ' + str(personMatch['Timestamp']))

                if ('FaceMatches' in personMatch):
                    for faceMatch in personMatch['FaceMatches']:
                        print('Face ID: ' + faceMatch['Face']['FaceId'])
                        print('Similarity: ' + str(faceMatch['Similarity']))
                print()
            if 'NextToken' in response:
                paginationToken = response['NextToken']
            else:
                finished = True
            print()
```

In the function `main`, replace the lines:

```
    analyzer.StartLabelDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetLabelDetectionResults()
```

with:

```
    collection='tests'
    analyzer.StartFaceSearchCollection(collection)

    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetFaceSearchCollectionResults()
```

If you've already run a video example other than Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), the code to replace might be different.

5. Change the value of `collection` to the name of the collection you created in step 1.
6. Run the code. A list of people in the video whose faces match those in the input collection is displayed. The tracking data for each matched person is also displayed.

GetFaceSearch operation response

The following is an example JSON response from `GetFaceSearch`.

The response includes an array of people (`Persons`) detected in the video whose faces match a face in the input collection. An array element, PersonMatch, exists for each time the person is matched in the video. Each `PersonMatch` includes an array of face matches from the input collection, FaceMatch, information about the matched person, PersonDetail, and the time the person was matched in the video.


```
{
    "JobStatus": "SUCCEEDED",
    "NextToken": "IJdbzkZfvBRqj8GPV82BPiZKkLOGCqDIsNZG/gQsEE5faTVK9JHOz/
xxxxxxxxxxxxxx",
    "Persons": [
        {
            "FaceMatches": [
                {
                    "Face": {
                        "BoundingBox": {
                            "Height": 0.527472972869873,
                            "Left": 0.33530598878860474,
                            "Top": 0.2161169946193695,
                            "Width": 0.35503000020980835
                        },
                        "Confidence": 99.90239715576172,
                        "ExternalImageId": "image.PNG",
                        "FaceId": "a2f2e224-bfaa-456c-b360-7c00241e5e2d",
                        "ImageId": "eb57ed44-8d8d-5ec5-90b8-6d190daff4c3"
                    },
                    "Similarity": 98.40909576416016
                }
            ],
            "Person": {
                "BoundingBox": {
                    "Height": 0.8694444298744202,
                    "Left": 0.2473958283662796,
                    "Top": 0.10092592239379883,
                    "Width": 0.49427083134651184
                },
                "Face": {
                    "BoundingBox": {
                        "Height": 0.23000000417232513,
```

```
                    "Left": 0.42500001192092896,
                    "Top": 0.16333332657814026,
                    "Width": 0.12937499582767487
                },
                "Confidence": 99.97504425048828,
                "Landmarks": [
                    {
                        "Type": "eyeLeft",
                        "X": 0.46415066719055176,
                        "Y": 0.2572723925113678
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.5068183541297913,
                        "Y": 0.23705792427062988
                    },
                    {
                        "Type": "nose",
                        "X": 0.49765899777412415,
                        "Y": 0.28383663296699524
                    },
                    {
                        "Type": "mouthLeft",
                        "X": 0.487221896648407,
                        "Y": 0.3452930748462677
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.5142884850502014,
                        "Y": 0.33167609572410583
                    }
                ],
                "Pose": {
                    "Pitch": 15.966927528381348,
                    "Roll": -15.547388076782227,
                    "Yaw": 11.34195613861084
                },
                "Quality": {
                    "Brightness": 44.80223083496094,
                    "Sharpness": 99.95819854736328
                }
            },
            "Index": 0
        },
```

```
            "Timestamp": 0
        },
        {
            "Person": {
                "BoundingBox": {
                    "Height": 0.2177777737379074,
                    "Left": 0.7593749761581421,
                    "Top": 0.13333334028720856,
                    "Width": 0.12250000238418579
                },
                "Face": {
                    "BoundingBox": {
                        "Height": 0.2177777737379074,
                        "Left": 0.7593749761581421,
                        "Top": 0.13333334028720856,
                        "Width": 0.12250000238418579
                    },
                    "Confidence": 99.63436889648438,
                    "Landmarks": [
                        {
                            "Type": "eyeLeft",
                            "X": 0.8005779385566711,
                            "Y": 0.20915353298187256
                        },
                        {
                            "Type": "eyeRight",
                            "X": 0.8391435146331787,
                            "Y": 0.21049551665782928
                        },
                        {
                            "Type": "nose",
                            "X": 0.8191410899162292,
                            "Y": 0.2523227035999298
                        },
                        {
                            "Type": "mouthLeft",
                            "X": 0.8093273043632507,
                            "Y": 0.29053622484207153
                        },
                        {
                            "Type": "mouthRight",
                            "X": 0.8366993069648743,
                            "Y": 0.29101791977882385
                        }
```

```
                ],
                "Pose": {
                    "Pitch": 3.165884017944336,
                    "Roll": 1.4182015657424927,
                    "Yaw": -11.151537895202637
                },
                "Quality": {
                    "Brightness": 28.910892486572266,
                    "Sharpness": 97.61507415771484
                }
            },
            "Index": 1
        },
        "Timestamp": 0
    },
    {
        "Person": {
            "BoundingBox": {
                "Height": 0.8388888835906982,
                "Left": 0,
                "Top": 0.15833333134651184,
                "Width": 0.2369791716337204
            },
            "Face": {
                "BoundingBox": {
                    "Height": 0.20000000298023224,
                    "Left": 0.029999999329447746,
                    "Top": 0.2199999988079071,
                    "Width": 0.11249999701976776
                },
                "Confidence": 99.85971069335938,
                "Landmarks": [
                    {
                        "Type": "eyeLeft",
                        "X": 0.06842322647571564,
                        "Y": 0.3010137975215912
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.10543643683195114,
                        "Y": 0.29697132110595703
                    },
                    {
                        "Type": "nose",
```

```
                            "X": 0.09569807350635529,
                            "Y": 0.33701086044311523
                        },
                        {
                            "Type": "mouthLeft",
                            "X": 0.0732642263174057,
                            "Y": 0.3757539987564087
                        },
                        {
                            "Type": "mouthRight",
                            "X": 0.10589495301246643,
                            "Y": 0.3722417950630188
                        }
                    ],
                    "Pose": {
                        "Pitch": -0.5589138865470886,
                        "Roll": -5.1093974113464355,
                        "Yaw": 18.69594955444336
                    },
                    "Quality": {
                        "Brightness": 43.052337646484375,
                        "Sharpness": 99.68138885498047
                    }
                },
                "Index": 2
            },
            "Timestamp": 0
        }......

    ],
    "VideoMetadata": {
        "Codec": "h264",
        "DurationMillis": 67301,
        "Format": "QuickTime / MOV",
        "FrameHeight": 1080,
        "FrameRate": 29.970029830932617,
        "FrameWidth": 1920
    }
}
```

Searching faces in a collection in streaming video

You can use Amazon Rekognition Video to detect and recognize faces from a collection in streaming video. With Amazon Rekognition Video you can create a stream processor (CreateStreamProcessor) to start and manage the analysis of streaming video.

To detect a known face in a video stream (face search), Amazon Rekognition Video uses Amazon Kinesis Video Streams to receive and process a video stream. The analysis results are output from Amazon Rekognition Video to a Kinesis data stream and then read by your client application.

To use Amazon Rekognition Video with streaming video, your application needs to implement the following:

- A Kinesis video stream for sending streaming video to Amazon Rekognition Video. For more information, see the Amazon Kinesis Video Streams Developer Guide.
- An Amazon Rekognition Video stream processor to manage the analysis of the streaming video. For more information, see Overview of Amazon Rekognition Video stream processor operations.
- A Kinesis data stream consumer to read the analysis results that Amazon Rekognition Video sends to the Kinesis data stream. For more information, see Kinesis Data Streams Consumers.

This section contains information about writing an application that creates the Kinesis video stream and other necessary resources, streams video into Amazon Rekognition Video, and receives the analysis results.

Topics

- Setting up your Amazon Rekognition Video and Amazon Kinesis resources
- Searching faces in a streaming video
- Streaming using a GStreamer plugin
- Troubleshooting streaming video

Setting up your Amazon Rekognition Video and Amazon Kinesis resources

The following procedures describe the steps you take to provision the Kinesis video stream and other resources that are used to recognize faces in a streaming video.

Prerequisites

To run this procedure, you need to have the AWS SDK for Java installed. For more information, see Getting started with Amazon Rekognition. The AWS account you use must have access permissions to the Amazon Rekognition API. For more information, see Actions Defined by Amazon Rekognition in the *IAM User Guide*.

To recognize faces in a video stream (AWS SDK)

1. If you haven't already, create an IAM service role to give Amazon Rekognition Video access to your Kinesis video streams and your Kinesis data streams. Note the ARN. For more information, see Giving access to streams using AmazonRekognitionServiceRole.
2. Create a collection and note the collection identifier you used.
3. Index the faces you want to search for into the collection you created in step 2.
4. Create a Kinesis video stream and note the stream's Amazon Resource Name (ARN).
5. Create a Kinesis data stream. Prepend the stream name with *AmazonRekognition* and note the stream's ARN.

You can then create the face search stream processor and start the stream processor using the stream processor name that you chose.

> **Note**
>
> You should start the stream processor only after you have verified you can ingest media into the Kinesis video stream.

Streaming video into Amazon Rekognition Video

To stream video into Amazon Rekognition Video, you use the Amazon Kinesis Video Streams SDK to create and use a Kinesis video stream. The `PutMedia` operation writes video data *fragments* into a Kinesis video stream that Amazon Rekognition Video consumes. Each video data fragment is typically 2–10 seconds in length and contains a self-contained sequence of video frames. Amazon Rekognition Video supports H.264 encoded videos, which can have three types of frames (I, B, and P). For more information, see Inter Frame. The first frame in the fragment must be an I-frame. An I-frame can be decoded independent of any other frame.

As video data arrives into the Kinesis video stream, Kinesis Video Streams assigns a unique number to the fragment. For an example, see PutMedia API Example.

- If you are streaming from an Matroska (MKV) encoded source, use the PutMedia operation to stream the source video into the Kinesis video stream that you created. For more information, see PutMedia API Example.
- If you are streaming from a device camera, see Streaming using a GStreamer plugin.

Giving Amazon Rekognition Video access to your resources

You use an AWS Identity and Access Management (IAM) service role to give Amazon Rekognition Video read access to Kinesis video streams. If you are using a face search stream processor, you use an IAM service role to give Amazon Rekognition Video write access to Kinesis data streams. If you are using a security monitoring stream processor, you use IAM roles to give Amazon Rekognition Video access to your Amazon S3 bucket and to an Amazon SNS topic.

Giving access for face search stream processors

You can create a permissions policy that allows Amazon Rekognition Video access to individual Kinesis video streams and Kinesis data streams.

To give Amazon Rekognition Video access for a face search stream processor

1. Create a new permissions policy with the IAM JSON policy editor, and use the following policy. Replace `video-arn` with the ARN of the desired Kinesis video stream. If you are using a face search stream processor, replace `data-arn` with the ARN of the desired Kinesis data stream.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "kinesis:PutRecord",
                "kinesis:PutRecords"
            ],
            "Resource": "data-arn"
        },
        {
            "Effect": "Allow",
```

```
            "Action": [
                "kinesisvideo:GetDataEndpoint",
                "kinesisvideo:GetMedia"
            ],
            "Resource": "video-arn"
        }
    ]
}
```

2. Create an IAM service role, or update an existing IAM service role. Use the following information to create the IAM service role:

    1. Choose **Rekognition** for the service name.
    2. Choose **Rekognition** for the service role use case.
    3. Attach the permissions policy that you created in step 1.

3. Note the ARN of the service role. You need it to start video analysis operations.

Giving access to streams using AmazonRekognitionServiceRole

As an alternative option for setting up access to Kinesis video streams and data streams, you can use the `AmazonRekognitionServiceRole` permissions policy. IAM provides the *Rekognition* service role use case that, when used with the `AmazonRekognitionServiceRole` permissions policy, can write to multiple Kinesis data streams and read from all your Kinesis video streams. To give Amazon Rekognition Video write access to multiple Kinesis data streams, you can prepend the names of the Kinesis data streams with *AmazonRekognition*—for example, `AmazonRekognitionMyDataStreamName`.

To give Amazon Rekognition Video access to your Kinesis video stream and Kinesis data stream

1. Create an IAM service role. Use the following information to create the IAM service role:

    1. Choose **Rekognition** for the service name.
    2. Choose **Rekognition** for the service role use case.
    3. Choose the **AmazonRekognitionServiceRole** permissions policy, which gives Amazon Rekognition Video write access to Kinesis data streams that are prefixed with *AmazonRekognition* and read access to all your Kinesis video streams.

2. To ensure your AWS account is secure, limit the scope of Rekognition's access to just the resources you are using. This can be done by attaching a trust policy to your IAM service role. For information on how to do this, see Cross-service confused deputy prevention.
3. Note the Amazon Resource Name (ARN) of the service role. You need it to start video analysis operations.

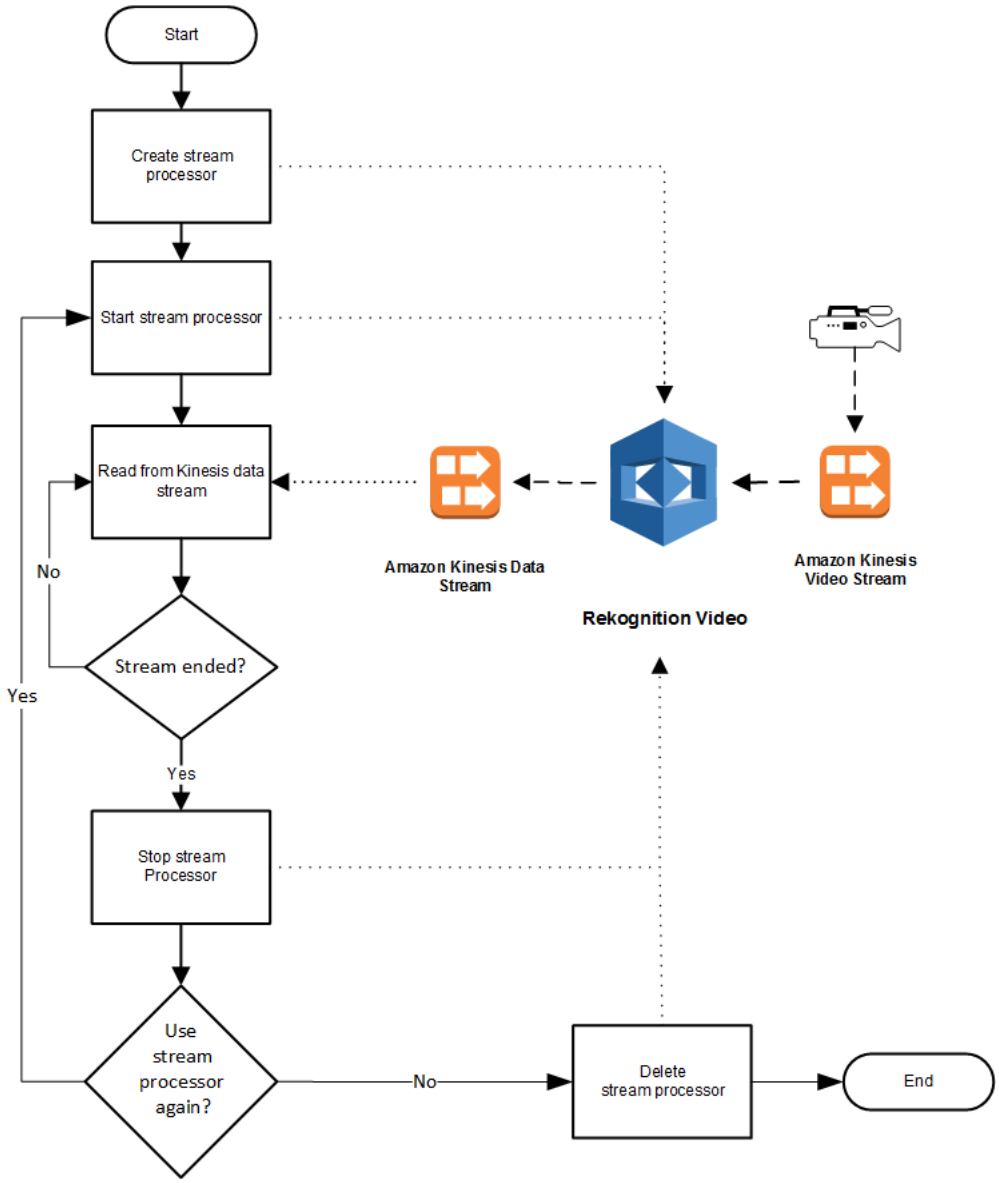
Searching faces in a streaming video

Amazon Rekognition Video can search faces in a collection that match faces that are detected in a streaming video. For more information about collections, see Searching faces in a collection.

Topics

- Creating the Amazon Rekognition Video face search stream processor
- Starting the Amazon Rekognition Video face search stream processor
- Using stream processors for face searching (Java V2 example)
- Using stream processors for face searching (Java V1 example)
- Reading streaming video analysis results
- Displaying Rekognition results with Kinesis Video Streams locally
- Understanding the Kinesis face recognition JSON frame record

The following diagram shows how Amazon Rekognition Video detects and recognizes faces in a streaming video.



Creating the Amazon Rekognition Video face search stream processor

Before you can analyze a streaming video, you create an Amazon Rekognition Video stream processor (CreateStreamProcessor). The stream processor contains information about the Kinesis data stream and the Kinesis video stream. It also contains the identifier for the collection that contains the faces you want to recognize in the input streaming video. You also specify a name for the stream processor. The following is a JSON example for the `CreateStreamProcessor` request.

```
{
       "Name": "streamProcessorForCam",
       "Input": {
              "KinesisVideoStream": {
```

```
                    "Arn": "arn:aws:kinesisvideo:us-east-1:nnnnnnnnnnnn:stream/
inputVideo"
                }
        },
        "Output": {
                "KinesisDataStream": {
                        "Arn": "arn:aws:kinesis:us-east-1:nnnnnnnnnnnn:stream/outputData"
                }
        },
        "RoleArn": "arn:aws:iam::nnnnnnnnnnn:role/roleWithKinesisPermission",
        "Settings": {
                "FaceSearch": {
                        "CollectionId": "collection-with-100-faces",
                        "FaceMatchThreshold": 85.5
                }
        }
}
```

The following is an example response from `CreateStreamProcessor`.

```
{
        “StreamProcessorArn”: “arn:aws:rekognition:us-
east-1:nnnnnnnnnnnn:streamprocessor/streamProcessorForCam”
}
```

Starting the Amazon Rekognition Video face search stream processor

You start analyzing streaming video by calling StartStreamProcessor with the stream processor name that you specified in `CreateStreamProcessor`. The following is a JSON example for the `StartStreamProcessor` request.

```
{
        "Name": "streamProcessorForCam"
}
```

If the stream processor successfully starts, an HTTP 200 response is returned, along with an empty JSON body.

Using stream processors for face searching (Java V2 example)

The following example code shows how to call various stream processor operations, such as CreateStreamProcessor and StartStreamProcessor, using the AWS SDK for Java version 2.

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.CreateStreamProcessorRequest;
import software.amazon.awssdk.services.rekognition.model.CreateStreamProcessorResponse;
import software.amazon.awssdk.services.rekognition.model.FaceSearchSettings;
import software.amazon.awssdk.services.rekognition.model.KinesisDataStream;
import software.amazon.awssdk.services.rekognition.model.KinesisVideoStream;
import software.amazon.awssdk.services.rekognition.model.ListStreamProcessorsRequest;
import software.amazon.awssdk.services.rekognition.model.ListStreamProcessorsResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.StreamProcessor;
import software.amazon.awssdk.services.rekognition.model.StreamProcessorInput;
import software.amazon.awssdk.services.rekognition.model.StreamProcessorSettings;
import software.amazon.awssdk.services.rekognition.model.StreamProcessorOutput;
import software.amazon.awssdk.services.rekognition.model.StartStreamProcessorRequest;
import
 software.amazon.awssdk.services.rekognition.model.DescribeStreamProcessorRequest;
import
 software.amazon.awssdk.services.rekognition.model.DescribeStreamProcessorResponse;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 * <p>
 * For more information, see the following documentation topic:
 * <p>
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-started.html
 */
public class CreateStreamProcessor {
    public static void main(String[] args) {
        final String usage = """

                Usage:    <role> <kinInputStream> <kinOutputStream> <collectionName>
 <StreamProcessorName>

                Where:
                   role - The ARN of the AWS Identity and Access Management (IAM) role
 to use. \s
                   kinInputStream - The ARN of the Kinesis video stream.\s
```

```
                    kinOutputStream - The ARN of the Kinesis data stream.\s
                    collectionName - The name of the collection to use that contains
content. \s
                    StreamProcessorName - The name of the Stream Processor. \s
                """;

        if (args.length != 5) {
            System.out.println(usage);
            System.exit(1);
        }

        String role = args[0];
        String kinInputStream = args[1];
        String kinOutputStream = args[2];
        String collectionName = args[3];
        String streamProcessorName = args[4];

        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        processCollection(rekClient, streamProcessorName, kinInputStream,
kinOutputStream, collectionName,
                role);
        startSpecificStreamProcessor(rekClient, streamProcessorName);
        listStreamProcessors(rekClient);
        describeStreamProcessor(rekClient, streamProcessorName);
        deleteSpecificStreamProcessor(rekClient, streamProcessorName);
    }

    public static void listStreamProcessors(RekognitionClient rekClient) {
        ListStreamProcessorsRequest request = ListStreamProcessorsRequest.builder()
                .maxResults(15)
                .build();

        ListStreamProcessorsResponse listStreamProcessorsResult =
rekClient.listStreamProcessors(request);
        for (StreamProcessor streamProcessor :
listStreamProcessorsResult.streamProcessors()) {
            System.out.println("StreamProcessor name - " + streamProcessor.name());
            System.out.println("Status - " + streamProcessor.status());
        }
    }
```

```
   private static void describeStreamProcessor(RekognitionClient rekClient, String
StreamProcessorName) {
       DescribeStreamProcessorRequest streamProcessorRequest =
DescribeStreamProcessorRequest.builder()
               .name(StreamProcessorName)
               .build();

       DescribeStreamProcessorResponse describeStreamProcessorResult = rekClient
               .describeStreamProcessor(streamProcessorRequest);
       System.out.println("Arn - " +
describeStreamProcessorResult.streamProcessorArn());
       System.out.println("Input kinesisVideo stream - "
               + describeStreamProcessorResult.input().kinesisVideoStream().arn());
       System.out.println("Output kinesisData stream - "
               + describeStreamProcessorResult.output().kinesisDataStream().arn());
       System.out.println("RoleArn - " + describeStreamProcessorResult.roleArn());
       System.out.println(
               "CollectionId - "
                       +
describeStreamProcessorResult.settings().faceSearch().collectionId());
       System.out.println("Status - " + describeStreamProcessorResult.status());
       System.out.println("Status message - " +
describeStreamProcessorResult.statusMessage());
       System.out.println("Creation timestamp - " +
describeStreamProcessorResult.creationTimestamp());
       System.out.println("Last update timestamp - " +
describeStreamProcessorResult.lastUpdateTimestamp());
   }

   private static void startSpecificStreamProcessor(RekognitionClient rekClient,
String StreamProcessorName) {
       try {
           StartStreamProcessorRequest streamProcessorRequest =
StartStreamProcessorRequest.builder()
                   .name(StreamProcessorName)
                   .build();

           rekClient.startStreamProcessor(streamProcessorRequest);
           System.out.println("Stream Processor " + StreamProcessorName + "
started.");

       } catch (RekognitionException e) {
           System.out.println(e.getMessage());
```

```
            System.exit(1);
        }
    }

    private static void processCollection(RekognitionClient rekClient, String
StreamProcessorName,
                                          String kinInputStream, String
kinOutputStream, String collectionName, String role) {
        try {
            KinesisVideoStream videoStream = KinesisVideoStream.builder()
                    .arn(kinInputStream)
                    .build();

            KinesisDataStream dataStream = KinesisDataStream.builder()
                    .arn(kinOutputStream)
                    .build();

            StreamProcessorOutput processorOutput = StreamProcessorOutput.builder()
                    .kinesisDataStream(dataStream)
                    .build();

            StreamProcessorInput processorInput = StreamProcessorInput.builder()
                    .kinesisVideoStream(videoStream)
                    .build();

            FaceSearchSettings searchSettings = FaceSearchSettings.builder()
                    .faceMatchThreshold(75f)
                    .collectionId(collectionName)
                    .build();

            StreamProcessorSettings processorSettings =
StreamProcessorSettings.builder()
                    .faceSearch(searchSettings)
                    .build();

            CreateStreamProcessorRequest processorRequest =
CreateStreamProcessorRequest.builder()
                    .name(StreamProcessorName)
                    .input(processorInput)
                    .output(processorOutput)
                    .roleArn(role)
                    .settings(processorSettings)
                    .build();
```

```
            CreateStreamProcessorResponse response =
 rekClient.createStreamProcessor(processorRequest);
            System.out.println("The ARN for the newly create stream processor is "
                    + response.streamProcessorArn());

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }

    private static void deleteSpecificStreamProcessor(RekognitionClient rekClient,
 String StreamProcessorName) {
        rekClient.stopStreamProcessor(a -> a.name(StreamProcessorName));
        rekClient.deleteStreamProcessor(a -> a.name(StreamProcessorName));
        System.out.println("Stream Processor " + StreamProcessorName + " deleted.");
    }
}
```

Using stream processors for face searching (Java V1 example)

The following example code shows how to call various stream processor operations, such as CreateStreamProcessor and StartStreamProcessor, using Java V1. The example includes a stream processor manager class (StreamManager) that provides methods to call stream processor operations. The starter class (Starter) creates a StreamManager object and calls various operations.

To configure the example:

1. Set the values of the Starter class member fields to your desired values.
2. In the Starter class function `main`, uncomment the desired function call.

Starter class

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-
rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

// Starter class. Use to create a StreamManager class
// and call stream processor operations.
package com.amazonaws.samples;
import com.amazonaws.samples.*;
```

```
public class Starter {

 public static void main(String[] args) {


     String streamProcessorName="Stream Processor Name";
     String kinesisVideoStreamArn="Kinesis Video Stream Arn";
     String kinesisDataStreamArn="Kinesis Data Stream Arn";
     String roleArn="Role Arn";
     String collectionId="Collection ID";
     Float matchThreshold=50F;

  try {
   StreamManager sm= new StreamManager(streamProcessorName,
     kinesisVideoStreamArn,
     kinesisDataStreamArn,
     roleArn,
     collectionId,
     matchThreshold);
   //sm.createStreamProcessor();
   //sm.startStreamProcessor();
   //sm.deleteStreamProcessor();
   //sm.deleteStreamProcessor();
   //sm.stopStreamProcessor();
   //sm.listStreamProcessors();
   //sm.describeStreamProcessor();
  }
  catch(Exception e){
   System.out.println(e.getMessage());
  }
 }
}
```

StreamManager class

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-
rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

// Stream manager class. Provides methods for calling
// Stream Processor operations.
```

```
package com.amazonaws.samples;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.CreateStreamProcessorRequest;
import com.amazonaws.services.rekognition.model.CreateStreamProcessorResult;
import com.amazonaws.services.rekognition.model.DeleteStreamProcessorRequest;
import com.amazonaws.services.rekognition.model.DeleteStreamProcessorResult;
import com.amazonaws.services.rekognition.model.DescribeStreamProcessorRequest;
import com.amazonaws.services.rekognition.model.DescribeStreamProcessorResult;
import com.amazonaws.services.rekognition.model.FaceSearchSettings;
import com.amazonaws.services.rekognition.model.KinesisDataStream;
import com.amazonaws.services.rekognition.model.KinesisVideoStream;
import com.amazonaws.services.rekognition.model.ListStreamProcessorsRequest;
import com.amazonaws.services.rekognition.model.ListStreamProcessorsResult;
import com.amazonaws.services.rekognition.model.StartStreamProcessorRequest;
import com.amazonaws.services.rekognition.model.StartStreamProcessorResult;
import com.amazonaws.services.rekognition.model.StopStreamProcessorRequest;
import com.amazonaws.services.rekognition.model.StopStreamProcessorResult;
import com.amazonaws.services.rekognition.model.StreamProcessor;
import com.amazonaws.services.rekognition.model.StreamProcessorInput;
import com.amazonaws.services.rekognition.model.StreamProcessorOutput;
import com.amazonaws.services.rekognition.model.StreamProcessorSettings;

public class StreamManager {

    private String streamProcessorName;
    private String kinesisVideoStreamArn;
    private String kinesisDataStreamArn;
    private String roleArn;
    private String collectionId;
    private float matchThreshold;

    private AmazonRekognition rekognitionClient;


    public StreamManager(String spName,
      String kvStreamArn,
      String kdStreamArn,
      String iamRoleArn,
      String collId,
      Float threshold){
     streamProcessorName=spName;
     kinesisVideoStreamArn=kvStreamArn;
```

```
     kinesisDataStreamArn=kdStreamArn;
     roleArn=iamRoleArn;
     collectionId=collId;
     matchThreshold=threshold;
     rekognitionClient=AmazonRekognitionClientBuilder.defaultClient();

    }

    public void createStreamProcessor() {
     //Setup input parameters
        KinesisVideoStream kinesisVideoStream = new
KinesisVideoStream().withArn(kinesisVideoStreamArn);
        StreamProcessorInput streamProcessorInput =
                new StreamProcessorInput().withKinesisVideoStream(kinesisVideoStream);
        KinesisDataStream kinesisDataStream = new
KinesisDataStream().withArn(kinesisDataStreamArn);
        StreamProcessorOutput streamProcessorOutput =
                new StreamProcessorOutput().withKinesisDataStream(kinesisDataStream);
        FaceSearchSettings faceSearchSettings =
                new
FaceSearchSettings().withCollectionId(collectionId).withFaceMatchThreshold(matchThreshold);
        StreamProcessorSettings streamProcessorSettings =
                new StreamProcessorSettings().withFaceSearch(faceSearchSettings);

        //Create the stream processor
        CreateStreamProcessorResult createStreamProcessorResult =
rekognitionClient.createStreamProcessor(
                new
CreateStreamProcessorRequest().withInput(streamProcessorInput).withOutput(streamProcessorOutpu

.withSettings(streamProcessorSettings).withRoleArn(roleArn).withName(streamProcessorName));

        //Display result
        System.out.println("Stream Processor " + streamProcessorName + " created.");
        System.out.println("StreamProcessorArn - " +
createStreamProcessorResult.getStreamProcessorArn());
    }

    public void startStreamProcessor() {
        StartStreamProcessorResult startStreamProcessorResult =
                rekognitionClient.startStreamProcessor(new
StartStreamProcessorRequest().withName(streamProcessorName));
        System.out.println("Stream Processor " + streamProcessorName + " started.");
    }
```

```
   public void stopStreamProcessor() {
       StopStreamProcessorResult stopStreamProcessorResult =
               rekognitionClient.stopStreamProcessor(new
StopStreamProcessorRequest().withName(streamProcessorName));
       System.out.println("Stream Processor " + streamProcessorName + " stopped.");
   }

   public void deleteStreamProcessor() {
       DeleteStreamProcessorResult deleteStreamProcessorResult = rekognitionClient
               .deleteStreamProcessor(new
DeleteStreamProcessorRequest().withName(streamProcessorName));
       System.out.println("Stream Processor " + streamProcessorName + " deleted.");
   }

   public void describeStreamProcessor() {
       DescribeStreamProcessorResult describeStreamProcessorResult = rekognitionClient
               .describeStreamProcessor(new
DescribeStreamProcessorRequest().withName(streamProcessorName));

       //Display various stream processor attributes.
       System.out.println("Arn - " +
describeStreamProcessorResult.getStreamProcessorArn());
       System.out.println("Input kinesisVideo stream - "
               +
describeStreamProcessorResult.getInput().getKinesisVideoStream().getArn());
       System.out.println("Output kinesisData stream - "
               +
describeStreamProcessorResult.getOutput().getKinesisDataStream().getArn());
       System.out.println("RoleArn - " + describeStreamProcessorResult.getRoleArn());
       System.out.println(
               "CollectionId - " +
describeStreamProcessorResult.getSettings().getFaceSearch().getCollectionId());
       System.out.println("Status - " + describeStreamProcessorResult.getStatus());
       System.out.println("Status message - " +
describeStreamProcessorResult.getStatusMessage());
       System.out.println("Creation timestamp - " +
describeStreamProcessorResult.getCreationTimestamp());
       System.out.println("Last update timestamp - " +
describeStreamProcessorResult.getLastUpdateTimestamp());
   }

   public void listStreamProcessors() {
       ListStreamProcessorsResult listStreamProcessorsResult =
```

```
                rekognitionClient.listStreamProcessors(new
 ListStreamProcessorsRequest().withMaxResults(100));

        //List all stream processors (and state) returned from Rekognition
        for (StreamProcessor streamProcessor :
 listStreamProcessorsResult.getStreamProcessors()) {
            System.out.println("StreamProcessor name - " + streamProcessor.getName());
            System.out.println("Status - " + streamProcessor.getStatus());
        }
    }
}
```

Reading streaming video analysis results

You can use the Amazon Kinesis Data Streams Client Library to consume analysis results that are sent to the Amazon Kinesis Data Streams output stream. For more information, see Reading Data from a Kinesis Data Stream. Amazon Rekognition Video places a JSON frame record for each analyzed frame into the Kinesis output stream. Amazon Rekognition Video doesn't analyze every frame that's passed to it through the Kinesis video stream.

A frame record that's sent to a Kinesis data stream contains information about which Kinesis video stream fragment the frame is in, where the frame is in the fragment, and faces that are recognized in the frame. It also includes status information for the stream processor. For more information, see Understanding the Kinesis face recognition JSON frame record.

The Amazon Kinesis Video Streams Parser Library contains example tests that consume Amazon Rekognition Video results and integrates it with the original Kinesis video stream. For more information, see Displaying Rekognition results with Kinesis Video Streams locally.

Amazon Rekognition Video streams Amazon Rekognition Video analysis information to the Kinesis data stream. The following is a JSON example for a single record.

```
{
  "InputInformation": {
    "KinesisVideo": {
      "StreamArn": "arn:aws:kinesisvideo:us-west-2:nnnnnnnnnnnn:stream/stream-name",
      "FragmentNumber": "91343852333289682796718532614445757584843717598",
      "ServerTimestamp": 1510552593.455,
      "ProducerTimestamp": 1510552593.193,
      "FrameOffsetInSeconds": 2
    }
  },
```

```
  "StreamProcessorInformation": {
    "Status": "RUNNING"
  },
  "FaceSearchResponse": [
    {
      "DetectedFace": {
        "BoundingBox": {
          "Height": 0.075,
          "Width": 0.05625,
          "Left": 0.428125,
          "Top": 0.40833333
        },
        "Confidence": 99.975174,
        "Landmarks": [
          {
            "X": 0.4452057,
            "Y": 0.4395594,
            "Type": "eyeLeft"
          },
          {
            "X": 0.46340984,
            "Y": 0.43744427,
            "Type": "eyeRight"
          },
          {
            "X": 0.45960626,
            "Y": 0.4526856,
            "Type": "nose"
          },
          {
            "X": 0.44958648,
            "Y": 0.4696949,
            "Type": "mouthLeft"
          },
          {
            "X": 0.46409217,
            "Y": 0.46704912,
            "Type": "mouthRight"
          }
        ],
        "Pose": {
          "Pitch": 2.9691637,
          "Roll": -6.8904796,
          "Yaw": 23.84388
```

```
        },
        "Quality": {
          "Brightness": 40.592964,
          "Sharpness": 96.09616
        }
      },
      "MatchedFaces": [
        {
          "Similarity": 88.863960,
          "Face": {
            "BoundingBox": {
              "Height": 0.557692,
              "Width": 0.749838,
              "Left": 0.103426,
              "Top": 0.206731
            },
            "FaceId": "ed1b560f-d6af-5158-989a-ff586c931545",
            "Confidence": 99.999201,
            "ImageId": "70e09693-2114-57e1-807c-50b6d61fa4dc",
            "ExternalImageId": "matchedImage.jpeg"
          }
        }
      ]
    }
  ]
}
```


In the JSON example, note the following:

- **InputInformation** – Information about the Kinesis video stream that's used to stream video into Amazon Rekognition Video. For more information, see InputInformation.
- **StreamProcessorInformation** – Status information for the Amazon Rekognition Video stream processor. The only possible value for the `Status` field is RUNNING. For more information, see StreamProcessorInformation.
- **FaceSearchResponse** – Contains information about faces in the streaming video that match faces in the input collection. FaceSearchResponse contains a DetectedFace object, which is a face that was detected in the analyzed video frame. For each detected face, the array `MatchedFaces` contains an array of matching face objects (MatchedFace) found in the input collection, along with a similarity score.

Mapping the Kinesis video stream to the Kinesis data stream

You might want to map the Kinesis video stream frames to the analyzed frames that are sent to the Kinesis data stream. For example, during the display of a streaming video, you might want to display boxes around the faces of recognized people. The bounding box coordinates are sent as part of the Kinesis Face Recognition Record to the Kinesis data stream. To display the bounding box correctly, you need to map the time information that's sent with the Kinesis Face Recognition Record with the corresponding frames in the source Kinesis video stream.

The technique that you use to map the Kinesis video stream to the Kinesis data stream depends on if you're streaming live media (such as a live streaming video), or if you're streaming archived media (such as a stored video).

Mapping when you're streaming live media

To map a Kinesis video stream frame to a Kinesis data stream frame

1. Set the input parameter `FragmentTimeCodeType` of the PutMedia operation to `RELATIVE`.
2. Call `PutMedia` to deliver live media into the Kinesis video stream.
3. When you receive a Kinesis Face Recognition Record from the Kinesis data stream, store the values of `ProducerTimestamp` and `FrameOffsetInSeconds` from the KinesisVideo field.
4. Calculate the time stamp that corresponds to the Kinesis video stream frame by adding the `ProducerTimestamp` and `FrameOffsetInSeconds` field values together.

Mapping when you're streaming archived media

To map a Kinesis video stream frame to a Kinesis data stream frame

1. Call PutMedia to deliver archived media into the Kinesis video stream.
2. When you receive an `Acknowledgement` object from the `PutMedia` operation response, store the `FragmentNumber` field value from the Payload field. `FragmentNumber` is the fragment number for the MKV cluster.
3. When you receive a Kinesis Face Recognition Record from the Kinesis data stream, store the `FrameOffsetInSeconds` field value from the KinesisVideo field.
4. Calculate the mapping by using the `FrameOffsetInSeconds` and `FragmentNumber` values that you stored in steps 2 and 3. `FrameOffsetInSeconds` is the offset into the fragment with the specific `FragmentNumber` that's sent to the Amazon Kinesis data stream. For more

information about getting the video frames for a given fragment number, see Amazon Kinesis Video Streams Archived Media.

Displaying Rekognition results with Kinesis Video Streams locally

You can see the results of Amazon Rekognition Video displayed in your feed from Amazon Kinesis Video Streams using the Amazon Kinesis Video Streams Parser Library's example tests provided at KinesisVideo - Rekognition Examples. The `KinesisVideoRekognitionIntegrationExample` displays bounding boxes over detected faces and renders the video locally through JFrame. This process assumes you have successfully connected a media input from a device camera to a Kinesis video stream and started an Amazon Rekognition Stream Processor. For more information, see Streaming using a GStreamer plugin.

Step 1: Installing Kinesis Video Streams Parser Library

To create a directory and download the Github repository, run the following command:

```
$ git clone https://github.com/aws/amazon-kinesis-video-streams-parser-library.git
```

Navigate to the library directory and run the following Maven command to perform a clean installation:

```
$ mvn clean install
```

Step 2: Configuring the Kinesis Video Streams and Rekognition integration example test

Open the `KinesisVideoRekognitionIntegrationExampleTest.java` file. Remove the `@Ignore` right after the class header. Populate the data fields with the information from your Amazon Kinesis and Amazon Rekognition resources. For more information, see Setting up your Amazon Rekognition Video and Amazon Kinesis resources. If you are streaming video to your Kinesis video stream, remove the `inputStream` parameter.

See the following code example:

```
RekognitionInput rekognitionInput = RekognitionInput.builder()
  .kinesisVideoStreamArn("arn:aws:kinesisvideo:us-east-1:123456789012:stream/
rekognition-test-video-stream")
```

```
  .kinesisDataStreamArn("arn:aws:kinesis:us-east-1:123456789012:stream/
AmazonRekognition-rekognition-test-data-stream")
  .streamingProcessorName("rekognition-test-stream-processor")
  // Refer how to add face collection :
  // https://docs.aws.amazon.com/rekognition/latest/dg/add-faces-to-collection-
procedure.html
  .faceCollectionId("rekognition-test-face-collection")
  .iamRoleArn("rekognition-test-IAM-role")
  .matchThreshold(0.95f)
  .build();

KinesisVideoRekognitionIntegrationExample example =
 KinesisVideoRekognitionIntegrationExample.builder()
  .region(Regions.US_EAST_1)
  .kvsStreamName("rekognition-test-video-stream")
  .kdsStreamName("AmazonRekognition-rekognition-test-data-stream")
  .rekognitionInput(rekognitionInput)
  .credentialsProvider(new ProfileCredentialsProvider())
  // NOTE: Comment out or delete the inputStream parameter if you are streaming video,
 otherwise
  // the test will use a sample video.
  //.inputStream(TestResourceUtil.getTestInputStream("bezos_vogels.mkv"))
  .build();
```

Step 3: Running the Kinesis Video Streams and Rekognition integration example test

Ensure that your Kinesis video stream is receiving media input if you are streaming to it and start analyzing your stream with an Amazon Rekognition Video Stream Processor running. For more information, see Overview of Amazon Rekognition Video stream processor operations. Run the `KinesisVideoRekognitionIntegrationExampleTest` class as a JUnit test. After a short delay, a new window opens with a video feed from your Kinesis video stream with bounding boxes drawn over detected faces.

> **Note**
>
> The faces in the collection used in this example must have External Image Id (the file name) specified in this format in order for bounding box labels to display meaningful text: PersonName1-Trusted, PersonName2-Intruder, PersonName3-Neutral, etc. The labels can also be color-coded and are customizable in the FaceType.java file.

Understanding the Kinesis face recognition JSON frame record

Amazon Rekognition Video can recognize faces in a streaming video. For each analyzed frame, Amazon Rekognition Video outputs a JSON frame record to a Kinesis data stream. Amazon Rekognition Video doesn't analyze every frame that's passed to it through the Kinesis video stream.

The JSON frame record contains information about the input and output stream, the status of the stream processor, and information about faces that are recognized in the analyzed frame. This section contains reference information for the JSON frame record.

The following is the JSON syntax for a Kinesis data stream record. For more information, see Working with streaming video events.

> **Note**
>
> The Amazon Rekognition Video API works by comparing the faces in your input stream to a collection of faces, and returning the closest found matches, along with a similarity score.

```
{
    "InputInformation": {
        "KinesisVideo": {
            "StreamArn": "string",
            "FragmentNumber": "string",
            "ProducerTimestamp": number,
            "ServerTimestamp": number,
            "FrameOffsetInSeconds": number
        }
    },
    "StreamProcessorInformation": {
        "Status": "RUNNING"
    },
    "FaceSearchResponse": [
        {
            "DetectedFace": {
                "BoundingBox": {
                    "Width": number,
                    "Top": number,
                    "Height": number,
                    "Left": number
                },
                "Confidence": number,
```

```
                "Landmarks": [
                    {
                        "Type": "string",
                        "X": number,
                        "Y": number
                    }
                ],
                "Pose": {
                    "Pitch": number,
                    "Roll": number,
                    "Yaw": number
                },
                "Quality": {
                    "Brightness": number,
                    "Sharpness": number
                }
            },
            "MatchedFaces": [
                {
                    "Similarity": number,
                    "Face": {
                        "BoundingBox": {
                            "Width": number,
                            "Top": number,
                            "Height": number,
                            "Left": number
                        },
                        "Confidence": number,
                        "ExternalImageId": "string",
                        "FaceId": "string",
                        "ImageId": "string"
                    }
                }
            ]
        }
    ]
}
```

JSON record

The JSON record includes information about a frame that's processed by Amazon Rekognition Video. The record includes information about the streaming video, the status for the analyzed frame, and information about faces that are recognized in the frame.

InputInformation

Information about the Kinesis video stream that's used to stream video into Amazon Rekognition Video.

Type: InputInformation object

StreamProcessorInformation

Information about the Amazon Rekognition Video stream processor. This includes status information for the current status of the stream processor.

Type: StreamProcessorInformation object

FaceSearchResponse

Information about the faces detected in a streaming video frame and the matching faces found in the input collection.

Type: FaceSearchResponse object array

InputInformation

Information about a source video stream that's used by Amazon Rekognition Video. For more information, see Working with streaming video events.

KinesisVideo

Type: KinesisVideo object

KinesisVideo

Information about the Kinesis video stream that streams the source video into Amazon Rekognition Video. For more information, see Working with streaming video events.

StreamArn

The Amazon Resource Name (ARN) of the Kinesis video stream.

Type: String

FragmentNumber

The fragment of streaming video that contains the frame that this record represents.

Type: String

ProducerTimestamp

The producer-side Unix time stamp of the fragment. For more information, see PutMedia.

Type: Number

ServerTimestamp

The server-side Unix time stamp of the fragment. For more information, see PutMedia.

Type: Number

FrameOffsetInSeconds

The offset of the frame (in seconds) inside the fragment.

Type: Number

StreamProcessorInformation

Status information about the stream processor.

Status

The current status of the stream processor. The one possible value is RUNNING.

Type: String

FaceSearchResponse

Information about a face detected in a streaming video frame and the faces in a collection that match the detected face. You specify the collection in a call to CreateStreamProcessor. For more information, see Working with streaming video events.

DetectedFace

Face details for a face detected in an analyzed video frame.

Type: DetectedFace object

MatchedFaces

An array of face details for faces in a collection that matches the face detected in `DetectedFace`.

Type: MatchedFace object array

DetectedFace

Information about a face that's detected in a streaming video frame. Matching faces in the input collection are available in MatchedFace object field.

BoundingBox

The bounding box coordinates for a face that's detected within an analyzed video frame. The BoundingBox object has the same properties as the BoundingBox object that's used for image analysis.

Type: BoundingBox object

Confidence

The confidence level (1-100) that Amazon Rekognition Video has that the detected face is actually a face. 1 is the lowest confidence, 100 is the highest.

Type: Number

Landmarks

An array of facial landmarks.

Type: Landmark object array

Pose

Indicates the pose of the face as determined by its pitch, roll, and yaw.

Type: Pose object

Quality

Identifies face image brightness and sharpness.

Type: ImageQuality object

MatchedFace

Information about a face that matches a face detected in an analyzed video frame.

Face

Face match information for a face in the input collection that matches the face in the DetectedFace object.

Type: Face object

Similarity

The level of confidence (1-100) that the faces match. 1 is the lowest confidence, 100 is the highest.

Type: Number

Streaming using a GStreamer plugin

Amazon Rekognition Video can analyze a live streaming video from a device camera. To access media input from a device source, you need to install GStreamer. GStreamer is a third-party multimedia framework software that connects media sources and processing tools together in workflow pipelines. You also need to install the Amazon Kinesis Video Streams Producer Plugin for Gstreamer. This process assumes that you have successfully set up your Amazon Rekognition Video and Amazon Kinesis resources. For more information, see Setting up your Amazon Rekognition Video and Amazon Kinesis resources.

Step 1: Install Gstreamer

Download and install Gstreamer, a third-party multi-media platform software. You can use a package management software like Homebrew (Gstreamer on Homebrew) or get it directly from the Freedesktop website.

Verify the successful installation of Gstreamer by launching a video feed with a test source from your command line terminal.

```
$ gst-launch-1.0 videotestsrc ! autovideosink
```

Step 2: Install the Kinesis Video Streams Producer plugin

In this section, you will download the Amazon Kinesis Video Streams Producer Library and install the Kinesis Video Streams Gstreamer plugin.

Create a directory and clone the source code from the Github repository. Be sure to include the `--recursive` parameter.

```
$ git clone --recursive https://github.com/awslabs/amazon-kinesis-video-streams-producer-sdk-cpp.git
```

Follow the instructions provided by the library to configure and build the project. Make sure you use the platform-specific commands for your operating system. Use the `-DBUILD_GSTREAMER_PLUGIN=ON` parameter when you run `cmake` to install the Kinesis Video Streams Gstreamer plugin. This project requires the following additional packages that are included in the installation: GCC or Clang, Curl, Openssl and Log4cplus. If your build fails because of a missing package, verify that the package is installed and in your PATH. If you encounter a "can't run C compiled program" error while building, run the build command again. Sometimes, the correct C compiler is not found.

Verify the installation of the Kinesis Video Streams plugin by running the following command.

```
$ gst-inspect-1.0 kvssink
```

The following information, such as factory and plugin details, should appear:

```
Factory Details:
  Rank                     primary + 10 (266)
  Long-name                KVS Sink
  Klass                    Sink/Video/Network
  Description              GStreamer AWS KVS plugin
  Author                   AWS KVS <kinesis-video-support@amazon.com>

Plugin Details:
  Name                     kvssink
  Description              GStreamer AWS KVS plugin
  Filename                 /Users/YOUR_USER/amazon-kinesis-video-streams-producer-sdk-cpp/build/libgstkvssink.so
  Version                  1.0
```

```
  License                  Proprietary
  Source module            kvssinkpackage
  Binary package           GStreamer
  Origin URL               http://gstreamer.net/

  ...
```

Step 3: Run Gstreamer with the Kinesis Video Streams plugin

Before you begin streaming from a device camera to Kinesis Video Streams, you might need to convert the media source to an acceptable codec for Kinesis Video Streams. To determine the specifications and format capabilities of devices currently connected to your machine, run the following command.

```
$ gst-device-monitor-1.0
```

To begin streaming, launch Gstreamer with the following sample command and add your credentials and Amazon Kinesis Video Streams information. You should use the access keys and region for the IAM service role you created while giving Amazon Rekognition access to your Kinesis streams. For more information on access keys, see Managing Access Keys for IAM Users in the *IAM User Guide*. Also, you may adjust the video format argument parameters as required by your usage and available from your device.

```
$ gst-launch-1.0 autovideosrc device=/dev/video0 ! videoconvert ! video/x-
raw,format=I420,width=640,height=480,framerate=30/1 !
                x264enc bframes=0 key-int-max=45 bitrate=500 ! video/x-h264,stream-
format=avc,alignment=au,profile=baseline !
                kvssink stream-name="YOUR_STREAM_NAME" storage-size=512 access-
key="YOUR_ACCESS_KEY" secret-key="YOUR_SECRET_ACCESS_KEY" aws-region="YOUR_AWS_REGION"
```

For more launch commands, see Example GStreamer Launch Commands.

> **Note**
>
> If your launch command terminates with a non-negotiation error, check the output from the Device Monitor and make sure that the `videoconvert` parameter values are valid capabilities of your device.

You will see a video feed from your device camera on your Kinesis video stream after a few seconds. To begin detecting and matching faces with Amazon Rekognition, start your Amazon Rekognition Video stream processor. For more information, see Overview of Amazon Rekognition Video stream processor operations.

Troubleshooting streaming video

This topic provides troubleshooting information for using Amazon Rekognition Video with streaming videos.

Topics

- I don't know if my stream processor was successfully created
- I don't know if I've configured my stream processor correctly
- My stream processor isn't returning results
- The state of my stream processor is FAILED
- My stream processor isn't returning the expected results

I don't know if my stream processor was successfully created

Use the following AWS CLI command to get a list of stream processors and their current status.

```
aws rekognition list-stream-processors
```

You can get additional details by using the following AWS CLI command. Replace `stream-processor-name` with the name of the required stream processor.

```
aws rekognition describe-stream-processor --name stream-processor-name
```

I don't know if I've configured my stream processor correctly

If your code isn't outputting the analysis results from Amazon Rekognition Video, your stream processor might not be configured correctly. Do the following to confirm that your stream processor is configured correctly and able to produce results.

To determine if your solution is configured correctly

1. Run the following command to confirm that your stream processor is in the running state. Change `stream-processor-name` to the name of your stream processor. The stream

processor is running if the value of `Status` is `RUNNING`. If the status is `RUNNING` and you aren't getting results, see My stream processor isn't returning results. If the status is `FAILED`, see The state of my stream processor is FAILED.

```
aws rekognition describe-stream-processor --name stream-processor-name
```

2. If your stream processor is running, run the following Bash or PowerShell command to read data from the output Kinesis data stream.

   Bash

   ```
   SHARD_ITERATOR=$(aws kinesis get-shard-iterator --shard-id shardId-000000000000
    --shard-iterator-type TRIM_HORIZON --stream-name kinesis-data-stream-name --query
    'ShardIterator')
                           aws kinesis get-records --shard-iterator $SHARD_ITERATOR
   ```

   PowerShell

   ```
   aws kinesis get-records --shard-iterator ((aws kinesis get-shard-iterator --shard-
   id shardId-000000000000 --shard-iterator-type TRIM_HORIZON --stream-name kinesis-
   data-stream-name).split('"')[4])
   ```

3. Use the Decode tool on the Base64 Decode website to decode the output into a human-readable string. For more information, see Step 3: Get the Record.
4. If the commands work and you see face detection results in the Kinesis data stream, then your solution is properly configured. If the command fails, check the other troubleshooting suggestions and see Giving Amazon Rekognition Video access to your resources.

Alternatively, you can use the "kinesis-process-record" AWS Lambda blueprint to log messages from the Kinesis data stream to CloudWatch for continuous visualization. This incurs additional costs for AWS Lambda and CloudWatch.

My stream processor isn't returning results

Your stream processor might not return results for several reasons.

Reason 1: Your stream processor isn't configured correctly

Your stream processor might not be configured correctly. For more information, see I don't know if I've configured my stream processor correctly.

Reason 2: Your stream processor isn't in the RUNNING state

To troubleshoot the status of a stream processor

1. Check the status of the stream processor with the following AWS CLI command.

```
aws rekognition describe-stream-processor --name stream-processor-name
```

2. If the value of `Status` is `STOPPED`, start your stream processor with the following command:

```
aws rekognition start-stream-processor --name stream-processor-name
```

3. If the value of `Status` is `FAILED`, see The state of my stream processor is FAILED.
4. If the value of `Status` is `STARTING`, wait for 2 minutes and check the status by repeating step 1. If the value of Status is still `STARTING`, do the following:

   a. Delete the stream processor with the following command.

```
aws rekognition delete-stream-processor --name stream-processor-name
```

   b. Create a new stream processor with the same configuration. For more information, see Working with streaming video events.

   c. If you're still having problems, contact AWS Support.
5. If the value of `Status` is `RUNNING`, see Reason 3: There isn't active data in the Kinesis video stream.

Reason 3: There isn't active data in the Kinesis video stream

To check if there's active data in the Kinesis video stream

1. Sign in to the AWS Management Console, and open the Amazon Kinesis Video Streams console at https://console.aws.amazon.com/kinesisvideo/.
2. Select the Kinesis video stream that's the input for the Amazon Rekognition stream processor.
3. If the preview states **No data on stream**, then there's no data in the input stream for Amazon Rekognition Video to process.

For information about producing video with Kinesis Video Streams, see Kinesis Video Streams Producer Libraries.

The state of my stream processor is FAILED

You can check the state of a stream processor by using the following AWS CLI command.

```
aws rekognition describe-stream-processor --name stream-processor-name
```

If the value of Status is FAILED, check the troubleshooting information for the following error messages.

Error: "Access denied to Role"

The IAM role that's used by the stream processor doesn't exist or Amazon Rekognition Video doesn't have permission to assume the role.

To troubleshoot access to the IAM role

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. From the left navigation pane, choose **Roles**and confirm that the role exists.
3. If the role exists, check that the role has the *AmazonRekognitionServiceRole* permissions policy.
4. If the role doesn't exist or doesn't have the right permissions, see Giving Amazon Rekognition Video access to your resources.
5. Start the stream processor with the following AWS CLI command.

   ```
   aws rekognition start-stream-processor --name stream-processor-name
   ```

Error: "Access denied to Kinesis Video *or* Access denied to Kinesis Data"

The role doesn't have access to the Kinesis Video Streams API operations `GetMedia` and `GetDataEndpoint`. It also might not have access to the Kinesis Data Streams API operations `PutRecord` and `PutRecords`.

To troubleshoot API permissions

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. Open the role and make sure that it has the following permissions policy attached.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "kinesis:PutRecord",
                "kinesis:PutRecords"
            ],
            "Resource": "data-arn"
        },
        {
            "Effect": "Allow",
            "Action": [
                "kinesisvideo:GetDataEndpoint",
                "kinesisvideo:GetMedia"
            ],
            "Resource": "video-arn"
        }
    ]
}
```

3. If any of the permissions are missing, update the policy. For more information, see Giving Amazon Rekognition Video access to your resources.

Error: "Stream *input-video-stream-name* doesn't exist"

The Kinesis video stream input to the stream processor doesn't exist or isn't configured correctly.

To troubleshoot the Kinesis video stream

1. Use the following command to confirm that the stream exists.

```
aws kinesisvideo list-streams
```

2. If the stream exists, check the following.

   - The Amazon Resource Name (ARN) is same as the ARN of the input stream for the stream processor.
   - The Kinesis video stream is in the same Region as the stream processor.

If the stream processor isn't configured correctly, delete it with the following AWS CLI command.

```
aws rekognition delete-stream-processor --name stream-processor-name
```

3. Create a new stream processor with the intended Kinesis video stream. For more information, see Creating the Amazon Rekognition Video face search stream processor.

Error: "Collection not found"

The Amazon Rekognition collection that's used by the stream processor to match faces doesn't exist, or the wrong collection is being used.

To confirm the collection

1. Use the following AWS CLI command to determine if the required collection exists. Change `region` to the AWS Region in which you're running your stream processor.

   ```
   aws rekognition list-collections --region region
   ```

   If the required collection doesn't exist, create a new collection and add face information. For more information, see Searching faces in a collection.
2. In your call to CreateStreamProcessor, check that the value of the `CollectionId` input parameter is correct.
3. Start the stream processor with the following AWS CLI command.

   ```
   aws rekognition start-stream-processor --name stream-processor-name
   ```

Error: "Stream *output-kinesis-data-stream-name* under account *account-id* not found"

The output Kinesis data stream that's used by the stream processor doesn't exist in your AWS account or isn't in the same AWS Region as your stream processor.

To troubleshoot the Kinesis data stream

1. Use the following AWS CLI command to determine if the Kinesis data stream exists. Change `region` to the AWS Region in which you're using your stream processor.

```
aws kinesis list-streams --region region
```

2. If the Kinesis data stream exists, check that the Kinesis data stream name is same as the name of the output stream that's used by the stream processor.
3. If the Kinesis data stream doesn't exist, it might exist in another AWS Region. The Kinesis data stream must be in the same Region as the stream processor.
4. If necessary, create a new Kinesis data stream.

    a. Create a Kinesis data stream with the same name as the name used by the stream processor. For more information, see Step 1: Create a Data Stream.

    b. Start the stream processor with the following AWS CLI command.

    ```
    aws rekognition start-stream-processor --name stream-processor-name
    ```

My stream processor isn't returning the expected results

If your stream processor isn't returning the expected face matches, use the following information.

- Searching faces in a collection
- Recommendations for camera setup (streaming video)

People pathing

> **Note**
>
> *End of support notice:* On October 31, 2025, AWS will discontinue support for Amazon Rekognition People Pathing. After October 31, 2025, you will no longer be able to use the Rekognition People Pathing capability. For more information, visit this blog post.

Amazon Rekognition Video can create a track of the path people take in videos and provide information such as:

- The location of the person in the video frame at the time their path is tracked.
- Facial landmarks such as the position of the left eye, when detected.

Amazon Rekognition Video people pathing in stored videos is an asynchronous operation. To start the pathing of people in videos call StartPersonTracking. Amazon Rekognition Video publishes the completion status of the video analysis to an Amazon Simple Notification Service topic. If the video analysis is successful, call GetPersonTracking to get results of the video analysis. For more information about calling Amazon Rekognition Video API operations, see Calling Amazon Rekognition Video operations.

The following procedure shows how to track the path of people through a video stored in an Amazon S3 bucket. The example expands on the code in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK) which uses an Amazon Simple Queue Service queue to get the completion status of a video analysis request.

To detect people in a video stored in an Amazon S3 bucket (SDK)

1. Perform Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).
2. Add the following code to the class `VideoDetect` that you created in step 1.

   Java

```
      //Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights
 Reserved.
      //PDX-License-Identifier: MIT-0 (For details, see https://github.com/
awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
```

```
        //
Persons=================================================================================
        private static void StartPersonDetection(String bucket, String video)
 throws Exception{


            NotificationChannel channel= new NotificationChannel()
                    .withSNSTopicArn(snsTopicArn)
                    .withRoleArn(roleArn);

         StartPersonTrackingRequest req = new StartPersonTrackingRequest()
                 .withVideo(new Video()
                         .withS3Object(new S3Object()
                             .withBucket(bucket)
                             .withName(video)))
                 .withNotificationChannel(channel);



         StartPersonTrackingResult startPersonDetectionResult =
 rek.startPersonTracking(req);
         startJobId=startPersonDetectionResult.getJobId();

        }

        private static void GetPersonDetectionResults() throws Exception{
            int maxResults=10;
            String paginationToken=null;
            GetPersonTrackingResult personTrackingResult=null;

            do{
                if (personTrackingResult !=null){
                    paginationToken = personTrackingResult.getNextToken();
                }

                personTrackingResult = rek.getPersonTracking(new
 GetPersonTrackingRequest()
                      .withJobId(startJobId)
                      .withNextToken(paginationToken)
                      .withSortBy(PersonTrackingSortBy.TIMESTAMP)
                      .withMaxResults(maxResults));
```

```
                VideoMetadata
videoMetaData=personTrackingResult.getVideoMetadata();

                System.out.println("Format: " + videoMetaData.getFormat());
                System.out.println("Codec: " + videoMetaData.getCodec());
                System.out.println("Duration: " +
videoMetaData.getDurationMillis());
                System.out.println("FrameRate: " +
videoMetaData.getFrameRate());


                //Show persons, confidence and detection times
                List<PersonDetection> detectedPersons=
personTrackingResult.getPersons();

                for (PersonDetection detectedPerson: detectedPersons) {

                   long seconds=detectedPerson.getTimestamp()/1000;
                   System.out.print("Sec: " + Long.toString(seconds) + " ");
                   System.out.println("Person Identifier: "  +
detectedPerson.getPerson().getIndex());
                        System.out.println();
                }
           }  while (personTrackingResult !=null &&
personTrackingResult.getNextToken() != null);

       }
```

In the function `main`, replace the lines:

```
       StartLabelDetection(amzn-s3-demo-bucket, video);

       if (GetSQSMessageSuccess()==true)
        GetLabelDetectionResults();
```

with:

```
       StartPersonDetection(amzn-s3-demo-bucket, video);

       if (GetSQSMessageSuccess()==true)
        GetPersonDetectionResults();
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import
 software.amazon.awssdk.services.rekognition.model.StartPersonTrackingRequest;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartPersonTrackingResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.GetPersonTrackingResponse;
import
 software.amazon.awssdk.services.rekognition.model.GetPersonTrackingRequest;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.PersonDetection;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class VideoPersonDetection {
    private static String startJobId = "";

    public static void main(String[] args) {

        final String usage = """

                Usage:    <bucket> <video> <topicArn> <roleArn>

                Where:
```

```
                    bucket - The name of the bucket in which the video is located
(for example, (for example, myBucket).\s
                    video - The name of video (for example, people.mp4).\s
                    topicArn - The ARN of the Amazon Simple Notification Service
(Amazon SNS) topic.\s
                    roleArn - The ARN of the AWS Identity and Access Management
(IAM) role to use.\s
                 """;

       if (args.length != 4) {
           System.out.println(usage);
           System.exit(1);
       }

       String bucket = args[0];
       String video = args[1];
       String topicArn = args[2];
       String roleArn = args[3];
       Region region = Region.US_EAST_1;
       RekognitionClient rekClient = RekognitionClient.builder()
               .region(region)
               .build();

       NotificationChannel channel = NotificationChannel.builder()
               .snsTopicArn(topicArn)
               .roleArn(roleArn)
               .build();

       startPersonLabels(rekClient, channel, bucket, video);
       getPersonDetectionResults(rekClient);
       System.out.println("This example is done!");
       rekClient.close();
   }

   public static void startPersonLabels(RekognitionClient rekClient,
           NotificationChannel channel,
           String bucket,
           String video) {
       try {
           S3Object s3Obj = S3Object.builder()
                   .bucket(bucket)
                   .name(video)
                   .build();
```

```
            Video vidOb = Video.builder()
                    .s3Object(s3Obj)
                    .build();

            StartPersonTrackingRequest personTrackingRequest =
StartPersonTrackingRequest.builder()
                    .jobTag("DetectingLabels")
                    .video(vidOb)
                    .notificationChannel(channel)
                    .build();

            StartPersonTrackingResponse labelDetectionResponse =
rekClient.startPersonTracking(personTrackingRequest);
            startJobId = labelDetectionResponse.jobId();

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }

    public static void getPersonDetectionResults(RekognitionClient rekClient) {
        try {
            String paginationToken = null;
            GetPersonTrackingResponse personTrackingResult = null;
            boolean finished = false;
            String status;
            int yy = 0;

            do {
                if (personTrackingResult != null)
                    paginationToken = personTrackingResult.nextToken();

                GetPersonTrackingRequest recognitionRequest =
GetPersonTrackingRequest.builder()
                        .jobId(startJobId)
                        .nextToken(paginationToken)
                        .maxResults(10)
                        .build();

                // Wait until the job succeeds
                while (!finished) {
```

```
                    personTrackingResult =
rekClient.getPersonTracking(recognitionRequest);
                    status = personTrackingResult.jobStatusAsString();

                    if (status.compareTo("SUCCEEDED") == 0)
                        finished = true;
                    else {
                        System.out.println(yy + " status is: " + status);
                        Thread.sleep(1000);
                    }
                    yy++;
                }

                finished = false;

                // Proceed when the job is done - otherwise VideoMetadata is
null.
                VideoMetadata videoMetaData =
personTrackingResult.videoMetadata();

                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());
                System.out.println("Job");

                List<PersonDetection> detectedPersons =
personTrackingResult.persons();
                for (PersonDetection detectedPerson : detectedPersons) {
                    long seconds = detectedPerson.timestamp() / 1000;
                    System.out.print("Sec: " + seconds + " ");
                    System.out.println("Person Identifier: " +
detectedPerson.person().index());
                    System.out.println();
                }

            } while (personTrackingResult != null &&
personTrackingResult.nextToken() != null);

        } catch (RekognitionException | InterruptedException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
```

```
    }
}
```

Python

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    # ============== People pathing ===============
    def StartPersonPathing(self):
        response=self.rek.start_person_tracking(Video={'S3Object': {'Bucket':
 self.bucket, 'Name': self.video}},
            NotificationChannel={'RoleArn': self.roleArn, 'SNSTopicArn':
 self.snsTopicArn})

        self.startJobId=response['JobId']
        print('Start Job Id: ' + self.startJobId)

    def GetPersonPathingResults(self):
        maxResults = 10
        paginationToken = ''
        finished = False

        while finished == False:
            response = self.rek.get_person_tracking(JobId=self.startJobId,
                                        MaxResults=maxResults,
                                        NextToken=paginationToken)

            print('Codec: ' + response['VideoMetadata']['Codec'])
            print('Duration: ' + str(response['VideoMetadata']
['DurationMillis']))
            print('Format: ' + response['VideoMetadata']['Format'])
            print('Frame rate: ' + str(response['VideoMetadata']['FrameRate']))
            print()

            for personDetection in response['Persons']:
                print('Index: ' + str(personDetection['Person']['Index']))
                print('Timestamp: ' + str(personDetection['Timestamp']))
                print()

            if 'NextToken' in response:
                paginationToken = response['NextToken']
```

```
            else:
                finished = True
```

In the function `main`, replace the lines:

```
    analyzer.StartLabelDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetLabelDetectionResults()
```

with:

```
    analyzer.StartPersonPathing()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetPersonPathingResults()
```

CLI

Run the following AWS CLI command to start people pathing in a video.

```
aws rekognition start-person-tracking --video "{"S3Object":{"Bucket":"amzn-s3-
demo-bucket","Name":"video-name"}}" \
--notification-channel "{"SNSTopicArn":"topic-ARN","RoleArn":"role-ARN"}" \
--region region-name --profile profile-name
```

Update the following values:

- Change `amzn-s3-demo-bucket` and `video-name` to the Amazon S3 bucket name and file name that you specified in step 2.
- Change `region-name` to the AWS region that you're using.
- Replace the value of `profile-name` in the line that creates the Rekognition session with the name of your developer profile.
- Change `topic-ARN` to the ARN of the Amazon SNS topic you created in step 3 of Configuring Amazon Rekognition Video.
- Change `role-ARN` to the ARN of the IAM service role you created in step 7 of Configuring Amazon Rekognition Video.

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see below:

```
aws rekognition start-person-tracking --video "{\"S3Object\":{\"Bucket\":\"amzn-
s3-demo-bucket\",\"Name\":\"video-name\"}}"
--notification-channel "{\"SNSTopicArn\":\"topic-ARN\",\"RoleArn\":\"role-ARN
\"}" \
--region region-name --profile profile-name
```

After running the proceeding code example, copy down the returned `jobID` and provide it to the following `GetPersonTracking` command below to get your results, replacing `job-id-number` with the `jobID` you previously received:

```
aws rekognition get-person-tracking --job-id job-id-number
```

> **Note**
>
> If you've already run a video example other than Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), the code to replace might be different.

3. Run the code. The unique identifiers for tracked people are shown along with the time, in seconds, the people's paths were tracked.

GetPersonTracking operation response

`GetPersonTracking` returns an array, `Persons`, of PersonDetection objects which contain details about people detected in the video and when their paths are tracked.

You can sort `Persons` by using the `SortBy` input parameter. Specify `TIMESTAMP` to sort the elements by the time people's paths are tracked in the video. Specify `INDEX` to sort by people tracked in the video. Within each set of results for a person, the elements are sorted by descending

confidence in the accuracy of the path tracking. By default, `Persons` is returned sorted by `TIMESTAMP`. The following example is the JSON response from `GetPersonDetection`. The results are sorted by the time, in milliseconds since the start of the video, that people's paths are tracked in the video. In the response, note the following:

- **Person information** – The `PersonDetection` array element contains information about the detected person. For example, the time the person was detected (`Timestamp`), the position of the person in the video frame at the time they were detected (`BoundingBox`), and how confident Amazon Rekognition Video is that the person has been correctly detected (`Confidence`).

  Facial features are not returned at every timestamp for which the person's path is tracked. Furthermore, in some circumstances a tracked person's body might not be visible, in which case only their face location is returned.
- **Paging information** – The example shows one page of person detection information. You can specify how many person elements to return in the `MaxResults` input parameter for `GetPersonTracking`. If more results than `MaxResults` exist, `GetPersonTracking` returns a token (`NextToken`) used to get the next page of results. For more information, see Getting Amazon Rekognition Video analysis results.
- **Index** – A unique identifier for identifying the person throughout the video.
- **Video information** – The response includes information about the video format (`VideoMetadata`) in each page of information returned by `GetPersonDetection`.

```
{
    "JobStatus": "SUCCEEDED",
    "NextToken": "AcDymG0fSSoaI6+BBYpka5wVlqttysSPP8VvWcujMDluj1QpFo/vf
+mrMoqBGk8eUEiFlllR6g==",
    "Persons": [
        {
            "Person": {
                "BoundingBox": {
                    "Height": 0.8787037134170532,
                    "Left": 0.00572916679084301,
                    "Top": 0.12129629403352737,
                    "Width": 0.21666666865348816
                },
                "Face": {
                    "BoundingBox": {
```

```
                    "Height": 0.20000000298023224,
                    "Left": 0.029999999329447746,
                    "Top": 0.2199999988079071,
                    "Width": 0.11249999701976776
                },
                "Confidence": 99.85971069335938,
                "Landmarks": [
                    {
                        "Type": "eyeLeft",
                        "X": 0.06842322647571564,
                        "Y": 0.3010137975215912
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.10543643683195114,
                        "Y": 0.29697132110595703
                    },
                    {
                        "Type": "nose",
                        "X": 0.09569807350635529,
                        "Y": 0.33701086044311523
                    },
                    {
                        "Type": "mouthLeft",
                        "X": 0.0732642263174057,
                        "Y": 0.3757539987564087
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.10589495301246643,
                        "Y": 0.3722417950630188
                    }
                ],
                "Pose": {
                    "Pitch": -0.5589138865470886,
                    "Roll": -5.1093974113464355,
                    "Yaw": 18.69594955444336
                },
                "Quality": {
                    "Brightness": 43.052337646484375,
                    "Sharpness": 99.68138885498047
                }
            },
            "Index": 0
```

```
            },
            "Timestamp": 0
        },
        {
            "Person": {
                "BoundingBox": {
                    "Height": 0.9074074029922485,
                    "Left": 0.24791666865348816,
                    "Top": 0.09259258955717087,
                    "Width": 0.375
                },
                "Face": {
                    "BoundingBox": {
                        "Height": 0.23000000417232513,
                        "Left": 0.42500001192092896,
                        "Top": 0.16333332657814026,
                        "Width": 0.12937499582767487
                    },
                    "Confidence": 99.97504425048828,
                    "Landmarks": [
                        {
                            "Type": "eyeLeft",
                            "X": 0.46415066719055176,
                            "Y": 0.2572723925113678
                        },
                        {
                            "Type": "eyeRight",
                            "X": 0.5068183541297913,
                            "Y": 0.23705792427062988
                        },
                        {
                            "Type": "nose",
                            "X": 0.49765899777412415,
                            "Y": 0.28383663296699524
                        },
                        {
                            "Type": "mouthLeft",
                            "X": 0.487221896648407,
                            "Y": 0.3452930748462677
                        },
                        {
                            "Type": "mouthRight",
                            "X": 0.5142884850502014,
                            "Y": 0.33167609572410583
```

```
                        }
                    ],
                    "Pose": {
                        "Pitch": 15.966927528381348,
                        "Roll": -15.547388076782227,
                        "Yaw": 11.34195613861084
                    },
                    "Quality": {
                        "Brightness": 44.80223083496094,
                        "Sharpness": 99.95819854736328
                    }
                },
                "Index": 1
            },
            "Timestamp": 0
        }.....

    ],
    "VideoMetadata": {
        "Codec": "h264",
        "DurationMillis": 67301,
        "FileExtension": "mp4",
        "Format": "QuickTime / MOV",
        "FrameHeight": 1080,
        "FrameRate": 29.970029830932617,
        "FrameWidth": 1920
    }
}
```

Detecting personal protective equipment

Amazon Rekognition can detect Personal Protective Equipment (PPE) worn by persons in an image. You can use this information to improve workplace safety practices. For example, you can use PPE detection to help determine if workers on a construction site are wearing head covers, or if medical workers are wearing face covers and hand covers. The following image shows some of the types of PPE that can detected.

To detect PPE in an image you call the DetectProtectiveEquipment API and pass an input image. The response is a JSON structure that includes the following.

- The persons detected in the image.
- The parts of a body where PPE is worn (face, head, left-hand, and right-hand).
- The types of PPE detected on body parts (face cover, hand cover, and head cover).

- For items of detected PPE, an indicator for whether or not the PPE covers the corresponding body part.

Bounding boxes are returned for the locations of persons and items of PPE detected in the image.

Optionally, you can request a summary of the PPE items and persons detected in an image. For more information, see Summarizing PPE detected in an image.

> **Note**
>
> Amazon Rekognition PPE detection doesn't perform facial recognition or facial comparison and can't identify the detected persons.

Types of PPE

DetectProtectiveEquipment detects the following types of PPE. If you want to detect other types of PPE in images, consider using Amazon Rekognition Custom Labels to train a custom model. For more information, see Amazon Rekognition Custom Labels.

Face cover

`DetectProtectiveEquipment` can detect common face covers such as surgical, N95, and masks made of cloth.

Hand cover

`DetectProtectiveEquipment` can detect hand covers such as surgical gloves and safety gloves.

Head cover

`DetectProtectiveEquipment` can detect hard hats and helmets.

The API indicates that a head, hand, or face cover was detected in an image. The API doesn't return information about the type of a specific cover. For example, 'surgical glove' for the type of a hand cover.

PPE detection confidence

Amazon Rekognition makes a prediction about the presence of PPE, persons, and body parts in an image. The API provides a score (50-100) that indicates how confident Amazon Rekognition is in the accuracy of a prediction.

> **Note**
>
> If you plan to use the `DetectProtectiveEquipment` operation to make a decision that impacts an individual's rights, privacy, or access to services we recommend that you pass the result to a human for review and validation before taking action.

Summarizing PPE detected in an image

You can optionally request a summary of the PPE items and persons detected in an image. You can specify a list of required protective equipment (face cover, hand cover, or head cover) and a minimum confidence threshold (for example, 80%). The response includes a consolidated per-image identifier (ID) summary of persons with the required PPE, persons without the required PPE, and persons where a determination couldn't be made.

The summary allows you to quickly answer questions such as *How many persons are not wearing face covers?* or *Is everyone wearing PPE?* Each detected person in the summary has a unique ID. You can use the ID find out information such as the bounding box location of a person not wearing PPE.

> **Note**
>
> The ID is randomly generated on a per-image analysis basis and is not consistent across images or multiple analyses of the same image.

You can summarize face covers, head covers, hand covers, or a combination of your choice. To specify the required types of PPE, see Specifying summarization requirements. You can also specify a minimum confidence level (50-100) that must be met for detections to be included in the summary.

For more information about the summarization response from `DetectProtectiveEquipment`, see Understanding the DetectProtectiveEquipment response.

Tutorial: Creating a AWS Lambda function that detects images with PPE

You can create an AWS Lambda function that detects personal protective equipment (PPE) in images located in an Amazon S3 bucket. See the AWS Documentation SDK examples GitHub repository for this Java V2 tutorial.

Understanding the personal protective equipment detection API

The following information describes the DetectProtectiveEquipment API. For example code, see Detecting personal protective equipment in an image.

Supplying an image

You can provide the input image (JPG or PNG format) either as image bytes or reference an image stored in an Amazon S3 bucket.

We recommend using images where the person's face is facing the camera.

If your input image isn't rotated to 0 degrees orientation, we recommend rotating it to 0 degrees orientation before submitting it to `DetectProtectiveEquipment`. Images in JPG format might contain orientation information in Exchangeable image file format (Exif) metadata. You can use this information to write code that rotates your image. For more information, see Exif version 2.32. PNG format images don't contain image orientation information.

To pass an image from an Amazon S3 bucket, use a user with at least AmazonS3ReadOnlyAccess priviliges. Use a user with `AmazonRekognitionFullAccess` priviliges to call `DetectProtectiveEquipment.`

In the following example input JSON, the image is passed in an Amazon S3 bucket. For more information, see Working with images. The example requests a summary of all PPE types (head cover, hand cover, and face cover) with a minimum detection confidence (`MinConfidence`) of 80%. You should specify a `MinConfidence` value that is between 50-100% as `DetectProtectiveEquipment` returns predictions only where the detection confidence is between 50% - 100%. If you specify a value that is less than 50%, the results are the same specifying a value of 50%. For more information, see Specifying summarization requirements.

```
{
    "Image": {
        "S3Object": {
            "Bucket": "amzn-s3-demo-bucket",
            "Name": "worker.jpg"
        }
    },
    "SummarizationAttributes": {
        "MinConfidence": 80,
        "RequiredEquipmentTypes": [
            "FACE_COVER",
            "HAND_COVER",
            "HEAD_COVER"
        ]
    }
}
```

If you have a large collection of images to process, consider using AWS Batch to process calls to `DetectProtectiveEquipment` in batches in the background.

Specifying summarization requirements

You can optionally use the `SummarizationAttributes` (ProtectiveEquipmentSummarizationAttributes) input parameter to request summary information for the types of PPE detected in an image.

To specify the types of PPE to summarize, use the `RequiredEquipmentTypes` array field. In the array, include one or more of `FACE_COVER`, `HAND_COVER` or `HEAD_COVER`.

Use the `MinConfidence` field to specify a minimum detection confidence (50-100). The summary doesn't include Persons, body parts, body part coverage, and items of PPE, detected with a confidence lower than `MinConfidence`.

For information about the summary response from `DetectProtectiveEquipment`, see Understanding the DetectProtectiveEquipment response.

Understanding the DetectProtectiveEquipment response

`DetectProtectiveEquipment` returns an array of persons detected in the input image. For each person, information about detected body parts and detected items of PPE is returned. The

JSON for the following image of a worker wearing a head cover, hand cover, and a face cover is as follows.

In the JSON, note the following.

- **Detected Persons** – `Persons` is an array of persons detected on the image (including persons not wearing PPE). `DetectProtectiveEquipment` can detect PPE on up to 15 persons detected in an image. Each ProtectiveEquipmentPerson object in the array contains a person ID, a bounding box for the person, detected body parts, and detected items of PPE. The value of `Confidence` in `ProtectiveEquipmentPerson` indicates the percentage confidence that Amazon Rekognition has that the bounding box contains a person.
- **Body Parts** – `BodyParts` is an array of body parts (ProtectiveEquipmentBodyPart) detected on a person (including body parts not covered by PPE). Each `ProtectiveEquipmentBodyPart` includes the name (`Name`) of the detected body part. `DetectProtectEquipment` can detect face, head, left-hand, and right-hand body parts. The `Confidence` field in

`ProtectiveEquipmentBodyPart` indicates the percentage confidence that Amazon Rekognition has in the detection accuracy of the body part.

- **PPE Items** – The array `EquipmentDetections` in an `ProtectiveEquipmentBodyPart` object contains an array of detected PPE items. Each EquipmentDetection object contains the following fields.
  - `Type` – The type of the detected PPE.
  - `BoundingBox` – a bounding box around the detected PPE.
  - `Confidence` – The confidence Amazon Rekognition has that the bounding box contains the detected PPE.
  - `CoversBodyPart` – Indicates if the detected PPE is on the corresponding body part.

  The CoversBodyPart field `Value` is a boolean value that indicates if the detected PPE is on the corresponding body part. The field `Confidence` indicates the confidence in the prediction. You can use `CoversBodyPart` to filter out cases where the detected PPE is in the image, but not actually on the person.

  > **Note**
  >
  > `CoversBodyPart` doesn't indicate, or imply, that the person is adequately protected by the protective equipment or that the protective equipment itself is properly worn.

- **Summary Information** – `Summary` contains the summary information specified in the `SummarizationAttributes` input parameter. For more information, see Specifying summarization requirements.

  `Summary` is an object of type ProtectiveEquipmentSummary which contains the following information.

  - `PersonsWithRequiredEquipment` – An array of the IDs of persons where each person meets the following criteria.
    - The person is wearing all of the PPE specified in the `SummarizationAttributes` input parameter.
    - The `Confidence` for the person (`ProtectiveEquipmentPerson`), body part (`ProtectiveEquipmentBodyPart`), protective equipment (`EquipmentDetection`) is equal to or greater than the specified minimum confidence threshold (`MinConfidence`).
    - The value of `CoversBodyPart` for all items of PPE is true.

- PersonsWithoutRequiredEquipment – An array of the IDs of persons that meet one of the following criteria.
  - The Confidence value for the person (ProtectiveEquipmentPerson), body part (ProtectiveEquipmentBodyPart), and body part coverage (CoversBodyPart) are greater than the specified minimum confidence threshold (MinConfidence), but the person is missing one or more specified PPE (SummarizationAttributes).
  - The value of CoversBodyPart is false for any specified PPE (SummarizationAttributes) that has a Confidence value greater than the specified minimum confidence threshold (MinConfidence). The person also has all the specified PPE (SummarizationAttributes) and the Confidence values for person (ProtectiveEquipmentPerson), body part (ProtectiveEquipmentBodyPart), and protective equipment (EquipmentDetection) are greater than or equal to the minimum confidence threshold (MinConfidence.
- PersonsIndeterminate – An array of the IDs of persons detected where the Confidence value for the person (ProtectiveEquipmentPerson), body part (ProtectiveEquipmentBodyPart), protective equipment (EquipmentDetection), or CoversBodyPart boolean is lower than specified minimum confidence threshold (MinConfidence).

Use the array size to get a count for a particular summary. For example, the size of PersonsWithRequiredEquipment tells you the number of people detected as wearing the specified type of PPE.

You can use the person ID to find out further information about a person, such as the bounding box location of the person. The person ID maps to the ID field of a ProtectiveEquipmentPerson) object returned in Persons (array ofProtectiveEquipmentPerson). You can then get the Bounding box and other information from the corresponding ProtectiveEquipmentPerson object.

```
{
   "ProtectiveEquipmentModelVersion": "1.0",
   "Persons": [
       {
           "BodyParts": [
               {
                   "Name": "FACE",
```

```
                    "Confidence": 99.99861145019531,
                    "EquipmentDetections": [
                        {
                            "BoundingBox": {
                                "Width": 0.14528800547122955,
                                "Height": 0.14956723153591156,
                                "Left": 0.4363413453102112,
                                "Top": 0.34203192591667175
                            },
                            "Confidence": 99.90001678466797,
                            "Type": "FACE_COVER",
                            "CoversBodyPart": {
                                "Confidence": 98.0676498413086,
                                "Value": true
                            }
                        }
                    ]
                },
                {
                    "Name": "LEFT_HAND",
                    "Confidence": 96.9786376953125,
                    "EquipmentDetections": [
                        {
                            "BoundingBox": {
                                "Width": 0.14495663344860077,
                                "Height": 0.12936046719551086,
                                "Left": 0.5114737153053284,
                                "Top": 0.5744519829750061
                            },
                            "Confidence": 83.72270965576172,
                            "Type": "HAND_COVER",
                            "CoversBodyPart": {
                                "Confidence": 96.9288558959961,
                                "Value": true
                            }
                        }
                    ]
                },
                {
                    "Name": "RIGHT_HAND",
                    "Confidence": 99.82939147949219,
                    "EquipmentDetections": [
                        {
                            "BoundingBox": {
```

```
                            "Width": 0.20971858501434326,
                            "Height": 0.20528452098369598,
                            "Left": 0.2711356580257416,
                            "Top": 0.6750612258911133
                        },
                        "Confidence": 95.70789337158203,
                        "Type": "HAND_COVER",
                        "CoversBodyPart": {
                            "Confidence": 99.85433197021484,
                            "Value": true
                        }
                    }
                ]
            },
            {
                "Name": "HEAD",
                "Confidence": 99.9999008178711,
                "EquipmentDetections": [
                    {
                        "BoundingBox": {
                            "Width": 0.24350935220718384,
                            "Height": 0.34623199701309204,
                            "Left": 0.43011072278022766,
                            "Top": 0.01103297434747219
                        },
                        "Confidence": 83.88762664794922,
                        "Type": "HEAD_COVER",
                        "CoversBodyPart": {
                            "Confidence": 99.96485900878906,
                            "Value": true
                        }
                    }
                ]
            }
        ],
        "BoundingBox": {
            "Width": 0.7403100728988647,
            "Height": 0.9412225484848022,
            "Left": 0.02214839495718479,
            "Top": 0.03134796395897865
        },
        "Confidence": 99.98855590820312,
        "Id": 0
    }
```

```
    ],
    "Summary": {
        "PersonsWithRequiredEquipment": [
            0
        ],
        "PersonsWithoutRequiredEquipment": [],
        "PersonsIndeterminate": []
    }
}
```

Detecting personal protective equipment in an image

To detect Personal Protective Equipment (PPE) on persons in an image, use the DetectProtectiveEquipment non-storage API operation.

You can provide the input image as an image byte array (base64-encoded image bytes) or as an Amazon S3 object, by using the AWS SDK or the AWS Command Line Interface (AWS CLI). These examples use an image stored in an Amazon S3 bucket. For more information, see Working with images.

To detect PPE on persons in an image

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Upload an image (that contains one or more persons wearing PPE) to your S3 bucket.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following examples to call the `DetectProtectiveEquipment` operation. For information about displaying bounding boxes in an image, see Displaying bounding boxes.

Java

This example displays information about the PPE items detected on persons detected in an image.

Change the value of `amzn-s3-demo-bucket` to the name of the Amazon S3 bucket that contains your image. Change the value of `photo` to your image file name.

```
//Copyright 2020 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package com.amazonaws.samples;
import com.amazonaws.client.builder.AwsClientBuilder;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.ProtectiveEquipmentBodyPart;
import com.amazonaws.services.rekognition.model.S3Object;
import com.amazonaws.services.rekognition.model.ProtectiveEquipmentPerson;
import
 com.amazonaws.services.rekognition.model.ProtectiveEquipmentSummarizationAttributes;

import java.util.List;
import com.amazonaws.services.rekognition.model.BoundingBox;
import
 com.amazonaws.services.rekognition.model.DetectProtectiveEquipmentRequest;
import com.amazonaws.services.rekognition.model.DetectProtectiveEquipmentResult;
import com.amazonaws.services.rekognition.model.EquipmentDetection;


public class DetectPPE {

    public static void main(String[] args) throws Exception {

        String photo = "photo";
        String bucket = "bucket";


        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();
```

```
       ProtectiveEquipmentSummarizationAttributes summaryAttributes = new
ProtectiveEquipmentSummarizationAttributes()
               .withMinConfidence(80F)
               .withRequiredEquipmentTypes("FACE_COVER", "HAND_COVER",
"HEAD_COVER");

       DetectProtectiveEquipmentRequest request = new
DetectProtectiveEquipmentRequest()
               .withImage(new Image()
                       .withS3Object(new S3Object()
                               .withName(photo).withBucket(bucket)))
               .withSummarizationAttributes(summaryAttributes);

       try {
           System.out.println("Detected PPE for people in image " + photo);
           System.out.println("Detected people\n---------------");
           DetectProtectiveEquipmentResult result =
rekognitionClient.detectProtectiveEquipment(request);


           List <ProtectiveEquipmentPerson> persons = result.getPersons();


           for (ProtectiveEquipmentPerson person: persons) {
               System.out.println("ID: " + person.getId());
               List<ProtectiveEquipmentBodyPart>
bodyParts=person.getBodyParts();
               if (bodyParts.isEmpty()){
                   System.out.println("\tNo body parts detected");
               } else
                   for (ProtectiveEquipmentBodyPart bodyPart: bodyParts) {
                       System.out.println("\t" + bodyPart.getName() + ".
Confidence: " + bodyPart.getConfidence().toString());



                       List<EquipmentDetection>
equipmentDetections=bodyPart.getEquipmentDetections();

                       if (equipmentDetections.isEmpty()){
                           System.out.println("\t\tNo PPE Detected on " +
bodyPart.getName());
```

```
                        }
                        else {
                            for (EquipmentDetection item: equipmentDetections) {
                                System.out.println("\t\tItem: " + item.getType()
+ ". Confidence: " + item.getConfidence().toString());
                                System.out.println("\t\tCovers body part: "
                                        +
item.getCoversBodyPart().getValue().toString() + ". Confidence: " +
item.getCoversBodyPart().getConfidence().toString());

                                System.out.println("\t\tBounding Box");
                                BoundingBox box =item.getBoundingBox();

                                System.out.println("\t\tLeft: "
+box.getLeft().toString());
                                System.out.println("\t\tTop: " +
box.getTop().toString());
                                System.out.println("\t\tWidth: " +
box.getWidth().toString());
                                System.out.println("\t\tHeight: " +
box.getHeight().toString());
                                System.out.println("\t\tConfidence: " +
item.getConfidence().toString());
                                System.out.println();
                            }
                        }

                    }
            }
            System.out.println("Person ID Summary\n-----------------");

            //List<Integer> list=;
            DisplaySummary("With required equipment",
result.getSummary().getPersonsWithRequiredEquipment());
            DisplaySummary("Without required equipment",
result.getSummary().getPersonsWithoutRequiredEquipment());
            DisplaySummary("Indeterminate",
result.getSummary().getPersonsIndeterminate());


        } catch(AmazonRekognitionException e) {
            e.printStackTrace();
        }
    }
```

```
    static void DisplaySummary(String summaryType,List<Integer> idList)
    {
        System.out.print(summaryType + "\n\tIDs  ");
        if (idList.size()==0) {
            System.out.println("None");
        }
        else {
            int count=0;
            for (Integer id: idList ) {
                if (count++ == idList.size()-1) {
                    System.out.println(id.toString());
                }
                else {
                    System.out.print(id.toString() + ", ");
                }
            }
        }

        System.out.println();


    }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.detect_ppe.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.core.ResponseBytes;
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.BoundingBox;
import
 software.amazon.awssdk.services.rekognition.model.DetectProtectiveEquipmentRequest;
import
 software.amazon.awssdk.services.rekognition.model.DetectProtectiveEquipmentResponse;
import software.amazon.awssdk.services.rekognition.model.EquipmentDetection;
import
 software.amazon.awssdk.services.rekognition.model.ProtectiveEquipmentBodyPart;
```

```
import
 software.amazon.awssdk.services.rekognition.model.ProtectiveEquipmentSummarizationAttri
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.s3.S3Client;
import software.amazon.awssdk.services.s3.model.GetObjectRequest;
import software.amazon.awssdk.services.s3.model.GetObjectResponse;
import software.amazon.awssdk.services.s3.model.S3Exception;
import
 software.amazon.awssdk.services.rekognition.model.ProtectiveEquipmentPerson;
import java.io.ByteArrayInputStream;
import java.io.InputStream;
import java.util.List;
//snippet-end:[rekognition.java2.detect_ppe.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class DetectPPE {

 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <sourceImage> <bucketName>\n\n" +
         "Where:\n" +
         "   sourceImage - The name of the image in an Amazon S3 bucket (for
 example, people.png). \n\n" +
         "   bucketName - The name of the Amazon S3 bucket (for example, amzn-
s3-demo-bucket). \n\n";

     if (args.length != 2) {
          System.out.println(usage);
          System.exit(1);
     }

     String sourceImage = args[0];
     String bucketName = args[1];
```

```
    Region region = Region.US_WEST_2;
    S3Client s3 = S3Client.builder()
        .region(region)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    RekognitionClient rekClient = RekognitionClient.builder()
        .region(region)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    displayGear(s3, rekClient, sourceImage, bucketName) ;
    s3.close();
    rekClient.close();
    System.out.println("This example is done!");
}

// snippet-start:[rekognition.java2.detect_ppe.main]
public static void displayGear(S3Client s3,
                               RekognitionClient rekClient,
                               String sourceImage,
                               String bucketName) {

    byte[] data = getObjectBytes (s3, bucketName, sourceImage);
    InputStream is = new ByteArrayInputStream(data);

    try {
        ProtectiveEquipmentSummarizationAttributes summarizationAttributes =
ProtectiveEquipmentSummarizationAttributes.builder()
            .minConfidence(80F)
            .requiredEquipmentTypesWithStrings("FACE_COVER", "HAND_COVER",
"HEAD_COVER")
            .build();

        SdkBytes sourceBytes = SdkBytes.fromInputStream(is);
        software.amazon.awssdk.services.rekognition.model.Image souImage =
Image.builder()
            .bytes(sourceBytes)
            .build();

        DetectProtectiveEquipmentRequest request =
DetectProtectiveEquipmentRequest.builder()
            .image(souImage)
            .summarizationAttributes(summarizationAttributes)
```

```
            .build();

        DetectProtectiveEquipmentResponse result =
rekClient.detectProtectiveEquipment(request);
        List<ProtectiveEquipmentPerson> persons = result.persons();
        for (ProtectiveEquipmentPerson person: persons) {
            System.out.println("ID: " + person.id());
            List<ProtectiveEquipmentBodyPart> bodyParts=person.bodyParts();
            if (bodyParts.isEmpty()){
                System.out.println("\tNo body parts detected");
            } else
                for (ProtectiveEquipmentBodyPart bodyPart: bodyParts) {
                    System.out.println("\t" + bodyPart.name() + ". Confidence:
" + bodyPart.confidence().toString());
                    List<EquipmentDetection>
equipmentDetections=bodyPart.equipmentDetections();

                    if (equipmentDetections.isEmpty()){
                        System.out.println("\t\tNo PPE Detected on " +
bodyPart.name());
                    } else {
                        for (EquipmentDetection item: equipmentDetections) {
                            System.out.println("\t\tItem: " + item.type() + ".
Confidence: " + item.confidence().toString());
                            System.out.println("\t\tCovers body part: "
                                    + item.coversBodyPart().value().toString()
+ ". Confidence: " + item.coversBodyPart().confidence().toString());

                            System.out.println("\t\tBounding Box");
                            BoundingBox box =item.boundingBox();
                            System.out.println("\t\tLeft: "
+box.left().toString());
                            System.out.println("\t\tTop: " +
box.top().toString());
                            System.out.println("\t\tWidth: " +
box.width().toString());
                            System.out.println("\t\tHeight: " +
box.height().toString());
                            System.out.println("\t\tConfidence: " +
item.confidence().toString());
                            System.out.println();
                        }
                    }
                }
```

```
        }
        System.out.println("Person ID Summary\n-----------------");

        displaySummary("With required equipment",
result.summary().personsWithRequiredEquipment());
        displaySummary("Without required equipment",
result.summary().personsWithoutRequiredEquipment());
        displaySummary("Indeterminate",
result.summary().personsIndeterminate());

    } catch (RekognitionException e) {
        e.printStackTrace();
        System.exit(1);
    }
}

public static byte[] getObjectBytes (S3Client s3, String bucketName, String
keyName) {

    try {
        GetObjectRequest objectRequest = GetObjectRequest
            .builder()
            .key(keyName)
            .bucket(bucketName)
            .build();

        ResponseBytes<GetObjectResponse> objectBytes =
s3.getObjectAsBytes(objectRequest);
        return objectBytes.asByteArray();

    } catch (S3Exception e) {
        System.err.println(e.awsErrorDetails().errorMessage());
        System.exit(1);
    }
    return null;
}

static void displaySummary(String summaryType,List<Integer> idList) {
    System.out.print(summaryType + "\n\tIDs  ");
    if (idList.size()==0) {
        System.out.println("None");
    } else {
        int count=0;
        for (Integer id: idList ) {
```

```
                if (count++ == idList.size()-1) {
                    System.out.println(id.toString());
                } else {
                    System.out.print(id.toString() + ", ");
                }
            }
        }
        System.out.println();
    }
    // snippet-end:[rekognition.java2.detect_ppe.main]
}
```

AWS CLI

This AWS CLI command requests a PPE summary and displays the JSON output for the `detect-protective-equipment` CLI operation.

Change `amzn-s3-demo-bucket` to the name of an Amazon S3 bucket that contains an image. Change `input.jpg` to the name of the image that you want to use.

```
aws rekognition detect-protective-equipment \
  --image "S3Object={Bucket=amzn-s3-demo-bucket,Name=input.jpg}" \
  --summarization-attributes
 "MinConfidence=80,RequiredEquipmentTypes=['FACE_COVER','HAND_COVER','HEAD_COVER']"
```

This AWS CLI command displays the JSON output for the `detect-protective-equipment` CLI operation.

Change `amzn-s3-demo-bucket` to the name of an Amazon S3 bucket that contains an image. Change `input.jpg` to the name of the image that you want to use.

```
aws rekognition detect-protective-equipment \
  --image "S3Object={Bucket=amzn-s3-demo-bucket,Name=input.jpg}"
```

Python

This example displays information about the PPE items detected on persons detected in an image.

Change the value of `amzn-s3-demo-bucket` to the name of the Amazon S3 bucket that contains your image. Change the value of `photo` to your image file name. Replace the

value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2020 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def detect_ppe(photo, bucket):

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')

    response = client.detect_protective_equipment(Image={'S3Object': {'Bucket':
 bucket, 'Name': photo}},

 SummarizationAttributes={'MinConfidence': 80,

 'RequiredEquipmentTypes': ['FACE_COVER',

                     'HAND_COVER',

                     'HEAD_COVER']})

    print('Detected PPE for people in image ' + photo)
    print('\nDetected people\n---------------')
    for person in response['Persons']:

        print('Person ID: ' + str(person['Id']))
        print('Body Parts\n----------')
        body_parts = person['BodyParts']
        if len(body_parts) == 0:
            print('No body parts found')
        else:
            for body_part in body_parts:
                print('\t' + body_part['Name'] + '\n\t\tConfidence: ' +
str(body_part['Confidence']))
                print('\n\t\tDetected PPE\n\t\t------------')
                ppe_items = body_part['EquipmentDetections']
                if len(ppe_items) == 0:
                    print('\t\tNo PPE detected on ' + body_part['Name'])
                else:
```

```
                    for ppe_item in ppe_items:
                        print('\t\t' + ppe_item['Type'] + '\n\t\t\tConfidence: '
 + str(ppe_item['Confidence']))
                        print('\t\tCovers body part: ' + str(
                            ppe_item['CoversBodyPart']['Value']) + '\n\t\t
\tConfidence: ' + str(
                            ppe_item['CoversBodyPart']['Confidence']))
                        print('\t\tBounding Box:')
                        print('\t\t\tTop: ' + str(ppe_item['BoundingBox']
['Top']))
                        print('\t\t\tLeft: ' + str(ppe_item['BoundingBox']
['Left']))
                        print('\t\t\tWidth: ' + str(ppe_item['BoundingBox']
['Width']))
                        print('\t\t\tHeight: ' + str(ppe_item['BoundingBox']
['Height']))
                        print('\t\t\tConfidence: ' +
 str(ppe_item['Confidence']))
            print()
        print()

    print('Person ID Summary\n----------------')
    display_summary('With required equipment', response['Summary']
['PersonsWithRequiredEquipment'])
    display_summary('Without required equipment', response['Summary']
['PersonsWithoutRequiredEquipment'])
    display_summary('Indeterminate', response['Summary']
['PersonsIndeterminate'])

    print()
    return len(response['Persons'])

# Display summary information for supplied summary.
def display_summary(summary_type, summary):
    print(summary_type + '\n\tIDs: ', end='')
    if (len(summary) == 0):
        print('None')
    else:
        for num, id in enumerate(summary, start=0):
            if num == len(summary) - 1:
                print(id)
            else:
                print(str(id) + ', ', end='')
```

```
def main():
    photo = 'photo-name'
    bucket = 'amzn-s3-demo-bucket'
    person_count = detect_ppe(photo, bucket)
    print("Persons detected: " + str(person_count))

if __name__ == "__main__":
    main()
```

Example: Drawing bounding boxes around face covers

The following examples shows you how to draw bounding boxes around face covers detected on persons. For an example that uses AWS Lambda and Amazon DynamoDB, see the AWS Documentation SDK examples GitHub repository.

To detect face covers you use the DetectProtectiveEquipment non-storage API operation. The image is loaded from the local file system. You provide the input image to `DetectProtectiveEquipment` as an image byte array (base64-encoded image bytes). For more information, see Working with images.

The example displays a bounding box around detected face covers. The bounding box is green if the face cover fully covers the body part. Otherwise a red bounding box is displayed. As a warning, a yellow bounding box is displayed within the face cover bounding box, if the detection confidence is lower than the specified confidence value. If a face cover is not detected, a red bounding box is drawn around the person.

The image output is similar to the following.

To display bounding boxes on detected face covers

1. If you haven't already:

   a. Create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following examples to call the `DetectProtectiveEquipment` operation. For information about displaying bounding boxes in an image, see Displaying bounding boxes.

   Java

   In the function `main`, change the following:

   - The value of `photo` to path and file name of a local image file (PNG or JPEG).

- The value of `confidence` to the desired confidence level (50-100).

```
//Loads images, detects faces and draws bounding boxes.Determines exif
 orientation, if necessary.
package com.amazonaws.samples;


import java.awt.*;
import java.awt.image.BufferedImage;
import java.util.List;
import javax.imageio.ImageIO;
import javax.swing.*;

import java.io.ByteArrayInputStream;
import java.io.ByteArrayOutputStream;
import java.io.File;
import java.io.FileInputStream;
import java.io.InputStream;
import java.nio.ByteBuffer;
import com.amazonaws.util.IOUtils;

import com.amazonaws.client.builder.AwsClientBuilder;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.BoundingBox;
import
 com.amazonaws.services.rekognition.model.DetectProtectiveEquipmentRequest;
import com.amazonaws.services.rekognition.model.DetectProtectiveEquipmentResult;
import com.amazonaws.services.rekognition.model.EquipmentDetection;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.ProtectiveEquipmentBodyPart;
import com.amazonaws.services.rekognition.model.ProtectiveEquipmentPerson;

// Calls DetectFaces and displays a bounding box around each detected image.
public class PPEBoundingBox extends JPanel {

    private static final long serialVersionUID = 1L;

    BufferedImage image;
    static int scale;
    DetectProtectiveEquipmentResult result;
```

```
   float confidence=80;

   public PPEBoundingBox(DetectProtectiveEquipmentResult ppeResult,
BufferedImage bufImage, float requiredConfidence) throws Exception {
       super();
       scale = 2; // increase to shrink image size.

       result = ppeResult;
       image = bufImage;

       confidence=requiredConfidence;
   }
   // Draws the bounding box around the detected faces.
   public void paintComponent(Graphics g) {
       float left = 0;
       float top = 0;
       int height = image.getHeight(this);
       int width = image.getWidth(this);
       int offset=20;

       Graphics2D g2d = (Graphics2D) g; // Create a Java2D version of g.

       // Draw the image.
       g2d.drawImage(image, 0, 0, width / scale, height / scale, this);
       g2d.setColor(new Color(0, 212, 0));

       // Iterate through detected persons and display bounding boxes.
       List<ProtectiveEquipmentPerson> persons = result.getPersons();

       for (ProtectiveEquipmentPerson person: persons) {
           BoundingBox boxPerson = person.getBoundingBox();
           left = width * boxPerson.getLeft();
           top = height * boxPerson.getTop();
           Boolean foundMask=false;

           List<ProtectiveEquipmentBodyPart> bodyParts=person.getBodyParts();

           if (bodyParts.isEmpty()==false)
            {
                   //body parts detected

                   for (ProtectiveEquipmentBodyPart bodyPart: bodyParts) {
```

```
                        List<EquipmentDetection>
equipmentDetections=bodyPart.getEquipmentDetections();

                        for (EquipmentDetection item: equipmentDetections) {

                            if (item.getType().contentEquals("FACE_COVER"))
                            {
                                // Draw green or red bounding box depending on
mask coverage.
                                foundMask=true;
                                BoundingBox box =item.getBoundingBox();
                                left = width * box.getLeft();
                                top = height * box.getTop();
                                Color maskColor=new Color( 0, 212, 0);

                                if (item.getCoversBodyPart().getValue()==false)
{
                                    // red bounding box
                                    maskColor=new Color( 255, 0, 0);
                                }
                                g2d.setColor(maskColor);
                                g2d.drawRect(Math.round(left / scale),
Math.round(top / scale),
                                        Math.round((width * box.getWidth()) /
scale), Math.round((height * box.getHeight())) / scale);

                                // Check confidence is > supplied confidence.
                                if (item.getCoversBodyPart().getConfidence()<
confidence)
                                {
                                    // Draw a yellow bounding box inside face
mask bounding box
                                    maskColor=new Color( 255, 255, 0);
                                    g2d.setColor(maskColor);
                                    g2d.drawRect(Math.round((left + offset) /
scale),
                                            Math.round((top + offset) / scale),
                                            Math.round((width *
box.getWidth())- (offset * 2 ))/ scale,
                                            Math.round((height *
box.getHeight()) -( offset* 2)) / scale);
                                }

                            }
```

```
                        }

                    }

                }

            // Didn't find a mask, so draw person bounding box red
            if (foundMask==false) {

                left = width * boxPerson.getLeft();
                top = height * boxPerson.getTop();
                g2d.setColor(new Color(255, 0, 0));
                g2d.drawRect(Math.round(left / scale), Math.round(top / scale),
                        Math.round(((width) * boxPerson.getWidth()) / scale),
Math.round((height * boxPerson.getHeight())) / scale);
            }
        }

   }


   public static void main(String arg[]) throws Exception {

       String photo = "photo";

       float confidence =80;


       int height = 0;
       int width = 0;

       BufferedImage image = null;
       ByteBuffer imageBytes;

       // Get image bytes for call to DetectProtectiveEquipment
       try (InputStream inputStream = new FileInputStream(new File(photo))) {
           imageBytes = ByteBuffer.wrap(IOUtils.toByteArray(inputStream));
       }

       //Get image for display
       InputStream imageBytesStream;
       imageBytesStream = new ByteArrayInputStream(imageBytes.array());

       ByteArrayOutputStream baos = new ByteArrayOutputStream();
```

```
        image=ImageIO.read(imageBytesStream);
        ImageIO.write(image, "jpg", baos);
        width = image.getWidth();
        height = image.getHeight();

        //Get Rekognition client
        AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();


        // Call DetectProtectiveEquipment
        DetectProtectiveEquipmentRequest request = new
 DetectProtectiveEquipmentRequest()
                .withImage(new Image()
                        .withBytes(imageBytes));

        DetectProtectiveEquipmentResult result =
 rekognitionClient.detectProtectiveEquipment(request);


        // Create frame and panel.
        JFrame frame = new JFrame("Detect PPE");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        PPEBoundingBox panel = new PPEBoundingBox(result, image, confidence);
        panel.setPreferredSize(new Dimension(image.getWidth() / scale,
 image.getHeight() / scale));
        frame.setContentPane(panel);
        frame.pack();
        frame.setVisible(true);

    }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import java.awt.*;
import java.awt.image.BufferedImage;
import java.io.*;
import java.util.List;
```

```
import javax.imageio.ImageIO;
import javax.swing.*;
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.core.ResponseBytes;
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.model.BoundingBox;
import
 software.amazon.awssdk.services.rekognition.model.DetectProtectiveEquipmentRequest;
import software.amazon.awssdk.services.rekognition.model.EquipmentDetection;
import
 software.amazon.awssdk.services.rekognition.model.ProtectiveEquipmentBodyPart;
import
 software.amazon.awssdk.services.rekognition.model.ProtectiveEquipmentPerson;
import
 software.amazon.awssdk.services.rekognition.model.ProtectiveEquipmentSummarizationAttri
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.s3.S3Client;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.s3.model.GetObjectRequest;
import software.amazon.awssdk.services.s3.model.GetObjectResponse;
import software.amazon.awssdk.services.s3.model.S3Exception;
import
 software.amazon.awssdk.services.rekognition.model.DetectProtectiveEquipmentResponse;
//snippet-end:[rekognition.java2.display_mask.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class PPEBoundingBoxFrame extends JPanel {

 DetectProtectiveEquipmentResponse result;
 static BufferedImage image;
 static int scale;
 float confidence;

 public static void main(String[] args) throws Exception {
```

```
    final String usage = "\n" +
        "Usage: " +
        "   <sourceImage> <bucketName>\n\n" +
        "Where:\n" +
        "   sourceImage - The name of the image in an Amazon S3 bucket that
 shows a person wearing a mask (for example, masks.png). \n\n" +
        "   bucketName - The name of the Amazon S3 bucket (for example, amzn-
s3-demo-bucket). \n\n";

    if (args.length != 2) {
        System.out.println(usage);
        System.exit(1);
    }

    String sourceImage = args[0];
    String bucketName = args[1];
    Region region = Region.US_EAST_1;
    S3Client s3 = S3Client.builder()
        .region(region)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    RekognitionClient rekClient = RekognitionClient.builder()
        .region(region)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    displayGear(s3, rekClient, sourceImage, bucketName);
    s3.close();
    rekClient.close();
 }

 // snippet-start:[rekognition.java2.display_mask.main]
public static void displayGear(S3Client s3,
                                   RekognitionClient rekClient,
                                   String sourceImage,
                                   String bucketName) {
    float confidence = 80;
    byte[] data = getObjectBytes(s3, bucketName, sourceImage);
    InputStream is = new ByteArrayInputStream(data);

    try {
```

```
        ProtectiveEquipmentSummarizationAttributes summarizationAttributes =
 ProtectiveEquipmentSummarizationAttributes.builder()
             .minConfidence(70F)
             .requiredEquipmentTypesWithStrings("FACE_COVER")
             .build();

        SdkBytes sourceBytes = SdkBytes.fromInputStream(is);
        image = ImageIO.read(sourceBytes.asInputStream());

        // Create an Image object for the source image.
        software.amazon.awssdk.services.rekognition.model.Image souImage =
 Image.builder()
             .bytes(sourceBytes)
             .build();

        DetectProtectiveEquipmentRequest request =
 DetectProtectiveEquipmentRequest.builder()
             .image(souImage)
             .summarizationAttributes(summarizationAttributes)
             .build();

        DetectProtectiveEquipmentResponse result =
 rekClient.detectProtectiveEquipment(request);
        JFrame frame = new JFrame("Detect PPE");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        PPEBoundingBoxFrame panel = new PPEBoundingBoxFrame(result, image,
 confidence);
        panel.setPreferredSize(new Dimension(image.getWidth() / scale,
 image.getHeight() / scale));
        frame.setContentPane(panel);
        frame.pack();
        frame.setVisible(true);

    } catch (RekognitionException e) {
        e.printStackTrace();
        System.exit(1);
    } catch (Exception e) {
        e.printStackTrace();
    }
}

 public static byte[] getObjectBytes (S3Client s3, String bucketName, String
 keyName) {
```

```
    try {
        GetObjectRequest objectRequest = GetObjectRequest
            .builder()
            .key(keyName)
            .bucket(bucketName)
            .build();

        ResponseBytes<GetObjectResponse> objectBytes =
s3.getObjectAsBytes(objectRequest);
        return objectBytes.asByteArray();

    } catch (S3Exception e) {
        System.err.println(e.awsErrorDetails().errorMessage());
        System.exit(1);
    }
    return null;
 }

public PPEBoundingBoxFrame(DetectProtectiveEquipmentResponse ppeResult,
BufferedImage bufImage, float requiredConfidence) {
    super();
    scale = 1; // increase to shrink image size.
    result = ppeResult;
    image = bufImage;
    confidence=requiredConfidence;
}

// Draws the bounding box around the detected masks.
public void paintComponent(Graphics g) {
    float left = 0;
    float top = 0;
    int height = image.getHeight(this);
    int width = image.getWidth(this);
    int offset=20;

    Graphics2D g2d = (Graphics2D) g; // Create a Java2D version of g.

    // Draw the image.
    g2d.drawImage(image, 0, 0, width / scale, height / scale, this);
    g2d.setColor(new Color(0, 212, 0));

    // Iterate through detected persons and display bounding boxes.
    List<ProtectiveEquipmentPerson> persons = result.persons();
    for (ProtectiveEquipmentPerson person: persons) {
```

```
        List<ProtectiveEquipmentBodyPart> bodyParts=person.bodyParts();
        if (!bodyParts.isEmpty()){
            for (ProtectiveEquipmentBodyPart bodyPart: bodyParts) {
                List<EquipmentDetection>
 equipmentDetections=bodyPart.equipmentDetections();
                for (EquipmentDetection item: equipmentDetections) {

                    String myType = item.type().toString();
                    if (myType.compareTo("FACE_COVER") ==0) {

                        // Draw green bounding box depending on mask coverage.
                        BoundingBox box =item.boundingBox();
                        left = width * box.left();
                        top = height * box.top();
                        Color maskColor=new Color( 0, 212, 0);

                        if (item.coversBodyPart().equals(false)) {
                            // red bounding box.
                            maskColor=new Color( 255, 0, 0);
                        }
                        g2d.setColor(maskColor);
                        g2d.drawRect(Math.round(left / scale), Math.round(top /
 scale),
                                Math.round((width * box.width()) / scale),
 Math.round((height * box.height())) / scale);

                        // Check confidence is > supplied confidence.
                        if (item.coversBodyPart().confidence() < confidence) {
                            // Draw a yellow bounding box inside face mask
 bounding box.
                            maskColor=new Color( 255, 255, 0);
                            g2d.setColor(maskColor);
                            g2d.drawRect(Math.round((left + offset) / scale),
                                    Math.round((top + offset) / scale),
                                    Math.round((width * box.width())- (offset *
 2 ))/ scale,
                                    Math.round((height * box.height()) -
( offset* 2)) / scale);
                        }
                    }
                }
            }
        }
```

```
    }
 }
 // snippet-end:[rekognition.java2.display_mask.main]
}
```

Python

In the function `main`, change the following:

- The value of `photo` to path and file name of a local image file (PNG or JPEG).
- The value of `confidence` to the desired confidence level (50-100).
- Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
#Copyright 2020 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
import io
from PIL import Image, ImageDraw, ExifTags, ImageColor

def detect_ppe(photo, confidence):

    fill_green='#00d400'
    fill_red='#ff0000'
    fill_yellow='#ffff00'
    line_width=3

    #open image and get image data from stream.
    image = Image.open(open(photo,'rb'))
    stream = io.BytesIO()
    image.save(stream, format=image.format)
    image_binary = stream.getvalue()
    imgWidth, imgHeight = image.size
    draw = ImageDraw.Draw(image)

    client=boto3.client('rekognition')

    response = client.detect_protective_equipment(Image={'Bytes': image_binary})
```

```
    for person in response['Persons']:

        found_mask=False

        for body_part in person['BodyParts']:
            ppe_items = body_part['EquipmentDetections']

            for ppe_item in ppe_items:
                #found a mask
                if ppe_item['Type'] == 'FACE_COVER':
                    fill_color=fill_green
                    found_mask=True
                    # check if mask covers face
                    if ppe_item['CoversBodyPart']['Value'] == False:
                        fill_color=fill='#ff0000'
                    # draw bounding box around mask
                    box = ppe_item['BoundingBox']
                    left = imgWidth * box['Left']
                    top = imgHeight * box['Top']
                    width = imgWidth * box['Width']
                    height = imgHeight * box['Height']
                    points = (
                            (left,top),
                            (left + width, top),
                            (left + width, top + height),
                            (left , top + height),
                            (left, top)
                        )
                    draw.line(points, fill=fill_color, width=line_width)

                     # Check if confidence is lower than supplied value
                    if ppe_item['CoversBodyPart']['Confidence'] < confidence:
                        #draw warning yellow bounding box within face mask
bounding box
                        offset=line_width+ line_width
                        points = (
                                    (left+offset,top + offset),
                                    (left + width-offset, top+offset),
                                    ((left) + (width-offset), (top-offset) +
(height)),
                                    (left+ offset , (top) + (height -offset)),
                                    (left + offset, top + offset)
                                )
                        draw.line(points, fill=fill_yellow, width=line_width)
```

```
        if found_mask==False:
            # no face mask found so draw red bounding box around body
            box = person['BoundingBox']
            left = imgWidth * box['Left']
            top = imgHeight * box['Top']
            width = imgWidth * box['Width']
            height = imgHeight * box['Height']
            points = (
                (left,top),
                (left + width, top),
                (left + width, top + height),
                (left , top + height),
                (left, top)
                )
            draw.line(points, fill=fill_red, width=line_width)

    image.show()

def main():
    photo='photo'
    confidence=80
    detect_ppe(photo, confidence)

if __name__ == "__main__":
    main()
```

CLI

In the following CLI example change the value of the arguments listed below:

- The value of `photo` to path and file name of a local image file (PNG or JPEG).
- The value of `confidence` to the desired confidence level (50-100).
- Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
                                aws rekognition detect-protective-equipment
 --image "{"S3Object":{"Bucket":"amzn-s3-demo-bucket","Name":"image-name"}}" --
profile profile-name \
                                --summarization-attributes
 "{"MinConfidence":MinConfidenceNumber,"RequiredEquipmentTypes":["FACE_COVER"]}"
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
                                aws rekognition detect-protective-equipment  --
image "{\"S3Object\":{\"Bucket\":\"amzn-s3-demo-bucket\",\"Name\":\"image-name
\"}}" \
                                --profile profile-name --summarization-
attributes "{\"MinConfidence\":MinConfidenceNumber,\"RequiredEquipmentTypes\":
[\"FACE_COVER\"]}"
```

Recognizing celebrities

Amazon Rekognition makes it easy for customers to automatically recognize tens of thousands of well-known personalities in images and videos using machine learning. The metadata provided by the celebrity recognition API significantly reduces the repetitive manual effort required to tag content and make it readily searchable.

The rapid proliferation of image and video content means that media companies often struggle to organize, search, and utilize their media catalogs at scale. News channels and sports broadcasters often need to find images and videos quickly, in order to respond to current events and create relevant programming. Insufficient metadata makes these tasks difficult, but with Amazon Rekognition you can automatically tag large volumes of new or archival content to make it easily searchable for a comprehensive set of international, widely known celebrities like actors, sportspeople, and online content creators.

Amazon Rekognition celebrity recognition is designed to be used exclusively in cases where you expect there may be a known celebrity in an image or a video. For information about recognizing faces that are not celebrities, see Searching faces in a collection.

> **Note**
>
> If you are a celebrity and don't want to be included in this feature, contact AWS Support or email <rekognition-celebrity-opt-out@amazon.com>.

Topics

- Celebrity recognition compared to face search
- Recognizing celebrities in an image
- Recognizing celebrities in a stored video
- Getting information about a celebrity

Celebrity recognition compared to face search

Amazon Rekognition offers both celebrity recognition and face recognition functionality. These functionalities have some key differences in their use cases and best practices.

Celebrity recognition comes pre-trained with the ability to recognize hundreds of thousands of popular people in fields such as sports, media, politics, and business. This functionality is designed to help you search large volumes of images or videos in order to identify a small set that is likely to contain a particular celebrity. It's not intended to be used to match faces between different people that are not celebrities. In situations where the accuracy of the celebrity match is important, we recommend also using human operators to look through this smaller amount of marked content to help ensure a high level of accuracy and the proper application of human judgment. Celebrity recognition should not be used in a manner that could result in a negative impact on civil liberties.

In contrast, face recognition is a more general functionality that allows you to create your own face collections with your own face vectors to verify identities or search for any person, not just celebrities. Face recognition can be used for applications such as authenticating building access, public safety, and social media. In all these cases, it's recommended that you use best practices, appropriate confidence thresholds (including 99% for public safety use cases), and human review in situations where the accuracy of the match is important.

For more information, see Searching faces in a collection.

Recognizing celebrities in an image

To recognize celebrities within images and get additional information about recognized celebrities, use the RecognizeCelebrities non-storage API operation. For example, in social media or news and entertainment industries where information gathering can be time critical, you can use the `RecognizeCelebrities` operation to identify as many as 64 celebrities in an image, and return links to celebrity webpages, if they're available. Amazon Rekognition doesn't remember which image it detected a celebrity in. Your application must store this information.

If you haven't stored the additional information for a celebrity that's returned by `RecognizeCelebrities` and you want to avoid reanalyzing an image to get it, use GetCelebrityInfo. To call `GetCelebrityInfo`, you need the unique identifier that Amazon Rekognition assigns to each celebrity. The identifier is returned as part of the `RecognizeCelebrities` response for each celebrity recognized in an image.

If you have a large collection of images to process for celebrity recognition, consider using AWS Batch to process calls to `RecognizeCelebrities` in batches in the background. When you add a new image to your collection, you can use an AWS Lambda function to recognize celebrities by calling `RecognizeCelebrities` as the image is uploaded into an S3 bucket.

Calling RecognizeCelebrities

You can provide the input image as an image byte array (base64-encoded image bytes) or as an Amazon S3 object, by using either the AWS Command Line Interface (AWS CLI) or the AWS SDK. In the AWS CLI procedure, you upload an image in .jpg or .png format to an S3 bucket. In the AWS SDK procedures, you use an image that's loaded from your local file system. For information about input image recommendations, see Working with images.

To run this procedure, you need an image file that contains one or more celebrity faces.

To recognize celebrities in an image

1. If you haven't already:
   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.
2. Use the following examples to call the `RecognizeCelebrities` operation.

   Java

   This example displays information about the celebrities that are detected in an image.

   Change the value of `photo` to the path and file name of an image file that contains one or more celebrity faces.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.BoundingBox;
import com.amazonaws.services.rekognition.model.Celebrity;
import com.amazonaws.services.rekognition.model.RecognizeCelebritiesRequest;
import com.amazonaws.services.rekognition.model.RecognizeCelebritiesResult;
import java.io.File;
```

```
import java.io.FileInputStream;
import java.io.InputStream;
import java.nio.ByteBuffer;
import com.amazonaws.util.IOUtils;
import java.util.List;


public class RecognizeCelebrities {

   public static void main(String[] args) {
      String photo = "moviestars.jpg";

      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

      ByteBuffer imageBytes=null;
      try (InputStream inputStream = new FileInputStream(new File(photo))) {
         imageBytes = ByteBuffer.wrap(IOUtils.toByteArray(inputStream));
      }
      catch(Exception e)
      {
          System.out.println("Failed to load file " + photo);
          System.exit(1);
      }


      RecognizeCelebritiesRequest request = new RecognizeCelebritiesRequest()
         .withImage(new Image()
         .withBytes(imageBytes));

      System.out.println("Looking for celebrities in image " + photo + "\n");

      RecognizeCelebritiesResult
 result=rekognitionClient.recognizeCelebrities(request);

      //Display recognized celebrity information
      List<Celebrity> celebs=result.getCelebrityFaces();
      System.out.println(celebs.size() + " celebrity(s) were recognized.\n");

      for (Celebrity celebrity: celebs) {
          System.out.println("Celebrity recognized: " + celebrity.getName());
          System.out.println("Celebrity ID: " + celebrity.getId());
          BoundingBox boundingBox=celebrity.getFace().getBoundingBox();
          System.out.println("position: " +
```

```
            boundingBox.getLeft().toString() + " " +
            boundingBox.getTop().toString());
         System.out.println("Further information (if available):");
         for (String url: celebrity.getUrls()){
            System.out.println(url);
         }
         System.out.println();
      }
      System.out.println(result.getUnrecognizedFaces().size() + " face(s) were
 unrecognized.");
   }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.recognize_celebs.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.core.SdkBytes;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;
import
 software.amazon.awssdk.services.rekognition.model.RecognizeCelebritiesRequest;
import
 software.amazon.awssdk.services.rekognition.model.RecognizeCelebritiesResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.Celebrity;
//snippet-end:[rekognition.java2.recognize_celebs.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
```

```
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class RecognizeCelebrities {

 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <sourceImage>\n\n" +
         "Where:\n" +
         "   sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png). \n\n";

     if (args.length != 1) {
         System.out.println(usage);
         System.exit(1);
     }

     String sourceImage = args[0];
     Region region = Region.US_EAST_1;
     RekognitionClient rekClient = RekognitionClient.builder()
         .region(region)
         .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
         .build();

     System.out.println("Locating celebrities in " + sourceImage);
     recognizeAllCelebrities(rekClient, sourceImage);
     rekClient.close();
 }

 // snippet-start:[rekognition.java2.recognize_celebs.main]
 public static void recognizeAllCelebrities(RekognitionClient rekClient, String
 sourceImage) {

     try {
         InputStream sourceStream = new FileInputStream(sourceImage);
         SdkBytes sourceBytes = SdkBytes.fromInputStream(sourceStream);
         Image souImage = Image.builder()
             .bytes(sourceBytes)
             .build();

         RecognizeCelebritiesRequest request =
 RecognizeCelebritiesRequest.builder()
```

```
            .image(souImage)
            .build();

        RecognizeCelebritiesResponse result =
rekClient.recognizeCelebrities(request) ;
        List<Celebrity> celebs=result.celebrityFaces();
        System.out.println(celebs.size() + " celebrity(s) were recognized.\n");
        for (Celebrity celebrity: celebs) {
            System.out.println("Celebrity recognized: " + celebrity.name());
            System.out.println("Celebrity ID: " + celebrity.id());

            System.out.println("Further information (if available):");
            for (String url: celebrity.urls()){
                System.out.println(url);
            }
            System.out.println();
        }
        System.out.println(result.unrecognizedFaces().size() + " face(s) were
unrecognized.");

    } catch (RekognitionException | FileNotFoundException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
}
// snippet-end:[rekognition.java2.recognize_celebs.main]
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `recognize-celebrities` CLI operation.

Change `amzn-s3-demo-bucket` to the name of an Amazon S3 bucket that contains an image. Change `input.jpg` to the file name of an image that contains one or more celebrity faces.

Replace the value of `profile_name` with the name of your developer profile.

```
aws rekognition recognize-celebrities \
  --image "S3Object={Bucket=amzn-s3-demo-bucket,Name=input.jpg}"
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
                                    aws rekognition recognize-celebrities --
image \
                                    "{\"S3Object\":{\"Bucket\":\"amzn-s3-demo-
bucket\",\"Name\":\"image-name\"}}" --profile profile-name
```

Python

This example displays information about the celebrities that are detected in an image.

Change the value of `photo` to the path and file name of an image file that contains one or more celebrity faces.

Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def recognize_celebrities(photo):

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')

    with open(photo, 'rb') as image:
        response = client.recognize_celebrities(Image={'Bytes': image.read()})

    print('Detected faces for ' + photo)
    for celebrity in response['CelebrityFaces']:
        print('Name: ' + celebrity['Name'])
        print('Id: ' + celebrity['Id'])
        print('KnownGender: ' + celebrity['KnownGender']['Type'])
        print('Smile: ' + str(celebrity['Face']['Smile']['Value']))
```

```
        print('Position:')
        print('   Left: ' + '{:.2f}'.format(celebrity['Face']['BoundingBox']
['Height']))
        print('   Top: ' + '{:.2f}'.format(celebrity['Face']['BoundingBox']
['Top']))
        print('Info')
        for url in celebrity['Urls']:
            print('   ' + url)
        print()
    return len(response['CelebrityFaces'])

def main():
    photo = 'photo-name'
    celeb_count = recognize_celebrities(photo)
    print("Celebrities detected: " + str(celeb_count))

if __name__ == "__main__":
    main()
```

Node.Js

This example displays information about the celebrities that are detected in an image.

Change the value of `photo` to the path and file name of an image file that contains one or more celebrity faces. Change the value of `amzn-s3-demo-bucket` to the name of the S3 bucket containing the provided image file. Change the value of `REGION` to the name of the region associated with your user. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
// Import required AWS SDK clients and commands for Node.js
import { RecognizeCelebritiesCommand } from  "@aws-sdk/client-rekognition";
import  { RekognitionClient } from "@aws-sdk/client-rekognition";

// Set the AWS Region.
const REGION = "region-name"; //e.g. "us-east-1"
const profileName = "profile-name";

// Create SNS service object.
const rekogClient = new RekognitionClient({region: REGION,
  credentials: fromIni({profile: profileName,}),
});
```

```
const bucket = 'bucket-name'
const photo = 'photo-name'

// Set params
const params = {
    Image: {
      S3Object: {
        Bucket: bucket,
        Name: photo
      },
    },
  }

const recognize_celebrity = async() => {
    try {
        const response = await rekogClient.send(new
 RecognizeCelebritiesCommand(params));
        console.log(response.Labels)
        response.CelebrityFaces.forEach(celebrity =>{
            console.log(`Name: ${celebrity.Name}`)
            console.log(`ID: ${celebrity.Id}`)
            console.log(`KnownGender: ${celebrity.KnownGender.Type}`)
            console.log(`Smile: ${celebrity.Smile}`)
            console.log('Position: ')
            console.log(`   Left: ${celebrity.Face.BoundingBox.Height}`)
            console.log(`  Top : ${celebrity.Face.BoundingBox.Top}`)

        })
        return response.length; // For unit tests.
      } catch (err) {
        console.log("Error", err);
      }
}

recognize_celebrity()
```

.NET

This example displays information about the celebrities that are detected in an image.

Change the value of `photo` to the path and file name of an image file that contains one or more celebrity faces (.jpg or .png format).

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using System.IO;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class CelebritiesInImage
{
    public static void Example()
    {
        String photo = "moviestars.jpg";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        RecognizeCelebritiesRequest recognizeCelebritiesRequest = new
 RecognizeCelebritiesRequest();

        Amazon.Rekognition.Model.Image img = new
 Amazon.Rekognition.Model.Image();
        byte[] data = null;
        try
        {
            using (FileStream fs = new FileStream(photo, FileMode.Open,
 FileAccess.Read))
            {
                data = new byte[fs.Length];
                fs.Read(data, 0, (int)fs.Length);
            }
        }
        catch(Exception)
        {
            Console.WriteLine("Failed to load file " + photo);
            return;
        }

        img.Bytes = new MemoryStream(data);
        recognizeCelebritiesRequest.Image = img;

        Console.WriteLine("Looking for celebrities in image " + photo + "\n");
```

```
        RecognizeCelebritiesResponse recognizeCelebritiesResponse =
 rekognitionClient.RecognizeCelebrities(recognizeCelebritiesRequest);

        Console.WriteLine(recognizeCelebritiesResponse.CelebrityFaces.Count + "
 celebrity(s) were recognized.\n");
        foreach (Celebrity celebrity in
 recognizeCelebritiesResponse.CelebrityFaces)
        {
            Console.WriteLine("Celebrity recognized: " + celebrity.Name);
            Console.WriteLine("Celebrity ID: " + celebrity.Id);
            BoundingBox boundingBox = celebrity.Face.BoundingBox;
            Console.WriteLine("position: " +
               boundingBox.Left + " " + boundingBox.Top);
            Console.WriteLine("Further information (if available):");
            foreach (String url in celebrity.Urls)
                Console.WriteLine(url);
        }
        Console.WriteLine(recognizeCelebritiesResponse.UnrecognizedFaces.Count +
 " face(s) were unrecognized.");
    }
}
```

3. Record the value of one of the celebrity IDs that are displayed. You'll need it in [Getting information about a celebrity](#).

RecognizeCelebrities operation request

The input to `RecognizeCelebrities` is an image. In this example, the image is passed as image bytes. For more information, see [Working with images](#).

```
{
    "Image": {
        "Bytes": "/AoSiyvFpm....."
    }
}
```

RecognizeCelebrities operation response

The following is example JSON input and output for `RecognizeCelebrities`.

`RecognizeCelebrities` returns an array of recognized celebrities and an array of unrecognized faces. In the example, note the following:

- **Recognized celebrities** – `Celebrities` is an array of recognized celebrities. Each Celebrity object in the array contains the celebrity name and a list of URLs pointing to related content—for example, the celebrity's IMDB or Wikidata link. Amazon Rekognition returns an ComparedFace object that your application can use to determine where the celebrity's face is on the image and a unique identifier for the celebrity. Use the unique identifier to retrieve celebrity information later with the GetCelebrityInfo API operation.
- **Unrecognized faces** – `UnrecognizedFaces` is an array of faces that didn't match any known celebrities. Each ComparedFace object in the array contains a bounding box (as well as other information) that you can use to locate the face in the image.


```
{
    "CelebrityFaces": [{
        "Face": {
            "BoundingBox": {
                "Height": 0.617123007774353,
                "Left": 0.15641026198863983,
                "Top": 0.10864841192960739,
                "Width": 0.3641025722026825
            },
            "Confidence": 99.99589538574219,
            "Emotions": [{
                "Confidence": 96.3981749057023,
                "Type": "Happy"
                }
            ],
            "Landmarks": [{
                "Type": "eyeLeft",
                "X": 0.2837241291999817,
                "Y": 0.3637104034423828
            }, {
                "Type": "eyeRight",
                "X": 0.4091649055480957,
                "Y": 0.37378931045532227
            }, {
                "Type": "nose",
                "X": 0.35267341136932373,
```

```
                "Y": 0.49657556414604187
            }, {
                "Type": "mouthLeft",
                "X": 0.2786353826522827,
                "Y": 0.5455248355865479
            }, {
                "Type": "mouthRight",
                "X": 0.39566439390182495,
                "Y": 0.5597742199897766
            }],
            "Pose": {
                "Pitch": -7.749263763427734,
                "Roll": 2.004552125930786,
                "Yaw": 9.012002944946289
            },
            "Quality": {
                "Brightness": 32.69192123413086,
                "Sharpness": 99.9305191040039
            },
            "Smile": {
            "Confidence": 95.45394855702342,
            "Value": True
            }
        },
        "Id": "3Ir0du6",
        "KnownGender": {
            "Type": "Male"
        },
        "MatchConfidence": 98.0,
        "Name": "Jeff Bezos",
        "Urls": ["www.imdb.com/name/nm1757263"]
    }],
    "OrientationCorrection": "NULL",
    "UnrecognizedFaces": [{
        "BoundingBox": {
            "Height": 0.5345501899719238,
            "Left": 0.48461538553237915,
            "Top": 0.16949152946472168,
            "Width": 0.3153846263885498
        },
        "Confidence": 99.92860412597656,
        "Landmarks": [{
            "Type": "eyeLeft",
            "X": 0.5863404870033264,
```

```
            "Y": 0.36940744519233704
        }, {
            "Type": "eyeRight",
            "X": 0.6999204754829407,
            "Y": 0.3769848346710205
        }, {
            "Type": "nose",
            "X": 0.6349524259567261,
            "Y": 0.4804527163505554
        }, {
            "Type": "mouthLeft",
            "X": 0.5872702598571777,
            "Y": 0.5535582304000854
        }, {
            "Type": "mouthRight",
            "X": 0.6952020525932312,
            "Y": 0.5600858926773071
        }],
        "Pose": {
            "Pitch": -7.386096477508545,
            "Roll": 2.304218292236328,
            "Yaw": -6.175624370574951
        },
        "Quality": {
            "Brightness": 37.16635513305664,
            "Sharpness": 99.9305191040039
        },
        "Smile": {
            "Confidence": 95.45394855702342,
            "Value": True
        }
    }]
}
```


Recognizing celebrities in a stored video

Amazon Rekognition Video celebrity recognition in stored videos is an asynchronous operation. To recognize celebrities in a stored video, use StartCelebrityRecognition to start video analysis. Amazon Rekognition Video publishes the completion status of the video analysis to an Amazon Simple Notification Service topic. If the video analysis is succesful, call GetCelebrityRecognition. to get the analysis results. For more information about starting video analysis and getting the results, see Calling Amazon Rekognition Video operations.

This procedure expands on the code in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), which uses an Amazon SQS queue to get the completion status of a video analysis request. To run this procedure, you need a video file that contains one or more celebrity faces.

To detect celebrities in a video stored in an Amazon S3 bucket (SDK)

1. Perform Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).
2. Add the following code to the class `VideoDetect` that you created in step 1.

   Java

```
       //Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights
 Reserved.
       //PDX-License-Identifier: MIT-0 (For details, see https://github.com/
awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

     //
 Celebrities============================================================================
     private static void StartCelebrityDetection(String bucket, String video)
 throws Exception{

           NotificationChannel channel= new NotificationChannel()
                   .withSNSTopicArn(snsTopicArn)
                   .withRoleArn(roleArn);

          StartCelebrityRecognitionRequest req = new
 StartCelebrityRecognitionRequest()
                .withVideo(new Video()
                      .withS3Object(new S3Object()
                            .withBucket(bucket)
                            .withName(video)))
                .withNotificationChannel(channel);



          StartCelebrityRecognitionResult startCelebrityRecognitionResult =
 rek.startCelebrityRecognition(req);
          startJobId=startCelebrityRecognitionResult.getJobId();

       }

       private static void GetCelebrityDetectionResults() throws Exception{
```

```
            int maxResults=10;
            String paginationToken=null;
            GetCelebrityRecognitionResult celebrityRecognitionResult=null;

            do{
               if (celebrityRecognitionResult !=null){
                  paginationToken = celebrityRecognitionResult.getNextToken();
               }
               celebrityRecognitionResult = rek.getCelebrityRecognition(new
GetCelebrityRecognitionRequest()
                     .withJobId(startJobId)
                     .withNextToken(paginationToken)
                     .withSortBy(CelebrityRecognitionSortBy.TIMESTAMP)
                     .withMaxResults(maxResults));


               System.out.println("File info for page");
               VideoMetadata
videoMetaData=celebrityRecognitionResult.getVideoMetadata();

               System.out.println("Format: " + videoMetaData.getFormat());
               System.out.println("Codec: " + videoMetaData.getCodec());
               System.out.println("Duration: " +
videoMetaData.getDurationMillis());
               System.out.println("FrameRate: " + videoMetaData.getFrameRate());

               System.out.println("Job");

               System.out.println("Job status: " +
celebrityRecognitionResult.getJobStatus());


               //Show celebrities
               List<CelebrityRecognition> celebs=
celebrityRecognitionResult.getCelebrities();

               for (CelebrityRecognition celeb: celebs) {
                  long seconds=celeb.getTimestamp()/1000;
                  System.out.print("Sec: " + Long.toString(seconds) + " ");
                  CelebrityDetail details=celeb.getCelebrity();
                  System.out.println("Name: " + details.getName());
                  System.out.println("Id: " + details.getId());
                  System.out.println();
               }
```

```
           } while (celebrityRecognitionResult !=null &&
 celebrityRecognitionResult.getNextToken() != null);

        }
```

In the function `main`, replace the line:

```
        StartLabelDetection(amzn-s3-demo-bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetLabelDetectionResults();
```

with:

```
        StartCelebrityDetection(amzn-s3-demo-bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetCelebrityDetectionResults();
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.recognize_video_celebrity.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartCelebrityRecognitionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.CelebrityRecognitionSortBy;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.CelebrityRecognition;
import software.amazon.awssdk.services.rekognition.model.CelebrityDetail;
```

```
import
 software.amazon.awssdk.services.rekognition.model.StartCelebrityRecognitionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetCelebrityRecognitionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetCelebrityRecognitionResponse;
import java.util.List;
//snippet-end:[rekognition.java2.recognize_video_celebrity.import]

/**
*  To run this code example, ensure that you perform the Prerequisites as stated
 in the Amazon Rekognition Guide:
*  https://docs.aws.amazon.com/rekognition/latest/dg/video-analyzing-with-
sqs.html
*
* Also, ensure that set up your development environment, including your
 credentials.
*
* For information, see this documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/

public class RecognizeCelebritiesVideo {

private static String startJobId ="";

public static void main(String[] args) {

   final String usage = "\n" +
       "Usage: " +
       "   <bucket> <video> <topicArn> <roleArn>\n\n" +
       "Where:\n" +
       "   bucket - The name of the bucket in which the video is located (for
 example, (for example, amzn-s3-demo-bucket). \n\n"+
       "   video - The name of video (for example, people.mp4). \n\n" +
       "   topicArn - The ARN of the Amazon Simple Notification Service (Amazon
 SNS) topic. \n\n" +
       "   roleArn - The ARN of the AWS Identity and Access Management (IAM)
 role to use. \n\n" ;

   if (args.length != 4) {
       System.out.println(usage);
```

```
        System.exit(1);
    }

    String bucket = args[0];
    String video = args[1];
    String topicArn = args[2];
    String roleArn = args[3];
    Region region = Region.US_EAST_1;
    RekognitionClient rekClient = RekognitionClient.builder()
        .region(region)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

  NotificationChannel channel = NotificationChannel.builder()
        .snsTopicArn(topicArn)
        .roleArn(roleArn)
        .build();

  StartCelebrityDetection(rekClient, channel, bucket, video);
  GetCelebrityDetectionResults(rekClient);
  System.out.println("This example is done!");
  rekClient.close();
}

// snippet-start:[rekognition.java2.recognize_video_celebrity.main]
public static void StartCelebrityDetection(RekognitionClient rekClient,
                                            NotificationChannel channel,
                                            String bucket,
                                            String video){
    try {
        S3Object s3Obj = S3Object.builder()
            .bucket(bucket)
            .name(video)
            .build();

        Video vidOb = Video.builder()
            .s3Object(s3Obj)
            .build();

        StartCelebrityRecognitionRequest recognitionRequest =
 StartCelebrityRecognitionRequest.builder()
            .jobTag("Celebrities")
            .notificationChannel(channel)
            .video(vidOb)
```

```
            .build();

        StartCelebrityRecognitionResponse startCelebrityRecognitionResult =
 rekClient.startCelebrityRecognition(recognitionRequest);
        startJobId = startCelebrityRecognitionResult.jobId();

    } catch(RekognitionException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
}

public static void GetCelebrityDetectionResults(RekognitionClient rekClient) {

    try {
        String paginationToken=null;
        GetCelebrityRecognitionResponse recognitionResponse = null;
        boolean finished = false;
        String status;
        int yy=0 ;

        do{
            if (recognitionResponse !=null)
                paginationToken = recognitionResponse.nextToken();

            GetCelebrityRecognitionRequest recognitionRequest =
 GetCelebrityRecognitionRequest.builder()
                .jobId(startJobId)
                .nextToken(paginationToken)
                .sortBy(CelebrityRecognitionSortBy.TIMESTAMP)
                .maxResults(10)
                .build();

            // Wait until the job succeeds
            while (!finished) {
                recognitionResponse =
 rekClient.getCelebrityRecognition(recognitionRequest);
                status = recognitionResponse.jobStatusAsString();

                if (status.compareTo("SUCCEEDED") == 0)
                    finished = true;
                else {
                    System.out.println(yy + " status is: " + status);
                    Thread.sleep(1000);
```

```
                }
                yy++;
            }

            finished = false;

            // Proceed when the job is done - otherwise VideoMetadata is null.
            VideoMetadata videoMetaData=recognitionResponse.videoMetadata();
            System.out.println("Format: " + videoMetaData.format());
            System.out.println("Codec: " + videoMetaData.codec());
            System.out.println("Duration: " + videoMetaData.durationMillis());
            System.out.println("FrameRate: " + videoMetaData.frameRate());
            System.out.println("Job");

            List<CelebrityRecognition> celebs= recognitionResponse.celebrities();
            for (CelebrityRecognition celeb: celebs) {
                long seconds=celeb.timestamp()/1000;
                System.out.print("Sec: " + seconds + " ");
                CelebrityDetail details=celeb.celebrity();
                System.out.println("Name: " + details.name());
                System.out.println("Id: " + details.id());
                System.out.println();
            }

        } while (recognitionResponse.nextToken() != null);

    } catch(RekognitionException | InterruptedException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
}
// snippet-end:[rekognition.java2.recognize_video_celebrity.main]
}
```

Python

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    # ============== Celebrities ===============
    def StartCelebrityDetection(self):
```

```
        response=self.rek.start_celebrity_recognition(Video={'S3Object':
{'Bucket': self.bucket, 'Name': self.video}},
            NotificationChannel={'RoleArn': self.roleArn, 'SNSTopicArn':
self.snsTopicArn})

        self.startJobId=response['JobId']
        print('Start Job Id: ' + self.startJobId)

    def GetCelebrityDetectionResults(self):
        maxResults = 10
        paginationToken = ''
        finished = False

        while finished == False:
            response = self.rek.get_celebrity_recognition(JobId=self.startJobId,
                                                MaxResults=maxResults,
                                                NextToken=paginationToken)

            print(response['VideoMetadata']['Codec'])
            print(str(response['VideoMetadata']['DurationMillis']))
            print(response['VideoMetadata']['Format'])
            print(response['VideoMetadata']['FrameRate'])

            for celebrityRecognition in response['Celebrities']:
                print('Celebrity: ' +
                    str(celebrityRecognition['Celebrity']['Name']))
                print('Timestamp: ' + str(celebrityRecognition['Timestamp']))
                print()

            if 'NextToken' in response:
                paginationToken = response['NextToken']
            else:
                finished = True
```

In the function `main`, replace the lines:

```
    analyzer.StartLabelDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetLabelDetectionResults()
```

with:

```
    analyzer.StartCelebrityDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetCelebrityDetectionResults()
```

Node.JS

In the following Node.Js code example, replace the value of `amzn-s3-demo-bucket` with the name of the S3 bucket containing your video and the value of `videoName` with the name of the video file. You'll also need to replace the value of `roleArn` with the Arn associated with your IAM service role. Finally, replace the value of `region` with the name of the operating region associated with your account. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

// Import required AWS SDK clients and commands for Node.js
import { CreateQueueCommand, GetQueueAttributesCommand, GetQueueUrlCommand,
  SetQueueAttributesCommand, DeleteQueueCommand, ReceiveMessageCommand,
 DeleteMessageCommand } from  "@aws-sdk/client-sqs";
import {CreateTopicCommand, SubscribeCommand, DeleteTopicCommand } from "@aws-
sdk/client-sns";
import  { SQSClient } from "@aws-sdk/client-sqs";
import  { SNSClient } from "@aws-sdk/client-sns";
import  { RekognitionClient, StartLabelDetectionCommand,
 GetLabelDetectionCommand,
  StartCelebrityRecognitionCommand, GetCelebrityRecognitionCommand} from "@aws-
sdk/client-rekognition";
import { stdout } from "process";
import {fromIni} from '@aws-sdk/credential-providers';

// Set the AWS Region.
const REGION = "region-name"; //e.g. "us-east-1"
// Set the profile name
const profileName = "profile-name"
// Name the collection
// Create SNS service object.
const sqsClient = new SQSClient({ region: REGION,
  credentials: fromIni({profile: profileName,}), });
const snsClient = new SNSClient({ region: REGION,
```

```
  credentials: fromIni({profile: profileName,}), });
const rekClient = new RekognitionClient({region: REGION,
  credentials: fromIni({profile: profileName,}),
});

// Set bucket and video variables
const bucket = "bucket-name";
const videoName = "video-name";
const roleArn = "role-arn"
var startJobId = ""

var ts = Date.now();
const snsTopicName = "AmazonRekognitionExample" + ts;
const snsTopicParams = {Name: snsTopicName}
const sqsQueueName = "AmazonRekognitionQueue-" + ts;

 // Set the parameters
 const sqsParams = {
  QueueName: sqsQueueName, //SQS_QUEUE_URL
  Attributes: {
    DelaySeconds: "60", // Number of seconds delay.
    MessageRetentionPeriod: "86400", // Number of seconds delay.
  },
};

const createTopicandQueue = async () => {
  try {
    // Create SNS topic
    const topicResponse = await snsClient.send(new
 CreateTopicCommand(snsTopicParams));
    const topicArn = topicResponse.TopicArn
    console.log("Success", topicResponse);
    // Create SQS Queue
    const sqsResponse = await sqsClient.send(new
 CreateQueueCommand(sqsParams));
    console.log("Success", sqsResponse);
    const sqsQueueCommand = await sqsClient.send(new
 GetQueueUrlCommand({QueueName: sqsQueueName}))
    const sqsQueueUrl = sqsQueueCommand.QueueUrl
    const attribsResponse = await sqsClient.send(new
 GetQueueAttributesCommand({QueueUrl: sqsQueueUrl, AttributeNames:
 ['QueueArn']}))
    const attribs = attribsResponse.Attributes
    console.log(attribs)
```

```
    const queueArn = attribs.QueueArn
    // subscribe SQS queue to SNS topic
    const subscribed = await snsClient.send(new SubscribeCommand({TopicArn:
 topicArn, Protocol:'sqs', Endpoint: queueArn}))
    const policy = {
      Version: "2012-10-17",
      Statement: [
        {
          Sid: "MyPolicy",
          Effect: "Allow",
          Principal: {AWS: "*"},
          Action: "SQS:SendMessage",
          Resource: queueArn,
          Condition: {
            ArnEquals: {
              'aws:SourceArn': topicArn
            }
          }
        }
      ]
    };

    const response = sqsClient.send(new SetQueueAttributesCommand({QueueUrl:
 sqsQueueUrl, Attributes: {Policy: JSON.stringify(policy)}}))
    console.log(response)
    console.log(sqsQueueUrl, topicArn)
    return [sqsQueueUrl, topicArn]

  } catch (err) {
    console.log("Error", err);
  }
};

const startCelebrityDetection = async(roleArn, snsTopicArn) =>{
  try {
      //Initiate label detection and update value of startJobId with returned
 Job ID
      const response = await rekClient.send(new
 StartCelebrityRecognitionCommand({Video:{S3Object:{Bucket:bucket,
 Name:videoName}},
          NotificationChannel:{RoleArn: roleArn, SNSTopicArn: snsTopicArn}}))
          startJobId = response.JobId
          console.log(`Start Job ID: ${startJobId}`)
          return startJobId
```

```
    } catch (err) {
      console.log("Error", err);
    }
  };

const getCelebrityRecognitionResults = async(startJobId) =>{
  try {
      //Initiate label detection and update value of startJobId with returned
 Job ID
      var maxResults = 10
      var paginationToken = ''
      var finished = false

      while (finished == false){
          var response = await rekClient.send(new
 GetCelebrityRecognitionCommand({JobId: startJobId, MaxResults: maxResults,
              NextToken: paginationToken}))
          console.log(response.VideoMetadata.Codec)
          console.log(response.VideoMetadata.DurationMillis)
          console.log(response.VideoMetadata.Format)
          console.log(response.VideoMetadata.FrameRate)
          response.Celebrities.forEach(celebrityRecognition => {
              console.log(`Celebrity: ${celebrityRecognition.Celebrity.Name}`)
              console.log(`Timestamp: ${celebrityRecognition.Timestamp}`)
              console.log()
          })
          // Searh for pagination token, if found, set variable to next token
          if (String(response).includes("NextToken")){
              paginationToken = response.NextToken

          }else{
              finished = true
          }
      }
    } catch (err) {
      console.log("Error", err);
    }
  };

// Checks for status of job completion
const getSQSMessageSuccess = async(sqsQueueUrl, startJobId) => {
  try {
    // Set job found and success status to false initially
    var jobFound = false
```

```
    var succeeded = false
    var dotLine = 0
    // while not found, continue to poll for response
    while (jobFound == false){
      var sqsReceivedResponse = await sqsClient.send(new
ReceiveMessageCommand({QueueUrl:sqsQueueUrl,
        MaxNumberOfMessages:'ALL', MaxNumberOfMessages:10}));
      if (sqsReceivedResponse){
        var responseString = JSON.stringify(sqsReceivedResponse)
        if (!responseString.includes('Body')){
          if (dotLine < 40) {
            console.log('.')
            dotLine = dotLine + 1
          }else {
            console.log('')
            dotLine = 0
          };
          stdout.write('', () => {
            console.log('');
          });
          await new Promise(resolve => setTimeout(resolve, 5000));
          continue
        }
      }

      // Once job found, log Job ID and return true if status is succeeded
      for (var message of sqsReceivedResponse.Messages){
        console.log("Retrieved messages:")
        var notification = JSON.parse(message.Body)
        var rekMessage = JSON.parse(notification.Message)
        var messageJobId = rekMessage.JobId
        if (String(rekMessage.JobId).includes(String(startJobId))){
          console.log('Matching job found:')
          console.log(rekMessage.JobId)
          jobFound = true
          console.log(rekMessage.Status)
          if (String(rekMessage.Status).includes(String("SUCCEEDED"))){
            succeeded = true
            console.log("Job processing succeeded.")
            var sqsDeleteMessage = await sqsClient.send(new
DeleteMessageCommand({QueueUrl:sqsQueueUrl,
ReceiptHandle:message.ReceiptHandle}));
          }
        }else{
```

```
          console.log("Provided Job ID did not match returned ID.")
          var sqsDeleteMessage = await sqsClient.send(new
 DeleteMessageCommand({QueueUrl:sqsQueueUrl,
 ReceiptHandle:message.ReceiptHandle}));
        }
      }
    }
  return succeeded
  } catch(err) {
    console.log("Error", err);
  }
};

// Start label detection job, sent status notification, check for success
 status
// Retrieve results if status is "SUCEEDED", delete notification queue and
 topic
const runCelebRecognitionAndGetResults = async () => {
  try {
    const sqsAndTopic = await createTopicandQueue();
    //const startLabelDetectionRes = await startLabelDetection(roleArn,
 sqsAndTopic[1]);
    //const getSQSMessageStatus = await getSQSMessageSuccess(sqsAndTopic[0],
 startLabelDetectionRes)
    const startCelebrityDetectionRes = await startCelebrityDetection(roleArn,
 sqsAndTopic[1]);
    const getSQSMessageStatus = await getSQSMessageSuccess(sqsAndTopic[0],
 startCelebrityDetectionRes)
    console.log(getSQSMessageSuccess)
    if (getSQSMessageSuccess){
      console.log("Retrieving results:")
      const results = await
 getCelebrityRecognitionResults(startCelebrityDetectionRes)
    }
    const deleteQueue = await sqsClient.send(new DeleteQueueCommand({QueueUrl:
 sqsAndTopic[0]}));
    const deleteTopic = await snsClient.send(new DeleteTopicCommand({TopicArn:
 sqsAndTopic[1]}));
    console.log("Successfully deleted.")
  } catch (err) {
    console.log("Error", err);
  }
};
```

```
runCelebRecognitionAndGetResults()
```

CLI

Run the following AWS CLI command to start detecting celebrities in a video.

```
aws rekognition start-celebrity-recognition --video "{"S3Object":
{"Bucket":"amzn-s3-demo-bucket","Name":"video-name"}}" \
--notification-channel "{"SNSTopicArn":"topic-arn","RoleArn":"role-arn"}" \
--region region-name --profile profile-name
```

Update the following values:

- Change `amzn-s3-demo-bucket` and `video-name` to the Amazon S3 bucket name and file name that you specified in step 2.
- Change `region-name` to the AWS region that you're using.
- Replace the value of `profile-name` with the name of your developer profile.
- Change `topic-ARN` to the ARN of the Amazon SNS topic you created in step 3 of Configuring Amazon Rekognition Video.
- Change `role-ARN` to the ARN of the IAM service role you created in step 7 of Configuring Amazon Rekognition Video.

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see below:

```
aws rekognition start-celebrity-recognition --video "{\"S3Object\":{\"Bucket\":
\"amzn-s3-demo-bucket\",\"Name\":\"video-name\"}}" \
--notification-channel "{\"SNSTopicArn\":\"topic-arn\",\"RoleArn\":\"role-arn
\"}" \
--region region-name --profile profile-name
```

After running the proceeding code example, copy down the returned `jobID` and provide it to the following `GetCelebrityRecognition` command below to get your results, replacing `job-id-number` with the `jobID` you previously received:

```
aws rekognition get-celebrity-recognition --job-id job-id-number --profile
 profile-name
```

> **Note**
>
> If you've already run a video example other than Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), the code to replace might be different.

3. Run the code. Information about the celebrities recognized in the video is shown.

GetCelebrityRecognition operation response

The following is an example JSON response. The response includes the following:

- **Recognized celebrities** – `Celebrities` is an array of celebrities and the times that they are recognized in a video. A CelebrityRecognition object exists for each time the celebrity is recognized in the video. Each `CelebrityRecognition` contains information about a recognized celebrity (CelebrityDetail) and the time (`Timestamp`) the celebrity was recognized in the video. `Timestamp` is measured in milliseconds from the start of the video.
- **CelebrityDetail** – Contains information about a recognized celebrity. It includes the celebrity name (`Name`), identifier (`ID`), the celebrity's known gender(`KnownGender`), and a list of URLs pointing to related content (`Urls`). It also includes the confidence level that Amazon Rekognition Video has in the accuracy of the recognition, and details about the celebrity's face, FaceDetail. If you need to get the related content later, you can use `ID` with getCelebrityInfo.
- **VideoMetadata** – Information about the video that was analyzed.

```
{
    "Celebrities": [
        {
            "Celebrity": {
                "Confidence": 0.699999988079071,
                "Face": {
                    "BoundingBox": {
                        "Height": 0.20555555820465088,
                        "Left": 0.029374999925494194,
```

```
                    "Top": 0.22333332896232605,
                    "Width": 0.11562500149011612
                },
                "Confidence": 99.89837646484375,
                "Landmarks": [
                    {
                        "Type": "eyeLeft",
                        "X": 0.06857934594154358,
                        "Y": 0.30842265486717224
                    },
                    {
                        "Type": "eyeRight",
                        "X": 0.10396526008844376,
                        "Y": 0.300625205039978
                    },
                    {
                        "Type": "nose",
                        "X": 0.0966852456331253,
                        "Y": 0.34081998467445374
                    },
                    {
                        "Type": "mouthLeft",
                        "X": 0.075217105448246,
                        "Y": 0.3811396062374115
                    },
                    {
                        "Type": "mouthRight",
                        "X": 0.10744428634643555,
                        "Y": 0.37407416105270386
                    }
                ],
                "Pose": {
                    "Pitch": -0.9784082174301147,
                    "Roll": -8.808176040649414,
                    "Yaw": 20.28228759765625
                },
                "Quality": {
                    "Brightness": 43.312068939208984,
                    "Sharpness": 99.9305191040039
                }
            },
            "Id": "XXXXXX",
            "KnownGender": {
                "Type": "Female"
```

```
                },
                "Name": "Celeb A",
                "Urls": []
            },
            "Timestamp": 367
        },......
    ],
    "JobStatus": "SUCCEEDED",
    "NextToken": "XfXnZKiyMOGDhzBzYUhS5puM+g1IgezqFeYpv/H/+5noP/LmM57FitUAwSQ5D6G4AB/
PNwolrw==",
    "VideoMetadata": {
        "Codec": "h264",
        "DurationMillis": 67301,
        "FileExtension": "mp4",
        "Format": "QuickTime / MOV",
        "FrameHeight": 1080,
        "FrameRate": 29.970029830932617,
        "FrameWidth": 1920
    }
}
```

Getting information about a celebrity

In these procedures, you get celebrity information by using the getCelebrityInfo API operation. The celebrity is identified by using the celebrity ID that's returned from a previous call to RecognizeCelebrities.

Calling GetCelebrityInfo

These procedures require the celebrity ID for a celebrity that Amazon Rekognition knows. Use the celebrity ID that you note in Recognizing celebrities in an image.

To get celebrity information (SDK)

1. If you haven't already:

    a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

b. Install and configure the AWS CLI and AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Use the following examples to call the `GetCelebrityInfo` operation.

Java

This example displays the name and information about a celebrity.

Replace `id` with one of the celebrity IDs displayed in Recognizing celebrities in an image.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.GetCelebrityInfoRequest;
import com.amazonaws.services.rekognition.model.GetCelebrityInfoResult;


public class CelebrityInfo {

   public static void main(String[] args) {
      String id = "nnnnnnnn";

      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

      GetCelebrityInfoRequest request = new GetCelebrityInfoRequest()
         .withId(id);

      System.out.println("Getting information for celebrity: " + id);

      GetCelebrityInfoResult
 result=rekognitionClient.getCelebrityInfo(request);

      //Display celebrity information
      System.out.println("celebrity name: " + result.getName());
      System.out.println("Further information (if available):");
      for (String url: result.getUrls()){
         System.out.println(url);
      }
```

```
    }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.GetCelebrityInfoRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetCelebrityInfoResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class CelebrityInfo {
    public static void main(String[] args) {
        final String usage = """

                Usage:    <id>

                Where:
                   id - The id value of the celebrity. You can use the
 RecognizeCelebrities example to get the ID value.\s
                """;

        if (args.length != 1) {
            System.out.println(usage);
            System.exit(1);
        }

        String id = args[0];
```

```
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        getCelebrityInfo(rekClient, id);
        rekClient.close();
    }

    /**
     * Retrieves information about a celebrity identified in an image.
     *
     * @param rekClient the Amazon Rekognition client used to make the API call
     * @param id the unique identifier of the celebrity
     * @throws RekognitionException if there is an error retrieving the
 celebrity information
     */
    public static void getCelebrityInfo(RekognitionClient rekClient, String id)
 {
        try {
            GetCelebrityInfoRequest info = GetCelebrityInfoRequest.builder()
                    .id(id)
                    .build();

            GetCelebrityInfoResponse response =
 rekClient.getCelebrityInfo(info);
            System.out.println("celebrity name: " + response.name());
            System.out.println("Further information (if available):");
            for (String url : response.urls()) {
                System.out.println(url);
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

AWS CLI

This AWS CLI command displays the JSON output for the `get-celebrity-info` CLI operation. Replace `ID` with one of the celebrity IDs displayed in Recognizing celebrities in an image. Replace the value of `profile-name` with the name of your developer profile.

```
aws rekognition get-celebrity-info --id celebrity-id --profile profile-name
```

Python

This example displays the name and information about a celebrity.

Replace `id` with one of the celebrity IDs displayed in Recognizing celebrities in an image. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def get_celebrity_info(id):

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')

    # Display celebrity info
    print('Getting celebrity info for celebrity: ' + id)

    response = client.get_celebrity_info(Id=id)

    print(response['Name'])
    print('Further information (if available):')
    for url in response['Urls']:
        print(url)

def main():
    id = "celebrity-id"
    celebrity_info = get_celebrity_info(id)
```

```
if __name__ == "__main__":
    main()
```

.NET

This example displays the name and information about a celebrity.

Replace `id` with one of the celebrity IDs displayed in Recognizing celebrities in an image.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;


public class CelebrityInfo
{
    public static void Example()
    {
        String id = "nnnnnnnn";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        GetCelebrityInfoRequest celebrityInfoRequest = new
 GetCelebrityInfoRequest()
        {
            Id = id
        };

        Console.WriteLine("Getting information for celebrity: " + id);

        GetCelebrityInfoResponse celebrityInfoResponse =
 rekognitionClient.GetCelebrityInfo(celebrityInfoRequest);

        //Display celebrity information
        Console.WriteLine("celebrity name: " + celebrityInfoResponse.Name);
        Console.WriteLine("Further information (if available):");
        foreach (String url in celebrityInfoResponse.Urls)
            Console.WriteLine(url);
```

```
    }
}
```

GetCelebrityInfo operation request

The following is example JSON input and output for `GetCelebrityInfo`.

The input to `GetCelebrityInfo` is the ID for the required celebrity.

```
{
    "Id": "nnnnnnn"
}
```

GetCelebrityInfo operation response

`GetCelebrityInfo` returns an array (`Urls`) of links to information about the requested celebrity.

```
{
    "Name": "Celebrity Name",
    "Urls": [
        "www.imdb.com/name/nmnnnnnnn"
    ]
}
```

Moderating content

You can use Amazon Rekognition to detect content that is inappropriate, unwanted, or offensive. You can use Rekognition moderation APIs in social media, broadcast media, advertising, and e-commerce situations to create a safer user experience, provide brand safety assurances to advertisers, and comply with local and global regulations.

Today, many companies rely entirely on human moderators to review third-party or user-generated content, while others simply react to user complaints to take down offensive or inappropriate images, ads, or videos. However, human moderators alone cannot scale to meet these needs at sufficient quality or speed, which leads to a poor user experience, high costs to achieve scale, or even a loss of brand reputation. By using Rekognition for image and video moderation, human moderators can review a much smaller set of content, typically 1-5% of the total volume, already flagged by machine learning. This enables them to focus on more valuable activities and still achieve comprehensive moderation coverage at a fraction of their existing cost. To set up human workforces and perform human review tasks, you can use Amazon Augmented AI, which is already integrated with Rekognition.

You can enhance the accuracy of the moderation deep learning model with the Custom Moderation feature. With Custom Moderation, you train a custom moderation adapter by uploading your images and annotating these images. The trained adapter can then be provided to the DetectModerationLabels operation to to enhance its performance on your images. See Enhancing accuracy with Custom Moderation for more information.

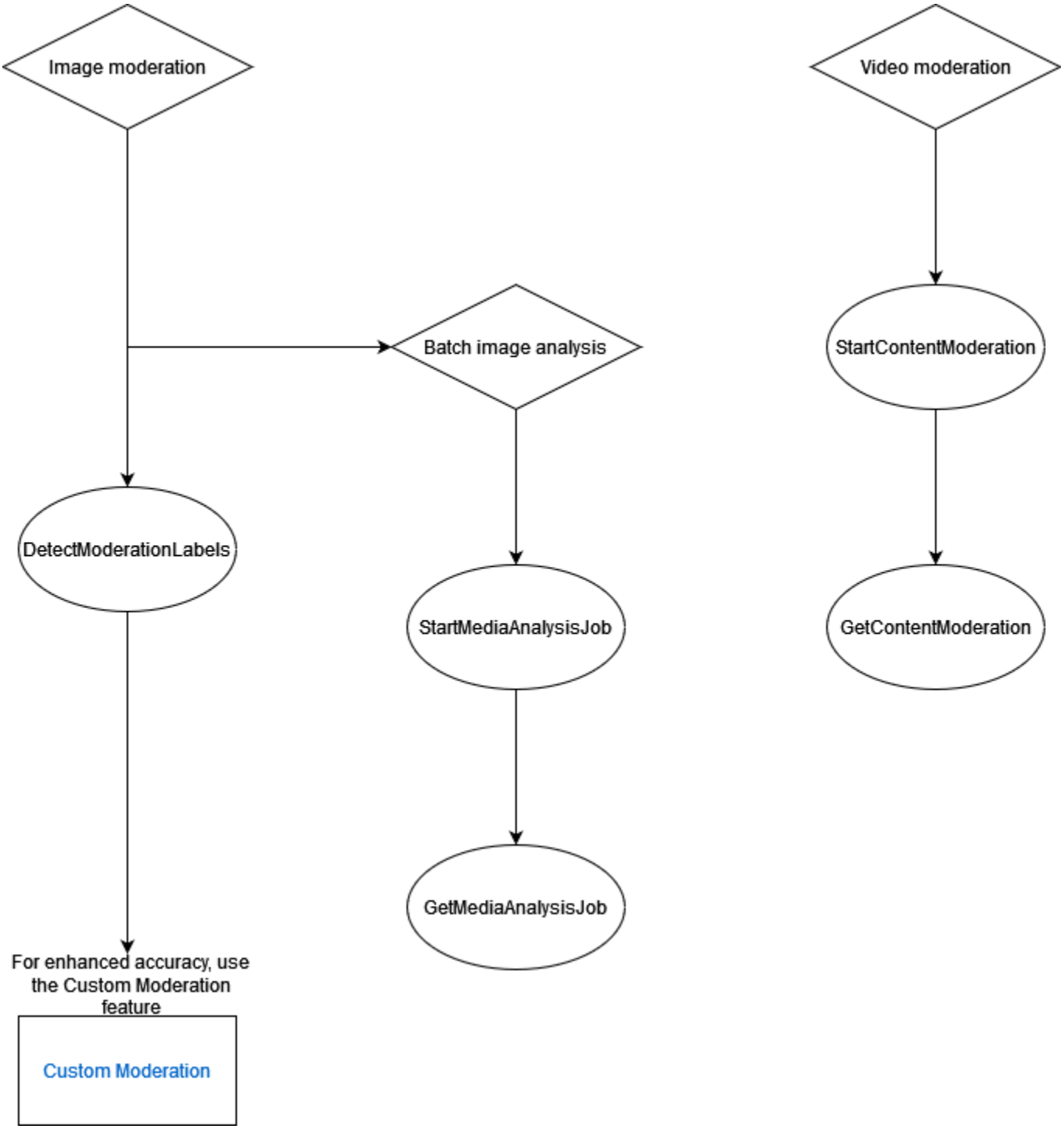
Labels supported by Rekognition content moderation operations

- To download a list of the moderation labels, click here.

Topics

- Using the image and video moderation APIs
- Testing Content Moderation version 7 and transforming the API response
- Detecting inappropriate images
- Detecting inappropriate stored videos
- Enhancing accuracy with Custom Moderation
- Reviewing inappropriate content with Amazon Augmented AI

The following diagram shows shows the order for calling operations, depending on your goals for using the image or video components of Content Moderation:



Using the image and video moderation APIs

In the Amazon Rekognition Image API, you can detect inappropriate, unwanted, or offensive content synchronously using DetectModerationLabels and asynchronously using StartMediaAnalysisJob and GetMediaAnalysisJob operations. You can use the Amazon Rekognition Video API to detect such content asynchronously by using the StartContentModeration and GetContentModeration operations.

Label Categories

Amazon Rekognition uses a three-level hierarchical taxonomy to label categories of inappropriate, unwanted, or offensive content. Each label with Taxonomy Level 1 (L1) has a number of Taxonomy Level 2 labels (L2), and some Taxonomy Level 2 labels may have Taxonomy Level 3 labels (L3). This allows a hierarchical classification of the content.

For each detected moderation label, the API also returns the `TaxonomyLevel`, which contains the level (1, 2, or 3) that the label belongs to. For example, an image may be labeled in accordance with the following categorization:

L1: Non-Explicit Nudity of Intimate parts and Kissing, L2: Non-Explicit Nudity, L3: Implied Nudity.

> **Note**
>
> We recommend using L1 or L2 categories to moderate your content and using L3 categories only to remove specific concepts that you do not want to moderate (i.e. to detect content that you may not want to categorize as inappropriate, unwanted, or offensive content based on your moderation policy).

The following table shows the relationships between the category levels and the possible labels for each level. To download a list of the moderation labels, click here.

Top-Level Category (L1)	Second-Level Category (L2)	Third-Level Category (L3)	Definitions
Explicit	Explicit Nudity	Exposed Male Genitalia	Human male genitalia, including the penis (whether

	erect or flaccid), the scrotum, and any discernible pubic hair. This term is applicable in contexts involving sexual activity or any visual content where male genitals are displayed either completely or partially.
Exposed Female Genitalia	External parts of the female reproductive system, encompassing the vulva, vagina, and any observable pubic hair. This term is applicable in scenarios involving sexual activity or any visual content where these aspects of female anatomy are displayed either completely or partially.

Exposed Buttocks or Anus	Human buttocks or anus, including instances where the buttocks are nude or when they are discernible through sheer clothing. The definition specifically applies to situations where the buttocks or anus are directly and completely visible, excluding scenarios where any form of underwear or clothing provides complete or partial coverage.
Exposed Female Nipple	Human female nipples, including fully visible and partially visible aerola (area surrounding the nipples) and nipples.

	Explicit Sexual Activity	N/A	Depiction of actual or simulated sexual acts which encompasses human sexual intercourse, oral sex, as well as male genital stimulation and female genital stimulation by other body parts and objects. The term also includes ejaculation or vaginal fluids on body parts and erotic practices or roleplaying involving bondage, discipline, dominance and submission, and sadomasochism.
	Sex Toys	N/A	Objects or devices used for sexual stimulation or pleasure, e.g., dildo, vibrator, butt plug, beats, etc.

Non-Explicit Nudity of Intimate parts and Kissing	Non-Explicit Nudity	Bare Back	Human posterior part where the majority of the skin is visible from the neck to the end of the spine. This term does not apply when the individua l's back is partially or fully occluded.
		Exposed Male Nipple	Human male nipples, including partially visible nipples.
		Partially Exposed Buttocks	Partially exposed human buttocks. This term includes a partially visible region of the buttocks or butt cheeks due to short clothes, or partially visible top portion of the anal cleft. The term does not apply to cases where the buttocks is fully nude.

		Partially Exposed Female Breast	Partially exposed human female breast where one a portion of the female's breast is visible or uncovered while not revealing the entire breast. This term applies when the region of the inner breast fold is visible or when the lower breast crease is visible with nipple fully covered or occluded.
		Implied Nudity	An individual who is nude, either topless or bottomless, but with intimate parts such as buttocks, nipples, or genitalia covered, occluded, or not fully visible.
	Obstructed Intimate Parts	Obstructed Female Nipple	Visual depiction of a situation in which a female's nipples is covered by opaque clothing or coverings , but their shapes are clearly visible.

		Obstructed Male Genitalia	Visual depiction of a situation in which a male's genitalia or penis is covered by opaque clothing or coverings, but its shape is clearly visible. This term applies when the obstructed genitalia in the image is in close-up.
	Kissing on the Lips	N/A	Depiction of one person's lips making contact with another person's lips.
Swimwear or Underwear	Female Swimwear or Underwear	N/A	Human clothing for female swimwear (e.g., one-piece swimsuits, bikinis, tankinis, etc.) and female underwear (e.g., bras, panties, briefs, lingerie, thongs, etc.)
	Male Swimwear or Underwear	N/A	Human clothing for male swimwear (e.g., swim trunks, boardshorts, swim briefs, etc.) and male underwear (e.g., briefs, boxers, etc.)

Violence	Weapons	N/A	Instruments or devices used to cause harm or damage to living beings, structures, or systems. This includes firearms (e.g., guns, rifles, machine gunes, etc.), sharp weapons (e.g., swords, knives, etc.), explosives and ammunition (e.g., missile, bombs, bullets, etc.).
	Graphic Violence	Weapon Violence	The use of weapons to cause harm, damage, injury, or death to oneself, other individuals, or properties.
		Physical Violence	The act of causing harm to other individuals or property (e.g., hitting, fighting, pulling hair, etc.) or other act of violence involving crowd or multiple individuals.

		Self-Harm	The act of causing harm to oneself, often by cutting body parts such as arms or legs, where cuts are typically visible.
		Blood & Gore	Visual represent ation of violence on a person, a group of individuals, or animals, involving open wounds, bloodshed, and mutilated body parts.
		Explosions and Blasts	Depiction of a violent and destructive burst of intense flames with thick smoke or dust and smoke erupting from the ground.
Visually Disturbing	Death and Emaciation	Emaciated Bodies	Human bodies that are extremely thin and undernour ished with severe physical wasting and depletion of muscle and fat tissue.
		Corpses	Human corpses in the form of mutilated bodies, hanging corpses, or skeletons.

	Crashes	Air Crash	Incidents of air vehicles, such as airplanes, helicopters, or other flying vehicles, resulting in damage, injury, or death. This term applies when parts of the air vehicles are visible.
Drugs & Tobacco	Products	Pills	Small, solid, often round or oval-shaped tables or capsules. This term applies to pills presented as standalones, in a bottle, or a transparent packet and does not apply to a visual depiction of a person taking pills.
	Drugs & Tobacco Paraphernalia & Use	Smoking	The act of inhaling, exhaling, and lighting up burning substances including cigarettes, cigars, e-cigarettes, hookah, or joint.
Alcohol	Alcohol Use	Drinking	The act of drinking alcoholic beverages from bottles or glasses of alcohol or liquor.

	Alcoholic Beverages	N/A	Close up of one or multiple bottles of alcohol or liquor, glasses or mugs with alcohol or liquor, and glasses or mugs with alcohol or liquor held by an individua l. This term does not apply to an individual drinking from bottles or glasses of alcohol or liquor.
Rude Gestures	Middle Finger	N/A	Visual depiction of a hand gesture with middle finger is extended upward while the other fingers are folded down.
Gambling	N/A	N/A	The act of participa ting in games of chance for a chance to win a prize in casinos, e.g., playing cards, blackjack s, roulette, slot machines at casinos, etc.
Hate Symbols	Nazi Party	N/A	Visual depiction of symbols, flags, or gestures associated with Nazi Party.

	White Supremacy	N/A	Visual depiction of symbols or clothings associated with Ku Klux Klan (KKK) and images with confederate flags.
	Extremist	N/A	Images containin g extremist and terrorist group flags.

Not every label in the L2 category has a supported label in the L3 category. Additionally, L3 labels under “Products” and “Drug and Tobacco Paraphernalia and Use” L2 labels aren’t exhaustive. These L2 labels cover concepts beyond the mentioned L3 labels and in such cases, only L2 labels is returned in the API response.

You determine the suitability of content for your application. For example, images of a suggestive nature might be acceptable, but images containing nudity might not. To filter images, use the ModerationLabel labels array that's returned by `DetectModerationLabels` (images) and by `GetContentModeration` (videos).

Content type

The API can also identify animated or illustrated content type, and the content type is returned as part of the response:

- Animated content includes video game and animation (e.g., cartoon, comics, manga, anime).
- Illustrated content includes drawing, painting, and sketches.

Confidence

You can set the confidence threshold that Amazon Rekognition uses to detect inappropriate content by specifying the `MinConfidence` input parameter. Labels aren't returned for inappropriate content that is detected with a lower confidence than `MinConfidence`.

Specifying a value for `MinConfidence` that is less than 50% is likely to return a high number of false-positive results (i.e. higher recall, lower precision). On the other hand, specifying a

MinConfidence above 50% is likely to return a lower number of false-positive results (i.e. lower recall, higher precision). If you don't specify a value for MinConfidence, Amazon Rekognition returns labels for inappropriate content that is detected with at least 50% confidence.

The ModerationLabel array contains labels in the preceding categories, and an estimated confidence in the accuracy of the recognized content. A top-level label is returned along with any second-level labels that were identified. For example, Amazon Rekognition might return “Explicit Nudity” with a high confidence score as a top-level label. That might be enough for your filtering needs. However, if it's necessary, you can use the confidence score of a second-level label (such as "Graphic Male Nudity") to obtain more granular filtering. For an example, see Detecting inappropriate images.

Versioning

Amazon Rekognition Image and Amazon Rekognition Video both return the version of the moderation detection model that is used to detect inappropriate content (ModerationModelVersion).

Sorting and Aggregating

When retrieving results with GetContentModeration, you can sort and aggregate your results.

Sort order — The array of labels returned is sorted by time. To sort by label, specify NAME in the SortByinput parameter for GetContentModeration. If the label appears multiple times in the video, there will be multiples instances of the ModerationLabel element.

Label information — The ModerationLabels array element contains a ModerationLabel object, which in turn contains the label name and the confidence Amazon Rekognition has in the accuracy of the detected label. Timestamp is the time the ModerationLabel was detected, defined as the number of milliseconds elapsed since the start of the video. For results aggregated by video SEGMENTS, the StartTimestampMillis, EndTimestampMillis, and DurationMillis structures are returned, which define the start time, end time, and duration of a segment respectively.

Aggregation — Specifies how results are aggregated when returned. The default is to aggregate by TIMESTAMPS. You can also choose to aggregate by SEGMENTS, which aggregates results over a time window. Only labels detected during the segments are returned.

Custom Moderation adapter statuses

Custom Moderation adapters can be in one of the following statuses: TRAINING_IN_PROGRESS, TRAINING_COMPLETED, TRAINING_FAILED, DELETING, DEPRECATED, or EXPIRED. For a full explanation of these adapter statuses, see Managing adapters.

> **Note**
>
> Amazon Rekognition isn't an authority on, and doesn't in any way claim to be an exhaustive filter of, inappropriate or offensive content. Additionally, the image and video moderation APIs don't detect whether an image includes illegal content, such as CSAM.

Testing Content Moderation version 7 and transforming the API response

Rekognition updated the machine learning model for the image video components of Content Moderation label detection feature from version 6.1 to 7. This update enhanced overall accuracy, and introduced several new categories along with modifying others.

If you are a current video user of version 6.1, we recommend you to take the following actions to seamlessly transition to version 7:

1. Download and use an AWS private SDK (see the the section called “AWS SDK and Usage Guide for Content Moderation version 7 ”) to call the StartContentModeration API.
2. Review the updated list of labels and confidence scores returned in the API response or console. Adjust your application post-processing logic accordingly if necessary.
3. Your account will remain on version 6.1 until May 13, 2024. If you wish to use version 6.1 beyond May 13, 2024, contact the AWS Support team by April 30, 2024 to request for an extension. We can extend your account to remain on version 6.1 until June 10, 2024. If we do not hear from you by April 30, 2024, your account will be automatically migrated to version 7.0 starting May 13, 2024.

AWS SDK and Usage Guide for Content Moderation version 7

Download the SDK that corresponds with your chosen development language, and consult the appropriate user guide.

Link to SDK	Installation / User Guide
Java-1.X	Guide - Java 1.pdf
Java-2.X	Guide - Java 2.pdf
JavaScript v2	Guide - JavaScript v2.pdf
JavaScript v3	Guide - JavaScript v3.pdf
Python	Guide - Python & AWS CLI.pdf
Ruby	Guide - RubyV3.pdf
go_v1	Guide - GO V1.pdf
go_v2	Guide - GO V2.pdf
DotNet	Guide - .NET.pdf
php	Guide - PHP.pdf

Label mappings for Versions 6.1 to 7

Content moderation version 7 added new label categories and modified previously existing label names. Reference the taxonomy table found at the section called " Label Categories " when deciding how to map 6.1 labels to 7 labels.

Some example label mappings are found in the following section. We recommend you review these mappings and the label definitions before making the necessary updates based on your application's post-processing logic.

L1 Mapping Schema

If you use post-processing logic which filters only on the top-level category (L1) (such as `Explicit Nudity`, `Suggestive`, `Violence` etc), refer to the table below to update your code.

V6.1 L1	V7 L1

Explicit Nudity	Explicit
Suggestive	Non-Explicit Nudity of Intimate parts and Kissing
	Swimwear or Underwear
Violence	Violence
Visually Disturbing	Visually Disturbing
Rude Gestures	Rude Gestures
Drugs	Drugs & Tobacco
Tobacco	Drugs & Tobacco
Alcohol	Alcohol
Gambling	Gambling
Hate Symbols	Hate Symbols

L2 Mapping Schema

If you use post-processing logic that filters on both L1 and L2 categories (such as `Explicit Nudity / Nudity, Suggestive / Female Swimwear Or Underwear`, `Violence / Weapon Violence` etc.), refer to the table below to update your code.

V6.1 L1	V6.1 L2	V7 L1	V7 L2	V7 L3	V7 ContentTypes
Explicit Nudity	Nudity	Explicit	Explicit Nudity	Exposed Female Nipple	
				Exposed Buttocks or Anus	

	Graphic Male Nudity	Explicit	Explicit Nudity	Exposed Male Genitalia	
	Graphic Female Nudity	Explicit	Explicit Nudity	Exposed Female Genitalia	
	Sexual Activity	Explicit	Explicit Sexual Activity		
	Illustrated Explicit Nudity	Explicit	Explicit Nudity		Map to "Animated" and "Illustrated"
	Illustrated Explicit Nudity	Explicit	Explicit Sexual Activity		Map to "Animated" and "Illustrated"
	Adult Toys	Explicit	Sex Toys		
Suggestive	Female Swimwear Or Underwear	Swimwear or Underwear	Female Swimwear or Underwear		
	Male Swimwear Or Underwear	Swimwear or Underwear	Male Swimwear or Underwear		
	Partial Nudity	Non-Explicit Nudity of Intimate parts and Kissing	Non-Explicit Nudity	Implied Nudity	

	Barechested Male	Non-Explicit Nudity of Intimate parts and Kissing	Non-Explicit Nudity	Exposed Male Nipple
	Revealing Clothes	Non-Explicit Nudity of Intimate parts and Kissing	Non-Explicit Nudity	
		Non-Explicit Nudity of Intimate parts and Kissing	Obstructed Intimate Parts	
	Sexual Situations	Non-Explicit Nudity of Intimate parts and Kissing	Kissing on the Lips	
Violence	Graphic Violence Or Gore	Violence	Graphic Violence	Blood & Gore
	Physical Violence	Violence	Graphic Violence	Physical Violence
	Weapon Violence	Violence	Graphic Violence	Weapon Violence
	Weapons	Violence	Weapons	
	Self Injury	Violence	Graphic Violence	Self-Harm

Visually Disturbing	Emaciated Bodies	Visually Disturbing	Death and Emaciation	Emaciated Bodies
	Corpses	Visually Disturbing	Death and Emaciation	Corpses
	Hanging	Visually Disturbing	Death and Emaciation	Corpses
	Air Crash	Visually Disturbing	Crashes	Air Crash
	Explosions And Blasts	Violence	Graphic Violence	Explosions and Blasts
Rude Gestures	Middle Finger	Rude Gestures	Middle Finger	
Drugs	Drug Products	Drugs & Tobacco	Products	
	Drug Use	Drugs & Tobacco	Drugs & Tobacco Paraphernalia & Use	
	Pills	Drugs & Tobacco	Products	Pills
	Drug Paraphernalia	Drugs & Tobacco	Drugs & Tobacco Paraphernalia & Use	
Tobacco	Tobacco Products	Drugs & Tobacco	Products	

	Smoking	Drugs & Tobacco	Drugs & Tobacco Paraphernalia & Use	Smoking
Alcohol	Drinking	Alcohol	Alcohol Use	Drinking
	Alcoholic Beverages	Alcohol	Alcoholic Beverages	
Gambling	Gambling	Gambling		
Hate Symbols	Nazi Party	Hate Symbols	Nazi Party	
	White Supremacy	Hate Symbols	White Supremacy	
	Extremist	Hate Symbols	Extremist	

Detecting inappropriate images

You can use the DetectModerationLabels operation to determine if an image contains inappropriate or offensive content. For a list of moderation labels in Amazon Rekognition, see Using the image and video moderation APIs.

Detecting inappropriate content in an image

The image must be in either a .jpg or a .png format. You can provide the input image as an image byte array (base64-encoded image bytes), or specify an Amazon S3 object. In these procedures, you upload an image (.jpg or .png) to your S3 bucket.

To run these procedures, you need to have the AWS CLI or the appropriate AWS SDK installed. For more information, see Getting started with Amazon Rekognition. The AWS account you use must have access permissions to the Amazon Rekognition API. For more information, see Actions Defined by Amazon Rekognition.

To detect moderation labels in an image (SDK)

1. If you haven't already:

   a. Create or update an user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Upload an image to your S3 bucket.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following examples to call the `DetectModerationLabels` operation.

   Java

   This example outputs detected inappropriate content label names, confidence levels, and the parent label for detected moderation labels.

   Replace the values of `amzn-s3-demo-bucket` and `photo` with the S3 bucket name and the image file name that you used in step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
import com.amazonaws.services.rekognition.model.DetectModerationLabelsRequest;
import com.amazonaws.services.rekognition.model.DetectModerationLabelsResult;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.ModerationLabel;
import com.amazonaws.services.rekognition.model.S3Object;

import java.util.List;

public class DetectModerationLabels
{
```

```
   public static void main(String[] args) throws Exception
   {
      String photo = "input.jpg";
      String bucket = "bucket";

      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();

      DetectModerationLabelsRequest request = new
 DetectModerationLabelsRequest()
        .withImage(new Image().withS3Object(new
 S3Object().withName(photo).withBucket(bucket)))
        .withMinConfidence(60F);
      try
      {
           DetectModerationLabelsResult result =
 rekognitionClient.detectModerationLabels(request);
           List<ModerationLabel> labels = result.getModerationLabels();
           System.out.println("Detected labels for " + photo);
           for (ModerationLabel label : labels)
           {
              System.out.println("Label: " + label.getName()
               + "\n Confidence: " + label.getConfidence().toString() + "%"
               + "\n Parent:" + label.getParentName());
          }
       }
       catch (AmazonRekognitionException e)
       {
         e.printStackTrace();
       }
    }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.recognize_video_text.import]
//snippet-start:[rekognition.java2.detect_mod_labels.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
```

```
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.Image;
import
 software.amazon.awssdk.services.rekognition.model.DetectModerationLabelsRequest;
import
 software.amazon.awssdk.services.rekognition.model.DetectModerationLabelsResponse;
import software.amazon.awssdk.services.rekognition.model.ModerationLabel;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;
//snippet-end:[rekognition.java2.detect_mod_labels.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class ModerateLabels {

 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <sourceImage>\n\n" +
         "Where:\n" +
         "   sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png). \n\n";

     if (args.length < 1) {
         System.out.println(usage);
         System.exit(1);
     }

     String sourceImage = args[0];
     Region region = Region.US_WEST_2;
     RekognitionClient rekClient = RekognitionClient.builder()
```

```
        .region(region)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    detectModLabels(rekClient, sourceImage);
    rekClient.close();
}

// snippet-start:[rekognition.java2.detect_mod_labels.main]
public static void detectModLabels(RekognitionClient rekClient, String
sourceImage) {

    try {
        InputStream sourceStream = new FileInputStream(sourceImage);
        SdkBytes sourceBytes = SdkBytes.fromInputStream(sourceStream);
        Image souImage = Image.builder()
            .bytes(sourceBytes)
            .build();

        DetectModerationLabelsRequest moderationLabelsRequest =
DetectModerationLabelsRequest.builder()
            .image(souImage)
            .minConfidence(60F)
            .build();

        DetectModerationLabelsResponse moderationLabelsResponse =
rekClient.detectModerationLabels(moderationLabelsRequest);
        List<ModerationLabel> labels =
moderationLabelsResponse.moderationLabels();
        System.out.println("Detected labels for image");

        for (ModerationLabel label : labels) {
            System.out.println("Label: " + label.name()
                + "\n Confidence: " + label.confidence().toString() + "%"
                + "\n Parent:" + label.parentName());
        }

    } catch (RekognitionException | FileNotFoundException e) {
        e.printStackTrace();
        System.exit(1);
    }
}
// snippet-end:[rekognition.java2.detect_mod_labels.main]
```

AWS CLI

This AWS CLI command displays the JSON output for the `detect-moderation-labels` CLI operation.

Replace `amzn-s3-demo-bucket` and `input.jpg` with the S3 bucket name and the image file name that you used in step 2. Replace the value of `profile_name` with the name of your developer profile. To use an adapter, provide the ARN of the project version to the `project-version` parameter.

```
aws rekognition detect-moderation-labels --image "{S3Object:{Bucket:<amzn-s3-demo-bucket>,Name:<image-name>}}" \
--profile profile-name \
--project-version "ARN"
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
aws rekognition detect-moderation-labels --image "{\"S3Object\":{\"Bucket\":\"amzn-s3-demo-bucket\",\"Name\":\"image-name\"}}" \
--profile profile-name
```

Python

This example outputs detected inappropriate or offensive content label names, confidence levels, and the parent label for detected inappropriate content labels.

In the function `main`, replace the values of `amzn-s3-demo-bucket` and `photo` with the S3 bucket name and the image file name that you used in step 2. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3
```

```
def moderate_image(photo, bucket):

    session = boto3.Session(profile_name='profile-name')
    client = session.client('rekognition')

    response = client.detect_moderation_labels(Image={'S3Object':
{'Bucket':bucket,'Name':photo}})

    print('Detected labels for ' + photo)
    for label in response['ModerationLabels']:
        print (label['Name'] + ' : ' + str(label['Confidence']))
        print (label['ParentName'])
    return len(response['ModerationLabels'])

def main():

    photo='image-name'
    bucket='amzn-s3-demo-bucket'
    label_count=moderate_image(photo, bucket)
    print("Labels detected: " + str(label_count))

if __name__ == "__main__":
    main()
```

.NET

This example outputs detected inappropriate or offensive content label names, confidence levels, and the parent label for detected moderation labels.

Replace the values of `amzn-s3-demo-bucket` and `photo` with the S3 bucket name and the image file name that you used in step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class DetectModerationLabels
{
    public static void Example()
```

```
    {
        String photo = "input.jpg";
        String bucket = "amzn-s3-demo-bucket";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        DetectModerationLabelsRequest detectModerationLabelsRequest = new
 DetectModerationLabelsRequest()
        {
            Image = new Image()
            {
                S3Object = new S3Object()
                {
                    Name = photo,
                    Bucket = bucket
                },
            },
            MinConfidence = 60F
        };

        try
        {
            DetectModerationLabelsResponse detectModerationLabelsResponse =
 rekognitionClient.DetectModerationLabels(detectModerationLabelsRequest);
            Console.WriteLine("Detected labels for " + photo);
            foreach (ModerationLabel label in
 detectModerationLabelsResponse.ModerationLabels)
                Console.WriteLine("Label: {0}\n Confidence: {1}\n Parent: {2}",
                    label.Name, label.Confidence, label.ParentName);
        }
        catch (Exception e)
        {
            Console.WriteLine(e.Message);
        }
    }
}
```

DetectModerationLabels operation request

The input to `DetectModerationLabels` is an image. In this example JSON input, the source image is loaded from an Amazon S3 bucket. `MinConfidence` is the minimum confidence that

Amazon Rekognition Image must have in the accuracy of the detected label for it to be returned in the response.

```
{
    "Image": {
        "S3Object": {
            "Bucket": "amzn-s3-demo-bucket",
            "Name": "input.jpg"
        }
    },
    "MinConfidence": 60
}
```

DetectModerationLabels operation response

`DetectModerationLabels` can retrieve input images from an S3 bucket, or you can provide them as image bytes. The following example is the response from a call to `DetectModerationLabels`.

In the following example JSON response, note the following:

- **Inappropriate Image Detection information** – The example shows a list of labels for inappropriate or offensive content found in the image. The list includes the top-level label and each second-level label that are detected in the image.

  Label – Each label has a name, an estimation of the confidence that Amazon Rekognition has that the label is accurate, and the name of its parent label. The parent name for a top-level label is "".

  Label confidence – Each label has a confidence value between 0 and 100 that indicates the percentage confidence that Amazon Rekognition has that the label is correct. You specify the required confidence level for a label to be returned in the response in the API operation request.

```
{
    "ModerationLabels": [
        {
            "Confidence": 99.44782257080078,
            "Name": "Smoking",
            "ParentName": "Drugs & Tobacco Paraphernalia & Use",
            "TaxonomyLevel": 3
```

```
        },
        {
            "Confidence": 99.44782257080078,
            "Name": "Drugs & Tobacco Paraphernalia & Use",
            "ParentName": "Drugs & Tobacco",
            "TaxonomyLevel": 2
        },
        {
            "Confidence": 99.44782257080078,
            "Name": "Drugs & Tobacco",
            "ParentName": "",
            "TaxonomyLevel": 1
        }
    ],
    "ModerationModelVersion": "7.0",
    "ContentTypes": [
        {
            "Confidence": 99.9999008178711,
            "Name": "Illustrated"
        }
    ]
}
```

Detecting inappropriate stored videos

Amazon Rekognition Video inappropriate or offensive content detection in stored videos is an asynchronous operation. To start detecting inappropriate or offensive content, call StartContentModeration. Amazon Rekognition Video publishes the completion status of the video analysis to an Amazon Simple Notification Service topic. If the video analysis is successful, call GetContentModeration to get the analysis results. For more information about starting video analysis and getting the results, see Calling Amazon Rekognition Video operations. For a list of moderation labels in Amazon Rekognition, see Using the image and video moderation APIs.

This procedure expands on the code in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), which uses an Amazon Simple Queue Service queue to get the completion status of a video analysis request.

To detect inappropriate or offensive content in a video stored in an Amazon S3 bucket (SDK)

1. Perform Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).
2. Add the following code to the class `VideoDetect` that you created in step 1.

Java

```
    //Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
    //PDX-License-Identifier: MIT-0 (For details, see https://github.com/
awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

        //Content moderation
 ========================================================================
        private static void StartUnsafeContentDetection(String bucket, String
 video) throws Exception{

            NotificationChannel channel= new NotificationChannel()
                    .withSNSTopicArn(snsTopicArn)
                    .withRoleArn(roleArn);

            StartContentModerationRequest req = new
 StartContentModerationRequest()
                    .withVideo(new Video()
                            .withS3Object(new S3Object()
                                .withBucket(bucket)
                                .withName(video)))
                    .withNotificationChannel(channel);



             StartContentModerationResult startModerationLabelDetectionResult =
 rek.startContentModeration(req);
             startJobId=startModerationLabelDetectionResult.getJobId();

         }

         private static void GetUnsafeContentDetectionResults() throws
 Exception{

             int maxResults=10;
             String paginationToken=null;
             GetContentModerationResult moderationLabelDetectionResult =null;

             do{
                 if (moderationLabelDetectionResult !=null){
                     paginationToken =
 moderationLabelDetectionResult.getNextToken();
                 }
```

```
                moderationLabelDetectionResult = rek.getContentModeration(
                        new GetContentModerationRequest()
                            .withJobId(startJobId)
                            .withNextToken(paginationToken)
                            .withSortBy(ContentModerationSortBy.TIMESTAMP)
                            .withMaxResults(maxResults));



                VideoMetadata
videoMetaData=moderationLabelDetectionResult.getVideoMetadata();

                System.out.println("Format: " + videoMetaData.getFormat());
                System.out.println("Codec: " + videoMetaData.getCodec());
                System.out.println("Duration: " +
videoMetaData.getDurationMillis());
                System.out.println("FrameRate: " +
videoMetaData.getFrameRate());


                //Show moderated content labels, confidence and detection
times
                List<ContentModerationDetection> moderationLabelsInFrames=
                        moderationLabelDetectionResult.getModerationLabels();

                for (ContentModerationDetection label:
moderationLabelsInFrames) {
                    long seconds=label.getTimestamp()/1000;
                    System.out.print("Sec: " + Long.toString(seconds));
                    System.out.println(label.getModerationLabel().toString());
                    System.out.println();
                }
            } while (moderationLabelDetectionResult !=null &&
moderationLabelDetectionResult.getNextToken() != null);

        }
```

In the function `main`, replace the lines:

```
       StartLabelDetection(amzn-s3-demo-bucket, video);
```

```
        if (GetSQSMessageSuccess()==true)
         GetLabelDetectionResults();
```

with:

```
        StartUnsafeContentDetection(amzn-s3-demo-bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetUnsafeContentDetectionResults();
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartContentModerationRequest;
import
 software.amazon.awssdk.services.rekognition.model.StartContentModerationResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.GetContentModerationResponse;
import
 software.amazon.awssdk.services.rekognition.model.GetContentModerationRequest;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import
 software.amazon.awssdk.services.rekognition.model.ContentModerationDetection;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
```

```
 */
public class VideoDetectInappropriate {
    private static String startJobId = "";

    public static void main(String[] args) {

        final String usage = """

                Usage:    <bucket> <video> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of video (for example, people.mp4).\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
                   roleArn - The ARN of the AWS Identity and Access Management
 (IAM) role to use.\s
                """;

        if (args.length != 4) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
        String topicArn = args[2];
        String roleArn = args[3];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
                .roleArn(roleArn)
                .build();

        startModerationDetection(rekClient, channel, bucket, video);
        getModResults(rekClient);
        System.out.println("This example is done!");
        rekClient.close();
    }
```

```
   public static void startModerationDetection(RekognitionClient rekClient,
           NotificationChannel channel,
           String bucket,
           String video) {

       try {
           S3Object s3Obj = S3Object.builder()
                   .bucket(bucket)
                   .name(video)
                   .build();

           Video vidOb = Video.builder()
                   .s3Object(s3Obj)
                   .build();

           StartContentModerationRequest modDetectionRequest =
StartContentModerationRequest.builder()
                   .jobTag("Moderation")
                   .notificationChannel(channel)
                   .video(vidOb)
                   .build();

           StartContentModerationResponse startModDetectionResult = rekClient
                   .startContentModeration(modDetectionRequest);
           startJobId = startModDetectionResult.jobId();

       } catch (RekognitionException e) {
           System.out.println(e.getMessage());
           System.exit(1);
       }
   }

   public static void getModResults(RekognitionClient rekClient) {
       try {
           String paginationToken = null;
           GetContentModerationResponse modDetectionResponse = null;
           boolean finished = false;
           String status;
           int yy = 0;

           do {
               if (modDetectionResponse != null)
                   paginationToken = modDetectionResponse.nextToken();
```

```
                GetContentModerationRequest modRequest =
GetContentModerationRequest.builder()
                        .jobId(startJobId)
                        .nextToken(paginationToken)
                        .maxResults(10)
                        .build();

                // Wait until the job succeeds.
                while (!finished) {
                    modDetectionResponse =
rekClient.getContentModeration(modRequest);
                    status = modDetectionResponse.jobStatusAsString();

                    if (status.compareTo("SUCCEEDED") == 0)
                        finished = true;
                    else {
                        System.out.println(yy + " status is: " + status);
                        Thread.sleep(1000);
                    }
                    yy++;
                }

                finished = false;

                // Proceed when the job is done - otherwise VideoMetadata is
null.
                VideoMetadata videoMetaData =
modDetectionResponse.videoMetadata();
                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());
                System.out.println("Job");

                List<ContentModerationDetection> mods =
modDetectionResponse.moderationLabels();
                for (ContentModerationDetection mod : mods) {
                    long seconds = mod.timestamp() / 1000;
                    System.out.print("Mod label: " + seconds + " ");
                    System.out.println(mod.moderationLabel().toString());
                    System.out.println();
                }
```

```
            } while (modDetectionResponse != null &&
 modDetectionResponse.nextToken() != null);

        } catch (RekognitionException | InterruptedException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

Python

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    # ============== Unsafe content ===============
    def StartUnsafeContent(self):
        response=self.rek.start_content_moderation(Video={'S3Object': {'Bucket':
 self.bucket, 'Name': self.video}},
            NotificationChannel={'RoleArn': self.roleArn, 'SNSTopicArn':
 self.snsTopicArn})

        self.startJobId=response['JobId']
        print('Start Job Id: ' + self.startJobId)

    def GetUnsafeContentResults(self):
        maxResults = 10
        paginationToken = ''
        finished = False

        while finished == False:
            response = self.rek.get_content_moderation(JobId=self.startJobId,
                                                MaxResults=maxResults,
                                                NextToken=paginationToken,
                                                SortBy="NAME",
                                                AggregateBy="TIMESTAMPS")

            print('Codec: ' + response['VideoMetadata']['Codec'])
            print('Duration: ' + str(response['VideoMetadata']
['DurationMillis']))
            print('Format: ' + response['VideoMetadata']['Format'])
```

```
            print('Frame rate: ' + str(response['VideoMetadata']['FrameRate']))
            print()

            for contentModerationDetection in response['ModerationLabels']:
                print('Label: ' +
                    str(contentModerationDetection['ModerationLabel']['Name']))
                print('Confidence: ' +
                    str(contentModerationDetection['ModerationLabel']
['Confidence']))
                print('Parent category: ' +
                    str(contentModerationDetection['ModerationLabel']
['ParentName']))
                print('Timestamp: ' +
 str(contentModerationDetection['Timestamp']))
                print()

            if 'NextToken' in response:
                paginationToken = response['NextToken']
            else:
                finished = True
```

In the function `main`, replace the lines:

```
    analyzer.StartLabelDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetLabelDetectionResults()
```

with:

```
    analyzer.StartUnsafeContent()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetUnsafeContentResults()
```

> **Note**
>
> If you've already run a video example other than Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), the code to replace might be different.

3. Run the code. A list of inappropriate content labels detected in the video is shown.

GetContentModeration operation response

The response from `GetContentModeration` is an array, `ModerationLabels`, of ContentModerationDetection objects. The array contains an element for each time an inappropriate content label is detected. Within a `ContentModerationDetectionObject` object, ModerationLabel contains information for a detected item of inappropriate or offensive content. `Timestamp` is the time, in milliseconds from the start of the video, when the label was detected. The labels are organized hierarchically in the same manner as the labels detected by inappropriate content image analysis. For more information, see Moderating content.

The following is an example response from `GetContentModeration`, sorted by `NAME` and aggregated by `TIMESTAMPS`.


```
{
    "JobStatus": "SUCCEEDED",
    "VideoMetadata": {
        "Codec": "h264",
        "DurationMillis": 54100,
        "Format": "QuickTime / MOV",
        "FrameRate": 30.0,
        "FrameHeight": 462,
        "FrameWidth": 884,
        "ColorRange": "LIMITED"
    },
    "ModerationLabels": [
        {
            "Timestamp": 36000,
            "ModerationLabel": {
                "Confidence": 52.451576232910156,
                "Name": "Alcohol",
                "ParentName": "",
                "TaxonomyLevel": 1
            },
            "ContentTypes": [
                {
                    "Confidence": 99.9999008178711,
                    "Name": "Animated"
                }
            ]
        },
        {
            "Timestamp": 36000,
```

```
            "ModerationLabel": {
                "Confidence": 52.451576232910156,
                "Name": "Alcoholic Beverages",
                "ParentName": "Alcohol",
                "TaxonomyLevel": 2
            },
            "ContentTypes": [
                {
                    "Confidence": 99.9999008178711,
                    "Name": "Animated"
                }
            ]
        }
    ],
    "ModerationModelVersion": "7.0",
    "JobId": "a1b2c3d4...",
    "Video": {
        "S3Object": {
            "Bucket": "amzn-s3-demo-bucket",
            "Name": "video-name.mp4"
        }
    },
    "GetRequestMetadata": {
        "SortBy": "TIMESTAMP",
        "AggregateBy": "TIMESTAMPS"
    }
}
```

The following is an example response from `GetContentModeration`, sorted by `NAME` and aggregated by `SEGMENTS`.

```
{
    "JobStatus": "SUCCEEDED",
    "VideoMetadata": {
        "Codec": "h264",
        "DurationMillis": 54100,
        "Format": "QuickTime / MOV",
        "FrameRate": 30.0,
        "FrameHeight": 462,
        "FrameWidth": 884,
        "ColorRange": "LIMITED"
    },
    "ModerationLabels": [
```

```
        {
            "Timestamp": 0,
            "ModerationLabel": {
                "Confidence": 0.0003000000142492354,
                "Name": "Alcohol Use",
                "ParentName": "Alcohol",
                "TaxonomyLevel": 2
            },
            "StartTimestampMillis": 0,
            "EndTimestampMillis": 29520,
            "DurationMillis": 29520,
            "ContentTypes": [
                {
                    "Confidence": 99.9999008178711,
                    "Name": "Illustrated"
                },
                {
                    "Confidence": 99.9999008178711,
                    "Name": "Animated"
                }
            ]
        }
    ],
    "ModerationModelVersion": "7.0",
    "JobId": "a1b2c3d4...",
    "Video": {
        "S3Object": {
            "Bucket": "amzn-s3-demo-bucket",
            "Name": "video-name.mp4"
        }
    },
    "GetRequestMetadata": {
        "SortBy": "TIMESTAMP",
        "AggregateBy": "SEGMENTS"
    }
}
```


Enhancing accuracy with Custom Moderation

Amazon Rekognition's DetectModerationLabels API lets you detect content that is inappropriate, unwanted, or offensive. The Rekognition Custom Moderation feature allows you to enhance the accuracy of DetectModerationLabels by using adapters. Adapters are modular components that can

be added to an existing Rekognition deep learning model, extending its capabilities for the tasks it's trained on. By creating an adapter and providing it to the DetectModerationLabels operation, you can achieve better accuracy for the content moderation tasks related to your specific use case.

When customizing Rekognition's content moderation model for specific moderation labels, you must create a project and train an adapter on a set of images you provide. You can then iteratively check the adapter's performance and retrain the adapter to your desired level of accuracy. Projects are used to contain the different versions of adapters.

You can use the Rekognition console to create projects and adapters. Alternatively, you can make use of an AWS SDK and the associated APIs to create a project, train an adapter, and manage your adapters.

Creating and using adapters

Adapters are modular components that can be added to the existing Rekognition deep learning model, extending its capabilities for the tasks it's trained on. By training a deep learning model with adapters, you can achieve better accuracy for image analysis tasks related to your specific use case.

To create and use an adapter, you must provide training and testing data to Rekognition. You can accomplish this in one of two different ways:

- Bulk analysis and verification - You can create a training dataset by bulk analyzing images that Rekognition will analyze and assign labels to. You can then review the generated annotations for your images and verify or correct the predictions. For more information on how the Bulk analysis of images works, see Bulk analysis.
- Manual annotation - With this approach you create your training data by uploading and annotating images. You create your test data by either uploading and annotating images or by auto-splitting.

Choose one of the following topics to learn more:

Topics

- Bulk analysis and verification
- Manual annotation

Bulk analysis and verification

With this approach, you upload a large number of images you want to use as training data and then use Rekognition to get predictions for these images, which automatically assigns labels to them. You can use these predictions as a starting point for your adapter. You can verify the accuracy of the predictions, and then train the adapter based on the verified predictions. This can be done with the AWS console.

Bulk Analysis and Custom Moderation

Upload images for bulk analysis

To create a training dataset for your adapter, upload images in bulk for Rekognition to predict labels for. For best results, provide as many images for training as possible up to the limit of 10000, and ensure the images are representative of all aspects of your use-case.

When using the AWS Console you can upload images directly from your computer or provide an Amazon Simple Storage Service bucket that stores your images. However, when using the Rekognition APIs with an SDK, you must provide a manifest file that references images stored in an Amazon Simple Storage Service bucket. See Bulk analysis for more information.

Review predictions

Once you have uploaded your images to the Rekognition console, Rekognition will generate labels for them. You can then verify the predictions as one of the following categories: true positive, false positive, true negative, false negative. After you have verified the predictions you can train an adapter on your feedback.

Train the adapter

Once you have finished verifying the predictions returned by bulk analysis, you can initiate the training process for your adapter.

Get the AdapterId

Once the adapter has been trained, you can get the unique ID for your adapter to use with Rekognition's image analysis APIs.

Call the API Operation

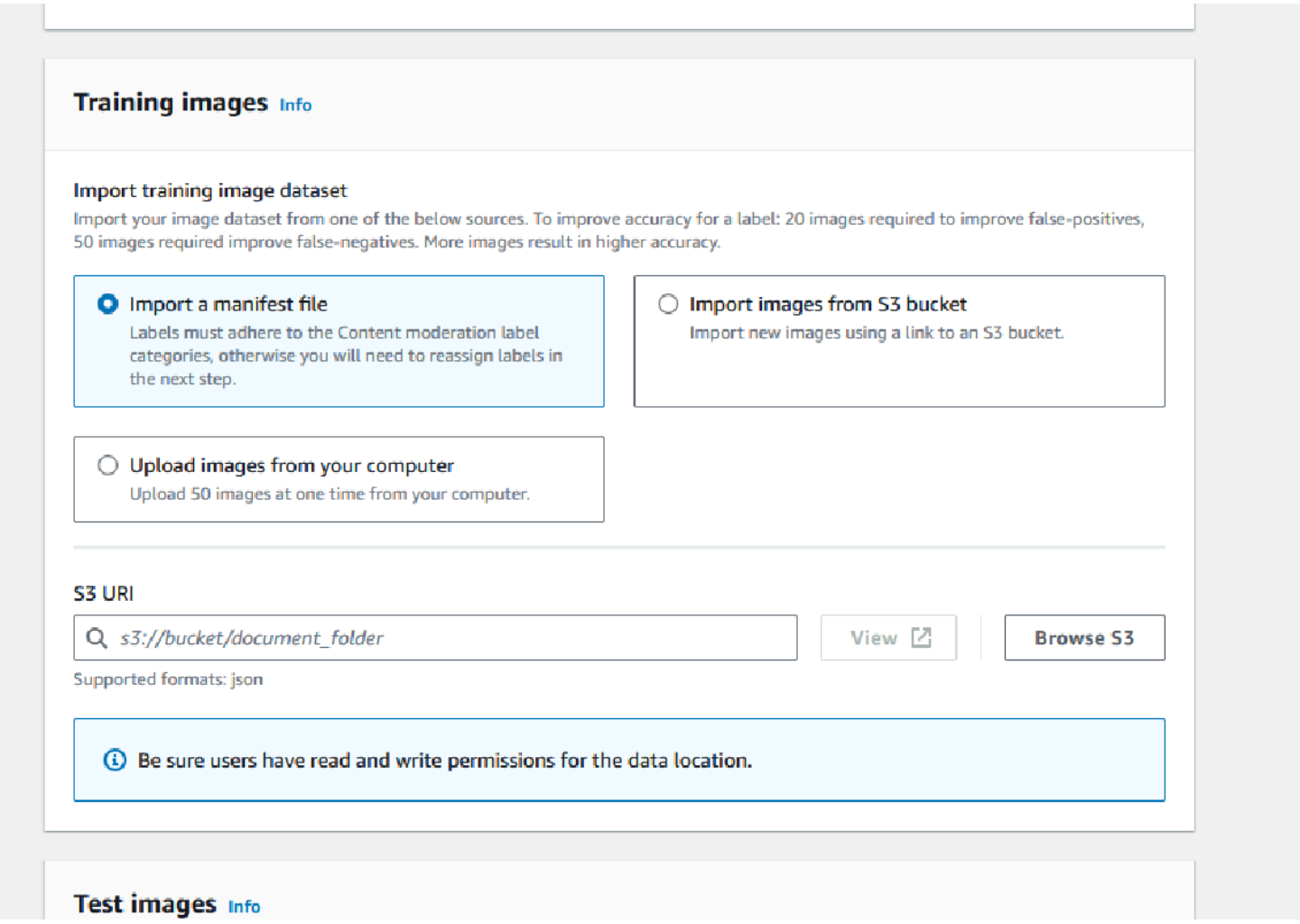
To apply your custom adapter, provide its ID when calling one of the image analysis APIs that supports adapters. This enhances the accuracy of predictions for your images.

Manual annotation

With this approach, you create your training data by uploading and annotating images manually. You create your test data by either uploading and annotating test images or by auto-splitting to have Rekognition automatically use a portion of your training data as test images.

Uploading and annotating images

To train the adapter, you'll need to upload a set of sample images representative of your use case. For best results, provide as many images for training as possible up to the limit of 10000, and ensure the images are representative of all aspects of your use-case.



When using the AWS Console you can upload images directly from your computer, provide a manifest file, or provide an Amazon S3 bucket that stores your images.

However, when using the Rekognition APIs with an SDK, you must provide a manifest file that references images stored in an Amazon S3 bucket.

You can use the Rekognition console's annotation interface to annotate your images. Annotate your images by tagging them with labels, this establishes a "ground truth" for training. You must also designate training and testing sets, or use the auto-split feature, before you can train an adapter. When you finish designating your datasets and annotating your images, you can create an adapter based on the annotated images in your testing set. You can then evaluate the performance of your adapter.

Create a test set

You will need to provide an annotated test set or use the auto-split feature. The training set is used to actually train the adapter. The adapter learns the patterns contained in these annotated images. The test set is used to evaluate the model's performance before finalizing the adapter.

Train the adapter

Once you have finished annotating the training data, or have provided a manifest file, you can initiate the training process for your adapter.

Get the Adapter ID

Once the adapter has been trained, you can get the unique ID for your adapter to use with Rekognition's image analysis APIs.

Call the API operation

To apply your custom adapter, provide its ID when calling one of the image analysis APIs that supports adapters. This enhances the accuracy of predictions for your images.

Preparing your datasets

Creating an adapter requires you to provide Rekognition with two datasets, a training dataset and a testing dataset. Each dataset is comprised of provide two elements: images and annotations/labels. The following sections explain what labels and images are used for and how they come together to create datasets.

Images

You will need to train an adapter on representative samples of your images. When you select images for training, try to include at least a few images that demonstrate the expected response for each of the labels you are targeting with your adapter.

To create a training dataset, you need to provide one of the following two image types:

- Images with False Positive predictions. For example, when a base model predicts that an image has alcohol, but it doesn't.
- Images with False Negative predictions. For example, when a base model predicts that an image doesn't have alcohol, but it does.

To create a balanced dataset, it is recommended that you provide one of the following two image types:

- Images with True Positive predictions. For example, when a base model correctly predicts that an image has alcohol. It is recommended to provide these images if you provide False Positive images.
- Images with True Negative predictions. For example, when a base model correctly predicts that an image doesn't have alcohol. It is recommended to provide these images if you provide False Negative images.

Labels

A label refers to any of the following: objects, events, concepts or activities. For Content Moderation, a label is an instance of content that is inappropriate, unwanted, or offensive.

In the context of creating an adapter by training Rekognition’s base model, when a label is assigned to an image it’s called an annotation. When training an adapter with the Rekognition Console, you’ll use the Console to add annotations to your images by choosing a label and then tagging images that corresponds with the label. Through this process, the model learns to identify elements of your images based on the assigned label. This linking process allows the model to focus on the most relevant content when an adapter is created, leading to improved accuracy for image analysis.

Alternatively, you can provide a manifest files, which contains information on images and the annotations that go with them.

Training and testing datasets

The training dataset is the basis for fine-tuning the model and creating a custom adapter. You must provide an annotated training dataset for the model to learn from. The model learns from this dataset to improve its performance on the type of images you provide.

To improve accuracy, you must create your training dataset by annotation/labeling images. You can accomplish this in two ways:

- Manual label assignment - You can use the Rekognition Console to create a training dataset by uploading the images you want your dataset to contain and then manually assign labels to these images.
- Manifest file — You can use a manifest file to train your adapter. The manifest file contains information on the ground-truth annotations for your training and testing images, as well as the location of your training images. You can provide the manifest file when training an adapter using the Rekognition APIs or when using the AWS Console.

The testing dataset is used to evaluate the adapter's performance after training. To ensure reliable evaluation, the testing dataset is created by using a slice of the original training dataset that the model hasn't seen before. This process ensures that the adapter's performance is assessed with new data, creating accurate measurements and metrics. For optimal accuracy improvements see Best practices for training adapters .

Managing adapters with the AWS CLI and SDKs

Rekognition lets you make use of multiple features that leverage pre-trained computer vision models. With these models you can carry out tasks like label detection and content moderation. You can also customize these certain models using an adapter.

You can make use of Rekognition's project creation and project management APIs (like CreateProject and CreateProjectVersion) to create and train adapters. The following pages describe how to use the API operations to create, train, and manage your adapters, using the AWS Console, your chosen AWS SDK, or the AWS CLI.

After you train an adapter you can use it when running inference with supported features. Currently, adapters are supported when using the Content Moderation feature.

When you train an adapter using an AWS SDK you must provide your ground-truth labels (image annotations) in the form of a manifest file. Alternatively, you can use the Rekognition Console to create and train an adapter.

> **Note**
>
> Adapters cannot be copied. Only Rekognition Custom Labels project versions can be copied.

Topics

- Adapter statuses
- Creating a project
- Describing projects
- Deleting a project
- Creating a project version
- Describing a project version
- Deleting a project version

Adapter statuses

Custom Moderation adapter (project versions) can be in one of the following statuses:

- TRAINING_IN_PROGRESS - The adapter is in the process of training on the files you provided as training documents.
- TRAINING_COMPLETED - The adapter has successfully completed training and is ready for you to review its performance.
- TRAINING_FAILED - The adapter has failed to complete its training for some reason, review the output manifest file and output manifest summary for information on the cause of the failure.
- DELETING - The adapter is in the process of being deleted.
- DEPRECATED - The adapter was trained on an older version of the Content Moderation base model. It is in a grace period and it will expire within 60 to 90 days of the release of the new base model version. During the grace period, you can still use the adapter for inference with DetectModerationLabels or StartMediaAnalysisJob API operations. Refer to Custom Moderation Console for the expiry date of your adapters.
- EXPIRED - The adapter was trained on an older version of the Content Moderation base model and it can no longer be used to obtain custom results with the DetectModerationLabels or StartMediaAnalysisJob API operations. If an Expired adapter is specified in an inference request, it will be ignored and the response is returned from the most recent version of the Custom Moderation base model instead.

Creating a project

With the CreateProject operation you can create a project that will hold an adapter for Rekognition's label detection operations. A project is a group of resources and in the case of label detection operations like DetectModerationLabels, a project allows you to store adapters that you can use to customize the base Rekognition model. When invoking CreateProject, you provide the name of the project you want to create to the ProjectName argument.

To create a project with the AWS console:

- Sign into the Rekognition Console
- Click on **Custom Moderation**
- Choose **Create Project**
- Select either **Create a New Project** or **Add to an existing project**
- Add a **Project name**
- Add an **Adapter name**
- Add a description if desired
- Choose how you want to import your training images: Manifest file, from S3 bucket, or from your computer
- Choose if you want to Autosplit your training data or import a manifest file
- Select whether or not you want the project to automatically update
- Click **Create project**

To create a project with the AWS CLI and SDK:

1. If you haven't already done so, install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs .
2. Use the following code to create a project:

CLI

```
# Request
# Creating Content Moderation Project
```

```
aws rekognition create-project \
    --project-name "project-name" \
    --feature CONTENT_MODERATION \
    --auto-update ENABLED
    --profile profile-name
```

Describing projects

You can use the DescribeProjects API to get information about your projects, including information about all the adapters associated with a project.

To describe projects with the AWS CLI and SDK:

1. If you haven't already done so, install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs .
2. Use the following code to describe a project:

CLI

```
# Request
# Getting CONTENT_MODERATION project details
aws rekognition describe-projects \
    --features CONTENT_MODERATION
    --profile profile-name
```

Deleting a project

You can delete a project by using the Rekognition console or by calling the DeleteProject API. To delete a project, you must first delete each of the associated adapters. A deleted project or model can't be undeleted.

To delete a project with the AWS console:

- Sign into the Rekognition Console.
- Click on **Custom Moderation**.

- You must delete each adapter associated with your project before you can delete the project itself. Delete any adapters associated with the project by selecting the adapter and then selecting **Delete**.
- Select the project and then select the **Delete** button.

To delete a project with the AWS CLI and SDK:

1. If you haven't already done so, install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs .
2. Use the following code to delete a project:

CLI

```
aws rekognition delete-project
  --project-arn project_arn \
  --profile profile-name
```

Creating a project version

You can train an adapter for deployment by using the CreateProjectVersion operation. CreateProjectVersion first creates a new version of an adapter associated with a project and then begins training the adapter. The response from CreateProjectVersion is an Amazon Resource Name (ARN) for the version of the model. Training takes a while to complete. You can get the current status by calling DescribeProjectVersions. When training a model, Rekognition uses the training and test datasets associated with the project. You create datasets using the console. For more information, see the section on datasets.

To create a project version with the Rekognition console:

- Sign into the AWS Rekognition Console
- Click on Custom Moderation
- Select a project.
- On the “Project detail” page, choose **Create adapter**

- On the “Create a project" page, fill in the required details for Project Details, Training images, and Testing images, then select **Create project** .
- On the “Assign labels to images” page, add labels to your images and when finished select **Start training**

To create a project version with the AWS CLI and SDK:

1. If you haven't already done so, install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs .
2. Use the following code to create a project version:

CLI

```
# Request
aws rekognition create-project-version \
 --project-arn project-arn \
 --training-data '{Assets=[GroundTruthManifest={S3Object="amzn-s3-demo-source-
bucket",Name="manifest.json"}]}' \
 --output-config S3Bucket=amzn-s3-demo-destination-bucket,S3KeyPrefix=my-results \
 --feature-config "ContentModeration={ConfidenceThreshold=70}"
 --profile profile-name
```

Describing a project version

You can list and describe adapters associated with a project by using the DescribeProjectVersions operation. You can specify up to 10 model versions in ProjectVersionArns. If you don't specify a value, descriptions for all model versions in the project are returned.

To describe a project version with the AWS CLI and SDK:

1. If you haven't already done so, install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs .
2. Use the following code to describe a project version:

CLI

```
aws rekognition describe-project-versions
  --project-arn project_arn \
  --version-names [versions]
```

Deleting a project version

You can delete an Rekognition adapter associated with a project using the DeleteProjectVersion operation. You can't delete an adapter if it's running or if it's training. To check the status of an adapter, call the DescribeProjectVersions operation and check the Status field returned by it. To stop a running adapter call StopProjectVersion. If the model is training, wait until it finishes training to delete it. You must delete each adapter associated with your project before you can delete the project itself.

To delete a project version with the Rekognition console:

- Sign into the Rekognition Console
- Click on Custom Moderation
- From the Projects tab you can see all your projects and associated adapters. Select an adapter and then select **Delete**.

To delete a project version with the AWS CLI and SDK:

1. If you haven't already done so, install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs .
2. Use the following code to delete a project version:

CLI

```
# Request
aws rekognition delete-project-version
  --project-version-arn model_arn \
  --profile profile-name
```

Custom Moderation adapter tutorial

This tutorial shows you how to create, train, evaluate, use, and manage adapters using the Rekognition Console. To create, use, and manage adapters with the AWS SDK, see Managing adapters with the AWS CLI and SDKs.

Adapters let you enhance the accuracy of Rekognition's API operations, customizing the model's behavior to fit your own needs and use cases. After you create an adapter with this tutorial, you'll be able to use it when analyzing your own images with operations like DetectModerationLabels, as well as retrain the adapter for further, future improvements.

In this tutorial you'll learn how to:

- Create a project using Rekognition Console
- Annotate your training data
- Train your adapter on your training dataset
- Review your adapter's performance
- Use your adapter for image analysis

Prerequisites

Before completing this tutorial it's recommended that you read through Creating and using adapters.

To create an adapter, you can use the Rekognition Console tool to create a project, upload and annotate your own images, and then train an adapter on these images. See Creating a project and training an adapter to get started.

Alternatively, you can use Rekognition's Console or API to retrieve predictions for images and then verify the predictions before training an adapter on these predictions. See Bulk analysis, prediction verification, and training an adapter to get started.

Image annotation

You can annotate images yourself by labeling images with the Rekognition console, or use Rekognition Bulk analysis to annotate images which you can then verify have been correctly labeled. Choose one of the topics below to get started.

Topics

- Creating a project and training an adapter
- Bulk analysis, prediction verification, and training an adapter

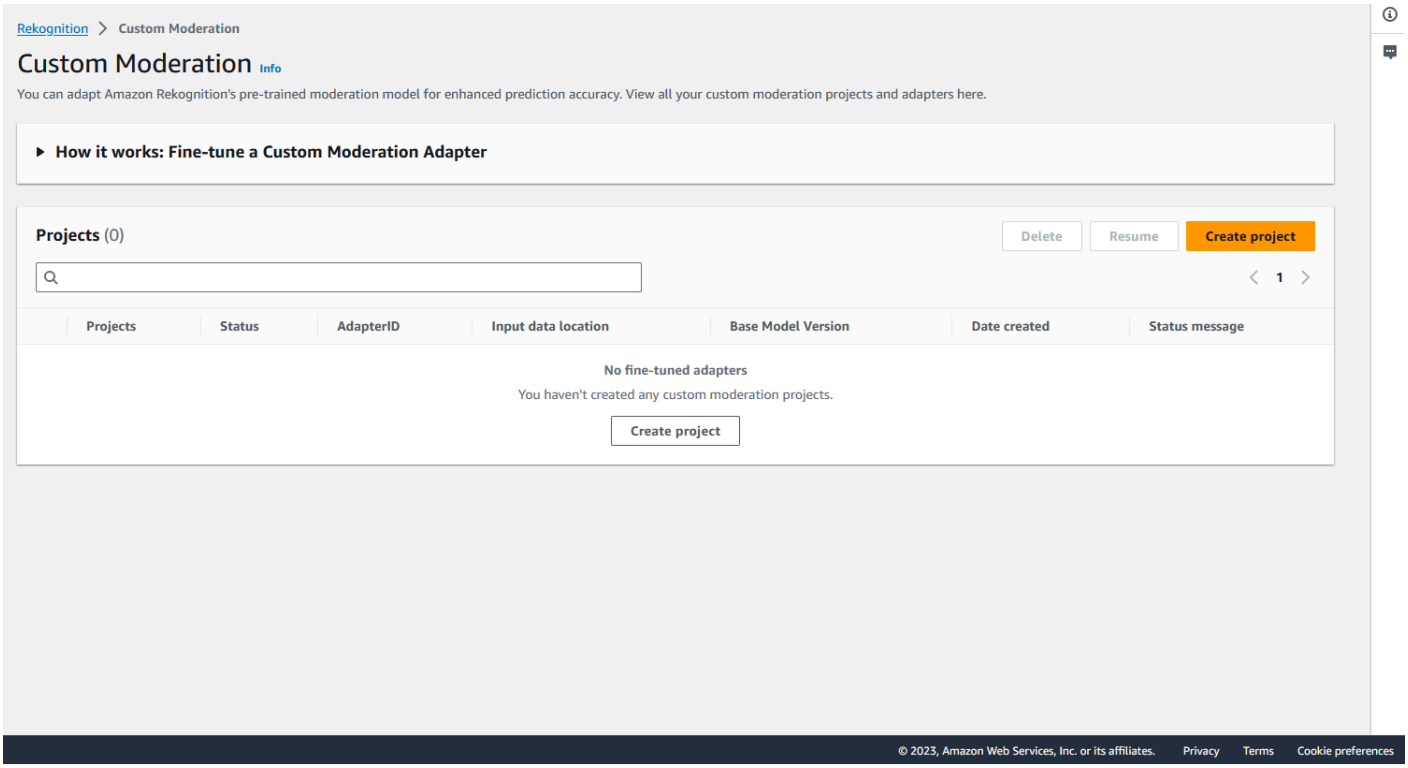
Creating a project and training an adapter

Complete the following steps to train your adapter by annotating images using the Rekognition console.

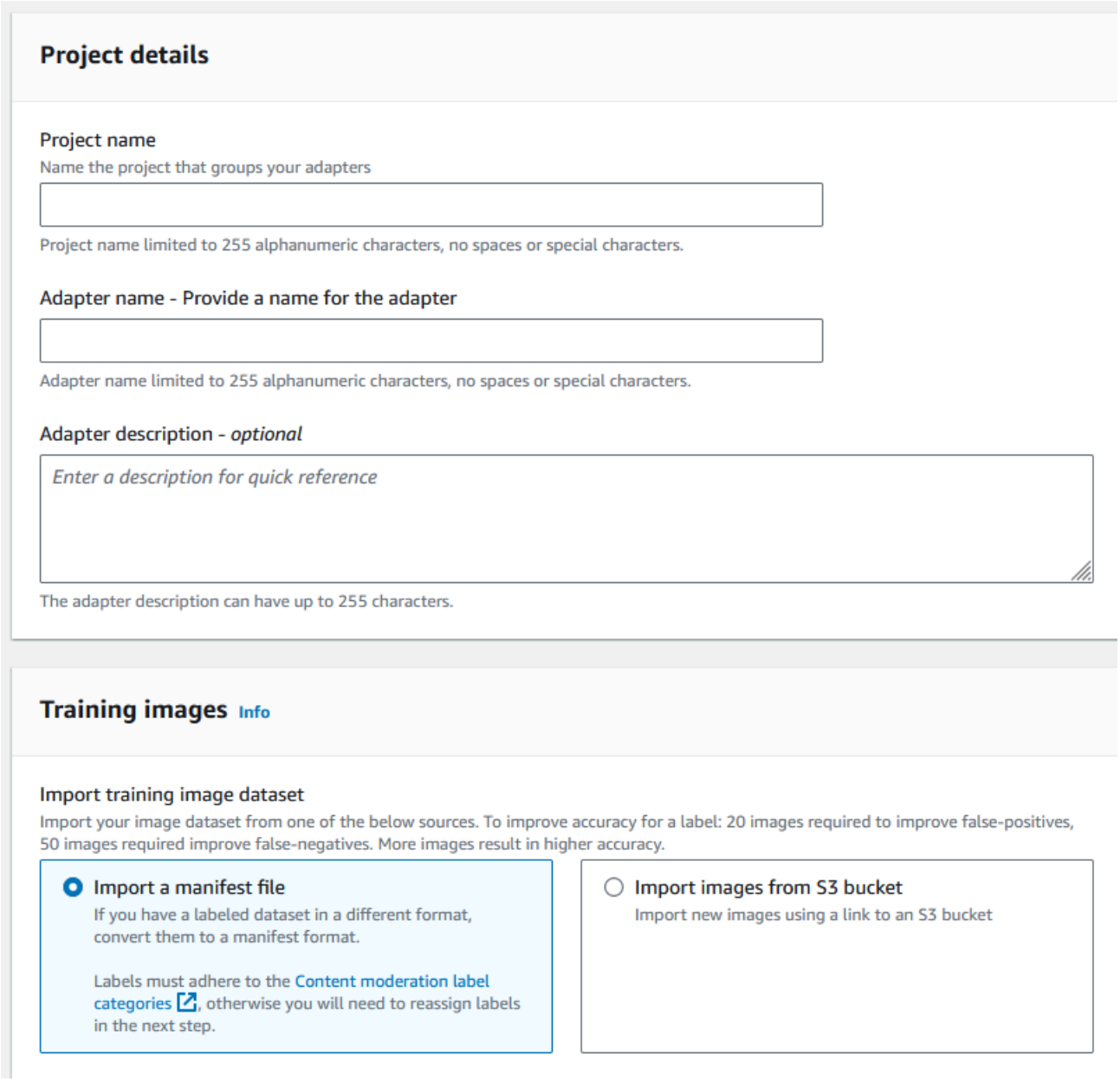
Create a project

Before you can train or use an adapter you must create the project that will contain it. You must also provide the images used to train your adapter. To create a project, an adapter, and your image datasets:

1. Sign in to the AWS Management Console and open the Rekognition console at https://console.aws.amazon.com/rekognition/.
2. In the left pane, choose **Custom Moderation.** The Rekognition Custom Moderation landing page is shown.



3. The Custom Moderation landing page shows you a list of all your projects and adapters, and there is also a button to create an adapter. Choose **Create project** to create a new project and adapter.
4. If this is your first time creating an adapter you will be prompted to create an Amazon S3 bucket to store files related to your project and your adapter. Choose **Create Amazon S3 bucket**.
5. On the following page, fill in the **adapter name** and the **project name**. Provide an adapter description if you wish.



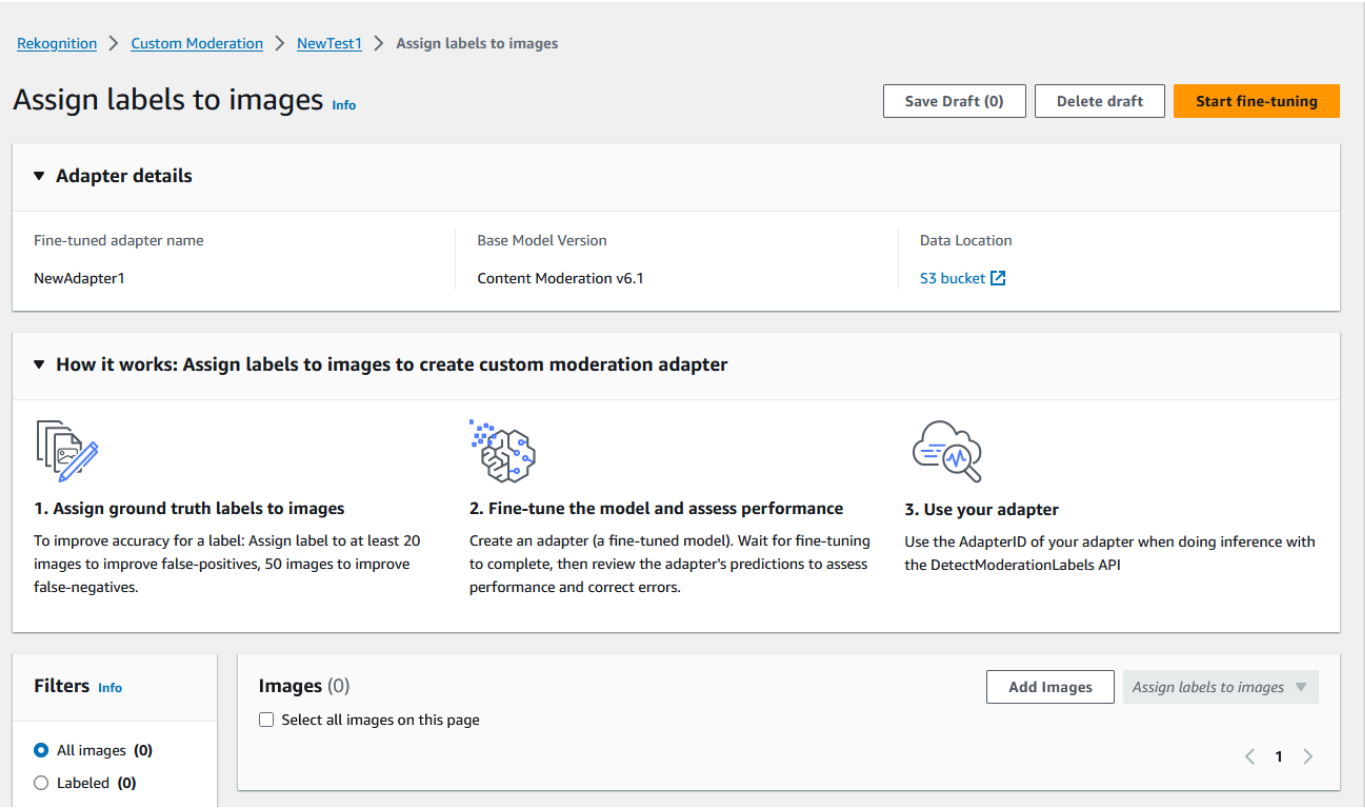
6. In this step, you'll also provide the images for your adapter. You can select: **Import images from your computer**, **Import manifest file**, or **Import images from Amazon S3 bucket**. If you choose to import your images from an Amazon S3 bucket, provide the path to the bucket and folder that contains your training images. If you upload your images directly from your computer, note that you can only upload up to 30 images at one time. If you are using a manifest file that contains annotations, you can skip the steps listed below covering image annotation and proceed to the section on Reviewing adapter performance.
7. In the **Test dataset details** section, choose **Autosplit** to have Rekognition automatically select the appropriate percentage of your images as testing data, or you can choose **Manually import manifest file**.

8. After filling in this information, select **Create Project**.

Train an adapter

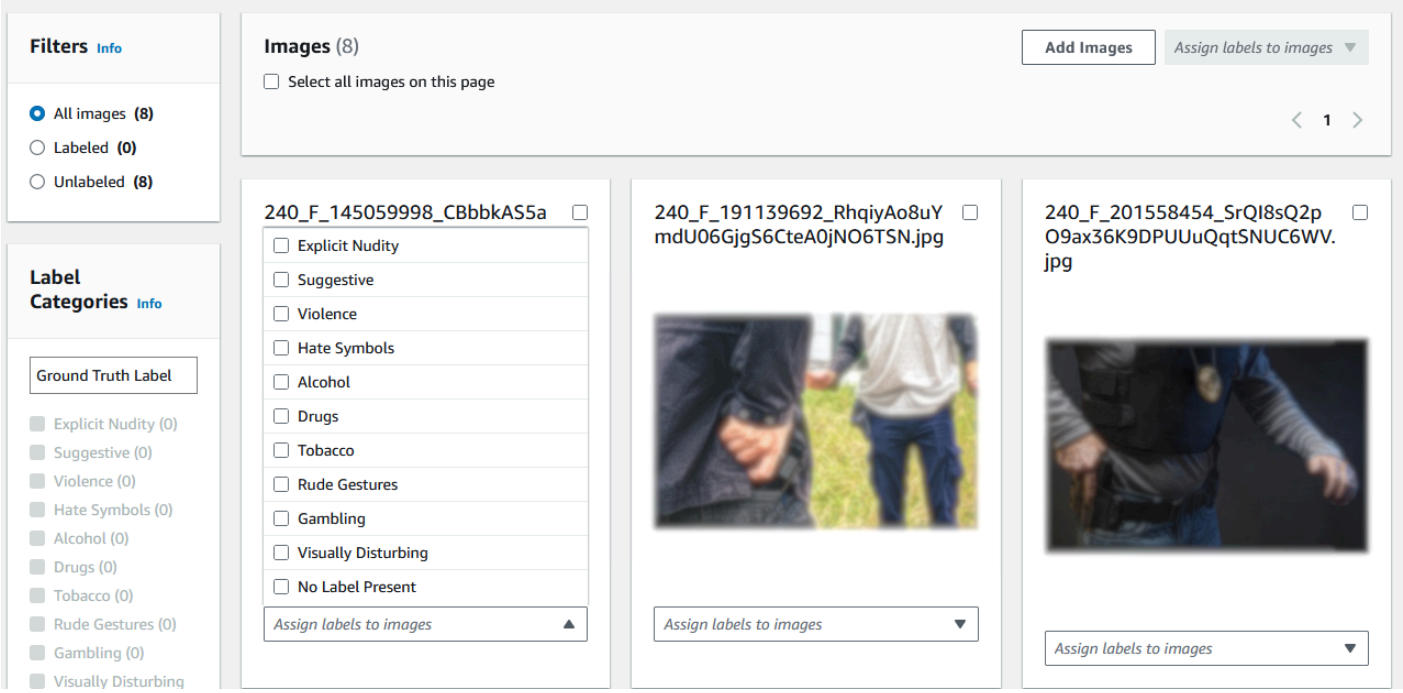
To train an adapter on your own un-annotated images:

1. Select the project that contains your adapter and then choose the option to **Assign label to images**.
2. On the **Assign label to images** page, you can see all the images that have been uploaded as training images. You can filter these images by both labeled/unlabeled status and by label category using the two attribute selection panels on the left. You can add additional images to your training dataset by selecting the **Add images** button.



3. After adding images to the training dataset, you must annotate your images with labels. After uploading your images, the "Assign labels to images" page will update to show the images you've uploaded. You will be prompted to select the label appropriate for you images from a drop-down list of labels supported by Rekognition Moderation. You can select more than one label.
4. Continue this process until you have added labels to each of the images in your training data.

5. After you have labeled all your data, select **Start training** to start training the model, which creates your adapter.



6. Before you start the training process you can add any **Tags** to the adapter that you'd like to. You can also provide the adapter with a custom encryption key or use an AWS KMS key. Once you have finished adding any tags you want and customizing the encryption to your liking, select **Train adapter** to start the training process for your adapter.
7. Wait for your adapter to finish training. Once training has completed, you'll receive a notification that your adapter has finished being created.

Once the status of your adapter is "Training completed" you can review your adapter's metrics

Bulk analysis, prediction verification, and training an adapter

Complete the following steps to train your adapter by verifying bulk analysis predictions from Rekognition's Content Moderation model.

To train an adapter by verifying predictions from Rekognition's Content Moderation model, you must:

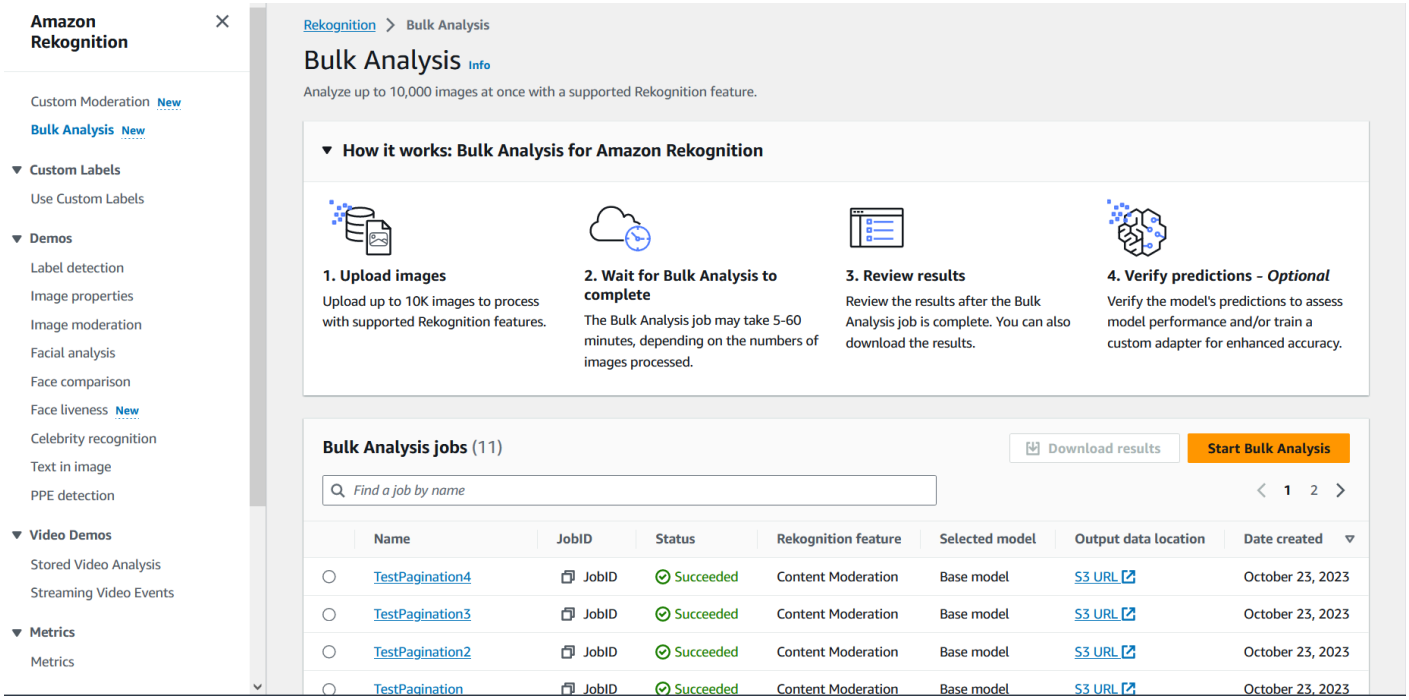
1. Carry out Bulk analysis on your images
2. Verify the predictions returned for your images

You can obtain predictions for images by carrying out Bulk analysis with Rekognition's base model or an adapter you have already created.

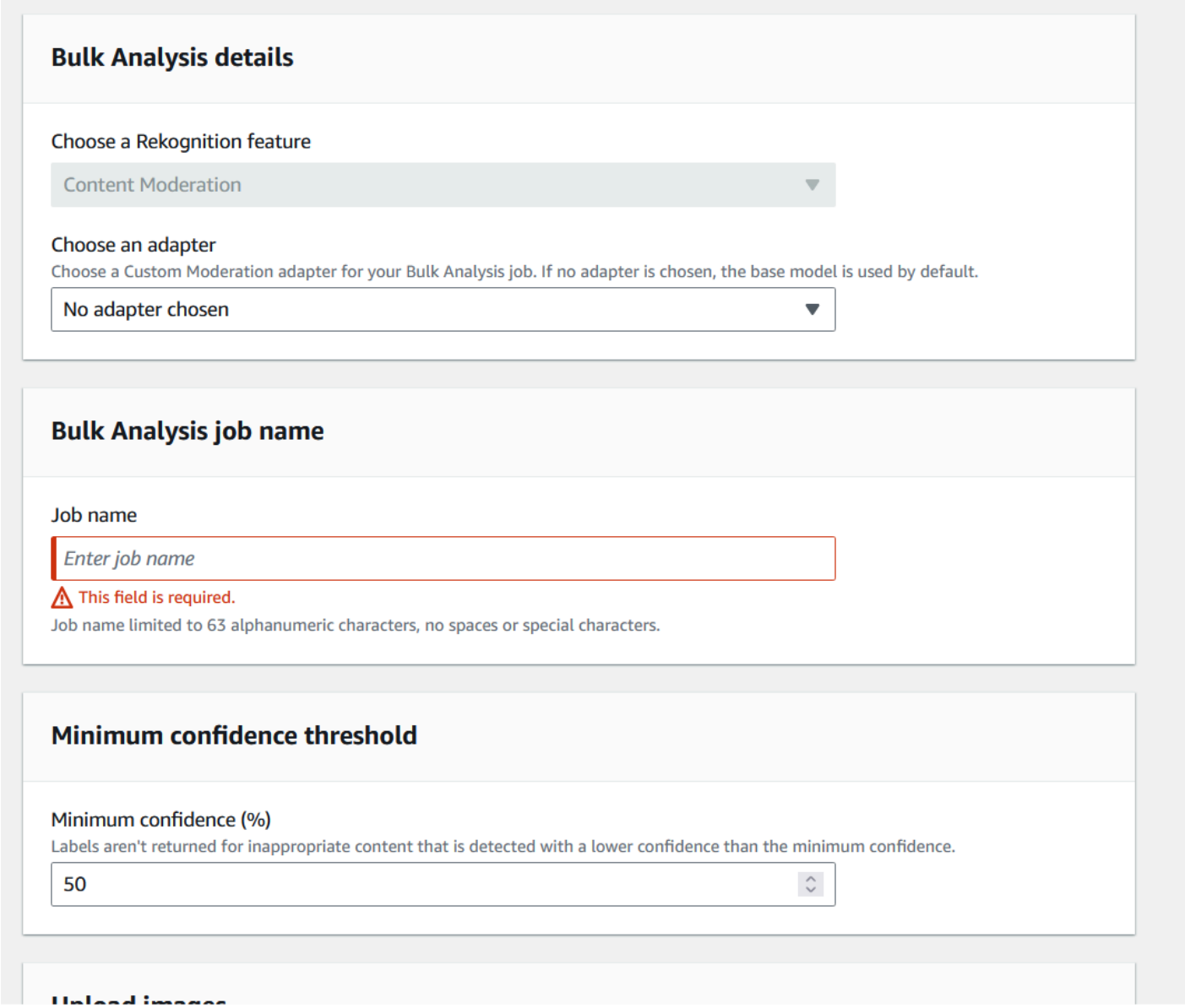
Run bulk analysis on your images

To train an adapter on predictions you have verified, you must first start a Bulk analysis job to analyze a batch of images using Rekognition's base model or an adapter of your choice. To run a Bulk analysis job:

1. Sign in to the AWS Management Console and open the Amazon Rekognition console at https://console.aws.amazon.com/rekognition/.
2. In the left pane, choose **Bulk analysis**. The Bulk analysis landing page appears. Choose **Start Bulk Analysis**. The Bulk Analysis feature overview showing steps to upload images, wait for analysis, review results, and optionally verify model predictions. Lists recent Bulk Analysis jobs for Content Moderation using the base model.

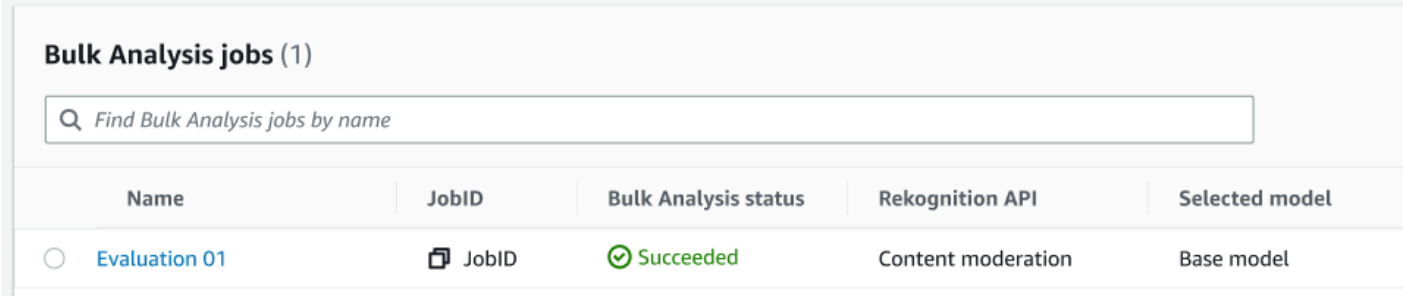


3. If this is your first time creating an adapter you will be prompted to create an Amazon Simple Storage Service bucket to store files related to your project and your adapter. Choose **Create Amazon S3 bucket**.
4. Select the adapter you want to use for the bulk analysis by using the **Choose an adapter** drop-down menu. If no adapter is chosen the base model will be used by default. For the purposes of this tutorial do not choose an adapter.

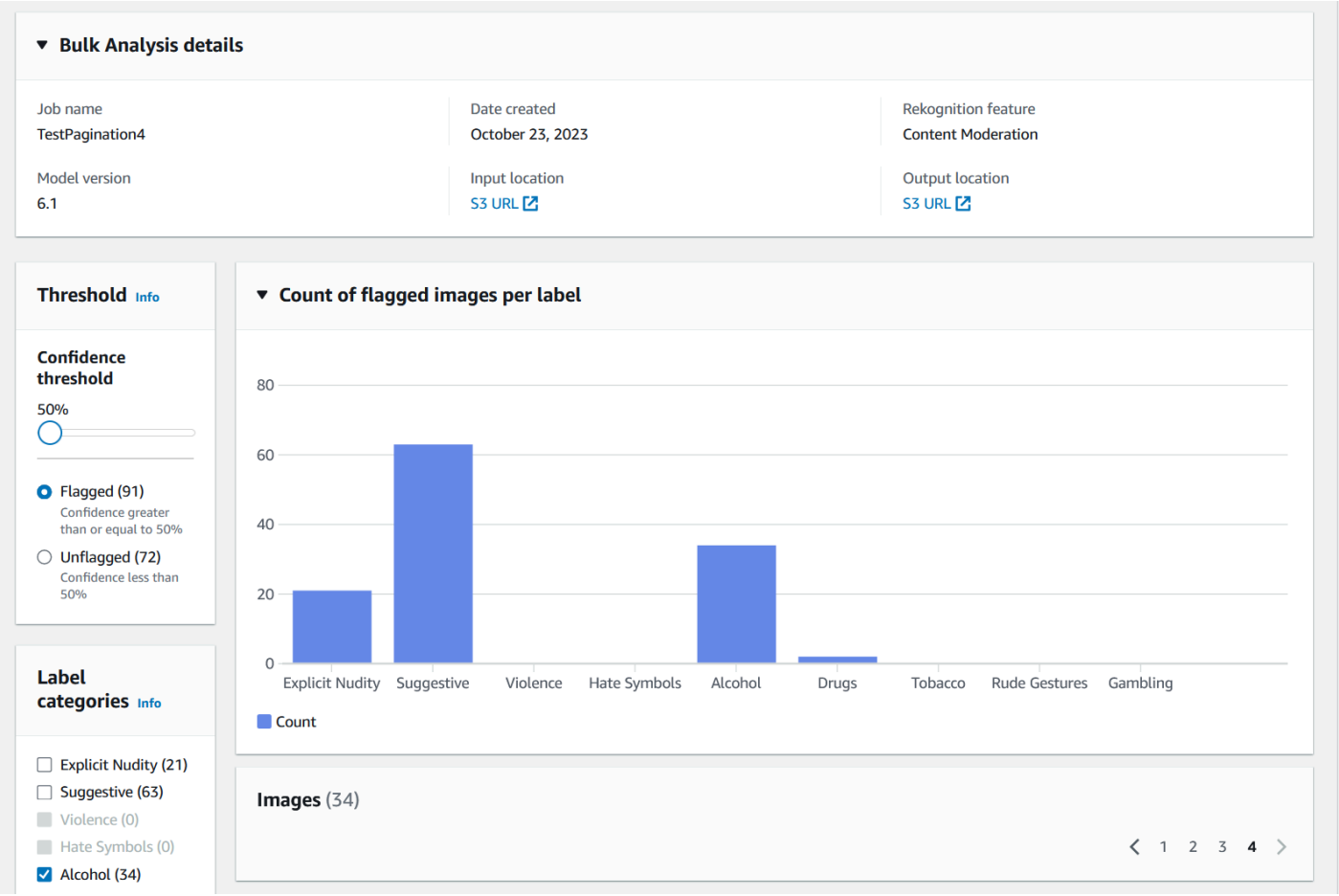


5. In the **Bulk analysis job name** field, fill in the bulk analysis job name.
6. Choose a value for the **Minimum confidence threshold**. Label predictions with less than your chosen confidence threshold won't be returned. Note that when you're evaluating the model's performance later on, you won't be able to adjust the confidence threshold below your chosen minimum confidence threshold.
7. In this step, you'll also provide the images you want to analyze with Bulk analysis. These images may also be used to train your adapter. You can choose **Upload images from your computer** or **Import images from Amazon S3 bucket**. If you choose to import your documents from an Amazon S3 bucket, provide the path to the bucket and folder that contains your training images. If you upload your documents directly from your computer, note that you can only upload 50 images at one time.

8. After filling in this information, choose **Start analysis**. This will start the analysis process using Rekognition's base model.
9. You can check the status of your Bulk analysis job by checking the Bulk Analysis status of the job on the main Bulk Analysis page. When the Bulk Analysis status becomes "Succeeded", the results of the analysis are ready for review.



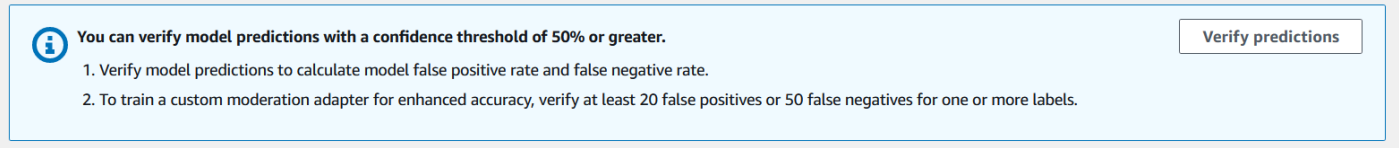
10. Choose the analysis you created from the list of **Bulk Analysis jobs**.
11. On the Bulk Analysis details page you can see the predictions that Rekognition's base model has made for the images you uploaded.
12. Review the base model's performance. You can change the confidence threshold that your adapter must have to assign a label to an image by using the Confidence threshold slider. The number of Flagged and Unflagged instances will change as you adjust the confidence threshold. The Label Categories panel displays the top-level categories that Rekognition recognizes, and you can select a category in this list to display any images that have been assigned that label.



Verify predictions

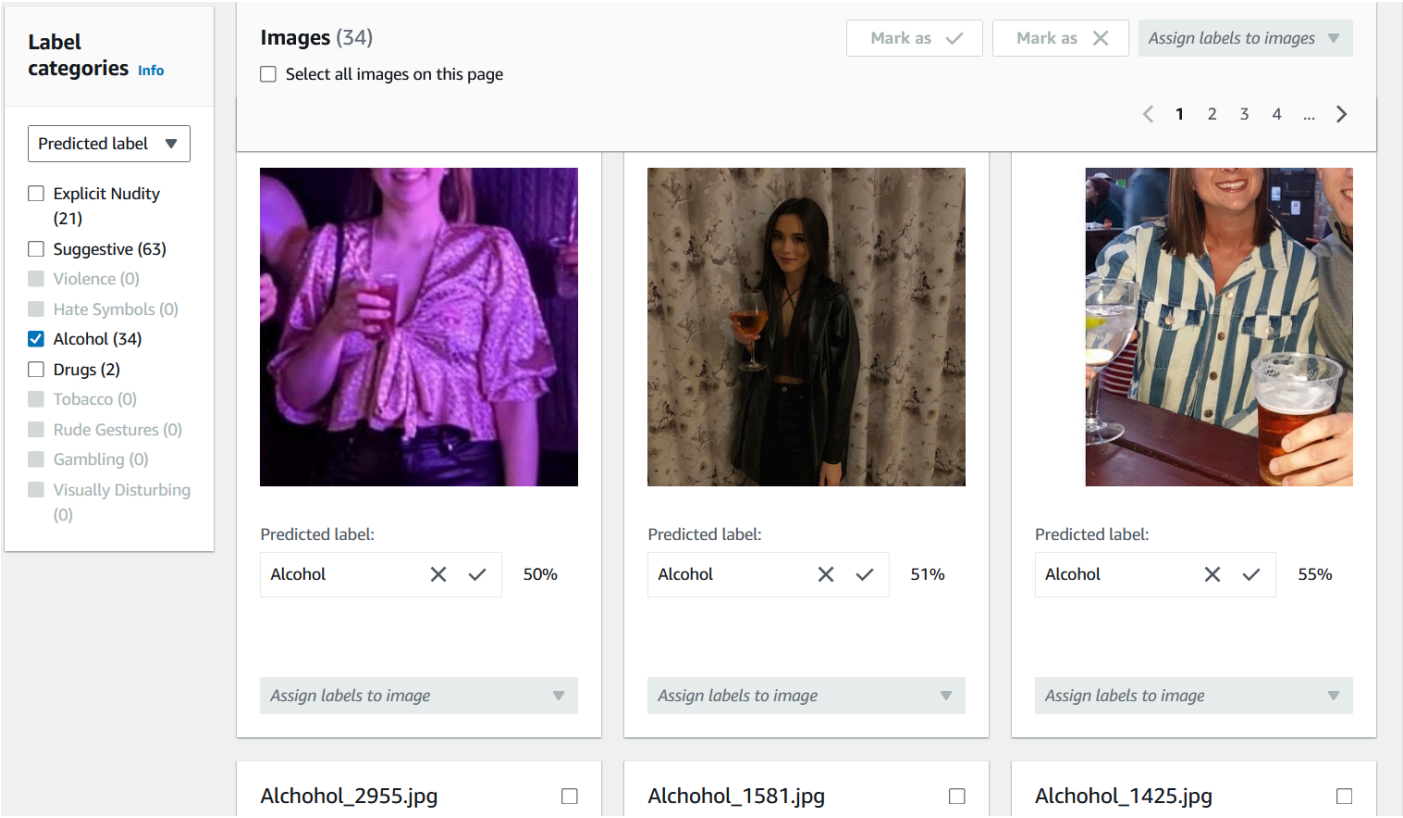
If you have reviewed the accuracy of Rekognition's base model or a chosen adapter, and want to improve this accuracy, you can utilize the verification workflow:

1. After you are finished reviewing the base model performance, you will want to verify the predictions. Correcting the predictions will allow you to train an adapter. Choose **Verify predictions** from the top of the Bulk analysis page.

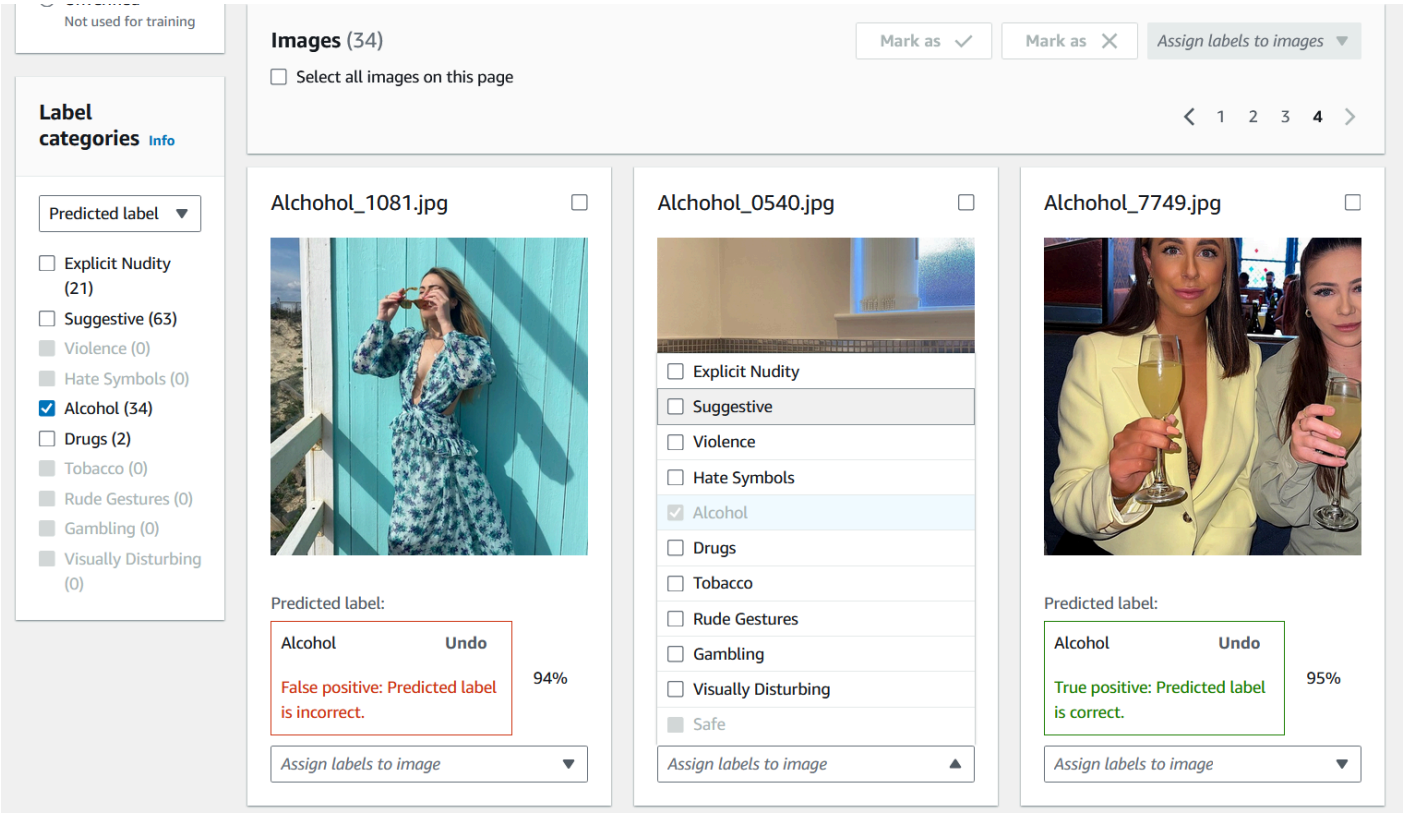


2. On the Verify predictions page, you can see all the images that you provided to Rekognition's base model, or a chosen adapter, along with the predicted label for each image. You must verify each prediction as correct or incorrect using the buttons under the image. Use the "X" button to mark a prediction as incorrect and the check-mark button to mark a prediction as correct.

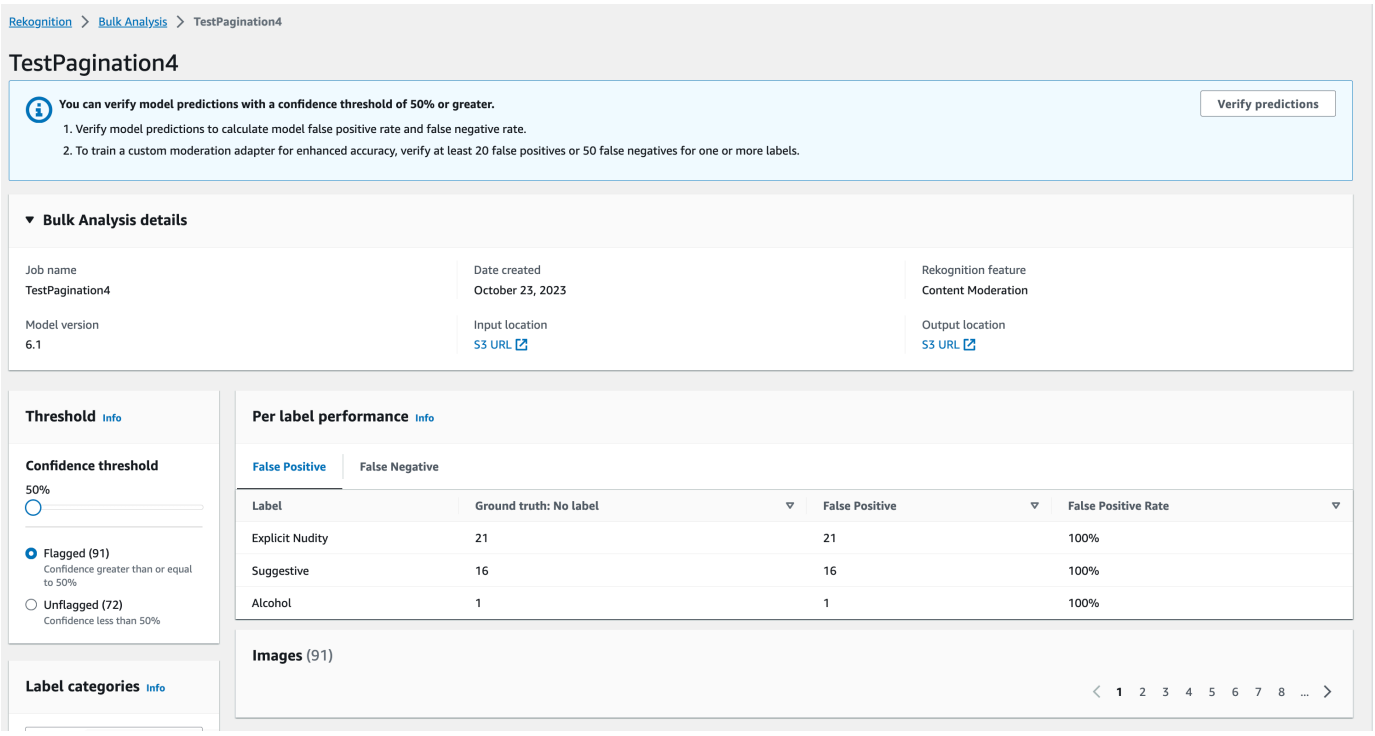
To train an adapter you will need to verify at least 20 false-positive predictions and 50 false negative predictions for a given label. The more predictions you verify, the better the adapter's performance will be.



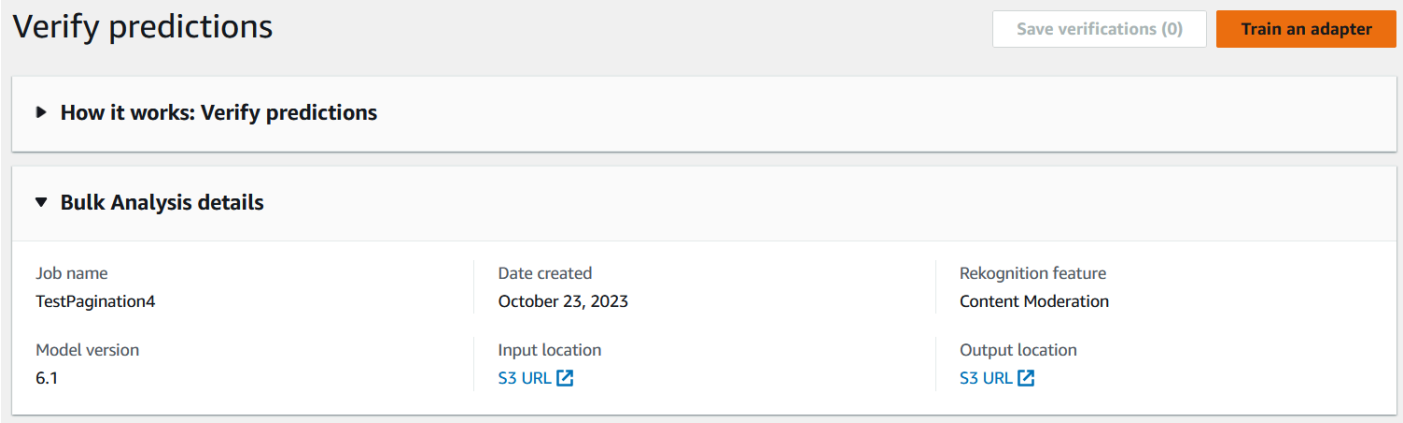
After you verify a prediction, the text below the image will change to show you the type of prediction you have verified. Once you have verified an image you can also add additional labels to the image using the **Assign labels to image** menu. You can see which images are flagged or unflagged by the model for your chosen confidence threshold or filter images by category.



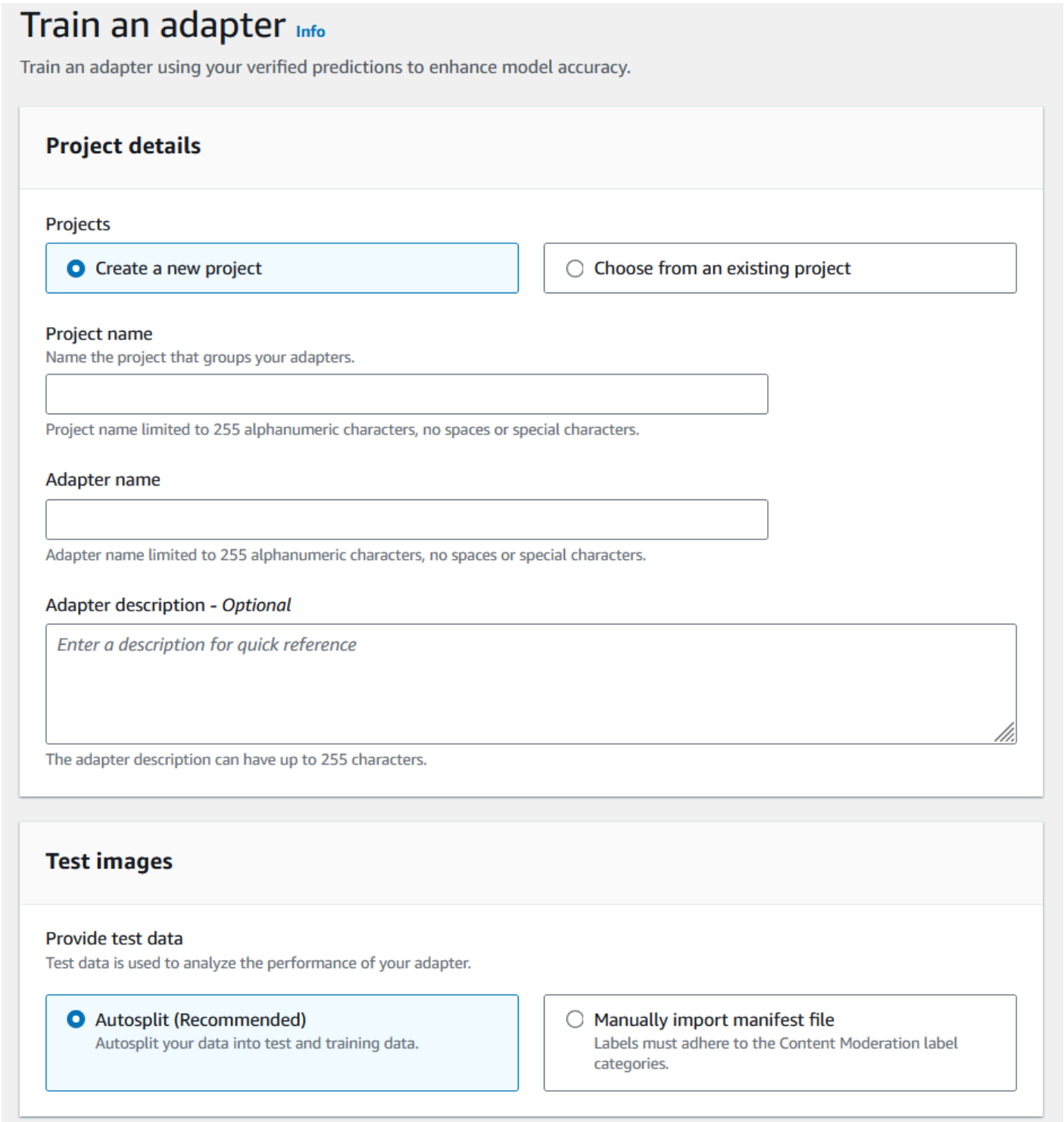
3. Once you have finished verifying all the predictions you want to verify, you can see statistics regarding your verified predictions in the **Per label performance** section of the Verification page. You can also return to the Bulk analysis details page to view these statistics.



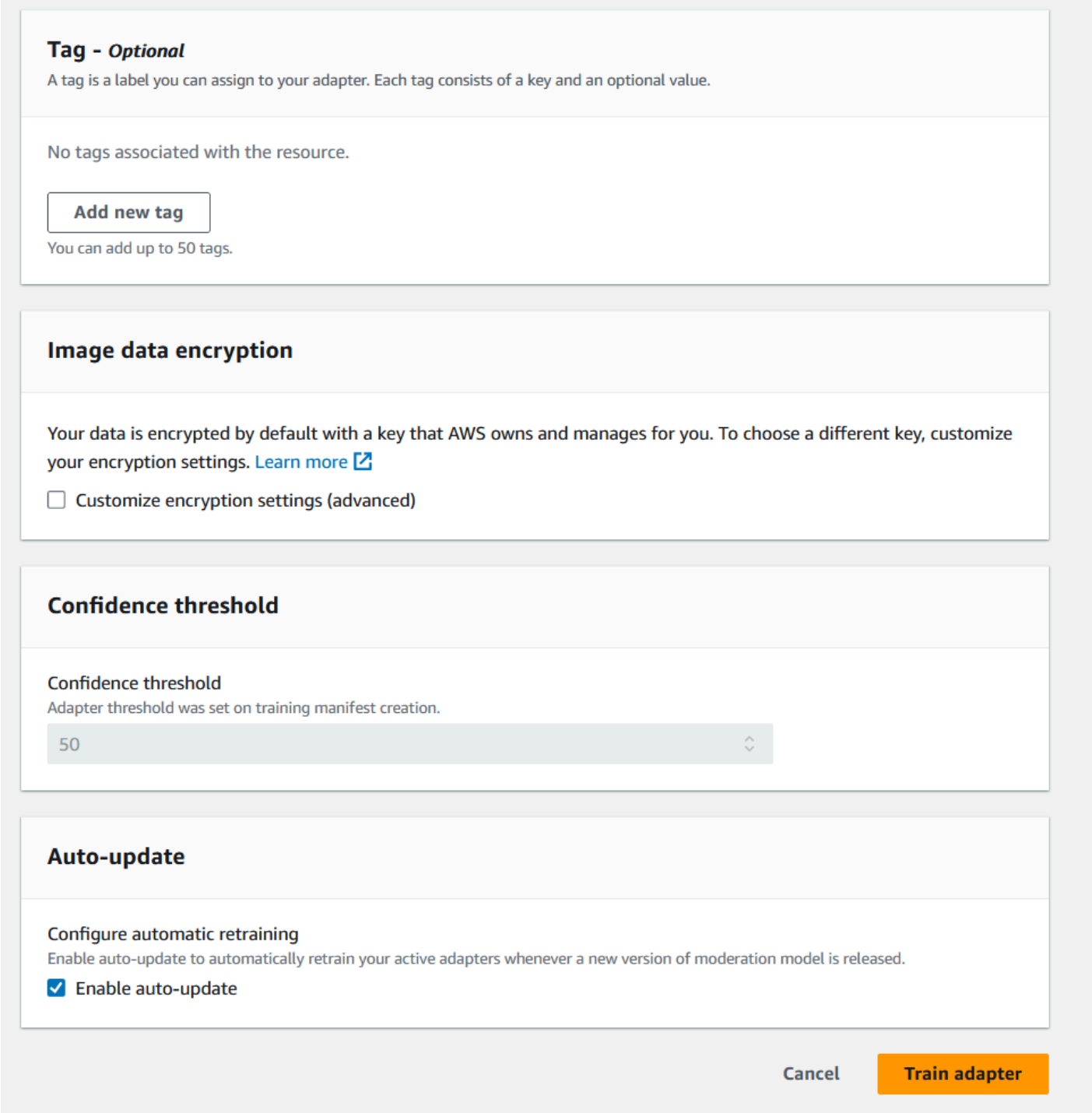
4. When you are satisfied with the statistics regarding the **Per label performance**, go to the **Verify predictions** page again then select the **Train an adapter** button to begin training your adapter.



5. On the Train an adapter page you will be prompted to create a project or choose an existing project. Name the project and the adapter that will be contained by the project. You must also specify the source of your test images. When specifying the images you can choose Autosplit to have Rekognition automatically use a portion of your training data as test images, or you can manually specify a manifest file. It's recommended to choose Autosplit.



6. Specify any tags you desire, as well a AWS KMS key if you don't want to use the default AWS key. It is recommended to leave **Auto-update** enabled.
7. Choose **Train adapter**.

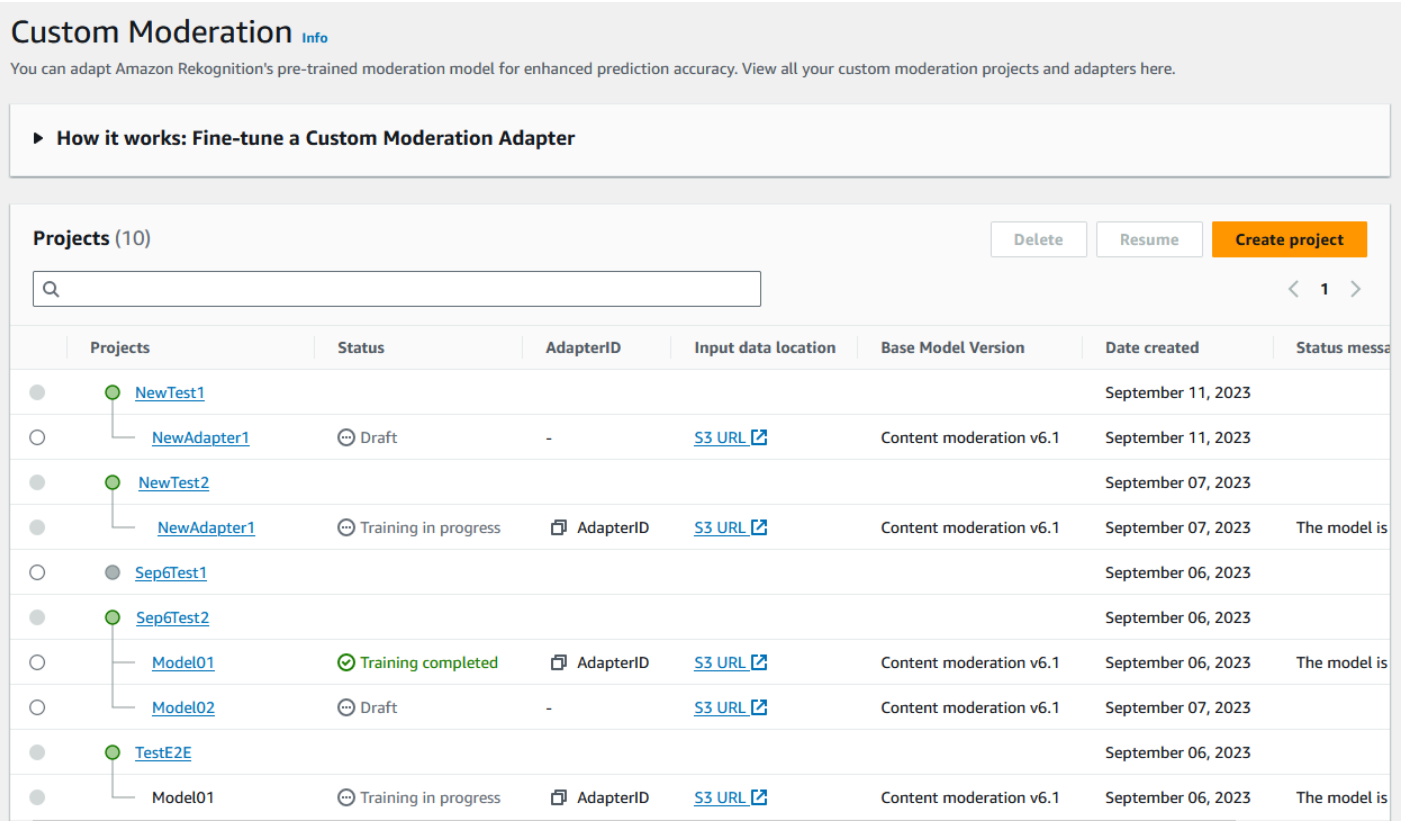


8. Once the status of your adapter on the Custom Moderation landing page has become "Training complete", you can review your adapter's performance. See Reviewing adapter performance for more information.

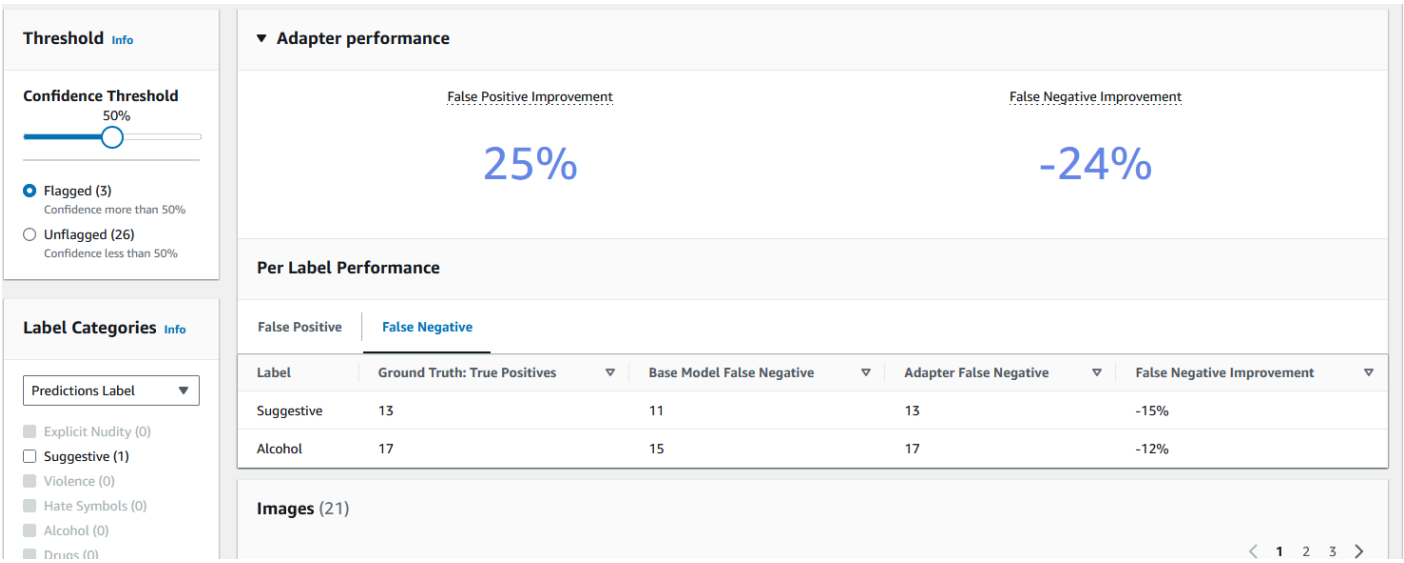
Reviewing adapter performance

To review your adapter performance:

1. When using the console, you'll be able to see the status of any adapters associated with a project under the Projects tab on the Custom Moderation landing page. Navigate to the Custom Moderation landing page.



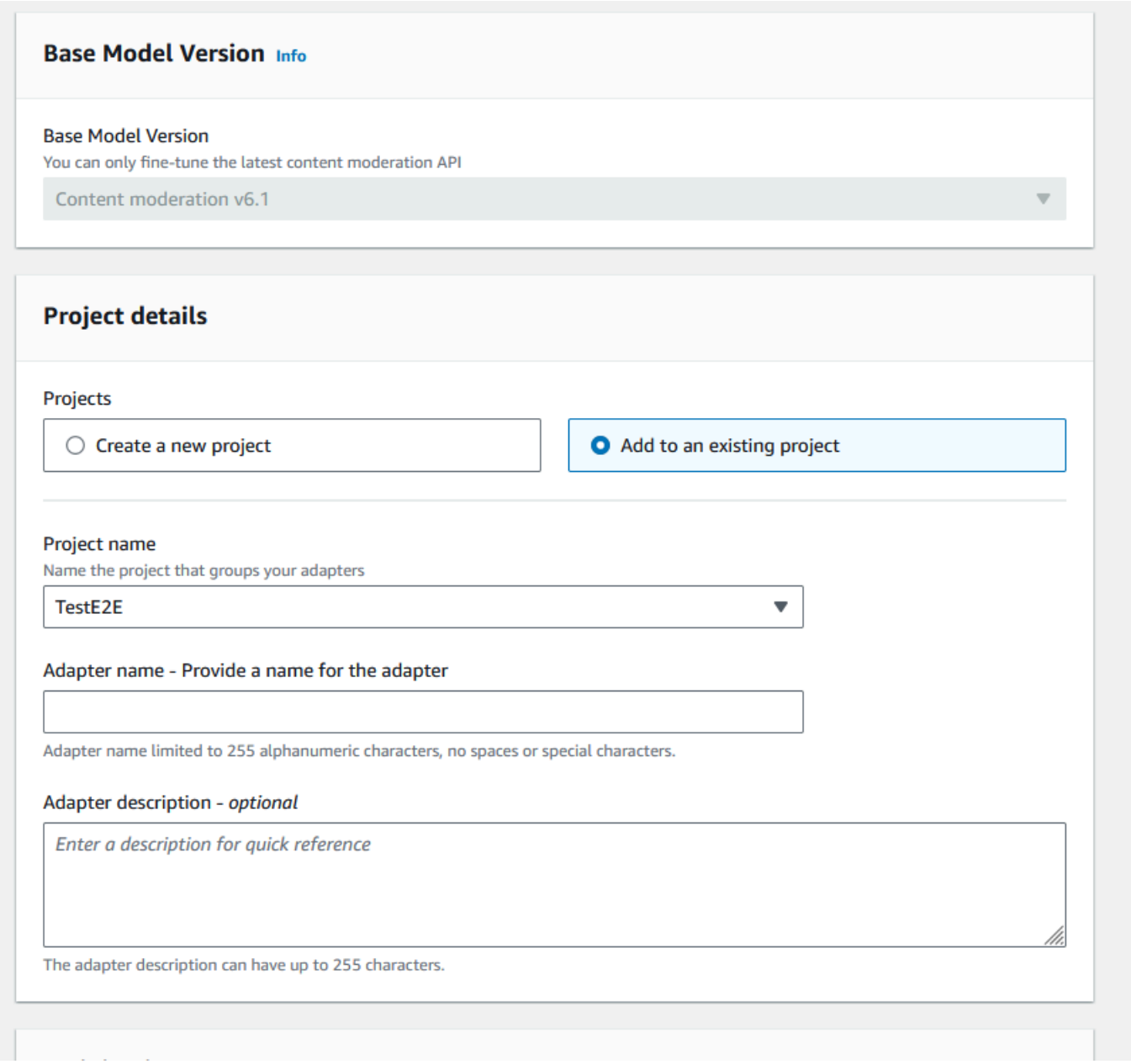
2. Select the adapter you want to review from this list. On the following Adapter details page, you can see a variety of metrics for the adapter.



3. With the **Threshold** panel you can change the minimum confidence threshold that your adapter must have to assign a label to an image. The number of Flagged and Unflagged instances will change as you adjust the confidence threshold. You can also filter by label category to see metrics for the categories you have selected. Set your chosen threshold.
4. You can assess the performance of your adapter on your test data by examining the metrics in the Adapter Performance panel. These metrics are calculated by comparing the adapter's extractions to the "ground truth" annotations on the test set.

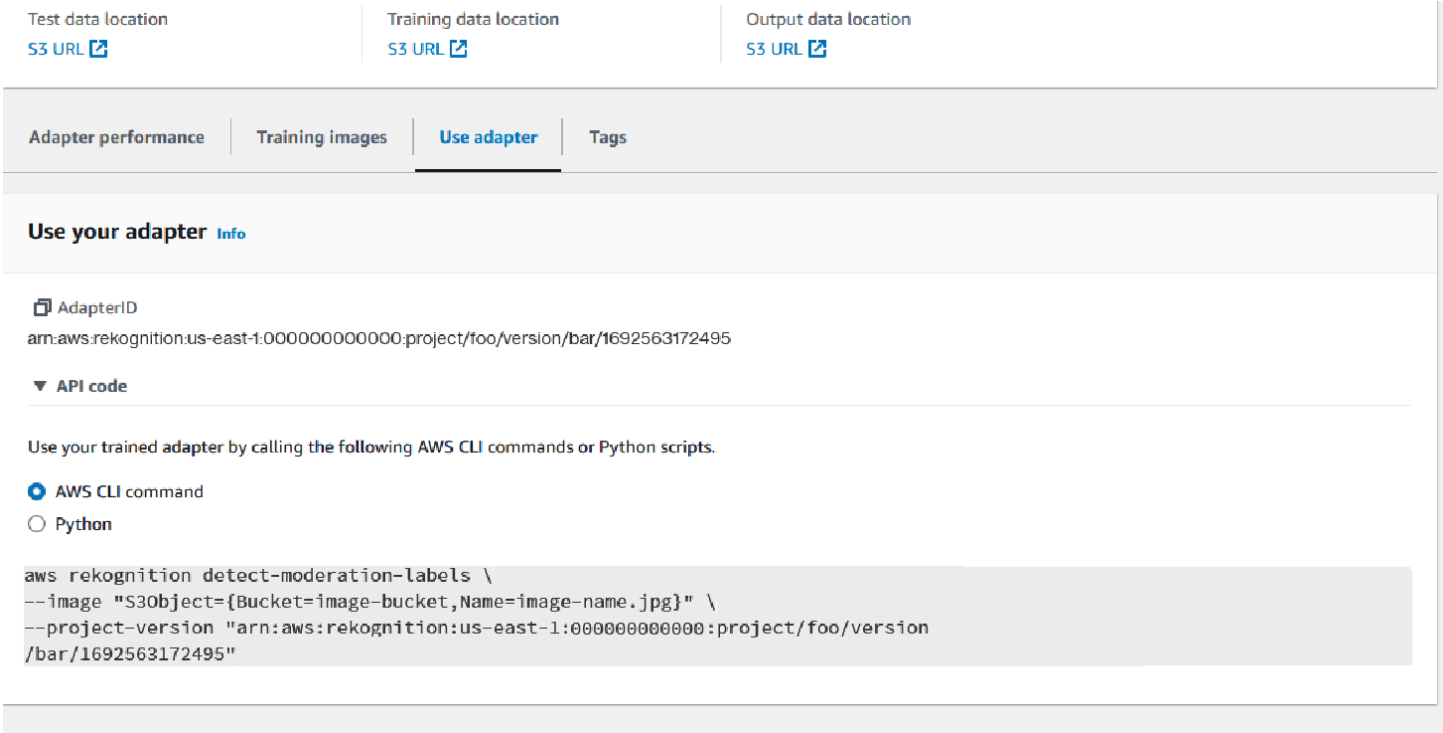
The adapter performance panel shows the False Positive Improvement and False Negative Improvement rates for the adapter that you created. The Per Label Performance tab can be used to compare the adapter and base model performance on each label category. It shows counts of false positive and false negative predictions by both the base model and the adapter, stratified by label category. By reviewing these metrics you can determine where the adapter needs improvement. For more information on these metrics, see Evaluating and improving your adapter.

To improve the performance, you can collect more training images and then create a new adapter based inside of the project. Simply return to the Custom Moderation landing page and create a new adapter inside of your project, providing more training images for the adapter to be trained on. This time choose the **Add to an existing project option** instead of **Create a new project**, and select the project you want to create the new adapter in from the **Project name** dropdown menu. As before, annotate your images or provide a manifest file with annotations.



Using your adapter

After you have created your adapter you can supply it to a supported Rekognition operation like DetectModerationLabels. To see code samples you can use to carry out inference with your adapter, select the “Use adapter” tab, where you can see code samples for both the AWS CLI and Python. You can also visit the respective section of the documentation for the operation you have created an adapter for to see more code samples, setup instructions, and a sample JSON.



Deleting your adapter and project

You can delete individual adapters, or delete your project. You must delete each adapter associated with your project before you can delete the project itself.

1. To delete an adapter associated with the project, choose the adapter and then choose **Delete**.
2. To delete a project, choose the project you want to delete and then choose **Delete**.

Evaluating and improving your adapter

After every round of adapter training, you'll want to review the performance metrics in the Rekognition Console tool to determine how close the adapter is to your desired level of performance. You can then further improve your adapter's accuracy for your images by uploading a new batch of training images and training a new adapter inside your project. Once you have created an improved version of the adapter, you can use the console to delete any older versions of the adapter that you no longer need.

You can also retrieve metrics using the DescribeProjectVersions API operation.

Performance metrics

Once you have finished the training process and created your adapter, it's important to evaluate how well the adapter is extracting information from your images.

Two metrics are provided in the Rekognition Console to assist you in analyzing your adapter's performance: false positive improvement and false negative improvement.

You can view these metrics for any adapter by selecting the "Adapter performance" tab in the adapter portion of the console. The adapter performance panel shows the False Positive Improvement and False Negative Improvement rates for the adapter that you created.

False positive improvement measures how much the adapter’s recognition of false-positives has improved over the base model. If the false positive improvement value is 25%, that means that the adapter improved its recognition of false positives by 25% on the test dataset.

False negative improvement measures how much the adapter’s recognition of false-negatives has improved over the base model. If the false negative improvement value is 25%, that means that the adapter improved its recognition of false negatives by 25% on the test dataset.

The Per Label Performance tab can be used to compare the adapter and base model performance on each label category. It shows counts of false positive and false negative predictions by both the base model and the adapter, stratified by label category. By reviewing these metrics you can determine where the adapter needs improvement.

For example, if the Base Model False Negative rate for the Alcohol label category is 15 while the Adapter False Negative Rate is 15 or higher, you know that you should focus on adding more images containing the Alcohol label when creating a new adapter.

When using the Rekognition API operations, the F1-Score metric is returned when calling the DescribeProjectVersions operationn.

Improving your model

Adapter deployment is an iterative process, as you’ll likely need to train an adapter several times to reach your target level of accuracy. After you create and train your adapter, you’ll want to test and evaluate your adapter’s performance on various types of labels.

If your adapter’s accuracy is lacking in any area, add new examples of those images to increase the adapter’s performance for those labels. Try to provide the adapter with additional, varied examples

which reflects the cases where it struggles. Providing your adapter with representative, varied images enables it to handle diverse real-world examples.

After adding new images to your training set, retrain the adapter, then re-evaluate on your test set and labels. Repeat this process until the adapter reaches your desired level of performance. If you provide more representative images and annotations, false positive and false negative scores. will gradually improve over successive training iterations.

Manifest file formats

The following sections show samples of the manifest file formats for input, output, and evaluation files.

Input manifest

A manifest file is a json-line delimited file, with each line containing a JSON that holds information about a single image.

Each entry in the Input Manifest must contain the `source-ref` field with a path to the image in the Amazon S3 bucket and, for Custom Moderation, the `content-moderation-groundtruth` field with ground annotations. All images in one dataset are expected to be in the same bucket. The structure is common to both training and testing manifest files.

The `CreateProjectVersion` operation for Custom Moderation uses the information provided in the Input Manifest to train an adapter.

The following example is one line of a manifest file for a single image that contains single unsafe class:

```
{
   "source-ref": "s3://foo/bar/1.jpg",
   "content-moderation-groundtruth": {
        "ModerationLabels": [
            {
                "Name": "Rude Gesture"
            }
        ]
   }
}
```

The following example is one line of a manifest file for a single, unsafe image that contains multiple unsafe classes, specifically Nudity and Rude Gesture.

```
{
   "source-ref": "s3://foo/bar/1.jpg",
   "content-moderation-groundtruth": {
        "ModerationLabels": [
            {
                "Name": "Rude Gesture"
            },
            {
                "Name": "Nudity"
            }
        ]
   }
}
```

The following example is one line of a manifest file for a single image that does not contain any unsafe classes:

```
{
   "source-ref": "s3://foo/bar/1.jpg",
   "content-moderation-groundtruth": {
        "ModerationLabels": []
   }
}
```

For the complete list of supported labels refer to Moderating content.

Output manifest

On completion of a training job, an output manifest file is returned. The output manifest file is a JSON-line delimited file with each line containing a JSON that holds information for a single image. Amazon S3 Path to the OutputManifest can be obtained from `DescribeProjectVersion` response:

- `TrainingDataResult.Output.Assets[0].GroundTruthManifest.S3Object` for training dataset

- `TestingDataResult.Output.Assets[0].GroundTruthManifest.S3Object` for testing dataset

The following information is returned for each entry in the Output Manifest:

Key Name	Description
`source-ref`	Reference to an image in s3 that was provided in the input maniefst
`content-moderation-groundtruth`	Ground truth annotations that were provided in the input manifest
`detect-moderation-labels`	Adapter predictions, part of the testing dataset only
`detect-moderation-labels-base-model`	Base model predictions, part of the testing dataset only

Adapter and Base model predictions are returned at ConfidenceTrehsold 5.0 in the format that is similar to the DetectModerationLabels response.

The following example shows structure of the Adapter and Base model predictions:

```
{
   "ModerationLabels": [
      {
         "Confidence": number,
         "Name": "string",
         "ParentName": "string"
      }
   ],
   "ModerationModelVersion": "string",
   "ProjectVersion": "string"
}
```

For the complete list of labels returned refer to Moderating content.

Evaluation results manifest

On completion of a training job, an evaluation result manifest file is returned. The evaluation results manifest is a JSON file output by the training job, and it contains information on how well the adapter performed on the test data.

Amazon S3 Path to the evaluation results manifest can be obtained from the `EvaluationResult.Summary.S3Object` field in the DescribeProejctVersion response.

The following example shows the structure of the evaluation results manifest:

```
{
    "AggregatedEvaluationResults": {
       "F1Score": number
    },

    "EvaluationDetails": {
        "EvaluationEndTimestamp": "datetime",
        "Labels": [
            "string"
        ],
        "NumberOfTestingImages": number,
        "NumberOfTrainingImages": number,
        "ProjectVersionArn": "string"
    },

    "ContentModeration": {
        "InputConfidenceThresholdEvalResults": {
            "ConfidenceThreshold": float,
            "AggregatedEvaluationResults": {
                "BaseModel": {
                    "TruePositive": int,
                    "TrueNegative": int,
                    "FalsePositive": int,
                    "FalseNegative": int
                },
                "Adapter": {
                    "TruePositive": int,
                    "TrueNegative": int,
                    "FalsePositive": int,
                    "FalseNegative": int
                }
            },
```

```
            "LabelEvaluationResults": [
                {
                    "Label": "string",
                    "BaseModel": {
                        "TruePositive": int,
                        "TrueNegative": int,
                        "FalsePositive": int,
                        "FalseNegative": int
                    },
                    "Adapter": {
                        "TruePositive": int,
                        "TrueNegative": int,
                        "FalsePositive": int,
                        "FalseNegative": int
                    }
                }
            ]
        }
        "AllConfidenceThresholdsEvalResults": [
            {
                "ConfidenceThreshold": float,
                "AggregatedEvaluationResults": {
                    "BaseModel": {
                        "TruePositive": int,
                        "TrueNegative": int,
                        "FalsePositive": int,
                        "FalseNegative": int
                    },
                    "Adapter": {
                        "TruePositive": int,
                        "TrueNegative": int,
                        "FalsePositive": int,
                        "FalseNegative": int
                    }
                },
                "LabelEvaluationResults": [
                    {
                       "Label": "string",
                        "BaseModel": {
                            "TruePositive": int,
                            "TrueNegative": int,
                            "FalsePositive": int,
                            "FalseNegative": int
                        },
```

```
                        "Adapter": {
                            "TruePositive": int,
                            "TrueNegative": int,
                            "FalsePositive": int,
                            "FalseNegative": int
                        }
                    }
                ]
            }
        ]
    }
}
```

The evaluation manifest file contains:

- Aggregated results as defined by `F1Score`
- Details for the evaluation job including the ProjectVersionArn, number of training images, number of testing images, and the labels the adapter was trained on.
- Aggregated TruePositive, TrueNegative, FalsePositive, and FalseNegative results for both base model and adapter performance.
- Per label TruePositive, TrueNegative, FalsePositive, and FalseNegative results for both base model and adapter performance, calculated at the input confidence threshold.
- Aggregated and per label TruePositive, TrueNegative, FalsePositive, and FalseNegative results for both base model and adapter performance at different confidence thresholds. The confidence threshold ranges from 5 to 100 in steps of 5.

Best practices for training adapters

It's suggested you abide by the dollowing best practices when creating, training, and using your adapters:

1. The sample image data should capture the representative errors that the customers intend to suppress. If the model is making repeated mistakes on visually similar images, make sure to bring many of those images for training.

2. Instead of only bringing in images that the model makes mistakes on a particular Moderation label, also make sure to bring in images that the model are not making mistakes on that Moderation label.
3. Supply a minimum of 50 False Negative samples OR 20 False Positive samples for training and a minimum of 20 samples for testing. However, supply as many annotated images as possible for better adapter performance.
4. Annotating all labels that matters to you for all images - if you decide that you need to annotate the occurrence for a label on an image, make sure to annotate the occurrence for this label on all other images.
5. The sample image data should contain as many variations on the label as possible, focusing on instances that are representative of the images that will analyzed in a production setting.

Setting up AutoUpdate permissions

Rekognition supports the AutoUpdate feature for custom adapters. This means automated retraining is given a best effort attempt when AutoUpdate flag is ENABLED on a project. These automatic updateds requires permission to access your Training/Testing datasets and the AWS KMS key that you train your customer adapter with. You can provide these permissions by following below steps.

Amazon S3 Bucket Permissions

By default, all Amazon S3 buckets and objects are private. Only the resource owner, the AWS account that created the bucket, can access the bucket and any objects that it contains. However, the resource owner can choose to grant access permissions to other resources and users by writing a bucket policy.

If you want to create or modify an Amazon S3 bucket to be used as a source of input datasets and destination of training results in a custom adapter training, you must further modify the bucket policy. To read from or write to an Amazon S3 bucket, Rekognition must have the the following permissions.

Rekognition Required Amazon S3 Policy

Rekognition requires a permission policy with the following attributes:

- The statement SID

- The bucket name
- The service principal name for Rekognition.
- The resources required for Rekognition the bucket and all of its contents
- The required actions that Rekognition needs to take.

The following policy allows Rekognition to access an Amazon S3 bucket during automated retraining.

```
{
    "Statement": [
        {
            "Effect": "Allow",
            "Sid": "AllowRekognitionAutoUpdateActions",
            "Principal": {
                "Service": "rekognition.amazonaws.com"
            },
            "Action": [
                "s3:ListBucket",
                "s3:GetObject",
                "s3:PutObject",
                "s3:HeadObject",
                "s3:HeadBucket"
            ],
            "Resource": [
                "arn:aws:s3:::amzn-s3-demo-bucket",
                "arn:aws:s3:::amzn-s3-demo-bucket/*"
            ]
        }
    ]
}
```

You can follow this guide to add above bucket policy to your S3 bucket.

See more information on bucket policies here.

AWS KMS Key Permissions

Rekognition allows you to provide an optional KmsKeyId while training a custom adapter. When provided, Rekognition uses this key to encrypt training and test images copied into the service for model training. The key is also used to encrypt training results and manifest files written to the output Amazon S3 bucket (OutputConfig).

If you choose to provide a KMS key as input to your custom adapter training (i.e. `Rekognition:CreateProjectVersion`), you must further modify the KMS Key policy to allow the Rekognition Service Principal to use this key for automated retraining in the future.Rekognition must have the the following permissions.

Rekognition Required AWS KMS Key Policy

Amazon Rekognition requires a permission policy with the following attributes:

- The statement SID
- The service principal name for Amazon Rekognition.
- The required actions that Amazon Rekognition needs to take.

The following key policy allows Amazon Rekognition to access an Amazon KMS key during automated retraining:

```
{
  "Version": "2023-10-06",
  "Statement": [
    {
      "Sid": "KeyPermissions",
      "Effect": "Allow",
      "Principal": {
            "Service": "rekognition.amazonaws.com"
        },
      "Action": [
        "kms:DescribeKey",
        "kms:GenerateDataKey",
        "kms:Decrypt"
      ]
      "Resource": "*"
    }
  ]
}
```

You can follow this guide to add above AWS KMS policy to your AWS KMS key.

See more information on AWS KMS policies here.

AWS Health Dashboard notfication for Rekognition

Your AWS Health Dashboard provides support for notifications that come from Rekognition. These notifications provide awareness and remediation guidance on scheduled changes in Rekognition Models that may affect your applications. Only events that are specific to the Rekognition Content Moderation feature are currently available.

The AWS Health Dashboard is part of the AWS Health service. It requires no set up and can be viewed by any user that is authenticated in your account. For more information, see Getting started wtih the AWS Health Dashboard.

If you receive a notification message similar to the following messages, it should be treated as an alarm to take action.

Example notification: A new model version is available for Rekognition Content Moderation.

Rekognition publishes the `AWS_MODERATION_MODEL_VERSION_UPDATE_NOTIFICATION` event to the AWS Health Dashboard to indicate that a new version of the moderation model has been released. This event is important if you are using the DetectModerationLabels API and adapters with this API. New models can impact quality depending on your use case, and will eventually replace previous model versions. It is recommended to validate your model quality and be aware of model update timelines when you get this alert.

If you receive a model version update notification, you should treat it as an alarm to take action. If you don't use adapters, you should evaluate the quality of the updated model on your existing use case. If you use adapters, you should train new adapters with the updated model and evaluate their quality. If you have auto-train set, new adapters will be trained automatically, and then you can evaluate their quality.

```
{
   "version": "0",
    "id": "id-number",
    "detail-type": "AWS Health Event",
    "source": "aws.health",
    "account": "123456789012",
    "time": "2023-10-06T06:27:57Z",
    "region": "region",
    "resources": [],
    "detail": {
```

```
        "eventArn": "arn:aws:health:us-east-1::event/
AWS_MODERATION_MODEL_UPDATE_NOTIFICATION_event-number",
        "service": "Rekognition",
        "eventTypeCode": "AWS_MODERATION_MODEL_VERSION_UPDATE_NOTIFICATION",
        "eventScopeCode": "ACCOUNT_SPECIFIC",
        "communicationId": "communication-id-number",
        "eventTypeCategory": "scheduledChange",
        "startTime": "Fri, 05 Apr 2023 12:00:00 GMT",
        "lastUpdatedTime": "Fri, 05 Apr 2023 12:00:00 GMT",
        "statusCode": "open",
        "eventRegion": "us-east-1",
        "eventDescription": [
            {
                "language": "en_US",
                "latestDescription": "A new model version is available for Rekognition
 Content Moderation."
            }
        ]
    }
}
```

See Monitoring AWS Health events with Amazon EventBridge to detect and react to AWS Health events using EventBridge.

Reviewing inappropriate content with Amazon Augmented AI

Amazon Augmented AI (Amazon A2I) enables you to build the workflows that are required for human review of machine learning predictions.

Amazon Rekognition is directly integrated with Amazon A2I so that you can easily implement human review for the use case of detecting unsafe images. Amazon A2I provides a human review workflow for image moderation. This enables you to easily review predictions from Amazon Rekognition. You can define confidence thresholds for your use case and adjust them over time. With Amazon A2I, you can use a pool of reviewers within your own organization or Amazon Mechanical Turk. You can also use workforce vendors that are prescreened by AWS for quality and adherence to security procedures.

The following steps walk you through how to set up Amazon A2I with Amazon Rekognition. First, you create a flow definition with Amazon A2I that has the conditions that trigger human review. Then, you pass the flow definition's Amazon Resource Name (ARN) to the Amazon Rekognition

`DetectModerationLabel` operation. In the `DetectModerationLabel` response, you can see if human review is required. The results of human review are available in an Amazon S3 bucket that is set by the flow definition.

To view an end-to-end demonstration of how to use Amazon A2I with Amazon Rekognition, see one of the following tutorials in the *Amazon SageMaker AI Developer Guide*.

- Demo: Get Started in the Amazon A2I Console
- Demo: Get Started Using the Amazon A2I API

  To get started using the API, you can also run an example Jupyter notebook. See Use a SageMaker Notebook Instance with Amazon A2I Jupyter Notebook to use the notebook Amazon Augmented AI (Amazon A2I) integration with Amazon Rekognition [Example] in a SageMaker AI notebook instance.

Running DetectModerationLabels with Amazon A2I

> **Note**
>
> Create all of your Amazon A2I resources and Amazon Rekognition resources in the same AWS Region.

1. Complete the prerequisites that are listed in Getting Started with Amazon Augmented AI in the *SageMaker AI Documentation*.

   Additionally, remember to set up your IAM permissions as in the page Permissions and Security in Amazon Augmented AI in the *SageMaker AI Documentation*.
2. Follow the instructions for Creating a Human Review Workflow in the *SageMaker AI Documentation*.

   A human review workflow manages the processing of an image. It holds the conditions that trigger a human review, the work team that the image is sent to, the UI template that the work team uses, and the Amazon S3 bucket that the work team's results are sent to.

   Within your `CreateFlowDefinition` call, you need to set the `HumanLoopRequestSource` to "AWS/Rekognition/DetectModerationLabels/Image/V3". After that, you need to decide how you want to set up your conditions that trigger human review.

With Amazon Rekognition you have two options for `ConditionType`: `ModerationLabelConfidenceCheck`, and `Sampling`.

`ModerationLabelConfidenceCheck` creates a human loop when confidence of a moderation label is within a range. Finally, `Sampling` sends a random percent of the documents processed for human review. Each `ConditionType` uses a different set of `ConditionParameters` to set what results in human review.

`ModerationLabelConfidenceCheck` has the `ConditionParameters` `ModerationLableName` which sets the key that needs to be reviewed by humans. Additionally, it has confidence, which set the percentage range for sending to human review with LessThan, GreaterThan, and Equals. `Sampling` has `RandomSamplingPercentage` which sets a percent of documents that will be sent to human review.

The following code example is a partial call of `CreateFlowDefinition`. It sends an image for human review if it's rated less than 98% on the label "Suggestive", and more than 95% on the label "Female Swimwear or Underwear". This means that if the image isn't considered suggestive but does have a woman in underwear or swimwear, you can double check the image by using human review.

```
def create_flow_definition():
'''
Creates a Flow Definition resource

Returns:
struct: FlowDefinitionArn
'''
humanLoopActivationConditions = json.dumps(
    {
        "Conditions": [
            {
              "And": [
                {
                    "ConditionType": "ModerationLabelConfidenceCheck",
                    "ConditionParameters": {
                        "ModerationLabelName": "Suggestive",
                        "ConfidenceLessThan": 98
                    }
                },
```

```
                    {
                        "ConditionType": "ModerationLabelConfidenceCheck",
                        "ConditionParameters": {
                            "ModerationLabelName": "Female Swimwear Or Underwear",
                            "ConfidenceGreaterThan": 95
                        }
                    }
                ]
            }
        ]
    }
)
```

`CreateFlowDefinition` returns a `FlowDefinitionArn`, which you use in the next step when you call `DetectModerationLabels`.

For more information see CreateFlowDefinition in the *SageMaker AI API Reference*.

3. Set the `HumanLoopConfig` parameter when you call `DetectModerationLabels`, as in Detecting inappropriate images. See step 4 for examples of a `DetectModerationLabels` call with `HumanLoopConfig` set.

   a. Within the `HumanLoopConfig` parameter, set the `FlowDefinitionArn` to the ARN of the flow definition that you created in step 2.

   b. Set your `HumanLoopName`. This should be unique within a Region and must be lowercase.

   c. (Optional) You can use `DataAttributes` to set whether or not the image you passed to Amazon Rekognition is free of personally identifiable information. You must set this parameter in order to send information to Amazon Mechanical Turk.

4. Run `DetectModerationLabels`.

   The following examples show how to use the AWS CLI and AWS SDK for Python (Boto3) to run `DetectModerationLabels` with `HumanLoopConfig` set.

   AWS SDK for Python (Boto3)

   The following request example uses the SDK for Python (Boto3). For more information, see detect_moderation_labels in the *AWS SDK for Python (Boto) API Reference*.

```
import boto3
```

```
rekognition = boto3.client("rekognition", aws-region)

response = rekognition.detect_moderation_labels( \
        Image={'S3Object': {'Bucket': bucket_name, 'Name': image_name}}, \
        HumanLoopConfig={ \
            'HumanLoopName': 'human_loop_name', \
            'FlowDefinitionArn': , "arn:aws:sagemaker:aws-
region:aws_account_number:flow-definition/flow_def_name" \
            'DataAttributes': {'ContentClassifiers':
 ['FreeOfPersonallyIdentifiableInformation','FreeOfAdultContent']}
         })
```

AWS CLI

The following request example uses the AWS CLI. For more information, see detect-moderation-labels in the *AWS CLI Command Reference*.

```
$ aws rekognition detect-moderation-labels \
    --image "S3Object={Bucket='bucket_name',Name='image_name'}" \
    --human-loop-config
 HumanLoopName="human_loop_name",FlowDefinitionArn="arn:aws:sagemaker:aws-
region:aws_account_number:flow-
definition/
flow_def_name",DataAttributes='{ContentClassifiers=["FreeOfPersonallyIdentifiableInforma
 "FreeOfAdultContent"]}'
```

```
$ aws rekognition detect-moderation-labels \
    --image "S3Object={Bucket='bucket_name',Name='image_name'}" \
    --human-loop-config \
        '{"HumanLoopName": "human_loop_name", "FlowDefinitionArn":
 "arn:aws:sagemaker:aws-region:aws_account_number:flow-
definition/flow_def_name", "DataAttributes": {"ContentClassifiers":
 ["FreeOfPersonallyIdentifiableInformation", "FreeOfAdultContent"]}}'
```

When you run `DetectModerationLabels` with `HumanLoopConfig` enabled, Amazon Rekognition calls the SageMaker AI API operation `StartHumanLoop`. This command takes the response from `DetectModerationLabels` and checks it against the flow definition's conditions in the example. If it meets the conditions for review, it returns a `HumanLoopArn`. This means that the members of the work team that you set in your

flow definition now can review the image. Calling the Amazon Augmented AI runtime operation `DescribeHumanLoop` provides information about the outcome of the loop. For more information, see DescribeHumanLoop in the *Amazon Augmented AI API Reference documentation*.

After the image has been reviewed, you can see the results in the bucket that is specified in your flow definition's output path. Amazon A2I will also notify you with Amazon CloudWatch Events when the review is complete. To see what events to look for, see CloudWatch Events in the *SageMaker AI Documentation*.

For more information, see Getting Started with Amazon Augmented AI in the *SageMaker AI Documentation*.

Detecting text

Amazon Rekognition can detect text in images and videos. It can then convert the detected text into machine-readable text. You can use machine-readable text detection in images to implement solutions such as:

- Visual search. For example, retrieving and displaying images that contain the same text.
- Content insights. For example, providing insights into themes that occur in text that's recognized in extracted video frames. Your application can search recognized text for relevant content, such as news, sport scores, athlete numbers, and captions.
- Navigation. For example, developing a speech-enabled mobile app for visually impaired people that recognizes the names of restaurants, shops, or street signs.
- Public safety and transportation support. For example, detecting car license plate numbers from traffic camera images.
- Filtering. For example, filtering personally identifiable information (PII) from images.

For text detection in videos, you can implement solutions such as:

- Searching videos for clips with specific text keywords, such as a guest's name on a graphic in a news show.
- Moderating content for compliance with organizational standards by detecting accidental text, profanity, or spam.
- Finding all text overlays on the video timeline for further processing, such as replacing text with text in another language for content internationalization.
- Finding text locations, so that other graphics can be aligned accordingly.

To detect text in images in JPEG or PNG format, use the DetectText operation. To asynchronously detect text in video, use the StartTextDetection and GetTextDetection operations. Both image and video text detection operations support most fonts, including highly stylized ones. After detecting text, Amazon Rekognition creates a representation of detected words and lines of text, shows the relationship between them, and tells you where the text is on an image or video frame.

The `DetectText` and `GetTextDetection` operations detect words and lines. A *word* is one or more script characters that aren't separated by spaces. `DetectText` can detect up to 100 words in an image. `GetTextDetection` can also detect up to 100 words per frame of video.

A word is one or more script characters that are not separated by spaces. Amazon Rekognition is designed to detect words in English, Arabic, Russian, German, French, Italian, Portuguese and Spanish.

A *line* is a string of equally spaced words. A line isn't necessarily a complete sentence (periods don't indicate the end of a line). For example, Amazon Rekognition detects a driver's license number as a line. A line ends when there is no aligned text after it or when there's a large gap between words, relative to the length of the words. Depending on the gap between words, Amazon Rekognition might detect multiple lines in text that are aligned in the same direction. If a sentence spans multiple lines, the operation returns multiple lines.

Consider the following image.

The blue boxes represent information about the detected text and the location of the text that's returned by the `DetectText` operation. In this example, Amazon Rekognition detects "IT'S", "MONDAY", "but", "keep", and "Smiling" as words. Amazon Rekognition detects "IT'S", "MONDAY", "but keep", and "Smiling" as lines. To be detected, text must be within +/- 90 degrees orientation of the horizontal axis.

For an example, see Detecting text in an image.

Topics

- Detecting text in an image
- Detecting text in a stored video

Detecting text in an image

You can provide an input image as an image byte array (base64-encoded image bytes), or as an Amazon S3 object. In this procedure, you upload a JPEG or PNG image to your S3 bucket and specify the file name.

To detect text in an image (API)

1. If you haven't already, complete the following prerequisites.

   a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

   b. Install and configure the AWS Command Line Interface and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Upload the image that contains text to your S3 bucket.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following examples to call the `DetectText` operation.

   Java

   The following example code displays lines and words that were detected in an image.

   Replace the values of `amzn-s3-demo-bucket` and `photo` with the names of the S3 bucket and image that you used in step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package aws.example.rekognition.image;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
```

```
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
import com.amazonaws.services.rekognition.model.Image;
import com.amazonaws.services.rekognition.model.S3Object;
import com.amazonaws.services.rekognition.model.DetectTextRequest;
import com.amazonaws.services.rekognition.model.DetectTextResult;
import com.amazonaws.services.rekognition.model.TextDetection;
import java.util.List;



public class DetectText {

   public static void main(String[] args) throws Exception {


      String photo = "inputtext.jpg";
      String bucket = "bucket";

      AmazonRekognition rekognitionClient =
 AmazonRekognitionClientBuilder.defaultClient();



      DetectTextRequest request = new DetectTextRequest()
              .withImage(new Image()
              .withS3Object(new S3Object()
              .withName(photo)
              .withBucket(bucket)));


      try {
         DetectTextResult result = rekognitionClient.detectText(request);
         List<TextDetection> textDetections = result.getTextDetections();

         System.out.println("Detected lines and words for " + photo);
         for (TextDetection text: textDetections) {

                 System.out.println("Detected: " + text.getDetectedText());
                 System.out.println("Confidence: " +
 text.getConfidence().toString());
                 System.out.println("Id : " + text.getId());
                 System.out.println("Parent Id: " + text.getParentId());
                 System.out.println("Type: " + text.getType());
                 System.out.println();
```

```
         }
      } catch(AmazonRekognitionException e) {
         e.printStackTrace();
      }
   }
}
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
/**
*  To run this code example, ensure that you perform the Prerequisites as stated
 in the Amazon Rekognition Guide:
*  https://docs.aws.amazon.com/rekognition/latest/dg/video-analyzing-with-
sqs.html
*
* Also, ensure that set up your development environment, including your
 credentials.
*
* For information, see this documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/

//snippet-start:[rekognition.java2.detect_text.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.DetectTextRequest;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.DetectTextResponse;
import software.amazon.awssdk.services.rekognition.model.TextDetection;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;
//snippet-end:[rekognition.java2.detect_text.import]
```

```
/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class DetectTextImage {

 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <sourceImage>\n\n" +
         "Where:\n" +
         "   sourceImage - The path to the image that contains text (for
 example, C:\\AWS\\pic1.png). \n\n";

   if (args.length != 1) {
         System.out.println(usage);
         System.exit(1);
     }

     String sourceImage = args[0] ;
     Region region = Region.US_WEST_2;
     RekognitionClient rekClient = RekognitionClient.builder()
         .region(region)
         .credentialsProvider(ProfileCredentialsProvider.create("default"))
         .build();

     detectTextLabels(rekClient, sourceImage );
     rekClient.close();
 }

 // snippet-start:[rekognition.java2.detect_text.main]
 public static void detectTextLabels(RekognitionClient rekClient, String
 sourceImage) {

     try {
         InputStream sourceStream = new FileInputStream(sourceImage);
         SdkBytes sourceBytes = SdkBytes.fromInputStream(sourceStream);
         Image souImage = Image.builder()
```

```
            .bytes(sourceBytes)
            .build();

        DetectTextRequest textRequest = DetectTextRequest.builder()
            .image(souImage)
            .build();

        DetectTextResponse textResponse = rekClient.detectText(textRequest);
        List<TextDetection> textCollection = textResponse.textDetections();
        System.out.println("Detected lines and words");
        for (TextDetection text: textCollection) {
            System.out.println("Detected: " + text.detectedText());
            System.out.println("Confidence: " + text.confidence().toString());
            System.out.println("Id : " + text.id());
            System.out.println("Parent Id: " + text.parentId());
            System.out.println("Type: " + text.type());
            System.out.println();
        }

    } catch (RekognitionException | FileNotFoundException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
}
// snippet-end:[rekognition.java2.detect_text.main]
```

AWS CLI

This AWS CLI command displays the JSON output for the `detect-text` CLI operation.

Replace the values of `amzn-s3-demo-bucket` and `Name` with the names of the S3 bucket and image that you used in step 2.

Replace the value of `profile_name` with the name of your developer profile.

```
aws rekognition detect-text  --image "{"S3Object":{"Bucket":"amzn-s3-demo-
bucket","Name":"image-name"}}" --profile default
```

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see the following:

```
aws rekognition detect-text  --image "{\"S3Object\":{\"Bucket\":\"amzn-s3-demo-
bucket\",\"Name\":\"image-name\"}}" --profile default
```

Python

The following example code displays lines and words detected in an image.

Replace the values of `amzn-s3-demo-bucket` and `photo` with the names of the S3 bucket and image that you used in step 2. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
# Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

import boto3

def detect_text(photo, bucket):

    session = boto3.Session(profile_name='default')
    client = session.client('rekognition')

    response = client.detect_text(Image={'S3Object': {'Bucket': bucket, 'Name':
 photo}})

    textDetections = response['TextDetections']
    print('Detected text\n----------')
    for text in textDetections:
        print('Detected text:' + text['DetectedText'])
        print('Confidence: ' + "{:.2f}".format(text['Confidence']) + "%")
        print('Id: {}'.format(text['Id']))
        if 'ParentId' in text:
            print('Parent Id: {}'.format(text['ParentId']))
        print('Type:' + text['Type'])
        print()
    return len(textDetections)

def main():
    bucket = 'amzn-s3-demo-bucket'
    photo = 'photo-name'
    text_count = detect_text(photo, bucket)
    print("Text detected: " + str(text_count))
```

```
if __name__ == "__main__":
    main()
```

.NET

The following example code displays lines and words detected in an image.

Replace the values of amzn-s3-demo-bucket and photo with the names of the S3 bucket and image that you used in step 2.

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

using System;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

public class DetectText
{
    public static void Example()
    {
        String photo = "input.jpg";
        String bucket = "amzn-s3-demo-bucket";

        AmazonRekognitionClient rekognitionClient = new
 AmazonRekognitionClient();

        DetectTextRequest detectTextRequest = new DetectTextRequest()
        {
            Image = new Image()
            {
                S3Object = new S3Object()
                {
                    Name = photo,
                    Bucket = bucket
                }
            }
        };

        try
        {
```

```
            DetectTextResponse detectTextResponse =
 rekognitionClient.DetectText(detectTextRequest);
            Console.WriteLine("Detected lines and words for " + photo);
            foreach (TextDetection text in detectTextResponse.TextDetections)
            {
                Console.WriteLine("Detected: " + text.DetectedText);
                Console.WriteLine("Confidence: " + text.Confidence);
                Console.WriteLine("Id : " + text.Id);
                Console.WriteLine("Parent Id: " + text.ParentId);
                Console.WriteLine("Type: " + text.Type);
            }
        }
        catch (Exception e)
        {
            Console.WriteLine(e.Message);
        }
    }
}
```

Node.JS

The following example code displays lines and words detected in an image.

Replace the values of `amzn-s3-demo-bucket` and `photo` with the names of the S3 bucket and image that you used in step 2. Replace the value of `region` with the region found in your .aws credentials. Replace the value of `profile_name` in the line that creates the Rekognition session with the name of your developer profile.

```
var AWS = require('aws-sdk');

const bucket = 'bucket' // the bucketname without s3://
const photo  = 'photo' // the name of file

const config = new AWS.Config({
  accessKeyId: process.env.AWS_ACCESS_KEY_ID,
  secretAccessKey: process.env.AWS_SECRET_ACCESS_KEY,
})
AWS.config.update({region:'region'});
const client = new AWS.Rekognition();
const params = {
  Image: {
    S3Object: {
      Bucket: bucket,
```

```
      Name: photo
    },
  },
}
client.detectText(params, function(err, response) {
  if (err) {
    console.log(err, err.stack); // handle error if an error occurred
  } else {
    console.log(`Detected Text for: ${photo}`)
    console.log(response)
    response.TextDetections.forEach(label => {
      console.log(`Detected Text: ${label.DetectedText}`),
      console.log(`Type: ${label.Type}`),
      console.log(`ID: ${label.Id}`),
      console.log(`Parent ID: ${label.ParentId}`),
      console.log(`Confidence: ${label.Confidence}`),
      console.log(`Polygon: `)
      console.log(label.Geometry.Polygon)
    }
    )
  }
});
```

DetectText operation request

In the `DetectText` operation, you supply an input image either as a base64-encoded byte array or as an image stored in an Amazon S3 bucket. The following example JSON request shows the image loaded from an Amazon S3 bucket.

```
{
    "Image": {
        "S3Object": {
            "Bucket": "amzn-s3-demo-bucket",
            "Name": "inputtext.jpg"
        }
    }
}
```

Filters

Filtering by text region, size and confidence score provides you with additional flexibility to control your text detection output. By using regions of interest, you can easily limit text detection to the regions that are relevant to you, for example, the top right of profile photo or a fixed location in relation to a reference point when reading parts numbers from an image of a machine. Word bounding box size filter can be used to avoid small background text which may be noisy or irrelevant. Word confidence filter enables you to remove results that may be unreliable due to being blurry or smudged.

For information regarding filter values, see `DetectTextFilters`.

You can use the following filters:

- **MinConfidence** –Sets the confidence level of word detection. Words with detection confidence below this level are excluded from the result. Values should be between 0 and 100.
- **MinBoundingBoxWidth** – Sets the minimum width of the word bounding box. Words with bounding boxes that are smaller than this value are excluded from the result. The value is relative to the image frame width.
- **MinBoundingBoxHeight** – Sets the minimum height of the word bounding box. Words with bounding box heights less than this value are excluded from the result. The value is relative to the image frame height.
- **RegionsOfInterest** – Limits detection to a specific region of the image frame. The values are relative to the frame's dimensions. For text only partially within a region, the response is undefined.

DetectText operation response

The `DetectText` operation analyzes the image and returns an array, TextDetections, where each element (`TextDetection`) represents a line or word detected in the image. For each element, `DetectText` returns the following information:

- The detected text (`DetectedText`)
- The relationships between words and lines (`Id` and `ParentId`)
- The location of text on the image (`Geometry`)
- The confidence Amazon Rekognition has in the accuracy of the detected text and bounding box (`Confidence`)

- The type of the detected text (Type)

Detected text

Each TextDetection element contains recognized text (words or lines) in the DetectedText field. A word is one or more script characters not separated by spaces. DetectText can detect up to 100 words in an image. Returned text might include characters that make a word unrecognizable. For example, *C@t* instead of *Cat*. To determine whether a TextDetection element represents a line of text or a word, use the Type field.

Each TextDetection element includes a percentage value that represents the degree of confidence that Amazon Rekognition has in the accuracy of the detected text and of the bounding box that surrounds the text.

Word and line relationships

Each TextDetection element has an identifier field, Id. The Id shows the word's position in a line. If the element is a word, the parent identifier field, ParentId, identifies the line where the word was detected. The ParentId for a line is null. For example, the line "but keep" in the example image has the following the Id and ParentId values:

Text	ID	Parent ID
but keep	3	
but	8	3
keep	9	3

Text location on an image

To determine where the recognized text is on an image, use the bounding box (Geometry) information that's returned by DetectText. The Geometry object contains two types of bounding box information for detected lines and words:

- An axis-aligned coarse rectangular outline in a BoundingBox object
- A finer-grained polygon that's made up of multiple X and Y coordinates in a Point array

The bounding box and polygon coordinates show where the text is located on the source image. The coordinate values are a ratio of the overall image size. For more information, see BoundingBox.

The following JSON response from the `DetectText` operation shows the words and lines that were detected in the following image.

```
{
 'TextDetections': [{'Confidence': 99.35693359375,
                     'DetectedText': "IT'S",
                     'Geometry': {'BoundingBox': {'Height': 0.09988046437501907,
                                                  'Left': 0.6684935688972473,
                                                  'Top': 0.18226495385169983,
                                                  'Width': 0.1461552083492279},
                                  'Polygon': [{'X': 0.6684935688972473,
                                               'Y': 0.1838926374912262},
                                              {'X': 0.8141663074493408,
                                               'Y': 0.18226495385169983},
                                              {'X': 0.8146487474441528,
                                               'Y': 0.28051772713661194},
                                              {'X': 0.6689760088920593,
                                               'Y': 0.2821454107761383}]},
                     'Id': 0,
```

```
                    'Type': 'LINE'},
                   {'Confidence': 99.6207275390625,
                    'DetectedText': 'MONDAY',
                    'Geometry': {'BoundingBox': {'Height': 0.11442459374666214,
                                                 'Left': 0.5566731691360474,
                                                 'Top': 0.3525116443634033,
                                                 'Width': 0.39574965834617615},
                                 'Polygon': [{'X': 0.5566731691360474,
                                              'Y': 0.353712260723114},
                                             {'X': 0.9522717595100403,
                                              'Y': 0.3525116443634033},
                                             {'X': 0.9524227976799011,
                                              'Y': 0.4657355844974518},
                                             {'X': 0.5568241477012634,
                                              'Y': 0.46693623065948486}]},
                    'Id': 1,
                    'Type': 'LINE'},
                   {'Confidence': 99.6160888671875,
                    'DetectedText': 'but keep',
                    'Geometry': {'BoundingBox': {'Height': 0.08314694464206696,
                                                 'Left': 0.6398131847381592,
                                                 'Top': 0.5267938375473022,
                                                 'Width': 0.2021435648202896},
                                 'Polygon': [{'X': 0.640289306640625,
                                              'Y': 0.5267938375473022},
                                             {'X': 0.8419567942619324,
                                              'Y': 0.5295097827911377},
                                             {'X': 0.8414806723594666,
                                              'Y': 0.609940767288208},
                                             {'X': 0.6398131847381592,
                                              'Y': 0.6072247624397278}]},
                    'Id': 2,
                    'Type': 'LINE'},
                   {'Confidence': 88.95134735107422,
                    'DetectedText': 'Smiling',
                    'Geometry': {'BoundingBox': {'Height': 0.4326171875,
                                                 'Left': 0.46289217472076416,
                                                 'Top': 0.5634765625,
                                                 'Width': 0.5371078252792358},
                                 'Polygon': [{'X': 0.46289217472076416,
                                              'Y': 0.5634765625},
                                             {'X': 1.0, 'Y': 0.5634765625},
                                             {'X': 1.0, 'Y': 0.99609375},
                                             {'X': 0.46289217472076416,
```

```
                                    'Y': 0.99609375}]},
                  'Id': 3,
                  'Type': 'LINE'},
                 {'Confidence': 99.35693359375,
                  'DetectedText': "IT'S",
                  'Geometry': {'BoundingBox': {'Height': 0.09988046437501907,
                                               'Left': 0.6684935688972473,
                                               'Top': 0.18226495385169983,
                                               'Width': 0.1461552083492279},
                               'Polygon': [{'X': 0.6684935688972473,
                                            'Y': 0.1838926374912262},
                                           {'X': 0.8141663074493408,
                                            'Y': 0.18226495385169983},
                                           {'X': 0.8146487474441528,
                                            'Y': 0.28051772713661194},
                                           {'X': 0.6689760088920593,
                                            'Y': 0.2821454107761383}]},
                  'Id': 4,
                  'ParentId': 0,
                  'Type': 'WORD'},
                 {'Confidence': 99.6207275390625,
                  'DetectedText': 'MONDAY',
                  'Geometry': {'BoundingBox': {'Height': 0.11442466825246811,
                                               'Left': 0.5566731691360474,
                                               'Top': 0.35251158475875854,
                                               'Width': 0.39574965834617615},
                               'Polygon': [{'X': 0.5566731691360474,
                                            'Y': 0.3537122905254364},
                                           {'X': 0.9522718787193298,
                                            'Y': 0.35251158475875854},
                                           {'X': 0.9524227976799011,
                                            'Y': 0.4657355546951294},
                                           {'X': 0.5568241477012634,
                                            'Y': 0.46693626046180725}]},
                  'Id': 5,
                  'ParentId': 1,
                  'Type': 'WORD'},
                 {'Confidence': 99.96778869628906,
                  'DetectedText': 'but',
                  'Geometry': {'BoundingBox': {'Height': 0.0625,
                                               'Left': 0.6402802467346191,
                                               'Top': 0.5283203125,
                                               'Width': 0.08027780801057816},
                               'Polygon': [{'X': 0.6402802467346191,
```

```
                                          'Y': 0.5283203125},
                                         {'X': 0.7205580472946167,
                                          'Y': 0.5283203125},
                                         {'X': 0.7205580472946167,
                                          'Y': 0.5908203125},
                                         {'X': 0.6402802467346191,
                                          'Y': 0.5908203125}]},
                     'Id': 6,
                     'ParentId': 2,
                     'Type': 'WORD'},
                    {'Confidence': 99.26438903808594,
                     'DetectedText': 'keep',
                     'Geometry': {'BoundingBox': {'Height': 0.0818721204996109,
                                                  'Left': 0.7344760298728943,
                                                  'Top': 0.5280686020851135,
                                                  'Width': 0.10748066753149033},
                                  'Polygon': [{'X': 0.7349520921707153,
                                               'Y': 0.5280686020851135},
                                              {'X': 0.8419566750526428,
                                               'Y': 0.5295097827911377},
                                              {'X': 0.8414806127548218,
                                               'Y': 0.6099407076835632},
                                              {'X': 0.7344760298728943,
                                               'Y': 0.6084995269775391}]},
                     'Id': 7,
                     'ParentId': 2,
                     'Type': 'WORD'},
                    {'Confidence': 88.95134735107422,
                     'DetectedText': 'Smiling',
                     'Geometry': {'BoundingBox': {'Height': 0.4326171875,
                                                  'Left': 0.46289217472076416,
                                                  'Top': 0.5634765625,
                                                  'Width': 0.5371078252792358},
                                  'Polygon': [{'X': 0.46289217472076416,
                                               'Y': 0.5634765625},
                                              {'X': 1.0, 'Y': 0.5634765625},
                                              {'X': 1.0, 'Y': 0.99609375},
                                              {'X': 0.46289217472076416,
                                               'Y': 0.99609375}]},
                     'Id': 8,
                     'ParentId': 3,
                     'Type': 'WORD'}],
 'TextModelVersion': '3.0'}
```

Detecting text in a stored video

Amazon Rekognition Video text detection in stored videos is an asynchronous operation. To start detecting text, call StartTextDetection. Amazon Rekognition Video publishes the completion status of the video analysis to an Amazon SNS topic. If the video analysis is successful, call GetTextDetection to get the analysis results. For more information about starting video analysis and getting the results, see Calling Amazon Rekognition Video operations.

This procedure expands on the code in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK). It uses an Amazon SQS queue to get the completion status of a video analysis request.

To detect text in a video stored in an Amazon S3 bucket (SDK)

1. Perform the steps in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).
2. Add the following code to the class `VideoDetect` in step 1.

   Java

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)


private static void StartTextDetection(String bucket, String video) throws
 Exception{

    NotificationChannel channel= new NotificationChannel()
            .withSNSTopicArn(snsTopicArn)
            .withRoleArn(roleArn);

    StartTextDetectionRequest req = new StartTextDetectionRequest()
            .withVideo(new Video()
                    .withS3Object(new S3Object()
                        .withBucket(bucket)
                        .withName(video)))
            .withNotificationChannel(channel);
```

```
    StartTextDetectionResult startTextDetectionResult =
 rek.startTextDetection(req);
    startJobId=startTextDetectionResult.getJobId();

}

private static void GetTextDetectionResults() throws Exception{

    int maxResults=10;
    String paginationToken=null;
    GetTextDetectionResult textDetectionResult=null;

    do{
        if (textDetectionResult !=null){
            paginationToken = textDetectionResult.getNextToken();

        }


        textDetectionResult = rek.getTextDetection(new
 GetTextDetectionRequest()
             .withJobId(startJobId)
             .withNextToken(paginationToken)
             .withMaxResults(maxResults));

        VideoMetadata videoMetaData=textDetectionResult.getVideoMetadata();

        System.out.println("Format: " + videoMetaData.getFormat());
        System.out.println("Codec: " + videoMetaData.getCodec());
        System.out.println("Duration: " + videoMetaData.getDurationMillis());
        System.out.println("FrameRate: " + videoMetaData.getFrameRate());


        //Show text, confidence values
        List<TextDetectionResult> textDetections =
 textDetectionResult.getTextDetections();


        for (TextDetectionResult text: textDetections) {
            long seconds=text.getTimestamp()/1000;
            System.out.println("Sec: " + Long.toString(seconds) + " ");
            TextDetection detectedText=text.getTextDetection();
```

```
            System.out.println("Text Detected: " +
 detectedText.getDetectedText());
                System.out.println("Confidence: " +
 detectedText.getConfidence().toString());
                System.out.println("Id : " + detectedText.getId());
                System.out.println("Parent Id: " + detectedText.getParentId());
                System.out.println("Bounding Box" +
 detectedText.getGeometry().getBoundingBox().toString());
                System.out.println("Type: " + detectedText.getType());
                System.out.println();
        }
    } while (textDetectionResult !=null && textDetectionResult.getNextToken() !=
 null);


}
```

In the function `main`, replace the lines:

```
        StartLabelDetection(amzn-s3-demo-bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetLabelDetectionResults();
```

with:

```
        StartTextDetection(amzn-s3-demo-bucket, video);

        if (GetSQSMessageSuccess()==true)
         GetTextDetectionResults();
```

Java V2

This code is taken from the AWS Documentation SDK examples GitHub repository. See the full example here.

```
//snippet-start:[rekognition.java2.recognize_video_text.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.S3Object;
```

```
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartTextDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.StartTextDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.GetTextDetectionResponse;
import
 software.amazon.awssdk.services.rekognition.model.GetTextDetectionRequest;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.TextDetectionResult;
import java.util.List;
//snippet-end:[rekognition.java2.recognize_video_text.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class DetectTextVideo {

 private static String startJobId ="";
 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <bucket> <video> <topicArn> <roleArn>\n\n" +
         "Where:\n" +
         "   bucket - The name of the bucket in which the video is located (for
 example, (for example, amzn-s3-demo-bucket). \n\n"+
         "   video - The name of video (for example, people.mp4). \n\n" +
         "   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic. \n\n" +
         "   roleArn - The ARN of the AWS Identity and Access Management (IAM)
 role to use. \n\n" ;

     if (args.length != 4) {
         System.out.println(usage);
```

```
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
        String topicArn = args[2];
        String roleArn = args[3];

        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
            .region(region)
            .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
            .build();

        NotificationChannel channel = NotificationChannel.builder()
            .snsTopicArn(topicArn)
            .roleArn(roleArn)
            .build();

        startTextLabels(rekClient, channel, bucket, video);
        GetTextResults(rekClient);
        System.out.println("This example is done!");
        rekClient.close();
    }

    // snippet-start:[rekognition.java2.recognize_video_text.main]
    public static void startTextLabels(RekognitionClient rekClient,
                                       NotificationChannel channel,
                                       String bucket,
                                       String video) {
        try {
            S3Object s3Obj = S3Object.builder()
                .bucket(bucket)
                .name(video)
                .build();

            Video vidOb = Video.builder()
                .s3Object(s3Obj)
                .build();

            StartTextDetectionRequest labelDetectionRequest =
    StartTextDetectionRequest.builder()
                .jobTag("DetectingLabels")
                .notificationChannel(channel)
```

```
            .video(vidOb)
            .build();

        StartTextDetectionResponse labelDetectionResponse =
rekClient.startTextDetection(labelDetectionRequest);
        startJobId = labelDetectionResponse.jobId();

    } catch (RekognitionException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
}

public static void GetTextResults(RekognitionClient rekClient) {

    try {
        String paginationToken=null;
        GetTextDetectionResponse textDetectionResponse=null;
        boolean finished = false;
        String status;
        int yy=0 ;

        do{
            if (textDetectionResponse !=null)
                paginationToken = textDetectionResponse.nextToken();

            GetTextDetectionRequest recognitionRequest =
GetTextDetectionRequest.builder()
                .jobId(startJobId)
                .nextToken(paginationToken)
                .maxResults(10)
                .build();

            // Wait until the job succeeds.
            while (!finished) {
                textDetectionResponse =
rekClient.getTextDetection(recognitionRequest);
                status = textDetectionResponse.jobStatusAsString();

                if (status.compareTo("SUCCEEDED") == 0)
                    finished = true;
                else {
                    System.out.println(yy + " status is: " + status);
                    Thread.sleep(1000);
```

```
                }
                yy++;
            }

            finished = false;

            // Proceed when the job is done - otherwise VideoMetadata is null.
            VideoMetadata videoMetaData=textDetectionResponse.videoMetadata();
            System.out.println("Format: " + videoMetaData.format());
            System.out.println("Codec: " + videoMetaData.codec());
            System.out.println("Duration: " + videoMetaData.durationMillis());
            System.out.println("FrameRate: " + videoMetaData.frameRate());
            System.out.println("Job");

            List<TextDetectionResult> labels=
 textDetectionResponse.textDetections();
            for (TextDetectionResult detectedText: labels) {
                System.out.println("Confidence: " +
 detectedText.textDetection().confidence().toString());
                System.out.println("Id : " +
 detectedText.textDetection().id());
                System.out.println("Parent Id: " +
 detectedText.textDetection().parentId());
                System.out.println("Type: " +
 detectedText.textDetection().type());
                System.out.println("Text: " +
 detectedText.textDetection().detectedText());
                System.out.println();
            }

        } while (textDetectionResponse !=null &&
 textDetectionResponse.nextToken() != null);

    } catch(RekognitionException | InterruptedException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
 }
 // snippet-end:[rekognition.java2.recognize_video_text.main]
}
```

Python

```
#Copyright 2019 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    def StartTextDetection(self):
        response=self.rek.start_text_detection(Video={'S3Object': {'Bucket':
 self.bucket, 'Name': self.video}},
            NotificationChannel={'RoleArn': self.roleArn, 'SNSTopicArn':
 self.snsTopicArn})

        self.startJobId=response['JobId']
        print('Start Job Id: ' + self.startJobId)

    def GetTextDetectionResults(self):
        maxResults = 10
        paginationToken = ''
        finished = False

        while finished == False:
            response = self.rek.get_text_detection(JobId=self.startJobId,
                                        MaxResults=maxResults,
                                        NextToken=paginationToken)

            print('Codec: ' + response['VideoMetadata']['Codec'])

            print('Duration: ' + str(response['VideoMetadata']
['DurationMillis']))
            print('Format: ' + response['VideoMetadata']['Format'])
            print('Frame rate: ' + str(response['VideoMetadata']['FrameRate']))
            print()

            for textDetection in response['TextDetections']:
                text=textDetection['TextDetection']

                print("Timestamp: " + str(textDetection['Timestamp']))
                print("   Text Detected: " + text['DetectedText'])
                print("   Confidence: " +  str(text['Confidence']))
                print ("      Bounding box")
                print ("        Top: " + str(text['Geometry']['BoundingBox']
['Top']))
```

```
                print ("        Left: " + str(text['Geometry']['BoundingBox']
['Left']))
                print ("        Width: " +  str(text['Geometry']['BoundingBox']
['Width']))
                print ("        Height: " +  str(text['Geometry']['BoundingBox']
['Height']))
                print ("   Type: " + str(text['Type']) )
                print()

            if 'NextToken' in response:
                paginationToken = response['NextToken']
            else:
                finished = True
```

In the function `main`, replace the lines:

```
    analyzer.StartLabelDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetLabelDetectionResults()
```

with:

```
    analyzer.StartTextDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetTextDetectionResults()
```

CLI

Run the following AWS CLI command to start detecting text in a video.

```
 aws rekognition start-text-detection --video "{"S3Object":{"Bucket":"amzn-s3-
demo-bucket","Name":"video-name"}}"\
 --notification-channel "{"SNSTopicArn":"topic-arn","RoleArn":"role-arn"}" \
 --region region-name --profile profile-name
```

Update the following values:

- Change `amzn-s3-demo-bucket` and `video-name` to the Amazon S3 bucket name and file name that you specified in step 2.
- Change `region-name` to the AWS region that you're using.

- Replace the value of `profile-name` with the name of your developer profile.
- Change `topic-ARN` to the ARN of the Amazon SNS topic you created in step 3 of Configuring Amazon Rekognition Video.
- Change `role-ARN` to the ARN of the IAM service role you created in step 7 of Configuring Amazon Rekognition Video.

If you are accessing the CLI on a Windows device, use double quotes instead of single quotes and escape the inner double quotes by backslash (i.e. \) to address any parser errors you may encounter. For an example, see below:

```
aws rekognition start-text-detection --video \
 "{\"S3Object\":{\"Bucket\":\"amzn-s3-demo-bucket\",\"Name\":\"video-name\"}}" \
 --notification-channel "{\"SNSTopicArn\":\"topic-arn\",\"RoleArn\":\"role-arn
\"}" \
 --region region-name --profile profile-name
```

After running the proceeding code example, copy down the returned `jobID` and provide it to the following `GetTextDetection` command below to get your results, replacing `job-id-number` with the `jobID` you previously received:

```
aws rekognition get-text-detection --job-id job-id-number --profile profile-name
```

> **Note**
>
> If you've already run a video example other than Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), the code to replace might be different.

3. Run the code. Text that was detected in the video is shown in a list.

Filters

Filters are optional request parameters that can be used when you call `StartTextDetection`. Filtering by text region, size and confidence score provides you with additional flexibility to control your text detection output. By using regions of interest, you an easily limit text detection to the regions that are relevant, for example, a bottom third region for graphics or a top left corner for

reading scoreboards in a soccer game. Word bounding box size filter can be used to avoid small background text which may be noisy or irrelevant. And lastly, word confidence filter enables you to remove results that may be unreliable due to being blurry or smudged.

For information regarding filter values, see `DetectTextFilters`.

You can use the following filters:

- **MinConfidence** –Sets the confidence level of word detection. Words with detection confidence below this level are excluded from the result. Values should be between 0 and 100.
- **MinBoundingBoxWidth** – Sets the minimum width of the word bounding box. Words with bounding boxes that are smaller than this value are excluded from the result. The value is relative to the video frame width.
- **MinBoundingBoxHeight** – Sets the minimum height of the word bounding box. Words with bounding box heights less than this value are excluded from the result. The value is relative to the video frame height.
- **RegionsOfInterest** – Limits detection to a specific region of the frame. The values are relative to the frame dimensions. For objects only partially within the regions, the response is undefined.

GetTextDetection response

`GetTextDetection` returns an array (`TextDetectionResults`) that contains information about the text detected in the video. An array element, TextDetection, exists for each time a word or line is detected in the video. The array elements are sorted by time (in milliseconds) since the start of the video.

The following is a partial JSON response from `GetTextDetection`. In the response, note the following:

- **Text information** – The `TextDetectionResult` array element contains information about the detected text (TextDetection) and the time that the text was detected in the video (`Timestamp`).
- **Paging information** – The example shows one page of text detection information. You can specify how many text elements to return in the `MaxResults` input parameter for `GetTextDetection`. If more results than `MaxResults` exist, or there are more results than the default maximum, `GetTextDetection` returns a token (`NextToken`) that's used to get the next page of results. For more information, see Getting Amazon Rekognition Video analysis results.

- **Video information** – The response includes information about the video format (`VideoMetadata`) in each page of information that's returned by `GetTextDetection`.


```
{
    "JobStatus": "SUCCEEDED",
    "VideoMetadata": {
        "Codec": "h264",
        "DurationMillis": 174441,
        "Format": "QuickTime / MOV",
        "FrameRate": 29.970029830932617,
        "FrameHeight": 480,
        "FrameWidth": 854
    },
    "TextDetections": [
        {
            "Timestamp": 967,
            "TextDetection": {
                "DetectedText": "Twinkle Twinkle Little Star",
                "Type": "LINE",
                "Id": 0,
                "Confidence": 99.91780090332031,
                "Geometry": {
                    "BoundingBox": {
                        "Width": 0.8337579369544983,
                        "Height": 0.08365312218666077,
                        "Left": 0.08313830941915512,
                        "Top": 0.4663468301296234
                    },
                    "Polygon": [
                        {
                            "X": 0.08313830941915512,
                            "Y": 0.4663468301296234
                        },
                        {
                            "X": 0.9168962240219116,
                            "Y": 0.4674469828605652
                        },
                        {
                            "X": 0.916861355304718,
                            "Y": 0.5511001348495483
                        },
```

```
                    {
                        "X": 0.08310343325138092,
                        "Y": 0.5499999523162842
                    }
                ]
            }
        }
    },
    {
        "Timestamp": 967,
        "TextDetection": {
            "DetectedText": "Twinkle",
            "Type": "WORD",
            "Id": 1,
            "ParentId": 0,
            "Confidence": 99.98338317871094,
            "Geometry": {
                "BoundingBox": {
                    "Width": 0.2423887550830841,
                    "Height": 0.0833333358168602,
                    "Left": 0.08313817530870438,
                    "Top": 0.46666666865348816
                },
                "Polygon": [
                    {
                        "X": 0.08313817530870438,
                        "Y": 0.46666666865348816
                    },
                    {
                        "X": 0.3255269229412079,
                        "Y": 0.46666666865348816
                    },
                    {
                        "X": 0.3255269229412079,
                        "Y": 0.550000011920929
                    },
                    {
                        "X": 0.08313817530870438,
                        "Y": 0.550000011920929
                    }
                ]
            }
        }
    },
```

```
        {
            "Timestamp": 967,
            "TextDetection": {
                "DetectedText": "Twinkle",
                "Type": "WORD",
                "Id": 2,
                "ParentId": 0,
                "Confidence": 99.982666015625,
                "Geometry": {
                    "BoundingBox": {
                        "Width": 0.2423887550830841,
                        "Height": 0.08124999701976776,
                        "Left": 0.3454332649707794,
                        "Top": 0.46875
                    },
                    "Polygon": [
                        {
                            "X": 0.3454332649707794,
                            "Y": 0.46875
                        },
                        {
                            "X": 0.5878220200538635,
                            "Y": 0.46875
                        },
                        {
                            "X": 0.5878220200538635,
                            "Y": 0.550000011920929
                        },
                        {
                            "X": 0.3454332649707794,
                            "Y": 0.550000011920929
                        }
                    ]
                }
            }
        },
        {
            "Timestamp": 967,
            "TextDetection": {
                "DetectedText": "Little",
                "Type": "WORD",
                "Id": 3,
                "ParentId": 0,
                "Confidence": 99.8787612915039,
```

```
                "Geometry": {
                    "BoundingBox": {
                        "Width": 0.16627635061740875,
                        "Height": 0.08124999701976776,
                        "Left": 0.6053864359855652,
                        "Top": 0.46875
                    },
                    "Polygon": [
                        {
                            "X": 0.6053864359855652,
                            "Y": 0.46875
                        },
                        {
                            "X": 0.7716627717018127,
                            "Y": 0.46875
                        },
                        {
                            "X": 0.7716627717018127,
                            "Y": 0.550000011920929
                        },
                        {
                            "X": 0.6053864359855652,
                            "Y": 0.550000011920929
                        }
                    ]
                }
            }
        },
        {
            "Timestamp": 967,
            "TextDetection": {
                "DetectedText": "Star",
                "Type": "WORD",
                "Id": 4,
                "ParentId": 0,
                "Confidence": 99.82640075683594,
                "Geometry": {
                    "BoundingBox": {
                        "Width": 0.12997658550739288,
                        "Height": 0.08124999701976776,
                        "Left": 0.7868852615356445,
                        "Top": 0.46875
                    },
                    "Polygon": [
```

```
                        {
                            "X": 0.7868852615356445,
                            "Y": 0.46875
                        },
                        {
                            "X": 0.9168618321418762,
                            "Y": 0.46875
                        },
                        {
                            "X": 0.9168618321418762,
                            "Y": 0.550000011920929
                        },
                        {
                            "X": 0.7868852615356445,
                            "Y": 0.550000011920929
                        }
                    ]
                }
            }
        }
    ],
    "NextToken": "NiHpGbZFnkM/S8kLcukMni15wb05iKtquu/Mwc+Qg1LVlMjjKNOD0Z0GusSPg7TONLe
+OZ3P",
    "TextModelVersion": "3.0"
}
```

Detecting video segments in stored video

Amazon Rekognition Video provides an API that identifies useful segments of video, such as black frames and end credits.

Viewers are watching more content than ever. In particular, Over-The-Top (OTT) and Video-On-Demand (VOD) platforms provide a rich selection of content choices anytime, anywhere, and on any screen. With proliferating content volumes, media companies are facing challenges in preparing and managing their content. This is crucial to providing a high-quality viewing experience and better monetizing content. Today, companies use large teams of trained human workforces to perform tasks such as the following.

- Finding where the opening and end credits are in a piece of content
- Choosing the right spots to insert advertisements, such as in silent black frame sequences
- Breaking up videos into smaller clips for better indexing

These manual processes are expensive, slow, and can't scale to keep up with the volume of content that is produced, licensed, and retrieved from archives daily.

You can use Amazon Rekognition Video to automate operational media analysis tasks using fully managed, purpose-built video segment detection APIs powered by machine learning (ML). By using the Amazon Rekognition Video segment APIs, you can easily analyze large volumes of videos and detect markers such as black frames or shot changes. You get SMPTE (Society of Motion Picture and Television Engineers) timecodes, timestamps, and frame numbers from each detection. No ML experience is required.

Amazon Rekognition Video analyzes videos stored in an Amazon Simple Storage Service (Amazon S3) bucket. The SMPTE timecodes that are returned are frame accurate – Amazon Rekognition Video provides the exact frame number of a detected segment of video, and handles various video frame rate formats automatically. You can use the frame accurate metadata from Amazon Rekognition Video to automate certain tasks completely, or to significantly reduce the review workload of trained human operators, so that they can focus on more creative work. You can perform tasks such as preparing content, inserting advertisements, and adding "binge-markers" to content at scale in the cloud.

For information about pricing, see Amazon Rekognition pricing.

Amazon Rekognition Video segment detection supports two types of segmentation tasks — Technical cues detection and Shot detection.

Topics

- Technical cues
- Shot detection
- About the Amazon Rekognition Video Segment detection API
- Using the Amazon Rekognition Segment API
- Example: Detecting segments in a stored video

Technical cues

A *technical cue* identifies black frames, color bars, opening credits, end credits, studio logos, and primary program content in a video.

Black frames

Videos often contain empty black frames with no audio that are used as cues to insert advertisements, or to mark the end of a program segment, such as a scene or opening credits. With Amazon Rekognition Video, you can detect black frame sequences to automate ad insertion, package content for VOD, and demarcate various program segments or scenes. Black frames with audio (such as fade outs or voiceovers) are considered as content and not returned.

Credits

Amazon Rekognition Video can automatically identify the exact frames where the opening and closing credits start and end for a movie or TV show. With this information, you can generate "binge markers" or interactive viewer prompts, such as "Next Episode’"or "Skip Intro," in video on demand (VOD) applications. You can also detect the first and last frame of program content in a video. Amazon Rekognition Video is trained to handle a wide variety of opening and end credit styles ranging from simple rolling credits to more challenging credits alongside content.

Color bars

Amazon Rekognition Video allows you to detect sections of video that display SMPTE color bars, which are a set of colors displayed in specific patterns to ensure color is calibrated correctly on

broadcast monitors, programs, and on cameras. For more information about SMPTE color bars, see SMPTE color bar. This metadata is useful to prepare content for VOD applications by removing color bar segments from the content, or to detect issues such as loss of broadcast signals in a recording, when color bars are shown continuously as a default signal instead of content.

Slates

Slates are sections of the video, typically near the beginning, that contain text metadata about the episode, studio, video format, audio channels, and more. Amazon Rekognition Video can identify the start and end of slates, making it easy to use the text metadata or remove the slate when preparing content for final viewing.

Studio logos

Studio logos are sequences that show the logos or emblems of the production studio involved in making the show. Amazon Rekognition Video can detect these sequences so that users can review them to identify studios.

Content

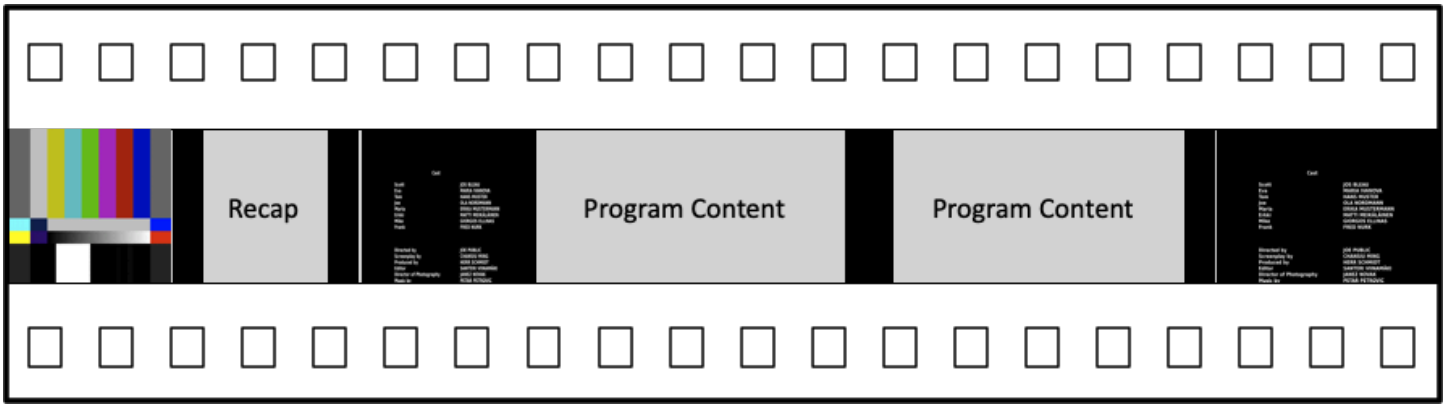
Content is the portions of the TV show or movie that contain the program or related elements. Black frames, credits, color bars, slates, and studio logos are not considered content. Amazon Rekognition Video can detect the start and end of each content segment in the video, so you can find the program run time or specific segments.

Content segments include, but are not limited to, the following:

- Program scenes between two ad breaks
- A quick recap of the previous episode at the beginning of the video
- Bonus post-credit content
- "Textless" content, such as a set of all program scenes that originally contained overlaid text, but where the text has been removed to support translation into other languages.

After Amazon Rekognition Video finishes detecting all of the content segments, you can apply domain knowledge or send them for human review to further categorize each segment. For example, if you use videos that always start with a recap, you could categorize the first content segment as a recap.

The following diagram shows technical cue segments on a show or movie's timeline. Note the color bars and opening credits, content segments such as the recap and main program, black frames throughout the video, and the end credits.



Shot detection

A shot is a series of interrelated consecutive pictures taken contiguously by a single camera and representing a continuous action in time and space. With Amazon Rekognition Video, you can detect the start, end, and duration of each shot, as well as a count for all the shots in a piece of content. You can use shot metadata for tasks such as the following.

- Creating promotional videos using selected shots.
- Inserting advertisements in locations that don't disrupt the viewer's experience, such as the middle of a shot when someone is speaking.
- Generating a set of preview thumbnails that avoid transitional content between shots.

A shot detection is marked at the exact frame where there is a hard cut to a different camera. If there is a soft transition from one camera to another, Amazon Rekognition Video omits the transition. This ensures that shot start and end times don't include sections without actual content.

The following diagram illustrates shot detection segments on a strip of film. Note that each shot is identified by a cut from one camera angle or location to the next.

About the Amazon Rekognition Video Segment detection API

To segment a stored video you use the asynchronous StartSegmentDetection and GetSegmentDetection API operations to start a segmentation job and fetch the results. Segment detection accepts videos stored in an Amazon S3 bucket and returns a JSON output. You can choose to detect only technical cues, only shot changes, or both together by configuring the `StartSegmentdetection` API request. You can also filter detected segments by setting thresholds for a minimum prediction confidence. For more information, see Using the Amazon Rekognition Segment API . For example code, see Example: Detecting segments in a stored video.

Using the Amazon Rekognition Segment API

Amazon Rekognition Video segment detection in stored videos is an Amazon Rekognition Video asynchronous operation. The Amazon Rekognition Segment API is a composite API where you choose the type of analysis (technical cues or shot detection) from a single API call. For information about calling asynchronous operations, see Calling Amazon Rekognition Video operations.

Topics

- Starting segment analysis
- Getting segment analysis results

Starting segment analysis

To start the detection of segments in a stored video call StartSegmentDetection. The input parameters are the same as other Amazon Rekognition Video operations with the addition of segment type selection and result filtering. For more information, see Starting video analysis.

The following is example JSON passed by `StartSegmentDetection`. The request specifies that both technical cue and shot detection segments are detected. Different filters for the minimum detection confidence are requested for technical cue segments (90%) and shot detection segments (80%).

```
{
  "Video": {
    "S3Object": {
      "Bucket": "test_files",
      "Name": "test_file.mp4"
    }
    "SegmentTypes":["TECHNICAL_CUES", "SHOT"]
    "Filters": {
      "TechnicalCueFilter": {
         "MinSegmentConfidence": 90,
         "BlackFrame" : {
            "MaxPixelThreshold": 0.1,
            "MinCoveragePercentage": 95
         }
      },
      "ShotFilter" : {
          "MinSegmentConfidence": 60
      }
  }
}
```

Choosing a segment type

Use the `SegmentTypes` array input parameter to detect technical cue and/or shot detection segments in the input video.

- TECHNICAL_CUE — identifies frame-accurate timestamps for the start, end, and duration of technical cues (black frames, color bars, opening credits, end credits, studio logos, and primary program content) detected in a video. For example, you can use technical cues to find the start of the end credits. For more information, see Technical cues.
- SHOT — Identifies the start, end, and duration of a shot. For example, you can use shot detection to identify candidate shots for a final edit of a video. For more information, see Shot detection.

Filtering the analysis results

You can use the `Filters` (StartSegmentDetectionFilters) input parameter to specify the minimum detection confidence returned in the response. Within `Filters`, use `ShotFilter` (StartShotDetectionFilter) to filter detected shots. Use `TechnicalCueFilter` (StartTechnicalCueDetectionFilter) to filter technical cues.

For example code, see Example: Detecting segments in a stored video.

Getting segment analysis results

Amazon Rekognition Video publishes the completion status of the video analysis to an Amazon Simple Notification Service topic. If the video analysis is successful, call GetSegmentDetection to get results of the video analysis.

The following is an example `GetSegmentDetection` request. The `JobId` is the job identifier returned from the call to `StartSegmentDetection`. For information about the other input parameters, see Getting Amazon Rekognition Video analysis results.

```
{
    "JobId": "270c1cc5e1d0ea2fbc59d97cb69a72a5495da75851976b14a1784ca90fc180e3",
    "MaxResults": 10,
    "NextToken": "XfXnZKiyMOGDhzBzYUhS5puM+g1IgezqFeYpv/H/+5noP/LmM57FitUAwSQ5D6G4AB/
PNwolrw=="
}
```

`GetSegmentDetection` returns results for the requested analysis and general information about the stored video.

General information

`GetSegmentDection` returns the following general information.

- **Audio information** — The response includes audio metadata in an array, `AudioMetadata`, of AudioMetadata objects. There can be multiple audio streams. Each `AudioMetadata` object contains metadata for a single audio stream. Audio information in an `AudioMetadata` objects includes the audio codec, the number of audio channels, the duration of the audio stream, and the sample rate. Audio metadata is returned in each page of information returned by `GetSegmentDetection`.

- **Video information** – Currently, Amazon Rekognition Video returns a single VideoMetadata object in the `VideoMetadata` array. The object contains information about the video stream in the input file that Amazon Rekognition Video chose to analyze. The `VideoMetadata` object includes the video codec, video format and other information. Video metadata is returned in each page of information returned by `GetSegmentDetection`.
- **Paging information** – The example shows one page of segment information. You can specify how many elements to return in the `MaxResults` input parameter for `GetSegmentDetection`. If more results than `MaxResults` exist, `GetSegmentDetection` returns a token (`NextToken`) used to get the next page of results. For more information, see Getting Amazon Rekognition Video analysis results.
- **Request information** – The type of analysis requested in the call to `StartSegmentDetection` is returned in the `SelectedSegmentTypes` field.

Segments

Technical cues and shot information detected in a video is returned in an array, `Segments`, of SegmentDetection objects. The array is sorted by the segment types (TECHNICAL_CUE or SHOT) specified in the `SegmentTypes` input parameter of `StartSegmentDetection`. Within each segment type the array is sorted by timestamp values. Each `SegmentDetection` object includes information about the type of detected segment (Technical cue or shot detection) and general information, such as the start time, end time, and the duration of the segment.

Time information is returned in three formats.

- **Milliseconds**

  The number of milliseconds since the start of the video. The fields `DurationMillis`, `StartTimestampMillis`, and `EndTimestampMillis` are in millisecond format.
- **Timecode**

  Amazon Rekognition Video timecodes are in SMPTE format where each frame of video has a unique timecode value. The format is *hh:mm:ss:frame*. For example, a timecode value of 01:05:40:07, would be read as one hour, five minutes, forty seconds and seven frames. Drop frame rate use cases are supported by Amazon Rekognition Video. The drop rate timecode format is *hh:mm:ss;frame*. The fields `DurationSMPTE`, `StartTimecodeSMPTE`, and `EndTimecodeSMPTE` are in timecode format.
- **Frame Counters**

The duration of each video segment is also expressed with the number of frames. The field `StartFrameNumber` gives the frame number at the start of a video segment, and `EndFrameNumber` gives the frame number at the end of a video segment. `DurationFrames` gives the total number of frames in a video segment. These values are calculated using a frame index that starts with 0.

You can use the `SegmentType` field to determine the type of a segment returned by Amazon Rekognition Video.

- **Technical Cues** – the `TechnicalCueSegment` field is an TechnicalCueSegment object that contains the detection confidence and the type of a technical cue. The types of technical cue are `ColorBars`, `EndCredits`, `BlackFrames`, `OpeningCredits`, `StudioLogo`, `Slate`, and `Content`.
- **Shot** – the `ShotSegment` field is a ShotSegment object than contains the detection confidence and an identifier for the shot segment within the video.

The following example is the JSON response from `GetSegmentDetection`.

```
{
    "SelectedSegmentTypes": [
        {
            "ModelVersion": "2.0",
            "Type": "SHOT"
        },
        {
            "ModelVersion": "2.0",
            "Type": "TECHNICAL_CUE"
        }
    ],
    "Segments": [
        {
            "DurationFrames": 299,
            "DurationSMPTE": "00:00:09;29",
            "StartFrameNumber": 0,
            "EndFrameNumber": 299,
            "EndTimecodeSMPTE": "00:00:09;29",
            "EndTimestampMillis": 9976,
            "StartTimestampMillis": 0,
            "DurationMillis": 9976,
```

```
            "StartTimecodeSMPTE": "00:00:00;00",
            "Type": "TECHNICAL_CUE",
            "TechnicalCueSegment": {
                "Confidence": 90.45006561279297,
                "Type": "BlackFrames"
            }
        },
        {
            "DurationFrames": 150,
            "DurationSMPTE": "00:00:05;00",
            "StartFrameNumber": 299,
            "EndFrameNumber": 449,
            "EndTimecodeSMPTE": "00:00:14;29",
            "EndTimestampMillis": 14981,
            "StartTimestampMillis": 9976,
            "DurationMillis": 5005,
            "StartTimecodeSMPTE": "00:00:09;29",
            "Type": "TECHNICAL_CUE",
            "TechnicalCueSegment": {
                "Confidence": 100.0,
                "Type": "Content"
            }
        },
        {
            "DurationFrames": 299,
            "ShotSegment": {
                "Index": 0,
                "Confidence": 99.9982681274414
            },
            "DurationSMPTE": "00:00:09;29",
            "StartFrameNumber": 0,
            "EndFrameNumber": 299,
            "EndTimecodeSMPTE": "00:00:09;29",
            "EndTimestampMillis": 9976,
            "StartTimestampMillis": 0,
            "DurationMillis": 9976,
            "StartTimecodeSMPTE": "00:00:00;00",
            "Type": "SHOT"
        },
        {
            "DurationFrames": 149,
            "ShotSegment": {
                "Index": 1,
                "Confidence": 99.9982681274414
```

```
            },
            "DurationSMPTE": "00:00:04;29",
            "StartFrameNumber": 300,
            "EndFrameNumber": 449,
            "EndTimecodeSMPTE": "00:00:14;29",
            "EndTimestampMillis": 14981,
            "StartTimestampMillis": 10010,
            "DurationMillis": 4971,
            "StartTimecodeSMPTE": "00:00:10;00",
            "Type": "SHOT"
        }
    ],
    "JobStatus": "SUCCEEDED",
    "VideoMetadata": [
        {
            "Format": "QuickTime / MOV",
            "FrameRate": 29.970029830932617,
            "Codec": "h264",
            "DurationMillis": 15015,
            "FrameHeight": 1080,
            "FrameWidth": 1920,
            "ColorRange": "LIMITED"

        }
    ],
    "AudioMetadata": [
        {
            "NumberOfChannels": 1,
            "SampleRate": 48000,
            "Codec": "aac",
            "DurationMillis": 15007
        }
    ]
}
```


For example code, see Example: Detecting segments in a stored video.

Example: Detecting segments in a stored video

The following procedure shows how to detect technical cue segments and shot detection segments in a video stored in an Amazon S3 bucket. The procedure also shows how to filter detected

segments based on the confidence that Amazon Rekognition Video has in the accuracy of the detection.

The example expands on the code in Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK) which uses an Amazon Simple Queue Service queue to get the completion status of a video analysis request.

To detect segments in a video stored in an Amazon S3 bucket (SDK)

1. Perform Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK).
2. Add the following to the code that you used in step 1.

   Java

   1. Add the following imports.

```
import com.amazonaws.services.rekognition.model.GetSegmentDetectionRequest;
import com.amazonaws.services.rekognition.model.GetSegmentDetectionResult;
import com.amazonaws.services.rekognition.model.SegmentDetection;
import com.amazonaws.services.rekognition.model.SegmentType;
import com.amazonaws.services.rekognition.model.SegmentTypeInfo;
import com.amazonaws.services.rekognition.model.ShotSegment;
import
 com.amazonaws.services.rekognition.model.StartSegmentDetectionFilters;
import
 com.amazonaws.services.rekognition.model.StartSegmentDetectionRequest;
import com.amazonaws.services.rekognition.model.StartSegmentDetectionResult;
import com.amazonaws.services.rekognition.model.StartShotDetectionFilter;
import
 com.amazonaws.services.rekognition.model.StartTechnicalCueDetectionFilter;
import com.amazonaws.services.rekognition.model.TechnicalCueSegment;
import com.amazonaws.services.rekognition.model.AudioMetadata;
```

   2. Add the following code to the class `VideoDetect`.

```
    //Copyright 2020 Amazon.com, Inc. or its affiliates. All Rights
 Reserved.
    //PDX-License-Identifier: MIT-0 (For details, see https://github.com/
awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
```

```
   private static void StartSegmentDetection(String bucket, String video)
throws Exception{

       NotificationChannel channel= new NotificationChannel()
               .withSNSTopicArn(snsTopicArn)
               .withRoleArn(roleArn);

       float minTechnicalCueConfidence = 80F;
       float minShotConfidence = 80F;

       StartSegmentDetectionRequest req = new
StartSegmentDetectionRequest()
               .withVideo(new Video()
                       .withS3Object(new S3Object()
                               .withBucket(bucket)
                               .withName(video)))
               .withSegmentTypes("TECHNICAL_CUE" , "SHOT")
               .withFilters(new StartSegmentDetectionFilters()
                       .withTechnicalCueFilter(new
StartTechnicalCueDetectionFilter()

.withMinSegmentConfidence(minTechnicalCueConfidence))
                       .withShotFilter(new StartShotDetectionFilter()

.withMinSegmentConfidence(minShotConfidence)))
               .withJobTag("DetectingVideoSegments")
               .withNotificationChannel(channel);

       StartSegmentDetectionResult startLabelDetectionResult =
rek.startSegmentDetection(req);
       startJobId=startLabelDetectionResult.getJobId();

   }

   private static void GetSegmentDetectionResults() throws Exception{

       int maxResults=10;
       String paginationToken=null;
       GetSegmentDetectionResult segmentDetectionResult=null;
       Boolean firstTime=true;


       do {
           if (segmentDetectionResult !=null){
```

```
                paginationToken = segmentDetectionResult.getNextToken();
            }

            GetSegmentDetectionRequest segmentDetectionRequest= new
 GetSegmentDetectionRequest()
                    .withJobId(startJobId)
                    .withMaxResults(maxResults)
                    .withNextToken(paginationToken);

            segmentDetectionResult =
 rek.getSegmentDetection(segmentDetectionRequest);

            if(firstTime) {
                System.out.println("\nStatus\n------");
                System.out.println(segmentDetectionResult.getJobStatus());
                System.out.println("\nRequested features
\n------------------");
                 for (SegmentTypeInfo requestedFeatures :
 segmentDetectionResult.getSelectedSegmentTypes()) {
                    System.out.println(requestedFeatures.getType());
                }
                 int count=1;
                 List<VideoMetadata> videoMetaDataList =
 segmentDetectionResult.getVideoMetadata();
                 System.out.println("\nVideo Streams\n-------------");
                 for (VideoMetadata videoMetaData: videoMetaDataList) {
                     System.out.println("Stream: " + count++);
                     System.out.println("\tFormat: " +
 videoMetaData.getFormat());
                     System.out.println("\tCodec: " +
 videoMetaData.getCodec());
                     System.out.println("\tDuration: " +
 videoMetaData.getDurationMillis());
                     System.out.println("\tFrameRate: " +
 videoMetaData.getFrameRate());
                 }


                 List<AudioMetadata> audioMetaDataList =
 segmentDetectionResult.getAudioMetadata();
                 System.out.println("\nAudio streams\n-------------");

                 count=1;
                 for (AudioMetadata audioMetaData: audioMetaDataList) {
```

```
                    System.out.println("Stream: " + count++);
                    System.out.println("\tSample Rate: " +
audioMetaData.getSampleRate());
                    System.out.println("\tCodec: " +
audioMetaData.getCodec());
                    System.out.println("\tDuration: " +
audioMetaData.getDurationMillis());
                    System.out.println("\tNumber of Channels: " +
audioMetaData.getNumberOfChannels());
                }
                System.out.println("\nSegments\n--------");

                firstTime=false;
            }


            //Show segment information

            List<SegmentDetection> detectedSegments=
segmentDetectionResult.getSegments();

            for (SegmentDetection detectedSegment: detectedSegments) {

               if
(detectedSegment.getType().contains(SegmentType.TECHNICAL_CUE.toString()))
{
                    System.out.println("Technical Cue");
                    TechnicalCueSegment
segmentCue=detectedSegment.getTechnicalCueSegment();
                    System.out.println("\tType: " + segmentCue.getType());
                    System.out.println("\tConfidence: " +
segmentCue.getConfidence().toString());
                }
               if
(detectedSegment.getType().contains(SegmentType.SHOT.toString())) {
                    System.out.println("Shot");
                    ShotSegment
segmentShot=detectedSegment.getShotSegment();
                    System.out.println("\tIndex " +
segmentShot.getIndex());
                    System.out.println("\tConfidence: " +
segmentShot.getConfidence().toString());
                }
                long seconds=detectedSegment.getDurationMillis();
```

```
                System.out.println("\tDuration : " + Long.toString(seconds)
+ " milliseconds");
                System.out.println("\tStart time code: " +
detectedSegment.getStartTimecodeSMPTE());
                System.out.println("\tEnd time code: " +
detectedSegment.getEndTimecodeSMPTE());
                System.out.println("\tDuration time code: " +
detectedSegment.getDurationSMPTE());
                System.out.println();

            }

       } while (segmentDetectionResult !=null &&
segmentDetectionResult.getNextToken() != null);

   }
```

3. In the function `main`, replace the lines:

```
       StartLabelDetection(amzn-s3-demo-bucket, video);

       if (GetSQSMessageSuccess()==true)
        GetLabelDetectionResults();
```

with:

```
       StartSegmentDetection(amzn-s3-demo-bucket, video);

       if (GetSQSMessageSuccess()==true)
        GetSegmentDetectionResults();
```

Java V2

```
//snippet-start:[rekognition.java2.recognize_video_text.import]
import software.amazon.awssdk.auth.credentials.ProfileCredentialsProvider;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.Video;
```

```
import
 software.amazon.awssdk.services.rekognition.model.StartTextDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.StartTextDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.GetTextDetectionResponse;
import
 software.amazon.awssdk.services.rekognition.model.GetTextDetectionRequest;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.TextDetectionResult;
import java.util.List;
//snippet-end:[rekognition.java2.recognize_video_text.import]

/**
* Before running this Java V2 code example, set up your development environment,
 including your credentials.
*
* For more information, see the following documentation topic:
*
* https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
*/
public class DetectVideoSegments {

 private static String startJobId ="";
 public static void main(String[] args) {

     final String usage = "\n" +
         "Usage: " +
         "   <bucket> <video> <topicArn> <roleArn>\n\n" +
         "Where:\n" +
         "   bucket - The name of the bucket in which the video is located (for
 example, (for example, amzn-s3-demo-bucket). \n\n"+
         "   video - The name of video (for example, people.mp4). \n\n" +
         "   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic. \n\n" +
         "   roleArn - The ARN of the AWS Identity and Access Management (IAM)
 role to use. \n\n" ;

     if (args.length != 4) {
         System.out.println(usage);
         System.exit(1);
     }
```

```
    String bucket = args[0];
    String video = args[1];
    String topicArn = args[2];
    String roleArn = args[3];

    Region region = Region.US_WEST_2;
    RekognitionClient rekClient = RekognitionClient.builder()
        .region(region)
        .credentialsProvider(ProfileCredentialsProvider.create("profile-name"))
        .build();

    NotificationChannel channel = NotificationChannel.builder()
        .snsTopicArn(topicArn)
        .roleArn(roleArn)
        .build();

    startTextLabels(rekClient, channel, bucket, video);
    GetTextResults(rekClient);
    System.out.println("This example is done!");
    rekClient.close();
}

// snippet-start:[rekognition.java2.recognize_video_text.main]
public static void startTextLabels(RekognitionClient rekClient,
                                   NotificationChannel channel,
                                   String bucket,
                                   String video) {
    try {
        S3Object s3Obj = S3Object.builder()
            .bucket(bucket)
            .name(video)
            .build();

        Video vidOb = Video.builder()
            .s3Object(s3Obj)
            .build();

        StartTextDetectionRequest labelDetectionRequest =
StartTextDetectionRequest.builder()
            .jobTag("DetectingLabels")
            .notificationChannel(channel)
            .video(vidOb)
            .build();
```

```
        StartTextDetectionResponse labelDetectionResponse =
rekClient.startTextDetection(labelDetectionRequest);
        startJobId = labelDetectionResponse.jobId();

    } catch (RekognitionException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
}

public static void GetTextResults(RekognitionClient rekClient) {

    try {
        String paginationToken=null;
        GetTextDetectionResponse textDetectionResponse=null;
        boolean finished = false;
        String status;
        int yy=0 ;

        do{
            if (textDetectionResponse !=null)
                paginationToken = textDetectionResponse.nextToken();

            GetTextDetectionRequest recognitionRequest =
GetTextDetectionRequest.builder()
                .jobId(startJobId)
                .nextToken(paginationToken)
                .maxResults(10)
                .build();

            // Wait until the job succeeds.
            while (!finished) {
                textDetectionResponse =
rekClient.getTextDetection(recognitionRequest);
                status = textDetectionResponse.jobStatusAsString();

                if (status.compareTo("SUCCEEDED") == 0)
                    finished = true;
                else {
                    System.out.println(yy + " status is: " + status);
                    Thread.sleep(1000);
                }
                yy++;
```

```
            }

            finished = false;

            // Proceed when the job is done - otherwise VideoMetadata is null.
            VideoMetadata videoMetaData=textDetectionResponse.videoMetadata();
            System.out.println("Format: " + videoMetaData.format());
            System.out.println("Codec: " + videoMetaData.codec());
            System.out.println("Duration: " + videoMetaData.durationMillis());
            System.out.println("FrameRate: " + videoMetaData.frameRate());
            System.out.println("Job");

            List<TextDetectionResult> labels=
 textDetectionResponse.textDetections();
            for (TextDetectionResult detectedText: labels) {
                System.out.println("Confidence: " +
 detectedText.textDetection().confidence().toString());
                System.out.println("Id : " +
 detectedText.textDetection().id());
                System.out.println("Parent Id: " +
 detectedText.textDetection().parentId());
                System.out.println("Type: " +
 detectedText.textDetection().type());
                System.out.println("Text: " +
 detectedText.textDetection().detectedText());
                System.out.println();
            }

        } while (textDetectionResponse !=null &&
 textDetectionResponse.nextToken() != null);

    } catch(RekognitionException | InterruptedException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
 }
 // snippet-end:[rekognition.java2.recognize_video_text.main]
}
```

Python

1. Add the following code to the class `VideoDetect` that you created in step 1.

```
# Copyright 2020 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# PDX-License-Identifier: MIT-0 (For details, see https://github.com/
awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

    def StartSegmentDetection(self):

        min_Technical_Cue_Confidence = 80.0
        min_Shot_Confidence = 80.0
        max_pixel_threshold = 0.1
        min_coverage_percentage = 60

        response = self.rek.start_segment_detection(
            Video={"S3Object": {"Bucket": self.bucket, "Name": self.video}},
            NotificationChannel={
                "RoleArn": self.roleArn,
                "SNSTopicArn": self.snsTopicArn,
            },
            SegmentTypes=["TECHNICAL_CUE", "SHOT"],
            Filters={
                "TechnicalCueFilter": {
                    "BlackFrame": {
                        "MaxPixelThreshold": max_pixel_threshold,
                        "MinCoveragePercentage": min_coverage_percentage,
                    },
                    "MinSegmentConfidence": min_Technical_Cue_Confidence,
                },
                "ShotFilter": {"MinSegmentConfidence": min_Shot_Confidence},
            }
        )

        self.startJobId = response["JobId"]
        print(f"Start Job Id: {self.startJobId}")

    def GetSegmentDetectionResults(self):
        maxResults = 10
        paginationToken = ""
        finished = False
        firstTime = True

        while finished == False:
            response = self.rek.get_segment_detection(
                JobId=self.startJobId, MaxResults=maxResults,
 NextToken=paginationToken
```

```
            )

            if firstTime == True:
                print(f"Status\n------\n{response['JobStatus']}")
                print("\nRequested Types\n---------------")
                for selectedSegmentType in response['SelectedSegmentTypes']:
                    print(f"\tType: {selectedSegmentType['Type']}")
                    print(f"\t\tModel Version:
 {selectedSegmentType['ModelVersion']}")

                print()
                print("\nAudio metadata\n--------------")
                for audioMetadata in response['AudioMetadata']:
                    print(f"\tCodec: {audioMetadata['Codec']}")
                    print(f"\tDuration: {audioMetadata['DurationMillis']}")
                    print(f"\tNumber of Channels:
 {audioMetadata['NumberOfChannels']}")
                    print(f"\tSample rate: {audioMetadata['SampleRate']}")
                print()
                print("\nVideo metadata\n--------------")
                for videoMetadata in response["VideoMetadata"]:
                    print(f"\tCodec: {videoMetadata['Codec']}")
                    print(f"\tColor Range: {videoMetadata['ColorRange']}")
                    print(f"\tDuration: {videoMetadata['DurationMillis']}")
                    print(f"\tFormat: {videoMetadata['Format']}")
                    print(f"\tFrame rate: {videoMetadata['FrameRate']}")
                    print("\nSegments\n--------")

                firstTime = False

            for segment in response['Segments']:

                if segment["Type"] == "TECHNICAL_CUE":
                    print("Technical Cue")
                    print(f"\tConfidence: {segment['TechnicalCueSegment']
['Confidence']}")
                    print(f"\tType: {segment['TechnicalCueSegment']
['Type']}")

                if segment["Type"] == "SHOT":
                    print("Shot")
                    print(f"\tConfidence: {segment['ShotSegment']
['Confidence']}")
```

```
                    print(f"\tIndex: " + str(segment["ShotSegment"]
["Index"]))

                print(f"\tDuration (milliseconds):
 {segment['DurationMillis']}")
                print(f"\tStart Timestamp (milliseconds):
 {segment['StartTimestampMillis']}")
                print(f"\tEnd Timestamp (milliseconds):
 {segment['EndTimestampMillis']}")

                print(f"\tStart timecode: {segment['StartTimecodeSMPTE']}")
                print(f"\tEnd timecode: {segment['EndTimecodeSMPTE']}")
                print(f"\tDuration timecode: {segment['DurationSMPTE']}")

                print(f"\tStart frame number {segment['StartFrameNumber']}")
                print(f"\tEnd frame number: {segment['EndFrameNumber']}")
                print(f"\tDuration frames: {segment['DurationFrames']}")

                print()

            if "NextToken" in response:
                paginationToken = response["NextToken"]
            else:
                finished = True
```

2. In the function `main`, replace the lines:

```
    analyzer.StartLabelDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetLabelDetectionResults()
```

with:

```
    analyzer.StartSegmentDetection()
    if analyzer.GetSQSMessageSuccess()==True:
        analyzer.GetSegmentDetectionResults()
```

> **Note**
>
> If you've already run a video example other than Analyzing a video stored in an Amazon S3 bucket with Java or Python (SDK), the code to replace might be different.

3. Run the code. Information about the segments detected in the input video are displayed.

Detecting face liveness

Amazon Rekognition Face Liveness helps you verify that a user going through facial verification is physically present in front of a camera. It detects spoof attacks presented to a camera or trying to bypass a camera. Users can complete a Face Liveness check by taking a short video selfie where they follow a series of prompts intended to verify their presence.

Face Liveness is determined with a probabilistic calculation, and then a confidence score (between 0–100) is returned after the check. The higher the score, the greater the confidence that the person taking the check is live. Face Liveness also returns a frame, called a reference image that can be used for face comparison and search. As with any probability-based system, Face Liveness cannot guarantee perfect results. Use it with other factors to make a risk-based decision about the personal identity of users.

Face Liveness uses multiple components:

- AWS Amplify SDK (React, Swift (iOS), and Android) with FaceLivenessDetector component
- AWS SDKs
- AWS Cloud APIs

When you configure your application to integrate with Face Liveness feature, it uses the following API operations:

- CreateFaceLivenessSession - Starts a Face Liveness session, letting the Face Liveness detection model be used in your application. Returns a SessionId for the created session. Also allows you to set your ChallengePrefrence, so you can use the FaceMovementChallenge option.
- StartFaceLivenessSession - Called by the AWS Amplify FaceLivenessDetector. Starts an event stream containing information about relevant events and attributes in the current session.
- GetFaceLivenessSessionResults - Retrieves the results of a specific Face Liveness session, including a Face Liveness confidence score, reference image, and audit images.

You will use the AWS Amplify SDK to integrate the Face Liveness feature with your face-based verification workflows for web applications. When users onboard or authenticate through your application, send them to the Face Liveness check workflow in the Amplify SDK. The Amplify SDK handles user interface and real-time feedback for users while they capture their video selfie.

When using FaceMovementAndLightChallenge the user's face moves into the oval displayed on their device, the Amplify SDK displays a sequence of colored lights on the screen. It then securely streams the selfie video to the cloud APIs. Alternatively, when using FaceMovementChallenge, the user's face moves into the oval displayed on their device, but there are no sequence of colored lights. While 'FaceMovementAndLightChallenge' remains the best setting to maximize accuracy, 'FaceMovementChallenge' allows customers to prioritize faster speed of liveness checks over accuracy. When selecting between these settings, customers should consider their use case requirements including expected attack types, desired false accept and false reject rates, and additional checks such as geolocation (e.g. based on IP), One Time Pass codes (OTPs), etc. Customers should make this decision after testing Liveness performance with various confidence score thresholds on their specific content. In addition, with both liveness check types the application owners should implement controls to secure the device the video stream is sent from. After the analysis is complete, you receive the following on the backend:

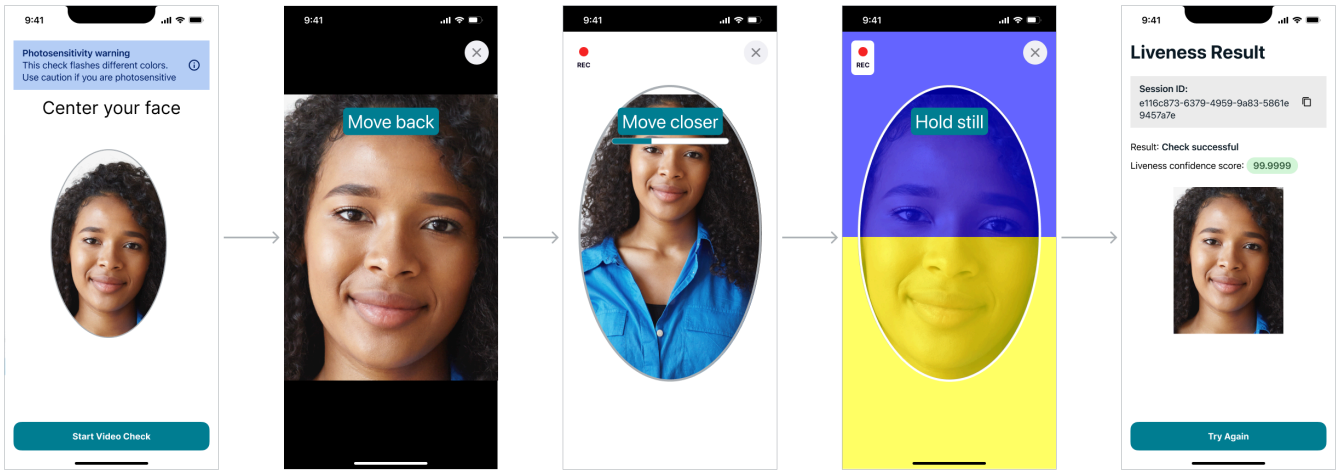
- A Face Liveness confidence score (between 0 and 100)
- A high-quality image called reference image that can be used for face match or face search
- A set of up to four images, called audit images, selected from the selfie video

Face Liveness can be leveraged for a variety of use cases. For example, Face Liveness can be used along with face matching (with CompareFaces and SearchFacesByImage) for identity verification, for age estimation on platforms with age-based access restriction, and for detecting real human users while detering bots.

You can learn more about the use cases for which the service is intended, how machine learning (ML) is used by the service, and key considerations in the responsible design and use of the service in Rekognition Face Liveness AI service card.

You can set thresholds for Face Liveness and face match confidence scores. Your chosen thresholds should reflect your use case. You then send an identity verification approval/denial to the user based on the score being above or below the thresholds. If denied, ask the user to try again or send them to another method.

The following graphic demonstrates the user flow, from instructions to liveness check to returned result:



User-Side Face Liveness Requirements

Amazon Rekognition Face Liveness requires the following minimum specifications:

Devices:

- Device must have a front-facing camera
- Minimum refresh rate of the device display: 60 Hz
- Minimum display or screen size: 4 inches
- Device should not be jail-broken or rooted

Camera specifications:

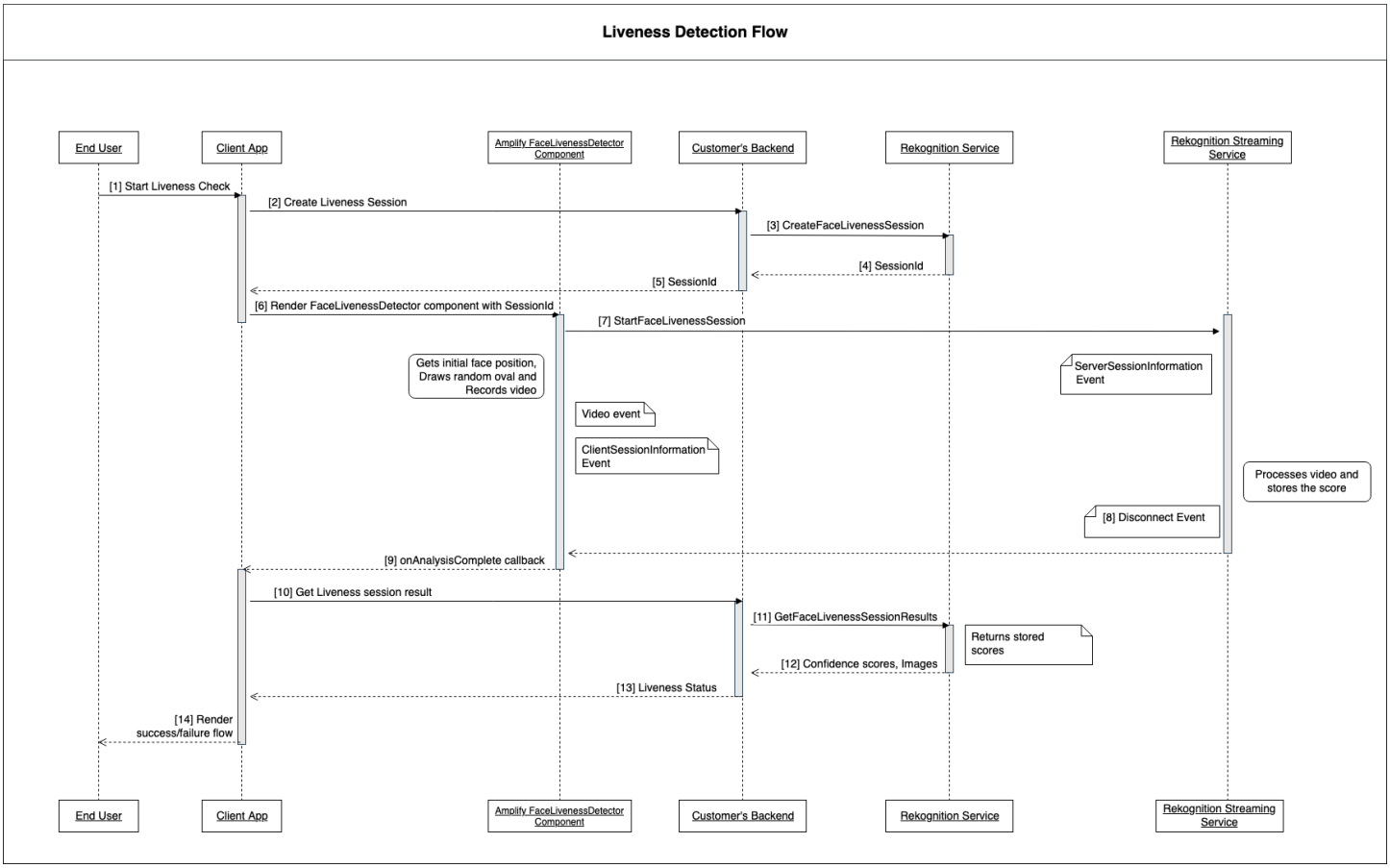
- Color Camera: front-facing camera should be able to record colors.
- No virtual camera or camera software.
- Minimum recording capability: 15 frames per second.
- Minimum video recording resolution: 480x640px.
- When users use a webcam with a desktop for a Face Liveness check, it is important to mount the webcam on top of the same screen where the Face Liveness check starts.

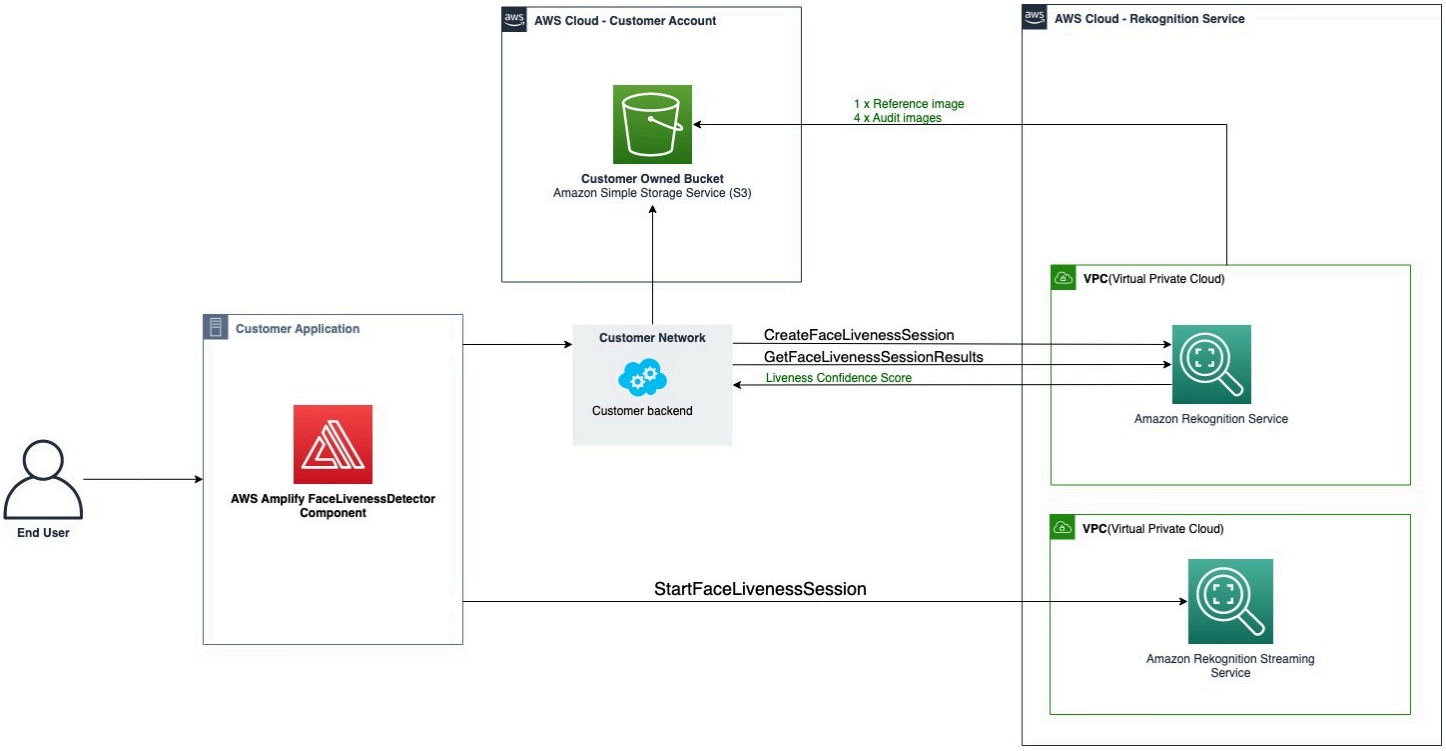
Minimum bandwidth requirement: 100 kbps

Browsers supported: Latest three versions of major browsers, such as Google Chrome, Mozilla Firefox, Apple Safari, and Microsoft Edge. For more information regarding browser support, see [What browsers are supported for use with the AWS Management Console?]

Architecture and Sequence Diagrams

The following diagrams detail how Amazon Rekognition Face Liveness operates regarding the feature's architecture and sequence of operations:





The Face Liveness check process involves several steps as outlined in the following:

1. The user initiates a Face Liveness check in the Client App.
2. The Client App calls the customer's backend, which in turn calls the Amazon Rekognition service. The service creates a Face Liveness Session and returns a unique SessionId. **Note:** After a SessionId is sent it expires in 3 minutes, so there is only a 3 minute window to complete Steps 3 through 7 below. A new sessionID must be used for every Face Liveness check. If a given sessionID is used for subsequent Face Liveness checks, the checks will fail. Additionally, a SessionId expires 3 minutes after it's sent, making all Liveness data associated with the session (e.g., sessionID, reference image, audit images, etc.) unavailable.
3. The Client App renders the FaceLivenessDetector Amplify component using the obtained SessionId and appropriate callbacks.
4. The FaceLivenessDetector component establishes a connection to the Amazon Rekognition streaming service, renders an oval on the user's screen, and displays a sequence of colored lights. FaceLivenessDetector records and streams video in real-time to the Amazon Rekognition streaming service.
5. The Amazon Rekognition streaming service processes the video in real-time, stores the results, and returns a DisconnectEvent to the FaceLivenessDetector component when the streaming is complete.

6. The FaceLivenessDetector component calls the `onAnalysisComplete` callback to signal to the Client App that the streaming is complete and that scores are ready for retrieval.
7. The Client App calls the customer's backend to get a Boolean flag indicating whether the user was live or not. Customer backend makes the request to the Amazon Rekognition service to get the confidence score, reference, and audit images. Customer backend uses these attributes to determine whether the user is live and returns an appropriate response to the Client App.
8. Finally, the Client App passes the response to the FaceLivenessDetector component, which appropriately renders the success/failure message to complete the flow.

Prerequisites

Prerequisites for using Amazon Rekognition Face Liveness include the following:

1. Set up an AWS Account
2. Set up the Face Liveness AWS SDKs
3. Set up AWS Amplify resources

Step 1: Set up an AWS account

If you do not yet have an AWS account, complete the steps seen at Create an AWS Account and User to create one.

Step 2: Set up the Face Liveness AWS SDKs

If you haven't already, install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

There are several ways to authenticate AWS SDK calls. The examples in this guide assume that you're using a default credentials profile for calling AWS CLI commands and AWS SDK API operations.

See the Granting Programmatic Access page for more information on granting your user account access to your chosen AWS SDK. The page also explains how to use a profile on your local computer and how to run the sample code in AWS environments.

Ensure that the user calling the Face Liveness operations has the correct permissions to call the operations, such as the `AmazonRekognitionFullAccess` and `AmazonS3FullAccess` permissions.

Step 3: Set up AWS Amplify Resources

To integrate Amazon Rekognition Face Liveness in your app, you must set up the AWS Amplify SDK to use the FaceLivenessDetector Amplify component.

If you haven't already, follow the instructions to set up the AWS Command Line Interface (AWS CLI) at Getting Started with the AWS CLI. After the CLI is installed, complete the Configure Auth step steps seen at the Amplify UI docs siteto set up your AWS Amplify resources.

Best Practices for Detecting Face Liveness

We recommend that you follow several best practices when using Amazon Rekognition Face Liveness. Face Liveness best practices include guidelines for where Face Liveness checks should be conducted, use of audit images, and choosing confidence score thresholds.

See Recommendations for Usage of Face Liveness for the full list of best practices.

Programming the Amazon Rekognition Face Liveness APIs

To use the Amazon Rekognition Face Liveness API, you must create a backend that carries out the following steps:

1. Call CreateFaceLivenessSession to initiate a Face Liveness session. When the `CreateFaceLivenessSession` operation is completed, the UI prompts the user to submit a video selfie. The AWS Amplify's FaceLivenessDetector component then calls StartFaceLivenessSession to perform Liveness detection.
2. Call GetFaceLivenessSessionResults to return the detection results associated with a Face Liveness session.
3. Proceed to configure your React application to use the FaceLivenessDetector component by following the steps at the Amplify Liveness guide.

Before using Face Liveness, make sure that you have created an AWS Account, set up the AWS CLI and AWS SDKs, and set up AWS Amplify. You should also ensure the IAM policy for your

backend API has permissions that cover the following: `GetFaceLivenessSessionResults`, and `CreateFaceLivenessSession`. See the Prerequisites section for more information.

Step 1: CreateFaceLivenessSession

CreateFaceLivenessSession API operation creates a Face Liveness session and returns a unique `SessionId`.

As part of the input for this operation, it is also possible to specify an Amazon S3 bucket location. This allows the storage of a reference image and audit images generated during the Face Liveness session. The Amazon S3 bucket must be located in the caller's AWS account and in the same region as the Face Liveness endpoint. Additionally, the S3 object keys are generated by the Face Liveness system.

It is also possible to provide an `AuditImagesLimit`, which is a number between 0 and 4. By default, it is set to 0. The number of images returned is best effort and based on the duration of the selfie-video.

Finally, you can provide a ChallengePreference, including the Type and version of challenge you want your session to default to. By default, this will use FaceLivenessMovementAndLightChallenge but can be set to FaceMovementChallenge.

Request Example

```
{
   "ClientRequestToken": "string",
   "KmsKeyId": "string",
   "Settings": {
      "AuditImagesLimit": number,
      "ChallengePreferences": [
         {
            "Type": "string",
            "Versions": {
               "Maximum": "string",
               "Minimum": "string"
            }
         }
      ],
      "OutputConfig": {
         "S3Bucket": "string",
         "S3KeyPrefix": "string"
```

```
      }
   }
}
```

Response Example

```
{
    {"SessionId": "0f959dbb-37cc-45d8-a08d-dc42cce85fa8"}
}
```

Step 2: StartFaceLivenessSession

When the CreateFaceLivenessSession API operation finishes, the AWS Amplify component performs the StartFaceLivenessSession API operation. The user is prompted to capture a video selfie. For a successful check, the user must position their face within the onscreen oval while maintaining good lighting. For more information, see Recommendations for Usage of Face Liveness.

This API operation requires the video captured during the Face Liveness session, the sessionId obtained from the CreateFaceLivenessSession API operation, and an `onAnalysisComplete` callback. The callback can be used to signal the backend to call the GetFaceLivenessSessionResults API operation, which returns a confidence score, reference, and audit images.

Note that this step is performed by the AWS Amplify FaceLivenessDetector component on the client application. You do not need to do additional setup to call `StartFaceLivenessSession`.

Step 3: GetFaceLivenessSessionResults

The GetFaceLivenessSessionResults API operation retrieves the results of a specific Face Liveness session. It requires the sessionId as input and returns the corresponding Face Liveness confidence score. It also provides a reference image that includes a face bounding box, and audit images that also contain face bounding boxes. The Face Liveness confidence score ranges from 0–100.

Request Example

```
{"SessionId": "0f959dbb-37cc-45d8-a08d-dc42cce85fa8"}
```

Response Example


```
{
    "SessionId": "0f959dbb-37cc-45d8-a08d-dc42cce85fa8",
    "Confidence": 98.9735,
    "ReferenceImage": {
        "S3Object": {
            "Bucket": "s3-bucket-name",
            "Name": "file-name",
        },
        "BoundingBox": {
           "Height": 0.4943420886993408,
            "Left": 0.8435328006744385,
            "Top": 0.8435328006744385,
            "Width": 0.9521094560623169}
    },
    "AuditImages": [{
        "S3Object": {
            "Bucket": "s3-bucket-name",
            "Name": "audit-image-name",
        },
        "BoundingBox": {
           "Width": 0.6399999856948853,
           "Height": 0.47999998927116394,
           "Left": 0.1644444465637207,
           "Top": 0.17666666209697723}
    }],
    "Status": "SUCCEEDED"
}
```


Step 4: Respond to results

After the Face Liveness session, compare the check's confidence score against the specified threshold. If the score is higher than the threshold, the user can go to the next screen or task. If the check fails, the user will be notified and prompted to try again.

Calling the Face Liveness APIs

You can test Amazon Rekognition Face Liveness with any supported AWS SDK , like the AWS Python SDK Boto3 or the AWS SDK for Java. You can call the `CreateFaceLivenessSession`

and `GetFaceLivenessSessionResults` APIs with your chosen SDK. The following section demonstrates how to call these APIs with the Python and Java SDKs.

To call the Face Liveness APIs:

- If you haven't already, create or update a user with `AmazonRekognitionFullAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.
- If you haven't already, install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

Python

The following snippet shows how you can call these APIs in your Python applications. Note that to run this example you will need to be using at least version 1.26.110 of the Boto3 SDK, although the most recent version of the SDK is recommended.

```
import boto3

session = boto3.Session(profile_name='default')
client = session.client('rekognition')

def create_session():

    response = client.create_face_liveness_session()

    session_id = response.get("SessionId")
    print('SessionId: ' + session_id)

    return session_id


def get_session_results(session_id):

    response = client.get_face_liveness_session_results(SessionId=session_id)

    confidence = response.get("Confidence")
    status = response.get("Status")

    print('Confidence: ' + "{:.2f}".format(confidence) + "%")
    print('Status: ' + status)
```

```
    return status


def main():
    session_id = create_session()
    print('Created a Face Liveness Session with ID: ' + session_id)

    status = get_session_results(session_id)
    print('Status of Face Liveness Session: ' + status)


if __name__ == "__main__":
    main()
```

Java

The following snippet shows how you can call these APIs in your Java applications:

```
package aws.example.rekognition.liveness;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
import com.amazonaws.services.rekognition.model.CreateFaceLivenessSessionRequest;
import com.amazonaws.services.rekognition.model.CreateFaceLivenessSessionResult;
import
 com.amazonaws.services.rekognition.model.GetFaceLivenessSessionResultsRequest;
import
 com.amazonaws.services.rekognition.model.GetFaceLivenessSessionResultsResult;

public class DemoLivenessApplication {

    static AmazonRekognition rekognitionClient;

    public static void main(String[] args) throws Exception {

        rekognitionClient = AmazonRekognitionClientBuilder.defaultClient();

        try {
            String sessionId = createSession();
```

```
            System.out.println("Created a Face Liveness Session with ID: " +
 sessionId);

            String status = getSessionResults(sessionId);
            System.out.println("Status of Face Liveness Session: " + status);

        } catch(AmazonRekognitionException e) {
           e.printStackTrace();
        }
    }

    private static String createSession() throws Exception {

        CreateFaceLivenessSessionRequest request = new
 CreateFaceLivenessSessionRequest();
        CreateFaceLivenessSessionResult result =
 rekognitionClient.createFaceLivenessSession(request);

        String sessionId = result.getSessionId();
        System.out.println("SessionId: " + sessionId);

        return sessionId;
    }

    private static String getSessionResults(String sessionId) throws Exception {

        GetFaceLivenessSessionResultsRequest request = new
 GetFaceLivenessSessionResultsRequest().withSessionId(sessionId);
        GetFaceLivenessSessionResultsResult result =
 rekognitionClient.getFaceLivenessSessionResults(request);

        Float confidence = result.getConfidence();
        String status = result.getStatus();

        System.out.println("Confidence: " + confidence);
        System.out.println("status: " + status);

        return status;
    }
}
```

Java V2

The following snippet demonstrates how to call the Face Liveness APIs with the AWS Java V2 SDK:

```
package aws.example.rekognition.liveness;

import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.AmazonRekognitionException;
import com.amazonaws.services.rekognition.model.CreateFaceLivenessSessionRequest;
import com.amazonaws.services.rekognition.model.CreateFaceLivenessSessionResult;
import
 com.amazonaws.services.rekognition.model.GetFaceLivenessSessionResultsRequest;
import
 com.amazonaws.services.rekognition.model.GetFaceLivenessSessionResultsResult;

public class DemoLivenessApplication {

    static AmazonRekognition rekognitionClient;

    public static void main(String[] args) throws Exception {

        rekognitionClient = AmazonRekognitionClientBuilder.defaultClient();

        try {
            String sessionId = createSession();
            System.out.println("Created a Face Liveness Session with ID: " +
 sessionId);

            String status = getSessionResults(sessionId);
            System.out.println("Status of Face Liveness Session: " + status);

        } catch(AmazonRekognitionException e) {
           e.printStackTrace();
        }
    }

    private static String createSession() throws Exception {

        CreateFaceLivenessSessionRequest request = new
 CreateFaceLivenessSessionRequest();
```

```
        CreateFaceLivenessSessionResult result =
 rekognitionClient.createFaceLivenessSession(request);

        String sessionId = result.getSessionId();
        System.out.println("SessionId: " + sessionId);

        return sessionId;
    }

    private static String getSessionResults(String sessionId) throws Exception {

        GetFaceLivenessSessionResultsRequest request = new
 GetFaceLivenessSessionResultsRequest().withSessionId(sessionId);
        GetFaceLivenessSessionResultsResult result =
 rekognitionClient.getFaceLivenessSessionResults(request);

        Float confidence = result.getConfidence();
        String status = result.getStatus();

        System.out.println("Confidence: " + confidence);
        System.out.println("status: " + status);

        return status;
    }
}
```

Node.Js

The following snippet demonstrates how to call the Face Liveness APIs with the AWS Node.Js SDK:

```
const Rekognition = require("aws-sdk/clients/rekognition");

const rekognitionClient = new Rekognition({ region: "us-east-1" });

async function createSession() {
    const response = await rekognitionClient.createFaceLivenessSession().promise();

    const sessionId = response.SessionId;
    console.log("SessionId:", sessionId);
```

```
    return sessionId;
}

async function getSessionResults(sessionId) {
    const response = await rekognitionClient
        .getFaceLivenessSessionResults({
            SessionId: sessionId,
        })
        .promise();

    const confidence = response.Confidence;
    const status = response.Status;
    console.log("Confidence:", confidence);
    console.log("Status:", status);

    return status;
}

async function main() {
    const sessionId = await createSession();
    console.log("Created a Face Liveness Session with ID:", sessionId);

    const status = await getSessionResults(sessionId);
    console.log("Status of Face Liveness Session:", status);
}

main();
```

Node.Js (Javascript SDK v3)

The following snippet demonstrates how to call the Face Liveness APIs with the AWS Node.Js SDK for Javascript v3:

```
import { RekognitionClient, CreateFaceLivenessSessionCommand } from "@aws-sdk/
client-rekognition"; // ES Modules
import const { RekognitionClient, CreateFaceLivenessSessionCommand } =
 require("@aws-sdk/client-rekognition"); // CommonJS import
const client = new RekognitionClient(config);
const input = {
  KmsKeyId: "STRING_VALUE",
  Settings: {
```

```
    OutputConfig: { // LivenessOutputConfig
      S3Bucket: "STRING_VALUE", // required
      S3KeyPrefix: "STRING_VALUE",
    },
    AuditImagesLimit: Number("int"),
  },
  ClientRequestToken: "STRING_VALUE",
};
const command = new CreateFaceLivenessSessionCommand(input);
const response = await client.send(command);
// { // CreateFaceLivenessSessionResponse
//   SessionId: "STRING_VALUE", // required
// };
```

Configuring and Customizing Your Application

Configuring Your Application

Your Face Liveness application can operate on mobile devices or desktop web browsers. You'll want to configure the Face Liveness components to integrate with your chosen solution. You must also ensure your application has permission to use a device's camera. The Amplify Liveness guide gives detailed instructions regarding how to:

- Install and configure AWS Amplify
- Import and render the FaceLivenessDetector component
- Listen to callbacks
- Render Amplify example error messaging

Customize Your Application

You can customize certain components of your liveness application using AWS Amplify.

For information on translation, see the Amplify Authenticator documentation.

For information on customizing Amplify components and themes, see the Amplify documentation regarding theming.

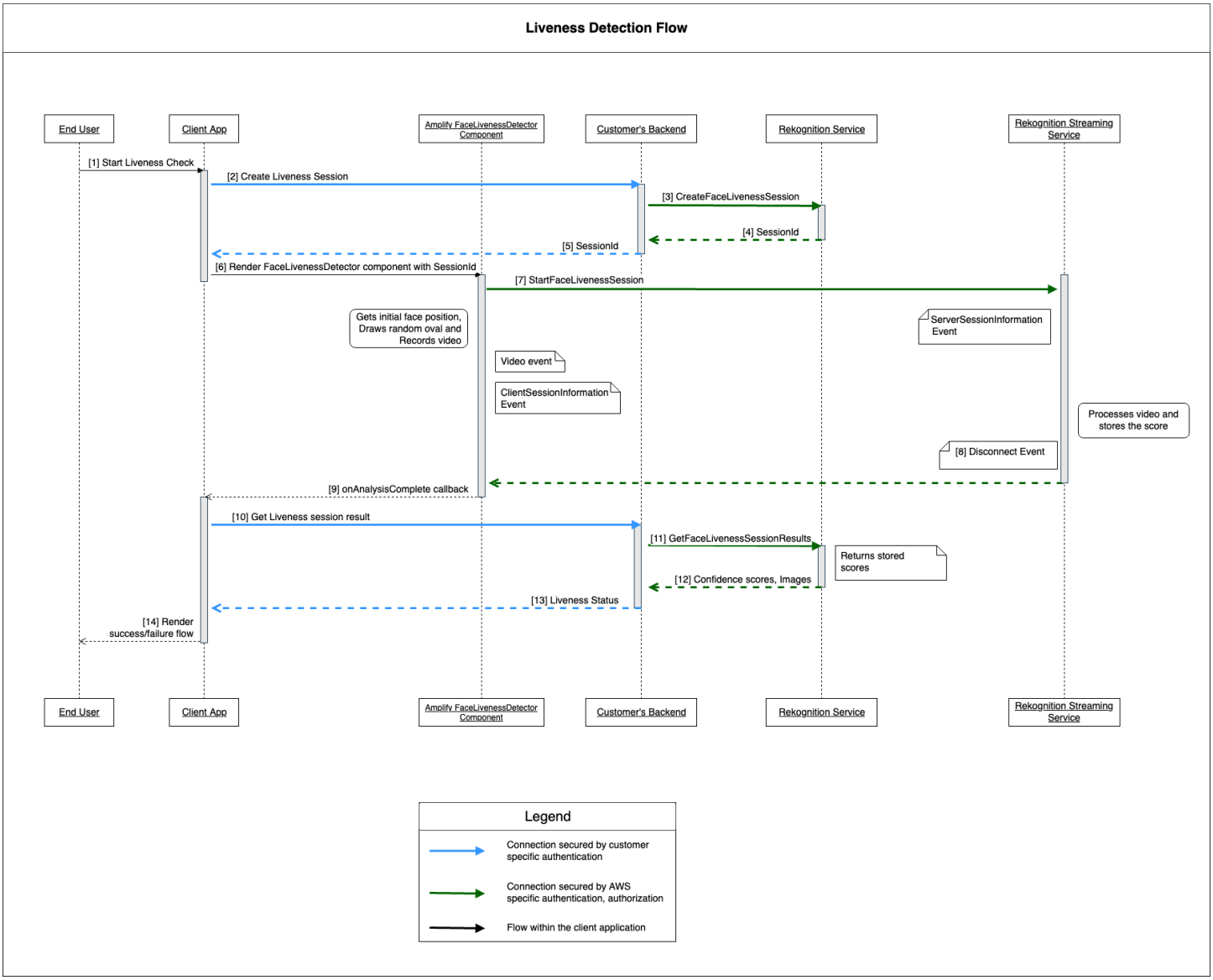
Face Liveness Shared Responsibility Model

Security and Compliance is a shared responsibility between AWS and you, the customer. Read more about AWS shared responsibility model here.

1. All calls to the AWS service (via client application or customer backend) are authenticated and authorized with AWS Auth (AWS Authentication). It's the responsibility of Face Liveness service owners to ensure this happens.
2. All calls to the customer backend (from the client application) are authenticated and authorized via the customer. This responsibility falls on the customer. The customer must ensure that calls from the client application are authenticated and haven't been manipulated in any way.
3. The customer backend must identify the end user performing the Face Liveness challenge. It's the customer's responsibility to tie an end user to a Face Liveness session. The Face Liveness service does not distinguish between end users. It is only able to identify the calling AWS identity (which the customer handles).
4. AWS recommends customers apply additional validation checks, such as location geolocation (e.g. based on IP), One Time Pass codes (OTPs) etc. in addition to Face Liveness that aligns with their use case requirements and security posture.

The 'FaceMovementAndLightChallenge' setting delivers the highest accuracy for Rekognition Liveness by requiring users to move their face toward the screen and hold still for a series of flashing lights. We recommend that customers use this default setting. Alternatively, customers can enable the 'FaceMovementChallenge' setting, which reduces the check time by several seconds by eliminating the flashing lights. While 'FaceMovementAndLightChallenge' remains the best setting to maximize accuracy , 'FaceMovementChallenge' allows customers to prioritize faster liveness checks. When selecting between these settings, customers should consider their use case requirements including expected attack types, desired false accept and false reject rates, and also implement additional checks such as geolocation (e.g. based on IP), One Time Pass codes (OTPs), etc. Customers should make this decision after testing Liveness performance with various confidence score thresholds depending on their use case. Customers are responsible to implement controls to secure the device of which the video is sent from

The following flow diagram shows which calls are authenticated by the AWS service or by the customer:



All calls to the Amazon Rekognition Face Liveness service are protected by AWS Auth (using AWS signing mechanism). This includes the following calls:

- [3] CreateFaceLivenessSession API call (from customer's backend)
- [7] StartFaceLivenessSession API call (from client application)
- [11] GetFaceLivenessSessionResults API call (from customer's backend)

All calls to customer's backend need to have an authentication and authorization mechanism. Customers need to ensure that the third-party code/library/etc used is being actively maintained and developed. Customers also need to ensure that the correct end user is making calls to the correct Face Liveness session. Customers must authenticate and authorize the following flows:

- [2] Create Face Liveness session (from client application)
- [10] Get Face Liveness session result (from client application)

Customers can follow the STRIDE security model to make sure that their API calls are protected.

Type	Description	Security Control
Spoofing	Threat action aimed at accessing and use of another user's credentials, such as username and password.	Authentication
Tampering	Threat action intending to maliciously change or modify persistent data. Examples include records in a database, and the alteratio n of data in transit between two computers over an open network, such as the internet.	Integrity
Repudiation	Threat action aimed at performing prohibited operations in a system that lacks the ability to trace the operations.	Non-Repudiation
Information disclosure	Threat action intending to read a file that one was not granted access to, or to read data in transit.	Confidentiality
Denial of service	Threat action attempting to deny access to valid users, such as by making a web server temporarily unavailab le or unusable.	Availability

Elevation of privilege	Threat action intending to gain privileged access to resources in order to gain unauthorized access to information or to compromise a system.	Authorization

AWS secures its connections in the following ways:

1. Calculating the request signature and then verifying the signature at the service side. Requests are ***authenticated*** using this signature.
2. AWS customers are required to setup proper IAM roles to ***authorize*** certain actions/operations. These IAM roles are needed to make calls to the AWS service.
3. Only HTTPS requests to AWS service are allowed. Requests are encrypted in the open network using TLS. This protects the ***confidentiality*** of the requests and maintains request ***integrity*** .
4. AWS service logs sufficient data to identify calls made by customers. This prevents ***repudiation*** attacks.
5. AWS service owns maintaining sufficient ***availability***

Customer is responsible for securing their service and API calls in the following ways:

1. Customer must ensure that they follow a proper mechanism for authentication. There are various authentication mechanisms that can be used to authenticate a request. Customers can explore digest based authentication , OAuth , OpenID connect , and other mechanisms.
2. Customers must make sure that their service supports proper encryption channels (like TLS/HTTPS) for making service API calls.
3. Customers must make sure that they log the data necessary to uniquely identify an API call and the caller. They should be able to identify the client calling their API with defined parameters and the time of the calls.
4. Customers must make sure that their system's available, and that they're protected against DDoS attacks. Here are some examples of defense techniques against DDoS attacks.

Customers are responsible for keeping their applications up-to-date. For more information, see Face Liveness update guidelines.

Face Liveness update guidelines

AWS regularly updates Face Liveness AWS SDKs (used in customer backend) and FaceLivenessDetector components of AWS Amplify SDKs (used in client applications) to provide new features, updated APIs, enhanced security, bug fixes, usability improvements, and more. We recommend that you keep the SDKs up-to-date to ensure optimal functioning of the feature. If you continue to use older versions of SDKs, requests may be blocked for maintainability and security reasons.

Face Liveness requires that you use the FaceLivenessDetector component, included in the AWS Amplify SDKs (React, iOS, Android).

Versioning and time-frames

We are versioning the following key components of the Face Liveness feature. We follow a semantic versioning format. For example, a version format of X.Y.Z where X represents the major version, Y represents the minor version, and Z represents the patch version.

- Face Liveness user challenges (For example,FaceMovementAndLightChallenge challenge) are partof the StartFaceLivenessSession API
- FaceLivenessDetector components delivered through AWS Amplify SDKs are used in client applications

Major versions: We reserve major version updates for critical security, breaking API, and show-stopper usability updates. Applications and the customer backend must be updated as soon as possible for you to continue to use Face Liveness features. Once we release a new major version, we support the previous major version for 120 days from the day of the new release. We may block the requests coming from the previous major version after 120 days.

Minor versions: We reserve minor version updates for important security and usability features and improvements. We highly recommend applying these updates. While we strive to ensure minor updates are backward compatible for as long as possible, we may announce end-of-support for a previous minor version 180 days after the release of a new minor version.

Patch versions: We reserve patch version updates for optional bug fixes and improvements. While we recommend that you keep your version up-to-date for the best security and user experience, we strive to ensure patch updates are fully backward compatible until we release a new major or minor version.

The versioning time window (120 days for major and 180 days for minor) applies to updating the SDK in your app, uploading your app to the app store or website, and users downloading the latest version of the app.

Version release and compatiblity matrix

The release of a major version for FaceLivenessDetector component or user challenge often coincide. To help you keep a track of version dependencies, see the resources linked in the following tables.

SDK versions and changelogs:

FaceLivenessDetector for web SDK		FaceLivenessDetector for iOS SDK	FaceLivenessDetector for Android SDK
Current version	Changelog	Current version/Changelog	Current version/Changelog

User challenges:

Challenge Name	Version	Release date	Retire date
FaceMovementAndLightChallenge	v1.0.0	4/10/2023	N/A
FaceMovementChallenge	v1.0.0	4/30/2025	N/A

Communication of new releases

AWS communicates new releases through the following channels:

- Service health update email notifications sent to the account email associated with the Face Liveness account ID.
- Published updates for AWS SDKs and associated notifications at the respective GitHub repos.

- Published updates for AWS Amplify SDKs and associated notifications at the respective GitHub repos.

We recommend that you subscribe to these channels to stay up-to-date.

Face Liveness FAQ

Use the following FAQ items to find answers to commonly asked questions about Rekognition Face Liveness.

- **What are the outputs of a face liveness check?**

  Rekognition Face Liveness provides the following outputs for every liveness check:

  - Confidence Score: A numerical score ranging from 0 to 100 is returned. This score indicates the likelihood that the selfie video is from a real person and not a bad actor using spoof.
  - High-Quality Image: A single high-quality image is extracted from the selfie video. This frame can be utilized for various purposes such as face comparison, age estimation, or face search.
  - Audit images: Up to four images are returned from the selfie video, which can be used for audit trail purposes.
- **Is Rekognition Face Liveness compliant with iBeta Presentation Attack Detection (PAD) tests?**

  iBeta Quality Assurance's Presentation Attack Detection (PAD) testing is conducted in accordance with ISO/IEC 30107-3. iBeta is accredited by NIST/NVLAP to test and provide results to this PAD standard. Rekognition Face Liveness passed Level 1 and Level 2 iBeta Presentation Attack Detection (PAD) conformance testing with a perfect PAD score. Report can be found on iBeta webpage here.
- **How can I get high-quality frame and additional frames?**

  The high-quality frame and additional frames can be returned as raw bytes or uploaded to an Amazon S3 bucket you specify, depending on the configurations of your CreateFaceLivenessSession API request.
- **Can I change the location of the oval and colored lights?**

No. The oval location and colored lights are features that enable higher accuracy and therefore cannot be customized.

- **Can I customize the user interface as per our application?**

  Yes, you can customize most screen components such as theme, color, language, text content, and font to align with your application. Details on how to customize these components can be found in the documentation for our React, Swift, and Android UI components.

- **Can I customize the countdown time and time to fit a face in oval?**

  No, the countdown time and face fit time have been pre-determined based on large-scale internal studies across 1000s of users, with the goal of providing an optimal balance between that enable higher accuracy and latency. For this reason, these time settings cannot be customized.

- **Do the different color lights meet accessibility guidelines?**

  Yes, the different color lights in our product adhere to the accessibility guidelines outlined in WCAG 2.1. As verified with over 1000s of user checks, the user experience displays approximately two colors per second, which complies with the recommendation of limiting colors to three per second. This reduces the likelihood of triggering epileptic seizures in the majority of the population.

- **Does the SDK adjust the screen brightness for optimal results?**

  The Face Liveness mobile SDKs (for Android and iOS) automatically adjust the brightness when the check is initiated. However, for the web SDK there are limitations on webpages that prevent automatic brightness adjustment. In such cases, we expect the web application to instruct end-users to manually increase the screen brightness for optimal results.

- **Does it need to be an oval? Could we use other similar shapes?**

  No, the size, shape, and location of the oval aren't customizable. The specific oval design has been carefully chosen for its effectiveness in accurately capturing and analyzing facial movements. Therefore, the oval shape can't be modified.

- **What is the end-to-end latency?**

We measure end-to-end latency from the time the user starts the action required to complete the liveness check to the time the user gets the result (pass or fail). In the best case, the latency is 5s. In average case, we expect it to be about 7s. In the worst case, the latency is 11s. We see variation in end-to-end latency as it's dependent on: the time the user to complete the required action (i.e., move their face into the oval), the network connectivity, the application latency, etc.

- **Can I use Face Liveness feature without Amplify SDK?**

  No, the Amplify SDK is required to use the Rekognition Face Liveness feature.

- **Where can I find the error states associated with Face Liveness?**

  You can see the different Face Liveness error states here.

- **Face Liveness is not available in my region. How can I use the feature?**

  You can choose to call Face Liveness in any of the regions where it is available, depending on your trafffic load and proximity. Face liveness is currently available in the following AWS regions:

  - US East (N. Virginia)
  - US West (Oregon)
  - Europe (Ireland)
  - Asia Pacific (Tokyo, Mumbai)

  Even if your AWS account is located in a different region, latency difference is not expected to be significant. You can obtain high-quality selfie frame and audit images through Amazon S3 location or as raw bytes, but your Amazon S3 bucket must match the AWS region of Face Liveness. If they are different, you must receive the images as raw bytes.

- **Does Amazon Rekognition Liveness Detection use customer content to improve the service?**

  You may opt out of having your image and video inputs used to improve or develop the quality of Rekognition and other Amazon machine-learning/artificial-intelligence technologies by using an AWS Organizations opt-out policy. For information about how to opt out, see Managing AI Services opt-out policy.

Bulk analysis

Amazon Rekognition Bulk Analysis lets you process a large collection of images asynchronously by using a manifest file with the StartMediaAnalysisJob operation. The output for each individual image matches the output returned by the operation that you use for analysis.

Currently, Rekognition supports analysis with the DetectModerationLabels operation.

You will be charged for the number of images that have been successfully processed by the job. The results of a finished job are outputted to a specified Amazon S3 bucket.

Note that Bulk Analysis does not support the Amazon A2I integration.

The API can detect animated or illustrated content types, and information about the detected content type is returned as part of the response.

Topics

- Processing images in bulk
- Bulk analysis output manifests
- Content type
- Verifying predictions and training adapters

Processing images in bulk

You can start a new bulk analysis job by submitting a manifest file and calling the StartMediaAnalysisJob operation. The input manifest file contains references to images in an Amazon S3 bucket and it is formatted as follows:

```
{"source-ref": "s3://foo/bar/1.jpg"}
```

To create a bulk analysis job (CLI)

1. If you haven't already:

    a. Create or update a user with `AmazonRekognitionFullAccess` and `AmazonS3ReadOnlyAccess` permissions. For more information, see Step 1: Set up an AWS account and create a User.

b. Install and configure the AWS CLI and the AWS SDKs. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Upload images to your S3 bucket.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

3. Use the following commands to create and retrieve bulk analysis jobs.

CLI

Use the following command to call the StartMediaAnalysisJob operation for analysis with the DetectModerationLabels operation:

```
# Requests
# Starting DetectModerationLabels job with default settings
aws rekognition start-media-analysis-job \
--operations-config "DetectModerationLabels={MinConfidence='1'}" \
--input "S3Object={Bucket=amzn-s3-demo-source-bucket,Name=my-input.jsonl}" \
--output-config "S3Bucket=amzn-s3-demo-destination-bucket;,S3KeyPrefix=my-results"
```

You can get information about a given job, such as the Amazon S3 path of the bucket where results and summary files are stored, by using the GetMediaAnalysisJob operation. You provide it with a job ID returned by StartMediaAnalysisJob or ListMediaAnalysisJob. Details about individual jobs are only retained for one year.

```
# Request
aws rekognition get-media-analysis-job \
--job-id customer-job-id
```

You can list all of your bulk analyses by using the ListMediaAnalysisJobs job operation, which returns pages of jobs. With the `max-results` argument, you can specify the maximum number of jobs to return per page, limited to the value of `max-results`. A maximum of 100 results are returned per page. Details about individual jobs are only retained for one year.

```
# Request
# Specify number of jobs to return per page, limited to max-results.
aws rekognition list-media-analysis-jobs --max-results 1
```

Bulk analysis output manifests

The bulk analysis job generates an output manifest file that contains the job results, as well as a manifest summary which contains statistics and details on any errors when processing the input manifest entries.

If duplicated entries were included in the input manifest, the job won't attempt to filter out unique inputs, and will instead process all provided entries.

The output manifest file is formatted as follows:

```
// Output manifest for content moderation
{"source-ref":"s3://foo/bar/1.jpg", "detect-moderation-labels":
 {"ModerationLabels":[],"ModerationModelVersion":"7.0","ContentTypes":
[{"Confidence":72.7257,"Name":"Animated"}]}}
```

The output manifest summary is formatted as follows:

```
{
    "version": "1.0",               # Schema version, 1.0 for GA.
    "statistics": {
        "total-json-lines": Number,  # Total number json lines (images) in the input
 manifest.
        "valid-json-lines": Number,  # Total number of JSON Lines (images) that contain
 references to valid images.
        "invalid-json-lines": Number # Total number of invalid JSON Lines. These lines
 were not handled.
    },
    "errors": [
        {
            "line-numer": Number,   # The number of the line in the manifest where the
 error occured.
            "source-ref": "String", # Optional. Name of the file if was parsed.
            "code": "String",       # Error code.
            "message": "String"     # Description of the error.
        }
     ]
}
```

Content type

Information on the type of media content analyzed by StartMediaAnalysisJob operation is returned by the GetMediaAnalysisJob operation. ContentType can be one of two different categories:

- Animated content, which includes video game and animation (e.g., cartoon, comics, manga, anime).
- Illustrated content, which includes drawing, painting, and sketches.

Verifying predictions and training adapters

Bulk Analysis can also be leveraged through the Rekognition console to get predictions for a batch of images, verify these predictions, and then create an adapter using the verified predictions. Adapters allow you to enhance the accuracy of any supported Rekognition operation.

Currently, you can create adapters for use with the Rekognition Custom Moderation feature. By creating an adapter and providing it to the DetectModerationLabels operation, you can achieve better accuracy for the content moderation tasks related to your specific use case.

For more information about Custom Moderation, see Enhancing accuracy with Custom Moderation. See Bulk analysis and verification for an explanation of how to verify predictions made with Bulk analysis. For a tutorial covering how to use the Rekognition console to verify predictions and create an adapter, see Custom Moderation adapter tutorial.

Tutorials

These cross-service tutorials demonstrate how to use Rekognition's API operations alongside other AWS services to create sample applications and accomplish a variety of tasks. Most of these tutorials make use of Amazon S3 to store images or video. Other commonly used services include AWS Lambda.

Topics

- Storing Amazon Rekognition Data with Amazon RDS and DynamoDB
- Using Amazon Rekognition and Lambda to tag assets in an Amazon S3 bucket
- Creating AWS video analyzer applications
- Creating an Amazon Rekognition Lambda function
- Using Amazon Rekognition for Identity Verification
- Using Amazon Rekognition (REK) to detect labels for marketing applications
- Detecting Labels in an Image Using Lambda and Python

Storing Amazon Rekognition Data with Amazon RDS and DynamoDB

When using Amazon Rekognition's APIs, it's important to remember that the API operations don't save any of the generated labels. You can save these labels by placing them in database, along with identifiers for the respective images.

This tutorial demonstrates detecting labels and saving those detected labels to a database. The sample application developed in this tutorial will read images from an Amazon S3 bucket call the DetectLabels operation on these images, and store the resulting labels in a database. The application will store data in either an Amazon RDS database instance or a DynamoDB database, depending on which database type you'd like to use.

You'll use the AWS SDK for Python or this tutorial. You can also see the AWS Documentation SDK examples GitHub repo for more Python tutorials.

Topics

- Prerequisites
- Getting Labels for Images in an Amazon S3 Bucket

- Creating an Amazon DynamoDB Table
- Uploading Data to DynamoDB
- Creating a MySQL Database in Amazon RDS
- Uploading Data to a Amazon RDS MySQL Table

Prerequisites

Before you begin this tutorial, you'll need install Python and complete the steps required to set up the Python AWS SDK. Beyond this, ensure that you have:

Created an AWS account and an IAM role

Installed the Python SDK (Boto3)

Properly configured your AWS access credentials

Created Amazon S3 bucket filled it with images

Created a RDS database instance, if using RDS to store data

Getting Labels for Images in an Amazon S3 Bucket

Start by writing a function that will take the name of an image in your Amazon S3 bucket and retrieve that image. This image will be displayed to confirm that the correct images are being passed into a call to DetectLabels which is also in the function.

1. Find the Amazon S3 bucket you would like to use and write down its name. You will make calls to this Amazon S3 bucket and read the images inside it. Ensure your bucket contains some images to pass to the DetectLabels operation.
2. Write the code to connect to your Amazon S3 bucket. You can connect to the Amazon S3 resource with Boto3 to retrieve an image from an Amazon S3 bucket. Once connected to the Amazon S3 resource, you can access your bucket by providing the Bucket method with the name of your Amazon S3 bucket. After connecting to the Amazon S3 bucket, you retrieve images from the bucket by using the Object method. By making use of Matplotlib, you can use this connection to visualize your images as they process. Boto3 is also used to connect to the Rekognition client.

   In the following code, provide your region to the region_name parameter. You will pass the Amazon S3 bucket name and the image name to DetectLabels , which returns the labels for

the corresponding image. After selecting just the labels from the response, both the name of the image and the labels are returned.

```
import boto3
from io import BytesIO
from matplotlib import pyplot as plt
from matplotlib import image as mp_img

boto3 = boto3.Session()

def read_image_from_s3(bucket_name, image_name):

    # Connect to the S3 resource with Boto 3
    # get bucket and find object matching image name
    s3 = boto3.resource('s3')
    bucket = s3.Bucket(name=bucket_name)
    Object = bucket.Object(image_name)

    # Downloading the image for display purposes, not necessary for detection of
 labels
    # You can comment this code out if you don't want to visualize the images
    file_name = Object.key
    file_stream = BytesIO()
    Object.download_fileobj(file_stream)
    img = mp_img.imread(file_stream, format="jpeg")
    plt.imshow(img)
    plt.show()

    # get the labels for the image by calling DetectLabels from Rekognition
    client = boto3.client('rekognition', region_name="region-name")
    response = client.detect_labels(Image={'S3Object': {'Bucket': bucket_name,
 'Name': image_name}},
                                    MaxLabels=10)

    print('Detected labels for ' + image_name)

    full_labels = response['Labels']

    return file_name, full_labels
```

3. Save this code in a file called get_images.py.

Creating an Amazon DynamoDB Table

The following code uses Boto3 to connect to DynamoDB and uses the DynamoDB `CreateTable` method to create a table named Images. The table has a composite primary key consisting of a partition key called Image and a sort key called Labels. The Image key contains the name of the image, while the Labels key stores the labels assigned to that Image.

```
import boto3

def create_new_table(dynamodb=None):
    dynamodb = boto3.resource(
        'dynamodb',)
    # Table defination
    table = dynamodb.create_table(
        TableName='Images',
        KeySchema=[
            {
                'AttributeName': 'Image',
                'KeyType': 'HASH'  # Partition key
            },
            {
                'AttributeName': 'Labels',
                'KeyType': 'RANGE'  # Sort key
            }
        ],
        AttributeDefinitions=[
            {
                'AttributeName': 'Image',
                'AttributeType': 'S'
            },
            {
                'AttributeName': 'Labels',
                'AttributeType': 'S'
            },
        ],
        ProvisionedThroughput={
            'ReadCapacityUnits': 10,
            'WriteCapacityUnits': 10
        }
    )
    return table

if __name__ == '__main__':
```

```
    device_table = create_new_table()
    print("Status:", device_table.table_status)
```

Save this code in an editor and run it once to create a DynamoDB table.

Uploading Data to DynamoDB

Now that the DynamoDB database has been created and you have a function to get labels for images, you can store the labels in DynamoDB The following code retrieves all the images in an S3 bucket, get labels for them, and stores the data in DynamoDB.

1. You'll need to write the code for uploading the data to DynamoDB. A function called `get_image_names` is used to connect to your Amazon S3 bucket and it returns the names of all images in the bucket as a list. You'll pass this list into the `read_image_from_S3` function, which is imported from the `get_images.py` file you created.

   ```
   import boto3
   import json
   from get_images import read_image_from_s3

   boto3 = boto3.Session()

   def get_image_names(name_of_bucket):

       s3_resource = boto3.resource('s3')
       my_bucket = s3_resource.Bucket(name_of_bucket)
       file_list = []
       for file in my_bucket.objects.all():
           file_list.append(file.key)
       return file_list
   ```

2. The `read_image_from_S3` function we created earlier will return the name of the image being processed and the dictionary of labels associated with that image. A function called `find_values` is used to get just the labels from the response. The name of the image and its labels are then ready to be uploaded to your DynamoDB table.

   ```
   def find_values(id, json_repr):
       results = []

       def _decode_dict(a_dict):
           try:
   ```

```
            results.append(a_dict[id])
        except KeyError:
            pass
        return a_dict

    json.loads(json_repr, object_hook=_decode_dict) # Return value ignored.
    return results
```

3. You will use a third function, called `load_data`, to actually load the images and labels into the DynamoDB table you created.

```
def load_data(image_labels, dynamodb=None):

    if not dynamodb:
        dynamodb = boto3.resource('dynamodb')

    table = dynamodb.Table('Images')

    print("Adding image details:", image_labels)
    table.put_item(Item=image_labels)
    print("Success!!")
```

4. Here's where the three functions we defined previously are called, and the operations are carried out. Add the three functions defined above, along with the code below, to a Python file. Run the code.

```
bucket = "bucket_name"
file_list = get_image_names(bucket)

for file in file_list:
    file_name = file
    print("Getting labels for " + file_name)
    image_name, image_labels = read_image_from_s3(bucket, file_name)
    image_json_string = json.dumps(image_labels, indent=4)
    labels=set(find_values("Name", image_json_string))
    print("Labels found: " + str(labels))
    labels_dict = {}
    print("Saving label data to database")
    labels_dict["Image"] = str(image_name)
    labels_dict["Labels"] = str(labels)
    print(labels_dict)
    load_data(labels_dict)
```

```
    print("Success!")
```

You've just used DetectLabels to generate labels for your images and stored those labels in an DynamoDB instance. Be sure that you tear down all the resources you created while going through this tutorial. That will prevent you from being charged for resources you aren't using.

Creating a MySQL Database in Amazon RDS

Before going further, make sure you have completed the setup procedure for Amazon RDS and created a MySQL DB instance using Amazon RDS.

The following code makes use of the PyMySQL library and your Amazon RDS DB instance. It creates a table to hold the names of your images and the labels associated with those images. Amazon RDS receives commands to create tables and insert data into tables. To use Amazon RDS, you must connect to the Amazon RDS host using your host name, username, and password. You'll connect to Amazon RDS by providing these arguments to PyMySQL's `connect` function and creating an instance of a cursor.

1. In the following code, replace the value of host with your Amazon RDS host endpoint and replace the value of user with the master username associated with your Amazon RDS instance. You will also need to replace password with the master password for your main user.

```
import pymysql

host = "host-endpoint"
user = "username"
password = "master-password"
```

2. Create a database and a table to insert your image and label data into. Do this by running and committing a creation query. The following code creates a database. Run this code only once.

```
conn = pymysql.connect(host=host, user=user, passwd=password)
print(conn)
cursor = conn.cursor()
print("Connection successful")

# run once
create_query = "create database rekogDB1"
print("Creation successful!")
cursor.execute(create_query)
```

```
cursor.connection.commit()
```

3. Once the database has been created, you must create a table to insert your image names and labels into. To create a table, you will first pass the use SQL command, along with the name of your database, to the `execute` function. After the connection is made, a query to create a table is run. The following code connects to the database and then creates a table with both a primary key, called `image_id`, and a text attribute storing the labels. Use the imports and variables you defined earlier, and run this code to create a table in your database.

```
# connect to existing DB
cursor.execute("use rekogDB1")
cursor.execute("CREATE TABLE IF NOT EXISTS test_table(image_id VARCHAR (255)
 PRIMARY KEY, image_labels TEXT)")
conn.commit()
print("Table creation - Successful creation!")
```

Uploading Data to a Amazon RDS MySQL Table

After creating the Amazon RDS database and a table in the database, you can get labels for your images and store those labels in the Amazon RDS database.

1. Connect to your Amazon S3 bucket and retrieve the names of all the images in the bucket. These image names will be passed into the `read_image_from_s3` function you created earlier to get the labels for all your images. The following code connects to your Amazon S3 bucket and returns a list of all the images in your bucket.

```
import pymysql
from get_images import read_image_from_s3
import json
import boto3

host = "host-endpoint"
user = "username"
password = "master-password"

conn = pymysql.connect(host=host, user=user, passwd=password)
print(conn)
cursor = conn.cursor()
print("Connection successful")
```

```
def get_image_names(name_of_bucket):

    s3_resource = boto3.resource('s3')
    my_bucket = s3_resource.Bucket(name_of_bucket)
    file_list = []
    for file in my_bucket.objects.all():
        file_list.append(file.key)
    return file_list
```

2. The response from the DetectLabels API contains more than just the labels, so write a function to extract only the label values. The following function returns a list full of just the labels.

```
def find_values(id, json_repr):
    results = []

    def _decode_dict(a_dict):
        try:
            results.append(a_dict[id])
        except KeyError:
            pass
        return a_dict

    json.loads(json_repr, object_hook=_decode_dict) # Return value ignored.
    return results
```

3. You will need a function to insert the image names and labels into your table. The following function runs an insertion query and inserts any given pair of image name and labels.

```
def upload_data(image_id, image_labels):

    # insert into db
    cursor.execute("use rekogDB1")
    query = "INSERT IGNORE INTO test_table(image_id, image_labels) VALUES (%s, %s)"
    values = (image_id, image_labels)
    cursor.execute(query, values)
    conn.commit()
    print("Insert successful!")
```

4. Finally, you must run the functions you defined above. In the following code, the names of all the images in your bucket are collected and provided to the function that calls DetectLabels. Afterward, the labels and the name of the image they apply to are uploaded to your Amazon

RDS database. Copy the three functions defined above, along with the code below, into a Python file. Run the Python file.

```
bucket = "bucket-name"
file_list = get_image_names(bucket)

for file in file_list:
    file_name = file
    print("Getting labels for " + file_name)
    image_name, image_labels = read_image_from_s3(bucket, file_name)
    image_json = json.dumps(image_labels, indent=4)
    labels=set(find_values("Name", image_json))
    print("Labels found: " + str(labels))
    unique_labels=set(find_values("Name", image_json))
    print(unique_labels)
    image_name_string = str(image_name)
    labels_string = str(unique_labels)
    upload_data(image_name_string, labels_string)
    print("Success!")
```

You have successfully used DetectLabels to generate labels for your images and stored those labels in a MySQL database using Amazon RDS. Be sure that you tear down all the resources you created while going through this tutorial. This will prevent you from being charged for resources you aren't using.

For more AWS multiservice examples, see the AWS Documentation SDK examples GitHub repository.

Using Amazon Rekognition and Lambda to tag assets in an Amazon S3 bucket

In this tutorial, you create an AWS Lambda function that automatically tags digital assets located in an Amazon S3 bucket. The Lambda function reads all objects in a given Amazon S3 bucket. For each object in the bucket, it passes the image to the Amazon Rekognition service to geneate a series of labels. Each label is used to create a tag that is applied to the image. After you execute the Lambda function, it automatically creates tags based on all images in a given Amazon S3 bucket and applies them to the images.

For example, assume you run the Lambda function and you have this image in an Amazon S3 bucket.

The application then automatically creates tags and applies them to the image.

Tags (6)

Track storage cost of other criteria by tagging your objects. **Learn more**

Key	Value
Nature	99.99188
Volcano	97.60948
Eruption	96.54574
Lava	79.63064
Mountain	99.99188
Outdoors	99.99188

> **Note**
>
> The services you use in this tutorial are part of the AWS Free Tier. When you are done with the tutorial, we recommend terminating any resources you created during the tutorial so that you are not charged.

This tutorial uses the AWS SDK for Java version 2. See the AWS Documentation SDK examples GitHub repository for additional Java V2 tutorials.

Topics

- Prerequisites
- Configure the IAM Lambda role

- Create the project
- Write the code
- Package the project
- Deploy the Lambda function
- Test the Lambda method

Prerequisites

Before you begin, you need to complete the steps in Setting Up the AWS SDK for Java. Then make sure that you have the following:

- Java 1.8 JDK.
- Maven 3.6 or higher.
- An Amazon S3 bucket with 5-7 nature images in it. These images are read by the Lambda function.

Configure the IAM Lambda role

This tutorial uses the Amazon Rekognition and Amazon S3 services. Configure the **lambda-support** role to have policies that enable it to invoke these services from a Lambda function.

To configure the role

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose **Roles**, then choose **Create Role**.
3. Choose **AWS service**, and then choose **Lambda**.
4. Choose the **Permissions** tab.
5. Search for **AWSLambdaBasicExecutionRole**.
6. Choose **Next tags**.
7. Choose **Review**.
8. Name the role **lambda-support**.
9. Choose **Create role**.
10. Choose **lambda-support** to view the overview page.

11. Choose **Attach policies**.
12. Choose *AmazonRekognitionFullAccess* from the list of policies.
13. Choose **Attach policy**.
14. Search for **AmazonS3FullAccess**, and then choose **Attach policy**.

Create the project

Create a new Java project, then configure the Maven pom.xml with the required settings and dependencies. Make sure your pom.xml file looks like the following:

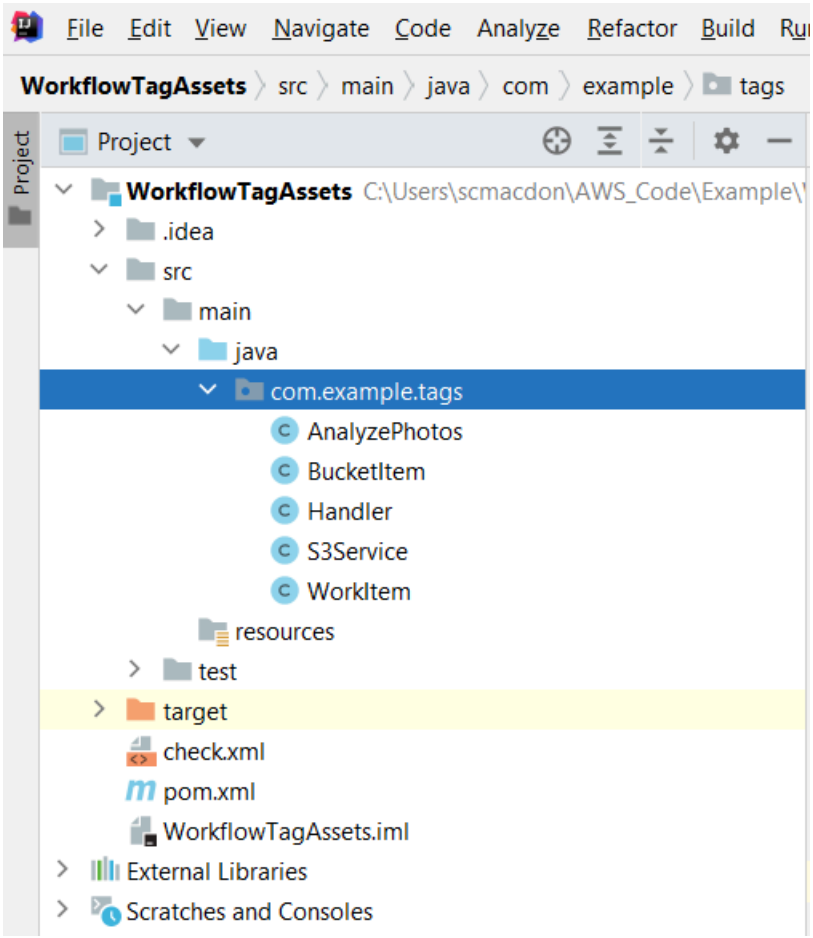
```
<?xml version="1.0" encoding="UTF-8"?>
 <project xmlns="http://maven.apache.org/POM/4.0.0"
     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
     xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/
maven-4.0.0.xsd">
<modelVersion>4.0.0</modelVersion>
<groupId>org.example</groupId>
<artifactId>WorkflowTagAssets</artifactId>
<version>1.0-SNAPSHOT</version>
<packaging>jar</packaging>
<name>java-basic-function</name>
<properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    <maven.compiler.source>1.8</maven.compiler.source>
    <maven.compiler.target>1.8</maven.compiler.target>
</properties>
<dependencyManagement>
    <dependencies>
        <dependency>
            <groupId>software.amazon.awssdk</groupId>
            <artifactId>bom</artifactId>
            <version>2.10.54</version>
            <type>pom</type>
            <scope>import</scope>
        </dependency>
    </dependencies>
</dependencyManagement>
<dependencies>
   <dependency>
        <groupId>com.amazonaws</groupId>
        <artifactId>aws-lambda-java-core</artifactId>
```

```
        <version>1.2.1</version>
    </dependency>
    <dependency>
        <groupId>com.google.code.gson</groupId>
        <artifactId>gson</artifactId>
        <version>2.8.6</version>
    </dependency>
    <dependency>
        <groupId>org.apache.logging.log4j</groupId>
        <artifactId>log4j-api</artifactId>
        <version>2.10.0</version>
    </dependency>
    <dependency>
        <groupId>org.apache.logging.log4j</groupId>
        <artifactId>log4j-core</artifactId>
        <version>2.13.0</version>
        <scope>test</scope>
    </dependency>
    <dependency>
        <groupId>org.apache.logging.log4j</groupId>
        <artifactId>log4j-slf4j18-impl</artifactId>
        <version>2.13.3</version>
        <scope>test</scope>
    </dependency>
    <dependency>
        <groupId>org.junit.jupiter</groupId>
        <artifactId>junit-jupiter-api</artifactId>
        <version>5.6.0</version>
        <scope>test</scope>
    </dependency>
    <dependency>
        <groupId>org.junit.jupiter</groupId>
        <artifactId>junit-jupiter-engine</artifactId>
        <version>5.6.0</version>
        <scope>test</scope>
    </dependency>
    <dependency>
        <groupId>com.googlecode.json-simple</groupId>
        <artifactId>json-simple</artifactId>
        <version>1.1.1</version>
    </dependency>
    <dependency>
        <groupId>software.amazon.awssdk</groupId>
        <artifactId>s3</artifactId>
```

```
    </dependency>
    <dependency>
        <groupId>software.amazon.awssdk</groupId>
        <artifactId>rekognition</artifactId>
    </dependency>
</dependencies>
<build>
    <plugins>
        <plugin>
            <artifactId>maven-surefire-plugin</artifactId>
            <version>2.22.2</version>
        </plugin>
        <plugin>
            <groupId>org.apache.maven.plugins</groupId>
            <artifactId>maven-shade-plugin</artifactId>
            <version>3.2.2</version>
            <configuration>
                <createDependencyReducedPom>false</createDependencyReducedPom>
            </configuration>
            <executions>
                <execution>
                    <phase>package</phase>
                    <goals>
                        <goal>shade</goal>
                    </goals>
                </execution>
            </executions>
        </plugin>
        <plugin>
            <groupId>org.apache.maven.plugins</groupId>
            <artifactId>maven-compiler-plugin</artifactId>
            <version>3.8.1</version>
            <configuration>
                <source>1.8</source>
                <target>1.8</target>
            </configuration>
        </plugin>
    </plugins>
  </build>
 </project>
```

Write the code

Use the AWS Lambda runtime Java API to create the Java class that defines the Lambda function. In this example, there is one Java class for the Lambda function named **Handler** and additional classes required for this use case. The following figure shows the Java classes in the project. Notice that all Java classes are located in a package named **com.example.tags**.



Create the following Java classes for the code:

- **Handler** uses the Lambda Java run-time API and performs the use case described in this AWS tutorial. The application logic that's executed is located in the handleRequest method.
- **S3Service** uses the Amazon S3 API to perform S3 operations.
- **AnalyzePhotos** uses the Amazon Rekognition API to analyze the images.
- **BucketItem** defines a model that stores Amazon S3 bucket information.
- **WorkItem** defines a model that stores Amazon Rekognition data.

Handler class

This Java code represents the **Handler** class. The class reads a flag that is passed to the Lambda function. The **s3Service.ListBucketObjects** method returns a **List** object where each element is a string value that represents the object key. If the flag value is true, then tags are applied by iterating through the list and applying tags to each object by calling the **s3Service.tagAssets** method. If the flag value is false, then the **s3Service.deleteTagFromObject** method is invoked that deletes the tags. Also, notice that you can log messages to Amazon CloudWatch logs by using a **LambdaLogger** object.

> **Note**
>
> Make sure you assign your bucket name to the **bucketName** variable.

```
package com.example.tags;

import com.amazonaws.services.lambda.runtime.Context;
import com.amazonaws.services.lambda.runtime.RequestHandler;
import com.amazonaws.services.lambda.runtime.LambdaLogger;
import java.util.ArrayList;
import java.util.List;
import java.util.Map;

public class Handler implements RequestHandler<Map<String,String>, String> {

@Override
public String handleRequest(Map<String, String> event, Context context) {
    LambdaLogger logger = context.getLogger();
    String delFlag = event.get("flag");
    logger.log("FLAG IS: " + delFlag);
    S3Service s3Service = new S3Service();
    AnalyzePhotos photos = new AnalyzePhotos();

    String bucketName = "<Enter your bucket name>";
    List<String> myKeys = s3Service.listBucketObjects(bucketName);
    if (delFlag.compareTo("true") == 0) {

        // Create a List to store the data.
        List<ArrayList<WorkItem>> myList = new ArrayList<>();
```

```
        // loop through each element in the List and tag the assets.
        for (String key : myKeys) {

            byte[] keyData = s3Service.getObjectBytes(bucketName, key);

            // Analyze the photo and return a list where each element is a WorkItem.
            ArrayList<WorkItem> item = photos.detectLabels(keyData, key);
            myList.add(item);
        }

        s3Service.tagAssets(myList, bucketName);
        logger.log("All Assets in the bucket are tagged!");

    } else {

        // Delete all object tags.
        for (String key : myKeys) {
            s3Service.deleteTagFromObject(bucketName, key);
            logger.log("All Assets in the bucket are deleted!");
        }
     }
    return delFlag;
 }
}
```

S3Service class

The following class uses the Amazon S3 API to perform S3 operations. For example, the **getObjectBytes** method returns a byte array that represents the image. Likewise, the **listBucketObjects** method returns a **List** object where each element is a string value that specifies the key name.

```
package com.example.tags;

import software.amazon.awssdk.core.ResponseBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.s3.S3Client;
import software.amazon.awssdk.services.s3.model.GetObjectRequest;
import software.amazon.awssdk.services.s3.model.PutObjectTaggingRequest;
import software.amazon.awssdk.services.s3.model.GetObjectResponse;
import software.amazon.awssdk.services.s3.model.S3Exception;
import software.amazon.awssdk.services.s3.model.ListObjectsResponse;
import software.amazon.awssdk.services.s3.model.S3Object;
```

```
import software.amazon.awssdk.services.s3.model.GetObjectTaggingResponse;
import software.amazon.awssdk.services.s3.model.ListObjectsRequest;
import java.util.ArrayList;
import java.util.List;
import software.amazon.awssdk.services.s3.model.Tagging;
import software.amazon.awssdk.services.s3.model.Tag;
import software.amazon.awssdk.services.s3.model.GetObjectTaggingRequest;
import software.amazon.awssdk.services.s3.model.DeleteObjectTaggingRequest;

public class S3Service {

private S3Client getClient() {

   Region region = Region.US_WEST_2;
   return S3Client.builder()
           .region(region)
           .build();
}

public byte[] getObjectBytes(String bucketName, String keyName) {

   S3Client s3 = getClient();

   try {

       GetObjectRequest objectRequest = GetObjectRequest
               .builder()
               .key(keyName)
               .bucket(bucketName)
               .build();

       // Return the byte[] from this object.
       ResponseBytes<GetObjectResponse> objectBytes =
s3.getObjectAsBytes(objectRequest);
       return objectBytes.asByteArray();

   } catch (S3Exception e) {
       System.err.println(e.awsErrorDetails().errorMessage());
       System.exit(1);
   }
   return null;
}

// Returns the names of all images in the given bucket.
```

```
public List<String> listBucketObjects(String bucketName) {

   S3Client s3 = getClient();
   String keyName;

   List<String> keys = new ArrayList<>();

   try {
       ListObjectsRequest listObjects = ListObjectsRequest
               .builder()
               .bucket(bucketName)
               .build();

       ListObjectsResponse res = s3.listObjects(listObjects);
       List<S3Object> objects = res.contents();

       for (S3Object myValue: objects) {
           keyName = myValue.key();
           keys.add(keyName);
       }
       return keys;

   } catch (S3Exception e) {
       System.err.println(e.awsErrorDetails().errorMessage());
       System.exit(1);
   }
   return null;
}

// Tag assets with labels in the given list.
public void tagAssets(List myList, String bucketName) {

   try {

       S3Client s3 = getClient();
       int len = myList.size();

       String assetName = "";
       String labelName = "";
       String labelValue = "";

       // Tag all the assets in the list.
       for (Object o : myList) {
```

```
            // Need to get the WorkItem from each list.
            List innerList = (List) o;
            for (Object value : innerList) {

                WorkItem workItem = (WorkItem) value;
                assetName = workItem.getKey();
                labelName = workItem.getName();
                labelValue = workItem.getConfidence();
                tagExistingObject(s3, bucketName, assetName, labelName, labelValue);
            }
        }

    } catch (S3Exception e) {
        System.err.println(e.awsErrorDetails().errorMessage());
        System.exit(1);
    }
}

// This method tags an existing object.
private void tagExistingObject(S3Client s3, String bucketName, String key, String
label, String LabelValue) {

    try {

        // First need to get existing tag set; otherwise the existing tags are
overwritten.
        GetObjectTaggingRequest getObjectTaggingRequest =
GetObjectTaggingRequest.builder()
                .bucket(bucketName)
                .key(key)
                .build();

        GetObjectTaggingResponse response =
s3.getObjectTagging(getObjectTaggingRequest);

        // Get the existing immutable list - cannot modify this list.
        List<Tag> existingList = response.tagSet();
        ArrayList<Tag> newTagList = new ArrayList(new ArrayList<>(existingList));

        // Create a new tag.
        Tag myTag = Tag.builder()
                .key(label)
                .value(LabelValue)
                .build();
```

```
        // push new tag to list.
        newTagList.add(myTag);
        Tagging tagging = Tagging.builder()
                .tagSet(newTagList)
                .build();

        PutObjectTaggingRequest taggingRequest = PutObjectTaggingRequest.builder()
                .key(key)
                .bucket(bucketName)
                .tagging(tagging)
                .build();

        s3.putObjectTagging(taggingRequest);
        System.out.println(key + " was tagged with " + label);

    } catch (S3Exception e) {
        System.err.println(e.awsErrorDetails().errorMessage());
        System.exit(1);
    }
  }

 // Delete tags from the given object.
 public void deleteTagFromObject(String bucketName, String key) {

    try {

        DeleteObjectTaggingRequest deleteObjectTaggingRequest =
 DeleteObjectTaggingRequest.builder()
                .key(key)
                .bucket(bucketName)
                .build();

        S3Client s3 = getClient();
        s3.deleteObjectTagging(deleteObjectTaggingRequest);

    } catch (S3Exception e) {
        System.err.println(e.awsErrorDetails().errorMessage());
        System.exit(1);
    }
  }
}
```

AnalyzePhotos class

The following Java code represents the **AnalyzePhotos** class. This class uses the Amazon Rekognition API to analyze the images.

```
package com.example.tags;

import software.amazon.awssdk.auth.credentials.EnvironmentVariableCredentialsProvider;
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.Image;
import software.amazon.awssdk.services.rekognition.model.DetectLabelsRequest;
import software.amazon.awssdk.services.rekognition.model.DetectLabelsResponse;
import software.amazon.awssdk.services.rekognition.model.Label;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import java.util.ArrayList;
import java.util.List;

public class AnalyzePhotos {

 // Returns a list of WorkItem objects that contains labels.
 public ArrayList<WorkItem> detectLabels(byte[] bytes, String key) {

    Region region = Region.US_EAST_2;
    RekognitionClient rekClient = RekognitionClient.builder()
            .credentialsProvider(EnvironmentVariableCredentialsProvider.create())
            .region(region)
            .build();

    try {

        SdkBytes sourceBytes = SdkBytes.fromByteArray(bytes);

        // Create an Image object for the source image.
        Image souImage = Image.builder()
                .bytes(sourceBytes)
                .build();

        DetectLabelsRequest detectLabelsRequest = DetectLabelsRequest.builder()
                .image(souImage)
                .maxLabels(10)
                .build();
```

```
        DetectLabelsResponse labelsResponse =
 rekClient.detectLabels(detectLabelsRequest);

        // Write the results to a WorkItem instance.
        List<Label> labels = labelsResponse.labels();
        ArrayList<WorkItem> list = new ArrayList<>();
        WorkItem item ;
        for (Label label: labels) {
            item = new WorkItem();
            item.setKey(key); // identifies the photo.
            item.setConfidence(label.confidence().toString());
            item.setName(label.name());
            list.add(item);
        }
        return list;

    } catch (RekognitionException e) {
        System.out.println(e.getMessage());
        System.exit(1);
    }
    return null ;
  }
}
```

BucketItem class

The following Java code represents the **BucketItem** class that stores Amazon S3 object data.

```
package com.example.tags;

public class BucketItem {

 private String key;
 private String owner;
 private String date ;
 private String size ;


 public void setSize(String size) {
    this.size = size ;
 }
```

```
 public String getSize() {
    return this.size ;
 }

 public void setDate(String date) {
    this.date = date ;
 }

 public String getDate() {
    return this.date ;
 }

 public void setOwner(String owner) {
    this.owner = owner ;
 }

 public String getOwner() {
    return this.owner ;
 }

 public void setKey(String key) {
    this.key = key ;
 }

 public String getKey() {
    return this.key ;
 }
}
```

WorkItem class

The following Java code represents the **WorkItem** class.

```
 package com.example.tags;

 public class WorkItem {

 private String key;
 private String name;
 private String confidence ;

public void setKey (String key) {
    this.key = key;
```

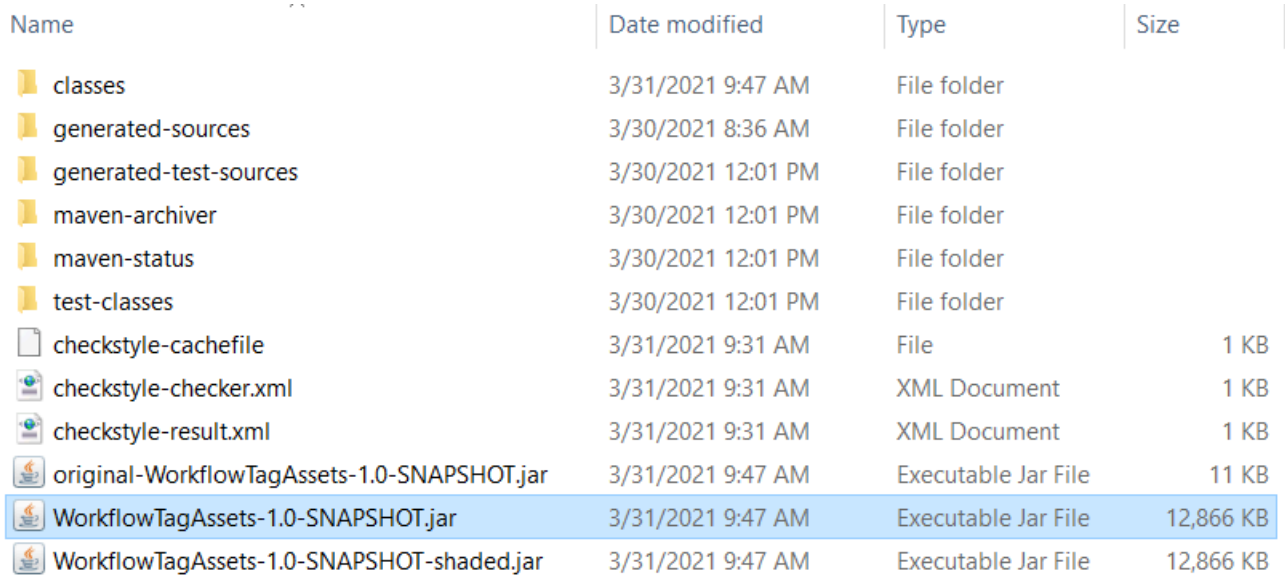
```
}

public String getKey() {
    return this.key;
}

public void setName (String name) {
    this.name = name;
}

public String getName() {
    return this.name;
}

public void setConfidence (String confidence) {
    this.confidence = confidence;
}

public String getConfidence() {
    return this.confidence;
}

}
```

Package the project

Package up the project into a .jar (JAR) file by using the following Maven command.

```
mvn package
```

The JAR file is located in the **target** folder (which is a child folder of the project folder).



Name	Date modified	Type	Size
classes	3/31/2021 9:47 AM	File folder	
generated-sources	3/30/2021 8:36 AM	File folder	
generated-test-sources	3/30/2021 12:01 PM	File folder	
maven-archiver	3/30/2021 12:01 PM	File folder	
maven-status	3/30/2021 12:01 PM	File folder	
test-classes	3/30/2021 12:01 PM	File folder	
checkstyle-cachefile	3/31/2021 9:31 AM	File	1 KB
checkstyle-checker.xml	3/31/2021 9:31 AM	XML Document	1 KB
checkstyle-result.xml	3/31/2021 9:31 AM	XML Document	1 KB
original-WorkflowTagAssets-1.0-SNAPSHOT.jar	3/31/2021 9:47 AM	Executable Jar File	11 KB
WorkflowTagAssets-1.0-SNAPSHOT.jar	3/31/2021 9:47 AM	Executable Jar File	12,866 KB
WorkflowTagAssets-1.0-SNAPSHOT-shaded.jar	3/31/2021 9:47 AM	Executable Jar File	12,866 KB

> **Note**
>
> Notice the use of the **maven-shade-plugin** in the project's POM file. This plugin is responsible for creating a JAR that contains the required dependencies. If you attempt to package up the project without this plugin, the required dependences are not included in the JAR file and you will encounter a **ClassNotFoundException**.

Deploy the Lambda function

1. Open the Lambda console.
2. Choose **Create Function**.
3. Choose **Author from scratch**.
4. In the **Basic information** section, enter **cron** as the name.
5. In the **Runtime**, choose **Java 8**.
6. Choose **Use an existing role**, and then choose **lambda-support** (the IAM role that you created).
7. Choose **Create function**.
8. For **Code entry type**, choose **Upload a .zip or .jar file**.
9. Choose **Upload**, and then browse to the JAR file that you created.
10. For **Handler**, enter the fully qualified name of the function, for example, **com.example.tags.Handler:handleRequest** (**com.example.tags** specifies the package, **Handler** is the class followed by :: and method name).

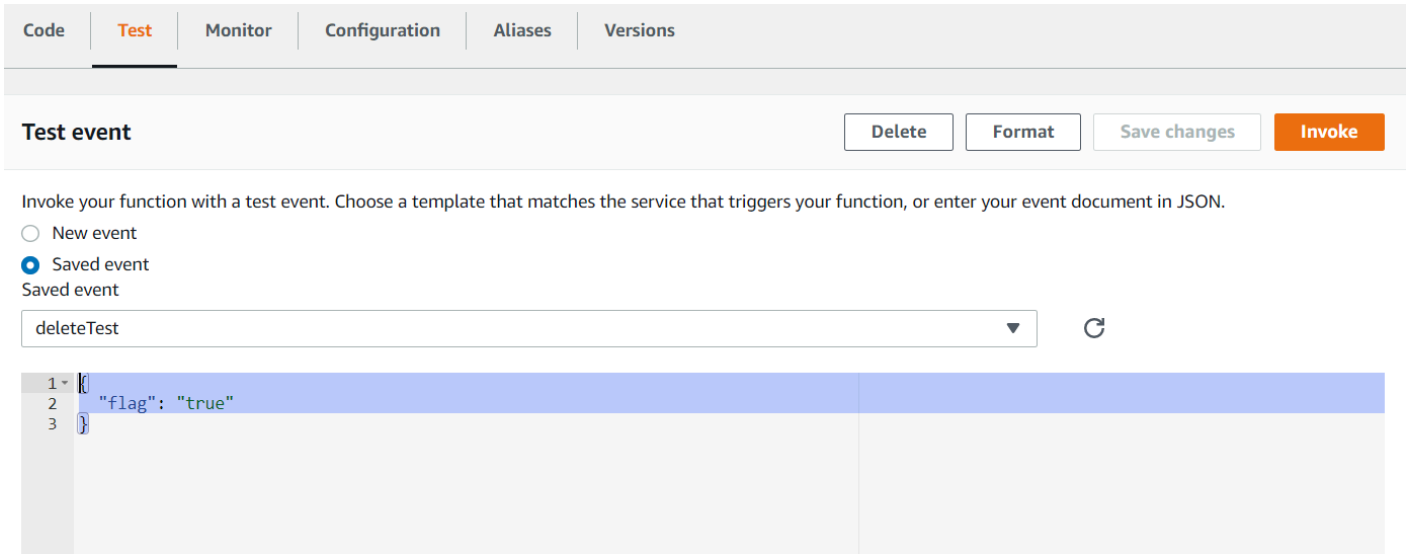
11. Choose **Save**.

Test the Lambda method

At this point in the tutorial, you can test the Lambda function.

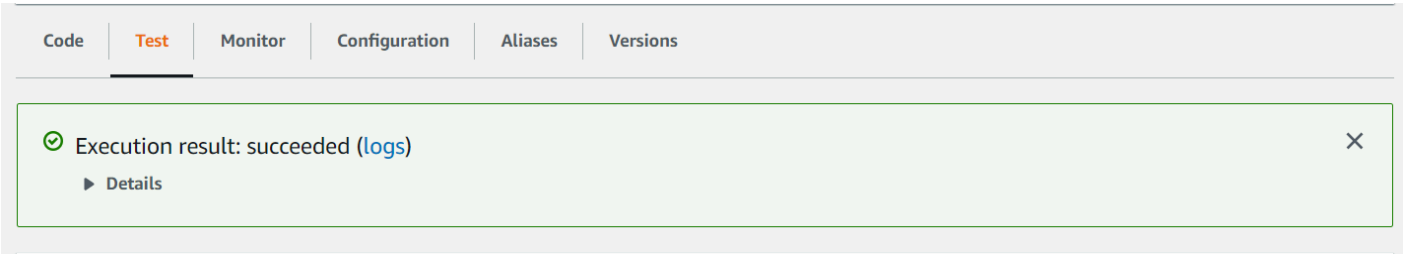
1. In the Lambda console, click the **Test** tab and then enter the following JSON.

```
                {
"flag": "true"
 }
```



> **Note**
>
> Passing **true** tags the digital assets and passing **false** deletes the tags.

2. Choose the **Invoke** button. After the Lambda function is invoked, you see a successful message.



Congratulations, you have created an AWS Lambda function that automactially applies tags to difital assets located in an Amazon S3 bucket. As stated at the beginning of this tutorial, be sure to terminate all of the resources you created while going through this tutorial to ensure that you're not charged.

For more AWS multiservice examples, see the AWS Documentation SDK examples GitHub repository.

Creating AWS video analyzer applications

You can create a Java web application that analyzes videos for label detection by using the AWS SDK for Java version 2. The application created in this AWS tutorial lets you upload a video (MP4 file) to an Amazon S3 bucket. Then the appliction uses the Amazon Rekognition service to analyze the video. The results are used to populate a data model and then a report is generated and emailed to a specific user by using the Amazon Simple Email Service.

The following illustration shows a report that is generated after the application completes analyzing the video. The columns in the table below show Age Range, Beard, Eye glasses, and Eyes open, as well as confidence values for different attribute predictions.

	Age Range	Beard	Eye glasses	Eyes open
2				
3	AgeRange(Low=38, High=56)	Beard(Value=false, Confidence=83.07253)	Eyeglasses(Value=true, Confidence=55.965977)	EyeOpen(Value=true, Confidence=94.691696)
4	AgeRange(Low=36, High=52)	Beard(Value=true, Confidence=50.721912)	Eyeglasses(Value=false, Confidence=63.886036)	EyeOpen(Value=true, Confidence=95.906364)
5	AgeRange(Low=51, High=69)	Beard(Value=true, Confidence=58.38352)	Eyeglasses(Value=false, Confidence=96.39576)	EyeOpen(Value=true, Confidence=53.580643)
6	AgeRange(Low=49, High=67)	Beard(Value=false, Confidence=81.41662)	Eyeglasses(Value=true, Confidence=65.28722)	EyeOpen(Value=true, Confidence=95.11523)
7	AgeRange(Low=51, High=69)	Beard(Value=true, Confidence=61.533833)	Eyeglasses(Value=false, Confidence=97.51163)	EyeOpen(Value=true, Confidence=82.21834)
8	AgeRange(Low=29, High=45)	Beard(Value=false, Confidence=74.22591)	Eyeglasses(Value=true, Confidence=64.906685)	EyeOpen(Value=true, Confidence=98.48175)
9	AgeRange(Low=51, High=69)	Beard(Value=true, Confidence=65.9394)	Eyeglasses(Value=false, Confidence=94.14824)	EyeOpen(Value=true, Confidence=94.857346)
10	AgeRange(Low=44, High=62)	Beard(Value=true, Confidence=78.648)	Eyeglasses(Value=true, Confidence=65.83134)	EyeOpen(Value=true, Confidence=98.538666)
11				

In this tutorial, you create a Spring Boot application that invokes various AWS services. The Spring Boot APIs are used to build a model, different views, and a controller. For more information, see Spring Boot.

This service uses the following AWS services:

- Amazon Rekognition
- Amazon S3
- Amazon SES
- AWS Elastic Beanstalk

The AWS services included in this tutorial are included in the AWS Free Tier. We recommend that you terminate all of the resources you create in the tutorial when you are finished with them to avoid being charged.

Prerequisites

Before you begin, you need to complete the steps in Setting Up the AWS SDK for Java. Then make sure that you have the following:

- Java 1.8 JDK.
- Maven 3.6 or later.
- An Amazon S3 bucket named **video[somevalue]**. Be sure to use this bucket name in your Amazon S3 Java code. For more information, see Creating a bucket.
- An IAM role. You need this for the **VideoDetectFaces** class that you will create. For more information, see Configuring Amazon Rekognition Video.
- A valid Amazon SNS topic. You need this for the **VideoDetectFaces** class that you will create. For more information, see Configuring Amazon Rekognition Video.

Procedure

In the course of the tutorial, you do the following:

1. Create a project
2. Add the POM dependencies to your project
3. Create the Java classes
4. Create the HTML files
5. Create the script files
6. Package the project into a JAR file
7. Deploy the application to AWS Elastic Beanstalk

To proceed with the tutorial, follow the detailed instructions in the AWS Documentation SDK examples GitHub repository.

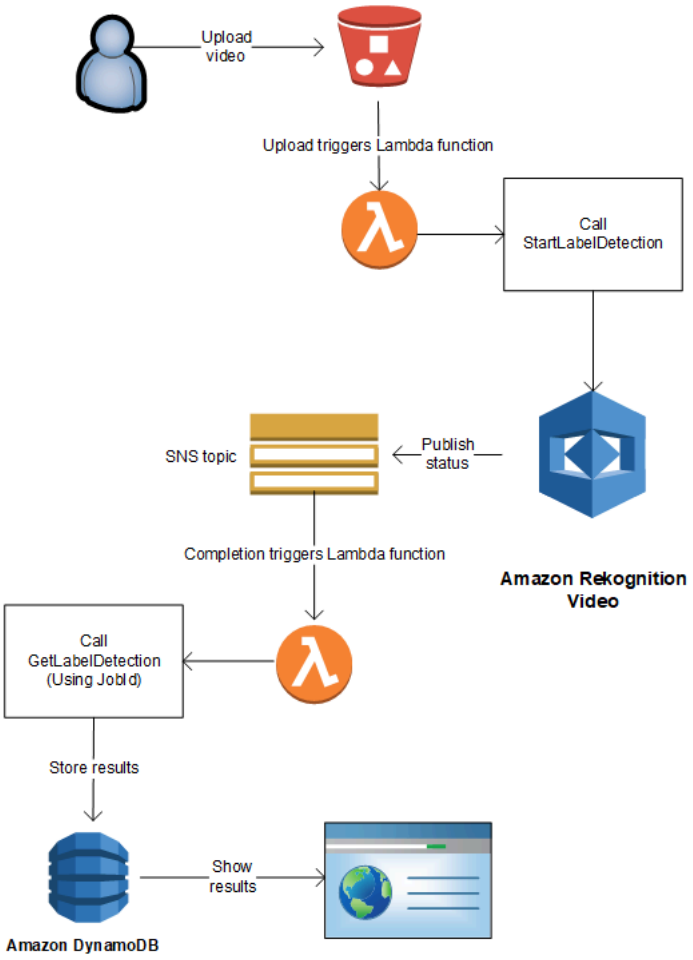
Creating an Amazon Rekognition Lambda function

This tutorial shows how to get the results of a video analysis operation for label detection by using a Java Lambda function.

> **Note**
>
> This tutorial uses the AWS SDK for Java 1.x. For a tutorial using Rekognition and the AWS SDK for Java version 2, see the AWS Documentation SDK examples GitHub repository.

You can use Lambda functions with Amazon Rekognition Video operations. For example, the following diagram shows a website that uses a Lambda function to automatically start analysis of a video when it's uploaded to an Amazon S3 bucket. When the Lambda function is triggered, it calls StartLabelDetection to start detecting labels in the uploaded video. For information about using Lambda to process event notifications from an Amazon S3 bucket, see Using AWS Lambda with Amazon S3 Events.

A second Lambda function is triggered when the analysis completion status is sent to the registered Amazon SNS topic. The second Lambda function calls GetLabelDetection to get the analysis results. The results are then stored in a database in preparation for displaying on a webpage. This second lambda function is the focus of this tutorial.



In this tutorial, the Lambda function is triggered when Amazon Rekognition Video sends the completion status for the video analysis to the registered Amazon SNS topic. It then collects video analysis results by calling GetLabelDetection. For demonstration purposes, this tutorial writes label detection results to a CloudWatch log. In your application's Lambda function, you should store the analysis results for later use. For example, you can use Amazon DynamoDB to save the analysis results. For more information, see Working with DynamoDB.

The following procedures show you how to:

- Create the Amazon SNS topic and set up permissions.
- Create the Lambda function by using the AWS Management Console and subscribe it to the Amazon SNS topic.
- Configure the Lambda function by using the AWS Management Console.
- Add sample code to an AWS Toolkit for Eclipse project and upload it to the Lambda function.
- Test the Lambda function by using the AWS CLI.

> **Note**
>
> Use the same AWS Region throughout the tutorial.

Prerequisites

This tutorial assumes that you're familiar with the AWS Toolkit for Eclipse. For more information, see AWS Toolkit for Eclipse.

Create the SNS topic

The completion status of an Amazon Rekognition Video video analysis operation is sent to an Amazon SNS topic. This procedure creates the Amazon SNS topic and the IAM service role that gives Amazon Rekognition Video access to your Amazon SNS topics. For more information, see Calling Amazon Rekognition Video operations.

To create an Amazon SNS topic

1. If you haven't already, create an IAM service role to give Amazon Rekognition Video access to your Amazon SNS topics. Note the Amazon Resource Name (ARN). For more information, see Giving access to multiple Amazon SNS topics.
2. Create an Amazon SNS topic by using the Amazon SNS console.You only need to specifiy the topic name. Prepend the topic name with *AmazonRekognition*. Note the topic ARN.

Create the Lambda function

You create the Lambda function by using the AWS Management Console. Then you use an AWS Toolkit for Eclipse project to upload the Lambda function package to AWS Lambda. It's also possible to create the Lambda function with the AWS Toolkit for Eclipse. For more information, see Tutorial: How to Create, Upload, and Invoke an AWS Lambda Function.

To create the Lambda function

1. Sign in to the AWS Management Console, and open the AWS Lambda console at https://console.aws.amazon.com/lambda/.
2. Choose **Create function**.
3. Choose **Author from scratch**.

4. In **Function name**, type a name for your function.
5. In **Runtime**, choose **Java 8**.
6. Choose **Choose or create an execution role**.
7. In **Execution role**, choose **Create a new role with basic Lambda permissions**.
8. Note the name of the new role that's displayed at the bottom of the **Basic information** section.
9. Choose **Create function**.

Configure the Lambda function

After you create the Lambda function, you configure it to be triggered by the Amazon SNS topic that you create in Create the SNS topic. You also adjust the memory requirements and timeout period for the Lambda function.

To configure the Lambda function

1. In **Function Code**, type `com.amazonaws.lambda.demo.JobCompletionHandler` for **Handler**.
2. In **Basic settings**, choose **Edit**. The **Edit basic settings** dialog is shown.
   a. Choose **1024** for **Memory**.
   b. Choose **10** seconds for **Timeout**.
   c. Choose **Save**.
3. In **Designer**, choose **+ Add trigger**. The Add trigger dialog is shown.
4. In **Trigger configuration** choose **SNS**.

   In **SNS topic**, choose the Amazon SNS topic that you created in Create the SNS topic.
5. Choose **Enable trigger**.
6. To add the trigger, choose **Add**.
7. Choose **Save** to save the Lambda function.

Configure the IAM Lambda role

To call Amazon Rekognition Video operations, you add the *AmazonRekognitionFullAccess* AWS managed policy to the IAM Lambda role. Start operations, such as StartLabelDetection, also require

pass role permissions for the IAM service role that Amazon Rekognition Video uses to access the Amazon SNS topic.

To configure the role

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose **Roles**.
3. In the list, choose the name of the execution role that you created in Create the Lambda function.
4. Choose the **Permissions** tab.
5. Choose **Attach policies**.
6. Choose *AmazonRekognitionFullAccess* from the list of policies.
7. Choose **Attach policy**.
8. Again, choose the execution role.
9. Choose **Add inline policy**.
10. Choose the **JSON** tab.
11. Replace the existing policy with the following policy. Replace `servicerole` with the IAM service role that you created in Create the SNS topic.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "mysid",
            "Effect": "Allow",
            "Action": "iam:PassRole",
            "Resource": "arn:servicerole"
        }
    ]
}
```

12. Choose **Review policy**.
13. In **Name***, type a name for the policy.
14. Choose **Create policy**.

Create the AWS Toolkit for Eclipse Lambda project

When the Lambda function is triggered, the following code gets the completion status from the Amazon SNS topic, and calls GetLabelDetection to get the analysis results. A count of labels detected, and a list of labels detected is written to a CloudWatch log. Your Lambda function should store the video analysis results for later use.

To create the AWS Toolkit for Eclipse Lambda project

1. Create an AWS Toolkit for EclipseAWS Lambda project.
   - For **Project name:**, type a project name of your choosing.
   - For **Class Name:**, enter *JobCompletionHandler*.
   - For **Input type:**, choose **SNS Event**.
   - Leave the other fields unchanged.
2. In the **Eclipse Project** explorer, open the generated Lambda handler method (JobCompletionHandler.java) and replace the contents with the following:

```
//Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
//PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/
amazon-rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)

package com.amazonaws.lambda.demo;

import com.amazonaws.services.lambda.runtime.Context;
import com.amazonaws.services.lambda.runtime.LambdaLogger;
import com.amazonaws.services.lambda.runtime.RequestHandler;
import com.amazonaws.services.lambda.runtime.events.SNSEvent;
import java.util.List;
import com.amazonaws.regions.Regions;
import com.amazonaws.services.rekognition.AmazonRekognition;
import com.amazonaws.services.rekognition.AmazonRekognitionClientBuilder;
import com.amazonaws.services.rekognition.model.GetLabelDetectionRequest;
import com.amazonaws.services.rekognition.model.GetLabelDetectionResult;
import com.amazonaws.services.rekognition.model.LabelDetection;
import com.amazonaws.services.rekognition.model.LabelDetectionSortBy;
import com.amazonaws.services.rekognition.model.VideoMetadata;
import com.fasterxml.jackson.databind.JsonNode;
import com.fasterxml.jackson.databind.ObjectMapper;
```

```
public class JobCompletionHandler implements RequestHandler<SNSEvent, String> {

   @Override
   public String handleRequest(SNSEvent event, Context context) {

      String message = event.getRecords().get(0).getSNS().getMessage();
      LambdaLogger logger = context.getLogger();

      // Parse SNS event for analysis results. Log results
      try {
         ObjectMapper operationResultMapper = new ObjectMapper();
         JsonNode jsonResultTree = operationResultMapper.readTree(message);
         logger.log("Rekognition Video Operation:========================");
         logger.log("Job id: " + jsonResultTree.get("JobId"));
         logger.log("Status : " + jsonResultTree.get("Status"));
         logger.log("Job tag : " + jsonResultTree.get("JobTag"));
         logger.log("Operation : " + jsonResultTree.get("API"));

         if (jsonResultTree.get("API").asText().equals("StartLabelDetection")) {

            if (jsonResultTree.get("Status").asText().equals("SUCCEEDED")){
               GetResultsLabels(jsonResultTree.get("JobId").asText(), context);
            }
            else{
               String errorMessage = "Video analysis failed for job "
                     + jsonResultTree.get("JobId")
                     + "State " + jsonResultTree.get("Status");
               throw new Exception(errorMessage);
            }

         } else
            logger.log("Operation not StartLabelDetection");

      } catch (Exception e) {
         logger.log("Error: " + e.getMessage());
         throw new RuntimeException (e);


      }

      return message;
   }
```

```
  void GetResultsLabels(String startJobId, Context context) throws Exception {

     LambdaLogger logger = context.getLogger();

     AmazonRekognition rek =
AmazonRekognitionClientBuilder.standard().withRegion(Regions.US_EAST_1).build();

     int maxResults = 1000;
     String paginationToken = null;
     GetLabelDetectionResult labelDetectionResult = null;
     String labels = "";
     Integer labelsCount = 0;
     String label = "";
     String currentLabel = "";

     //Get label detection results and log them.
     do {

        GetLabelDetectionRequest labelDetectionRequest = new
GetLabelDetectionRequest().withJobId(startJobId)

.withSortBy(LabelDetectionSortBy.NAME).withMaxResults(maxResults).withNextToken(pagination

        labelDetectionResult = rek.getLabelDetection(labelDetectionRequest);

        paginationToken = labelDetectionResult.getNextToken();
        VideoMetadata videoMetaData = labelDetectionResult.getVideoMetadata();

        // Add labels to log
        List<LabelDetection> detectedLabels = labelDetectionResult.getLabels();

        for (LabelDetection detectedLabel : detectedLabels) {
           label = detectedLabel.getLabel().getName();
           if (label.equals(currentLabel)) {
              continue;
           }
           labels = labels + label + " / ";
           currentLabel = label;
           labelsCount++;

        }
     } while (labelDetectionResult != null &&
labelDetectionResult.getNextToken() != null);
```

```
        logger.log("Total number of labels : " + labelsCount);
        logger.log("labels : " + labels);

    }


}
```

3. The Rekognition namespaces aren't resolved. To correct this:
   - Pause your mouse over the underlined portion of the line `import com.amazonaws.services.rekognition.AmazonRekognition;`.
   - Choose **Fix project set up...** .
   - Choose the latest version of the Amazon Rekognition archive.
   - Choose **OK** to add the archive to the project.
4. Save the file.
5. Right-click in your Eclipse code window, choose **AWS Lambda**, and then choose **Upload function to AWS Lambda**.
6. On the **Select Target Lambda Function** page, choose the AWS Region to use.
7. Choose **Choose an existing lambda function**, and select the Lambda function that you created in Create the Lambda function.
8. Choose **Next**. The **Function Configuration** dialog box is shown.
9. In **IAM Role** choose the IAM role that you created in Create the Lambda function.
10. Choose **Finish**, and the Lambda function is uploaded to AWS.

Test the Lambda function

Use the following AWS CLI command to test the Lambda function by starting the label detection analysis of a video. After analysis is finished, the Lambda function is triggered. Confirm that the analysis succeeded by checking the CloudWatch Logs logs.

To test the Lambda function

1. Upload an MOV or MPEG-4 format video file to your S3 bucket. For test purposes, upload a video that's no longer than 30 seconds in length.

   For instructions, see Uploading Objects into Amazon S3 in the *Amazon Simple Storage Service User Guide*.

2. Run the following AWS CLI command to start detecting labels in a video.

```
aws rekognition start-label-detection --video
 "S3Object={Bucket="bucketname",Name="videofile"}" \
--notification-channel "SNSTopicArn=TopicARN,RoleArn=RoleARN" \
--region Region
```

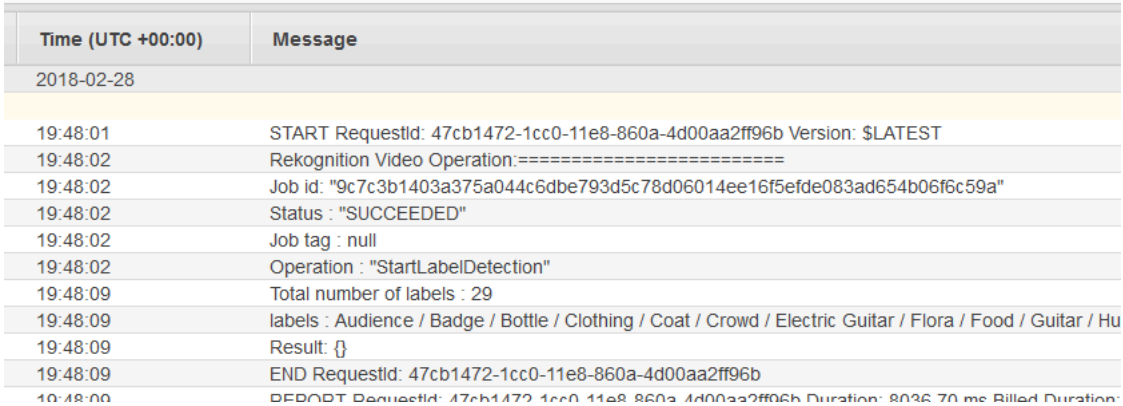
   Update the following values:

   - Change `bucketname` and `videofile` to the Amazon S3 bucket name and file name of the video that you want to detect labels in.
   - Change `TopicARN` to the ARN of the Amazon SNS topic that you created in Create the SNS topic.
   - Change `RoleARN` to the ARN of the IAM role that you created in Create the SNS topic.
   - Change `Region` to the AWS Region that you are using.

3. Note the value of `JobId` in the response. The response looks similar to the following JSON example.

```
{
    "JobId": "547089ce5b9a8a0e7831afa655f42e5d7b5c838553f1a584bf350ennnnnnnnnn"
}
```

4. Open the https://console.aws.amazon.com/cloudwatch/ console.
5. When the analysis completes, a log entry for the Lambda function appears in the **Log Group**.
6. Choose the Lambda function to see the log streams.
7. Choose the latest log stream to see the log entries made by the Lambda function. If the operation succeeded, it looks similar to the following output, which shows the details of video recognition operation, including the job ID, operation type "StartLabelDetection", and a list of detected label categories like Bottle, Clothing, Crowd, and Food:



Time (UTC +00:00)	Message
2018-02-28	
19:48:01	START RequestId: 47cb1472-1cc0-11e8-860a-4d00aa2ff96b Version: $LATEST
19:48:02	Rekognition Video Operation:==========
19:48:02	Job id: "9c7c3b1403a375a044c6dbe793d5c78d06014ee16f5efde083ad654b06f6c59a"
19:48:02	Status : "SUCCEEDED"
19:48:02	Job tag : null
19:48:02	Operation : "StartLabelDetection"
19:48:09	Total number of labels : 29
19:48:09	labels : Audience / Badge / Bottle / Clothing / Coat / Crowd / Electric Guitar / Flora / Food / Guitar / Hu
19:48:09	Result: {}
19:48:09	END RequestId: 47cb1472-1cc0-11e8-860a-4d00aa2ff96b
19:48:09	REPORT RequestId: 47cb1472-1cc0-11e8-860a-4d00aa2ff96b Duration: 8036.70 ms Billed Duration:

The value of **Job id** should match the value of `JobId` that you noted in step 3.

Using Amazon Rekognition for Identity Verification

Amazon Rekognition provides users with several operations that enable the simple creation of identity verification systems. Amazon Rekognition allows the user to detect faces in an image and then compare any detected faces to other faces by comparing face data. This face data is stored in server-side containers called Collections. By making use of Amazon Rekognition's face detection, face comparison, and collection management operations, you can create an application with an identity verification solution.

This tutorial will demonstrate two common workflows for the creation of applications requiring identity verification.

The first workflow involves the registration of a new user in a collection. The second workflow involves searching an existing collection for the purposes of logging in a returning user.

You'll use the AWS SDK for Python for this tutorial. You can also see the AWS Documentation SDK examples GitHub repo for more Python tutorials.

Topics

- Prerequisites
- Creating a Collection
- New User Registration
- Existing User Login

Prerequisites

Before you begin this tutorial, you'll need install Python and complete the steps required to set up the Python AWS SDK. Beyond this, ensure that you have:

- Created an AWS account and an IAM role
- Installed the Python SDK (Boto3)
- Properly configured your AWS access credentials
- Created a Amazon Simple Storage Service bucket and uploaded an image you wish to use as an ID for the purposes of Identity Verification.
- Have selected a second image to to serve as the target image for identity verification.

Creating a Collection

Before you can register a new user in a Collection or search a Collection for a user, you have to have a Collection to work with. An Amazon Rekognition Collection is a server-side container used to store information about detected faces.

Create the Collection

You'll start by writing a function that creates a Collection for use by your application. Amazon Rekognition stores information about faces that have been detected in server-side containers called Collections. You can search facial information stored in a Collection for known faces. To store facial information, you first need to create a Collection using the `CreateCollection` operation.

1. Select a name for the Collection that you would like to create. In the following code, replace the value of `collection_id` with the name of the Collection you'd like to create, and replace the value of `region` with the name of the region defined in your user credentials. You can use the `Tags` argument to apply any tags you would like to the collection, although this isn't required. The `CreateCollection` operation will return information about the collection you have created, including the Arn of the collection. Make a note of the Arn that you receive as a result of running the code.

```
import boto3

def create_collection(collection_id, region):
    client = boto3.client('rekognition', region_name=region)
```

```
    # Create a collection
    print('Creating collection:' + collection_id)
    response = client.create_collection(CollectionId=collection_id,
    Tags={"SampleKey1":"SampleValue1"})
    print('Collection ARN: ' + response['CollectionArn'])
    print('Status code: ' + str(response['StatusCode']))
    print('Done...')

collection_id = 'collection-id-name'
region = "region-name"
create_collection(collection_id, region)
```

2. Save and run the code. Copy down the collection Arn.

   Now that the Rekognition Collection has been created, you can store facial information and identifiers in that Collection. You will also be able to compare faces against the stored information for verification.

New User Registration

You'll want to be able to register new users and add their info to a Collection. The process of registering a new user typically involves the following steps:

Call the `DetectFaces` Operation

Write the code to check the quality of the face image via the `DetectFaces` operation. You'll use the `DetectFaces` operation to determine if an image captured by the camera is suitable for processing by the `SearchFacesByImage` operation. The image should contain only one face. You'll provide a local input image file to the `DetectFaces` operation and receive details for the faces detected in the image. The following sample code provides the input image to `DetectFaces` and then checks to see if only one face has been detected in the image.

1. In the following code example, replace `photo` with the name of the target image in which you'd like to detect faces. You'll also need to replace the value of `region` with the name of the region associated with your account.

   ```
   import boto3
   import json
   ```

```
def detect_faces(target_file, region):

    client=boto3.client('rekognition', region_name=region)

    imageTarget = open(target_file, 'rb')

    response = client.detect_faces(Image={'Bytes': imageTarget.read()},
    Attributes=['ALL'])

    print('Detected faces for ' + photo)
    for faceDetail in response['FaceDetails']:
        print('The detected face is between ' + str(faceDetail['AgeRange']['Low'])
              + ' and ' + str(faceDetail['AgeRange']['High']) + ' years old')

        print('Here are the other attributes:')
        print(json.dumps(faceDetail, indent=4, sort_keys=True))

        # Access predictions for individual face details and print them
        print("Gender: " + str(faceDetail['Gender']))
        print("Smile: " + str(faceDetail['Smile']))
        print("Eyeglasses: " + str(faceDetail['Eyeglasses']))
        print("Emotions: " + str(faceDetail['Emotions'][0]))

    return len(response['FaceDetails'])

photo = 'photo-name'
region = 'region-name'
face_count=detect_faces(photo, region)
print("Faces detected: " + str(face_count))

if face_count == 1:
    print("Image suitable for use in collection.")
else:
    print("Please submit an image with only one face.")
```

2. Save and run the proceeding code.

Call the `CompareFaces` Operation

Your application will need to be able to register new users in a Collection and confirm the identity of returning users. You will create the functions used to register a new user first. You'll start by using the `CompareFaces` operation to compare a local input/target image of the user and a

ID/stored image. If there is a match between the face detected in both images, you can search through the Collection to see if the user has been registered in it.

Start by writing a function that compares an input image to the ID image you have stored in your Amazon S3 bucket. In the following code example, you will need to provide the input image yourself, which should be captured after using some form of liveness detector. You will also need to pass the name of an image stored in your Amazon S3 bucket.

1. Replace the value of `bucket` with the name of the Amazon S3 bucket containing your source file. You will also need to replace the value of `source_file` with the name of the source image you are using. Replace the value of `target_file` with the name of the target file you have provided. Replace the value of `region` with the name of the `region` defined in your user credentials.

   You will also want to specify a minimum confidence level in the match that is returned in the response, using the `similarityThreshold` argument. Detected faces will only be returned in the `FaceMatches` array if the confidence is above this threshold. Your chosen `similarityThreshold` should reflect the nature of your specific use case. Any use case involving critical security applications should use 99 as the selected threshold.

```
import boto3

def compare_faces(bucket, sourceFile, targetFile, region):
    client = boto3.client('rekognition', region_name=region)

    imageTarget = open(targetFile, 'rb')

    response = client.compare_faces(SimilarityThreshold=99,
                                    SourceImage={'S3Object':
{'Bucket':bucket,'Name':sourceFile}},
                                    TargetImage={'Bytes': imageTarget.read()})

    for faceMatch in response['FaceMatches']:
        position = faceMatch['Face']['BoundingBox']
        similarity = str(faceMatch['Similarity'])
        print('The face at ' +
              str(position['Left']) + ' ' +
              str(position['Top']) +
              ' matches with ' + similarity + '% confidence')

    imageTarget.close()
```

```
    return len(response['FaceMatches'])

bucket = 'bucket-name'
source_file = 'source-file-name'
target_file = 'target-file-name'
region = "region-name"
face_matches = compare_faces(bucket, source_file, target_file, region)
print("Face matches: " + str(face_matches))

if str(face_matches) == "1":
    print("Face match found.")
else:
    print("No face match found.")
```

2. Save and run the proceeding code.

   You will be returned a response object containing information about the matched face and the confidence level.

Call the `SearchFacesByImage` Operation

If the confidence level of the `CompareFaces` operation is above your chosen `SimilarityThreshold`, you'll want to search your Collection for a face that might match the input image. If a match is found in your collection, that means the user is likely already registered in the Collection and there isn't a need to register a new user in your Collection. If there isn't a match, you can register the new user in your Collection.

1. Start by writing the code that will invoke the `SearchFacesByImage` operation. The operation will take in a local image file as an argument and then search your `Collection` for a face that matches the largest detected faces in the provided image.

   In the following code example, change the value of `collectionId` to the Collection that you want to search. Replace the value of `region` with the name of the region associated with your account. You'll also need to replace the value of `photo` with the name of the your input file. You will also want to specify a similarity threshold by replacing the value of `threshold` with a chosen percentile.

```
import boto3

collectionId = 'collection-id-name'
```

```
region = "region-name"
photo = 'photo-name'
threshold = 99
maxFaces = 1
client = boto3.client('rekognition', region_name=region)

# input image should be local file here, not s3 file
with open(photo, 'rb') as image:
    response = client.search_faces_by_image(CollectionId=collectionId,
    Image={'Bytes': image.read()},
    FaceMatchThreshold=threshold, MaxFaces=maxFaces)

faceMatches = response['FaceMatches']
print(faceMatches)

for match in faceMatches:
    print('FaceId:' + match['Face']['FaceId'])
    print('ImageId:' + match['Face']['ImageId'])
    print('Similarity: ' + "{:.2f}".format(match['Similarity']) + "%")
    print('Confidence: ' + str(match['Face']['Confidence']))
```

2. Save and run the proceeding code. If there's been a match, it means the person recognized in the image is already part of the Collection and there's no need to go on to the next steps. In this case, you can just allow the user access to the application.

Call the IndexFaces Operation

Assuming that no match was found in the Collection you searched, you will want to add the face of the user to your collection. You do this by calling the `IndexFaces` operation. When you call IndexFaces, Amazon Rekognition extracts the facial features of a face identified in your input image, storing the data in the specified collection.

1. Begin by writing the code to call `IndexFaces`. Replace the value of `image` with the name of the local file you want to use as an input image for the IndexFaces operation. You will also need to replace the value of `photo_name` with the desired name for your input image. Be sure to replace the value of `collection_id` with the ID of the collection you previously created. Next, replace the value of `region` with the name of the region associated with your account. You will also want to specify a value for the `MaxFaces` input parameter, which defines the maximum number of faces in an image that should be indexed. The default value for this parameter is 1.

```
import boto3

def add_faces_to_collection(target_file, photo, collection_id, region):
    client = boto3.client('rekognition', region_name=region)

    imageTarget = open(target_file, 'rb')

    response = client.index_faces(CollectionId=collection_id,
                                  Image={'Bytes': imageTarget.read()},
                                  ExternalImageId=photo,
                                  MaxFaces=1,
                                  QualityFilter="AUTO",
                                  DetectionAttributes=['ALL'])
    print(response)

    print('Results for ' + photo)
    print('Faces indexed:')
    for faceRecord in response['FaceRecords']:
        print('  Face ID: ' + faceRecord['Face']['FaceId'])
        print('  Location: {}'.format(faceRecord['Face']['BoundingBox']))
        print('  Image ID: {}'.format(faceRecord['Face']['ImageId']))
        print('  External Image ID: {}'.format(faceRecord['Face']
['ExternalImageId']))
        print('  Confidence: {}'.format(faceRecord['Face']['Confidence']))

    print('Faces not indexed:')
    for unindexedFace in response['UnindexedFaces']:
        print(' Location: {}'.format(unindexedFace['FaceDetail']['BoundingBox']))
        print(' Reasons:')
        for reason in unindexedFace['Reasons']:
            print('   ' + reason)
    return len(response['FaceRecords'])

image = 'image-file-name'
collection_id = 'collection-id-name'
photo_name = 'desired-image-name'
region = "region-name"

indexed_faces_count = add_faces_to_collection(image, photo_name, collection_id,
 region)
print("Faces indexed count: " + str(indexed_faces_count))
```

2. Save and run the proceeding code. Determine if you would like to save any of the data returned by the `IndexFaces` operation, such as the FaceID assigned to the person in the image. The next section will examine how to save this data. Copy down the returned `FaceId`, `ImageId`, and `Confidence` values before proceeding.

Store Image and FaceID Data in Amazon S3 and Amazon DynamoDB

Once the Face ID for the input image has been obtained, the image data can be saved in Amazon S3, while the face data and image URL can be entered into a database like DynamoDB.

1. Write the code to upload the input image to your Amazon S3 database. In the code sample that follows, replace the value of `bucket` with the name of the bucket to which you'd like to upload the file, then replace the value of `file_name` with the name of the local file you want to store in your Amazon S3 bucket. Provide a key name that will identify the file in the Amazon S3 bucket by replacing the value of `key_name` with a name you'd like to give the image file. The file you want to upload is the same one that was defined in earlier code samples, which is the input file you used for IndexFaces. Finally, replace the value of `region` with the name of the region associated with your account.

```
import boto3
import logging
from botocore.exceptions import ClientError

# store local file in S3 bucket
bucket = "amzn-s3-demo-bucket"
file_name = "file-name"
key_name = "key-name"
region = "region-name"
s3 = boto3.client('s3', region_name=region)
# Upload the file
try:
    response = s3.upload_file(file_name, bucket, key_name)
    print("File upload successful!")
except ClientError as e:
    logging.error(e)
```

2. Save and run the proceeding code sample to upload your input image to Amazon Amazon S3.
3. You'll want to save the returned Face ID to a database as well. This can be done by creating a DynamoDB database table and then uploading the Face ID to that table. The following code

sample creates a DynamoDB table. Note that you only need to run the code that creates this table once. In the following code, replace the value of `region` with the value of the region associated with your account. You will also need to replace the value of `database_name` with the name that you'd like to give the DynamoDB table.

```
import boto3

# Create DynamoDB database with image URL and face data, face ID

def create_dynamodb_table(table_name, region):
    dynamodb = boto3.client("dynamodb", region_name=region)

    table = dynamodb.create_table(
        TableName=table_name,
        KeySchema=[{
                'AttributeName': 'FaceID', 'KeyType': 'HASH'  # Partition key
                },],
            AttributeDefinitions=[
            {
                'AttributeName': 'FaceID', 'AttributeType': 'S'  }, ],
                ProvisionedThroughput={
            'ReadCapacityUnits': 10, 'WriteCapacityUnits': 10  }
    )
    print(table)
    return table

region = "region-name"
database_name = 'database-name'
dynamodb_table = create_dynamodb_table(database_name, region)
print("Table status:", dynamodb_table)
```

4. Save and run the proceeding code to create your table.
5. After creating the table, you can upload the returned FaceId to it. To do this, you'll establish a connection to the table with the Table function and then use the `put_item` function to upload the data.

   In the following code sample, replace the value of `bucket` with the name of the bucket containing the input image you uploaded to Amazon S3. You'll also need to replace the value of `file_name` with the name of the input file you uploaded to your Amazon S3 bucket and the value of `key_name` with the key that you previously used to identify the input file. Finally,

replace the value of `region` with the name of the region associated with your account. These values should match the ones provided in step 1.

The `AddDBEntry` stores the FaceId, ImageId, and Confidence values assigned to a face in a collection. Provide the function below with the values that you saved during Step 2 of the proceeding `IndexFaces` section.

```
import boto3
from pprint import pprint
from decimal import Decimal
import json

# The local file that was stored in S3 bucket
bucket = "amzn-s3-demo-bucket"
file_name = "file-name"
key_name = "key-name"
region = "region-name"
# Get URL of file
file_url = "https://s3.amazonaws.com/{}/{}".format(bucket, key_name)
print(file_url)

# upload face-id, face info, and image url
def AddDBEntry(file_name, file_url, face_id, image_id, confidence):
    dynamodb = boto3.resource('dynamodb', region_name=region)
    table = dynamodb.Table('FacesDB-4')
    response = table.put_item(
       Item={
            'ExternalImageID': file_name,
            'ImageURL': file_url,
            'FaceID': face_id,
            'ImageID': image_id,
            'Confidence': json.loads(json.dumps(confidence), parse_float=Decimal)
       }
    )
    return response

# Mock values for face ID, image ID, and confidence - replace them with actual
 values from your collection results
dynamodb_resp = AddDBEntry(file_name, file_url, "FACE-ID-HERE",
    "IMAGE-ID-HERE", confidence-here)
print("Database entry successful.")
pprint(dynamodb_resp, sort_dicts=False)
```

6. Save and run the proceeding code sample to store the returned Face ID data in a table.

Existing User Login

After a user has been registered in a Collection, they can be authenticated upon their return by using the `SearchFacesByImage` operation. You will need to get an input image and then check the quality of the input image using `DetectFaces`. This determines if a suitable image has been used before running the `SearchFacesbyImage` operation.

Call the DetectFaces Operation

1. You'll use the `DetectFaces` operation to check the quality of the face image and determine if an image captured by the camera is suitable for processing by the `SearchFacesByImage` operation. The input image should contain just one face. The following code sample takes an input image and provides it to the `DetectFaces` operation.

   In the following code example, replace the value of `photo` with the name of the local target image and replace the value of `region` with the name of the region associated with your account.

```
import boto3
import json

def detect_faces(target_file, region):

    client=boto3.client('rekognition', region_name=region)

    imageTarget = open(target_file, 'rb')

    response = client.detect_faces(Image={'Bytes': imageTarget.read()},
    Attributes=['ALL'])

    print('Detected faces for ' + photo)
    for faceDetail in response['FaceDetails']:
        print('The detected face is between ' + str(faceDetail['AgeRange']['Low'])
              + ' and ' + str(faceDetail['AgeRange']['High']) + ' years old')

        print('Here are the other attributes:')
        print(json.dumps(faceDetail, indent=4, sort_keys=True))

        # Access predictions for individual face details and print them
```

```
        print("Gender: " + str(faceDetail['Gender']))
        print("Smile: " + str(faceDetail['Smile']))
        print("Eyeglasses: " + str(faceDetail['Eyeglasses']))
        print("Emotions: " + str(faceDetail['Emotions'][0]))

    return len(response['FaceDetails'])

photo = 'photo-name'
region = 'region-name'
face_count=detect_faces(photo, region)
print("Faces detected: " + str(face_count))

if face_count == 1:
    print("Image suitable for use in collection.")
else:
    print("Please submit an image with only one face.")
```

2. Save and run the code.

Call the SearchFacesByImage Operation

1. Write the code to compare the detected face against the faces in the Collection with the `SearchFacesByImage`. You'll use the code shown in the proceeding New User Registration section and provide the input image to the `SearchFacesByImage` operation.

   In the following code example, change the value of `collectionId` to the collection that you want to search. You will also change the value of `bucket` to the name of an Amazon S3 bucket and the value of `fileName` to an image file in that bucket. Replace the value of `region` with the name of the region associated with your account. You will also want to specify a similarity threshold by replacing the value of `threshold` with a chosen percentile.

```
import boto3

bucket = 'amzn-s3-demo-bucket'
collectionId = 'collection-id-name'
region = "region-name"
fileName = 'file-name'
threshold = 70
maxFaces = 1
client = boto3.client('rekognition', region_name=region)
```

```
# input image should be local file here, not s3 file
with open(fileName, 'rb') as image:
    response = client.search_faces_by_image(CollectionId=collectionId,
    Image={'Bytes': image.read()},
    FaceMatchThreshold=threshold, MaxFaces=maxFaces)
```

2. Save and run the code.

Check for the Returned FaceID and Confidence Level

You can now check for information on the matched FaceId by printing out response elements like the FaceId, Similarity, and Confidence attributes.

```
faceMatches = response['FaceMatches']
print(faceMatches)

for match in faceMatches:
    print('FaceId:' + match['Face']['FaceId'])
    print('ImageId:' + match['Face']['ImageId'])
    print('Similarity: ' + "{:.2f}".format(match['Similarity']) + "%")
    print('Confidence: ' + str(match['Face']['Confidence']))
```

Using Amazon Rekognition (REK) to detect labels for marketing applications

This tutorial guides you through building a sample Python application that could be used to send emails to people, based on on images uploaded to a website. The sample application is designed to engage users in a social media marketing campaign by sending them personalized emails about travel deals if landmarks are recognized in their photos.

The solution integrates various AWS services, including Amazon Rekognition, Amazon S3, DynamoDB, CloudWatch, and Amazon SES. The application uses Amazon Rekognition to detect labels in images uploaded by accounts recognized in a DynamoDB database, and then the account holder is sent a marketing email based on the labels detected in the image. The full solution architecture is as follows:

- Store user data in DynamoDB database.
- User uploads image data and metadata (user account number) to Amazon S3.

- A Lambda function invokes DetectLabels to identify and record the labels in the uploaded image, look up the user email in DynamoDB, and send a marketing email to the user who uploaded the image.
- Results of Lambda function are logged in CloudWatch for later review.

Here is an overview of all the steps in the tutorial:

1. Create and populate a DynamoDB table.
2. Write a Lambda function with Logging and Notification.
3. Set up the Lambda function and permissions.
4. Upload images and metadata with Amazon S3.
5. Poll CloudWatch logs.

Topics

- Prerequisites
- Creating and populating a DynamoDB table
- Creating a Lambda Function with Logging and Notification
- Setting up permissions and the Lambda function
- Uploading Images to Amazon S3 with Metadata
- Polling CloudWatch Logs from the Client

Prerequisites

Before you begin this tutorial, you will need:

- An AWS account and appropriate IAM permissions.
- Python and Boto3 installed on your development environment.
- Basic understanding of Lambda, Amazon S3, DynamoDB, Amazon SES, and CloudWatch.
- Basic familiarity with Lambda and Amazon SES.

Creating and populating a DynamoDB table

To begin this tutorial, we'll create a DynamoDB table to store customer data such as: email address, age, phone number, and membership status, using an "AccountNumber" variable as the primary key. We'll also insert some sample data into the table.

Creating the DynamoDB table

First, we'll create the DynamoDB table. Here's how to set it up using Python and Boto3. We create a function called `create_user_table` and connect to the DynamoDB resource within it. In the code sample below, replace the value of "region_name" with the name of the region your account operates in, then run the code cell to create your table.

```
import boto3
def create_user_table(dynamodb=None):
    if not dynamodb:
        dynamodb = boto3.resource('dynamodb', region_name='us-east-1')

    table = dynamodb.create_table(
        TableName='CustomerDataTable',
        KeySchema=[
            {
                'AttributeName': 'AccountNumber',
                'KeyType': 'HASH'  # Partition key
            },
        ],
        AttributeDefinitions=[
            {
                'AttributeName': 'AccountNumber',
                'AttributeType': 'S'
            },
        ],
        ProvisionedThroughput={
            'ReadCapacityUnits': 10,
            'WriteCapacityUnits': 10
        }
    )

    # Wait until the table exists.
    table.wait_until_exists()
    print("Table status:", table.table_status)
```

```
# Create the DynamoDB table.
create_user_table()
```

Running this script has set up a DynamoDB table named `CustomerDataTable` with `AccountNumber` as the primary key.

Inserting sample data

Now we'll want to insert some sample data into the table. This sample data will help us test the complete functionality of the application.

We'll create a second function that adds sample data to the same `CustomerDataTable` we created previously. Three sample entries are created by the code below, and each entry includes an account number, email address, age, phone number, and membership status. In the code sample below, replace the value of `region_name` with the name of the region your account operates in, then run the code cell to create your table. If you would like to test the email delivery portion of the app, replace the value of `EmailAddress` in the first customer entry below with an email address you can receive email at. Save and run the code.

```
import boto3

def insert_sample_data(dynamodb=None):
    if not dynamodb:
        dynamodb = boto3.resource('dynamodb', region_name='us-east-1')

    table = dynamodb.Table('CustomerDataTable')

    # Sample data
    customers = [
        {
            'AccountNumber': 'ACC1000',
            'EmailAddress': 'email-for-delivery-here',
            'Age': 30,
            'PhoneNumber': '123-456-7890',
            'MembershipStatus': 'Active'
        },
        {
            'AccountNumber': 'ACC1001',
```

```
            'EmailAddress': 'jane.doe@example.com',
            'Age': 25,
            'PhoneNumber': '098-765-4321',
            'MembershipStatus': 'Inactive'
        },
        {
            'AccountNumber': 'ACC1002',
            'EmailAddress': 'pat.candella@example.com',
            'Age': 35,
            'PhoneNumber': '555-555-5555',
            'MembershipStatus': 'Active'
        }
    ]
        # Inserting data
    for customer in customers:
            print(f"Adding customer: {customer['AccountNumber']}")
            table.put_item(Item=customer)

# Insert sample data into DynamoDB
insert_sample_data()
```

With the DynamoDB table set up and populated, we can now proceed to integrate this data retrieval into the Lambda function. This lets our application retrieve user details based on the account number that will be identified in the upcoming image processing workflow.

Creating a Lambda Function with Logging and Notification

Now, we can create an Lambda function. We want to ensure that the Lambda function, which is triggered on image upload, can read both the image data and account metadata and use it to perform a lookup in the DynamoDB table for the associated user data. This means that not only will we need to invoke Amazon Rekognition's DetectLabels function, we also need a function that takes in the AccountNumber and uses it to retrieve the associated email address from DynamoDB. Additionally, we need a function that sends an email to the email address using Amazon SES. Finally, we use a logger to log info about the process. This data will be displayed by CloudWatch.

Creating the Lambda function

Here's an outline of how a Lambda function might handle these requirements. In the following code sample, ensure that the correct DynamoDB table is specified, if you have used something other than CustomerDataTable as the name of your table. Additionally, in the

"send_marketing_email" function, you should replace the value of the "Source" argument with an email address you have access to that will function as the sending email.

```
import json
import boto3
import logging

logger = logging.getLogger()
logger.setLevel(logging.INFO)

def lambda_handler(event, context):
    s3_bucket = event['Records'][0]['s3']['bucket']['name']
    s3_object_key = event['Records'][0]['s3']['object']['key']
    print(s3_bucket)
    print(s3_object_key)

    s3 = boto3.client('s3')
    try:
        s3_response = s3.head_object(Bucket=s3_bucket, Key=s3_object_key)
        account_number = s3_response['Metadata']['account_number']
    except Exception as e:
        logger.error(f"Failed to retrieve object or metadata: {str(e)}")
        raise e  # Optionally re-raise to handle the error upstream or signal a failure

    rekognition = boto3.client('rekognition')
    try:
        labels_response = rekognition.detect_labels(Image={'S3Object': {'Bucket':
 s3_bucket, 'Name': s3_object_key}})
        #logger.info(f"Detected labels: {json.dumps(labels_response['Labels'],
 indent=4)}")
    except Exception as e:
        #logger.info(f"Detected label: {label['Name']}")
        raise e

    #logger.info(f"Detected labels: {json.dumps(labels_response['Labels'], indent=4)}")

    landmark_detected = any(label['Name'] == 'Landmark' and label['Confidence'] > 20
 for label in labels_response['Labels'])
    if landmark_detected:
        result = notify_user_based_on_landmark(account_number)
        print(result)
        #logger.info(f"Detected label: {label['Name']}")
        #logger.info(f"Notification sent: {result}")
```

```
    return {
        'statusCode': 200,
        'body': json.dumps('Process completed successfully!')
    }

def notify_user_based_on_landmark(account_number):
     # Retrieve user data from DynamoDB
    dynamodb = boto3.resource('dynamodb')
    table = dynamodb.Table('CustomerDataTable')
    user_info = table.get_item(Key={'AccountNumber': account_number})

    # Send email if user is found
    if 'Item' in user_info:
        send_marketing_email(user_info['Item']['EmailAddress'])
    return "User notified with relevant travel information."

def send_marketing_email(email):
    ses = boto3.client('ses')
    response = ses.send_email(
        Source='your-email@example.com',
        Destination={'ToAddresses': [email]},
        Message={
            'Subject': {'Data': 'Explore New Destinations!'},
            'Body': {
                'Text': {'Data': 'Check out our exclusive travel packages inspired by
 the landmark in your uploaded image!'}
            }
        }
    )
    return f"Email sent to {email} with status {response['ResponseMetadata']
['HTTPStatusCode']}"
    print("succeess")
```

Now that we have written the Lambda function, we need to configure permissions for Lambda and create an instance of our Lambda function in the AWS Management Console.

Setting up permissions and the Lambda function

Create or Update IAM Role

Before we can use a Lambda function to handle any images uploaded by users, we must handle the permissions for it. The Lambda function needs an IAM role scoped to it that has policies

which allow it to interact with Amazon S3, DynamoDB, Amazon SES, Amazon Rekognition, and CloudWatch.

To configure your IAM role for the Lambda function:

1. Open AWS Management Console.
2. Go to IAM > Roles > Create role.

   Choose "Create role".
3. Select Lambda as the service that will use this role. Click "Next".
4. Attach the following policies (Note that these policies are selected solely for demonstration purposes, in a real production setting you would want to limit the permissions to only those that are needed.):

   - AmazonS3ReadOnlyAccess
   - AmazonRekognitionReadOnlyAccess
   - AmazonDynamoDBFullAccess
   - AmazonSESFullAccess
   - AWSLambdaExecute
   - AWSLambdaBasicExecutionRole (for CloudWatch logging)

   Click "Next".
5. Name the role and a description, then create the role by choosing "Create role".
6. Once we have configured the proper permissions for Lambda, we can create an instance of the Lambda function using the AWS Management Console.

   Go to the Lambda service in the AWS Management Console.
7. Click "Create function." Choose "Author from scratch."
8. Enter a function name and select the Python runtime. Under "Change default execution role", select "Use an existing role" and then choose the IAM role you created earlier.
9. Now you have to create and update the code in the lambda function tab. Go the the tab called "lambda_function", and replace the code there with the proceeding Lambda code sample.

   Save the changes and deploy the changes.
10. Now you have to configure an Amazon S3 Event as the Lambda Trigger.

On your Lambda function's configuration tab/page, go to Trigger, click on "Add trigger."

11. Select Amazon S3 from the list of available triggers.
12. To configure the trigger: Select the bucket from which the function should be triggered.

    Choose the event type, PUT. Optionally, you can specify a prefix or suffix if you only want to process files with certain names or types.
13. Activate the trigger by clicking "Add" and save the configuration.

Verifying Amazon SES Email Addresses

Before you can use Amazon SES to sent emails, you need to verify the email addresses of both the sender and recipient. To do this:

1. Go to the Amazon SES console. Navigate to "Identity Management", then to "Email Addresses".
2. Click on "Verify a New Email Address". Enter the email address you want to verify, and click "Verify This Email Address". You will receive an email with a verification link. Click the link to complete the verification process.
3. After you have verified the email addresses for both accounts, have set up your Lambda function with the correct permissions, and created some sample customer data, you can test the Lambda function by uploading a test image to your chosen Amazon S3 bucket.

Uploading Images to Amazon S3 with Metadata

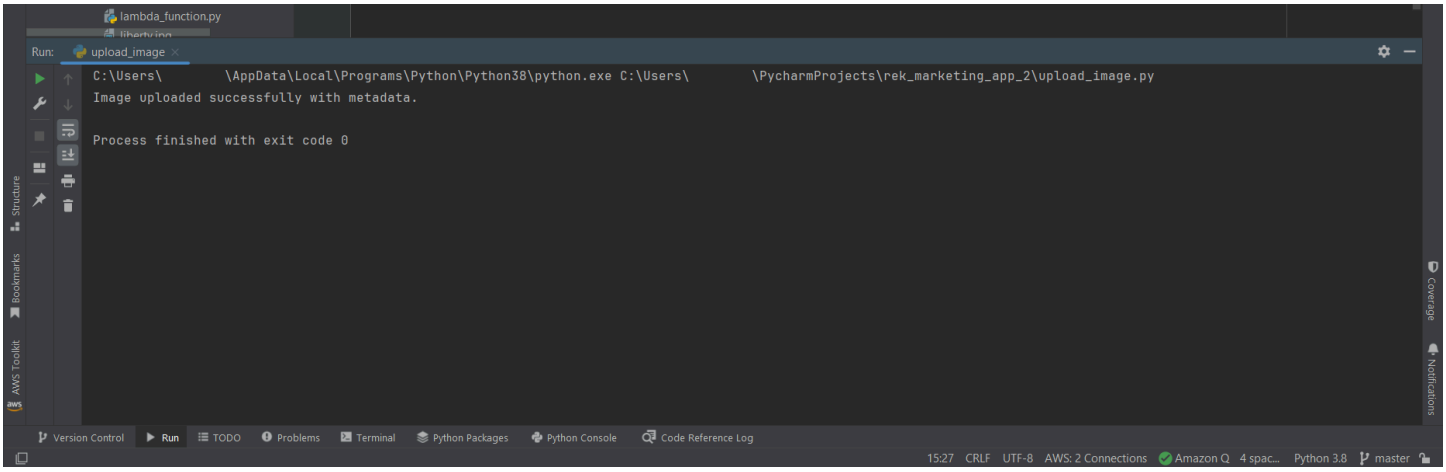
Now we can upload a test image to our chosen Amazon S3 bucket using the AWS Console or the script we prepared earlier. Write a script that uploads an image to the Amazon S3 bucket you previously specified in your Lambda function. In the code sample below, specify the path of your image as the first argument to "upload_image_to_s3", the bucket name as the second argument, and the account number of the user uploading the image as the final argument.

```
import boto3
def upload_image_to_s3(file_name, bucket, account_number):
    s3 = boto3.client('s3')
    try:
        with open(file_name, 'rb') as data:
            s3.upload_fileobj(
                Fileobj=data,
```

```
                Bucket=bucket,
                Key=file_name,
                ExtraArgs={
                    'Metadata': {'account_number': account_number}
                }
            )
        print("Image uploaded successfully with metadata.")
    except Exception as e:
        print("Failed to upload image")
        print(e)

# Usage
upload_image_to_s3('path-to-image-here', 's3-bucket-name-here', 'user-account-number-
here')
```

In this function, the `ExtraArgs` parameter in the `upload_fileobj` method is used to include user-defined metadata (`account_number`) along with the image. This metadata can later be used by AWS to process the image accordingly.

Save and run the script. This will upload the image.



A few minutes after uploading the image, you should receive an email at the address you previously associated with the account specified here.

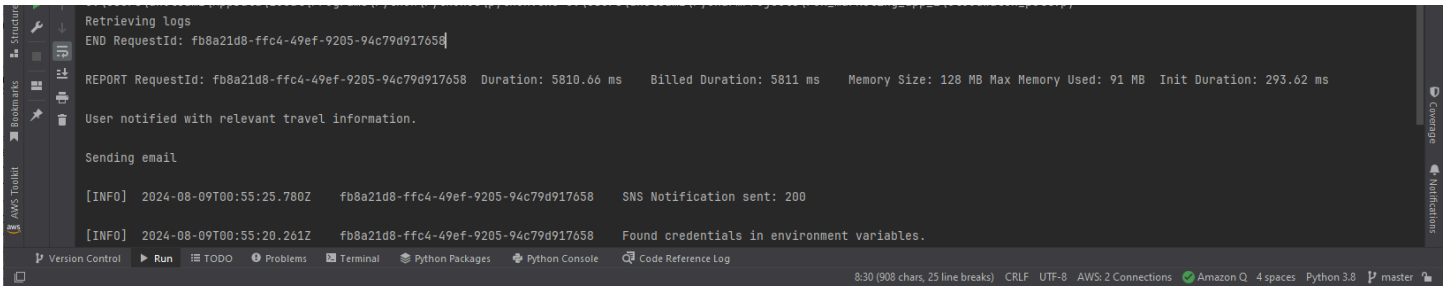
Polling CloudWatch Logs from the Client

Check the CloudWatch logs for your Lambda function to see if it was triggered and executed as expected. Logs can be found under CloudWatch > Logs > Log groups > /AWS/lambda/your_function_name. You can also write a script to access and print the logs. The following code

sample polls the Lambda group for logs, printing out the logs that were generated in the last hour. Save and run the code.

```
import boto3
import time

def fetch_lambda_logs(log_group_name, start_time):
    client = boto3.client('logs')
    query = "fields @timestamp, @message | sort @timestamp desc | limit 20"
    start_query_response = client.start_query(
        logGroupName=log_group_name,
        startTime=int(start_time),
        endTime=int(time.time()),
        queryString=query,
    )
    query_id = start_query_response['queryId']
    response = None
    while response is None or response['status'] == 'Running':
        time.sleep(1)  # Wait for 1 second before checking the query status again
        response = client.get_query_results(queryId=query_id)
    return response['results']

# Usage
log_group = '/aws/lambda/RekMediaFunction'
logs = fetch_lambda_logs(log_group, int(time.time()) - 3600)  # Fetch logs from the
 last hour
print("Retrieving logs")
for log in logs:
    #print(log)
    print(log[1]['value'])
```

Running the code should print out the logs and you should be able to see that the user was notified via an email containing the relevant travel information.



You have successfully created an application capable of detecting labels in images uploaded to an Amazon S3 bucket and then emailing the user who uploaded the image with a promotional message. Be sure to delete any resources you no longer need so you aren't charged for them.

Detecting Labels in an Image Using Lambda and Python

AWS Lambda is a compute service that you can use to run code without provisioning or managing servers. You can call Rekognition API operations from within an Lambda function. The following instructions show how to create a Lambda function in Python that calls `DetectLabels`.

The Lambda function calls `DetectLabels` and it returns an array of labels detected in the image, as well as the level of confidence by which they were detected.

The instructions include sample Python code which shows you how to call the Lambda function and supply it with an image sourced from an Amazon S3 bucket or your local computer.

Make sure your chosen images meet Rekognition's limits. See Guidelines and quotas in Rekognition and the DetectLabels API Reference for information on image file type and size limits.

Create an Lambda function (console)

In this step, you create an empty Lambda function and an IAM execution role that lets your Lambda function call the `DetectLabels` operation. In later steps, you add the source code and optionally add a layer to the Lambda function.

If you are using documents stored in an Amazon S3 bucket, this step also demonstrates how to grant access to the bucket that stores your documents.

To create an AWS Lambda function (console)

1. Sign in to the AWS Management Console and open the AWS Lambda console at https://console.aws.amazon.com/lambda/.
2. Choose **Create function**. For more information, see Create a Lambda Function with the Console.
3. Choose the following options:

   - Choose **Author from scratch**.
   - Enter a value for **Function name**.
   - For **Runtime**, choose the most recent version of Python.

- For **Architecture**, choose **x86_64**.

4. Choose **Create function** to create the AWS Lambda function.
5. On the function page, choose the **Configuration** tab.
6. On the **Permissions** pane, under **Execution role**, choose the role name to open the role in the IAM console.
7. In the **Permissions** tab, choose **Add permissions** and then **Create inline policy**.
8. Choose the **JSON** tab and replace the policy with the following policy:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": "rekognition:DetectLabels",
            "Resource": "*",
            "Effect": "Allow",
            "Sid": "DetectLabels"
        }
    ]
}
```

9. Choose **Review policy**.
10. Enter a name for the policy, for example *DetectLabels-access*.
11. Choose **Create policy**.
12. If you are storing documents for analysis in an Amazon S3 bucket, you must add an Amazon S3 access policy. To do this, repeat steps 7 to 11 in the AWS Lambda console and make the following changes.

    a. For step 8, use the following policy. Replace *bucket/folder path* with the Amazon S3 bucket and folder path to the documents that you want to analyze.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "S3Access",
            "Effect": "Allow",
            "Action": "s3:GetObject",
            "Resource": "arn:aws:s3:::bucket/folder path/*"
        }
```

```
    ]
}
```

b. For step 10, choose a different policy name, such as *S3Bucket-access*.

(Optional) Create a layer (console)

You don't need to perform this step to use a Lambda function and call `DetectLabels`.

The `DetectLabels` operation is included in the default Lambda Python environment as part of AWS SDK for Python (Boto3).

If other parts of your Lambda function require recent AWS service updates that aren't in the default Lambda Python environment, then you can perform this step to add the most recent Boto3 SDK release as a layer to your function.

To add the SDK as a layer, you first create a zip file archive that contains the Boto3 SDK. Then, you create a layer and add the zip file archive to the layer. For more information, see Using layers with your Lambda function.

To create and add a layer (console)

1. Open a command prompt and enter the following commands to create a deployment package with the most recent version of the AWS SDK.

   ```
   pip install boto3 --target python/.
   zip boto3-layer.zip -r python/
   ```

2. Note the name of the zip file (boto3-layer.zip), which you use in step 8 of this procedure.
3. Open the AWS Lambda console at https://console.aws.amazon.com/lambda/.
4. In the navigation pane, choose **Layers**.
5. Choose **Create layer**.
6. Enter values for **Name** and **Description**.
7. For **Code entry type**, choose **Upload a .zip file** and select **Upload**.
8. In the dialog box, choose the zip file archive (boto3-layer.zip) that you created in step 1 of this procedure.
9. For **Compatible runtimes**, choose the most recent version of Python.

10. Choose **Create** to create the layer.
11. Choose the navigation pane menu icon.
12. In the navigation pane, choose **Functions**.
13. In the resources list, choose the function that you created previously in ???.
14. Choose the **Code** tab.
15. In the **Layers** section, choose **Add a layer**.
16. Choose **Custom layers**.
17. In **Custom layers**, choose the layer name that you entered in step 6.
18. In **Version** choose the layer version, which should be 1.
19. Choose **Add**.

Add Python code (console)

In this step, you add your Python code to your Lambda function through the Lambda console code editor. The code detects labels in a image using the `DetectLabels` operation. It returns an array of labels detected in the image, as well as the level of confidence in the labels detected.

The document you provide to the `DetectLabels` operation can be located in an Amazon S3 bucket or a local computer.

To add Python code (console)

1. Navigate to the **Code** tab.
2. In the code editor, replace the code in **lambda_function.py** with the following code:

```
import boto3
import logging
from botocore.exceptions import ClientError
import json
import base64

# Instantiate logger
logger = logging.getLogger(__name__)

# connect to the Rekognition client
rekognition = boto3.client('rekognition')

def lambda_handler(event, context):
```

```
    try:
        image = None
        if 'S3Bucket' in event and 'S3Object' in event:
            s3 = boto3.resource('s3')
            s3_object = s3.Object(event['S3Bucket'], event['S3Object'])
            image = s3_object.get()['Body'].read()

        elif 'image' in event:
            image_bytes = event['image'].encode('utf-8')
            img_b64decoded = base64.b64decode(image_bytes)
            image = img_b64decoded


        elif image is None:
            raise ValueError('Missing image, check image or bucket path.')

        else:
            raise ValueError("Only base 64 encoded image bytes or S3Object are
 supported.")

        response = rekognition.detect_labels(Image={'Bytes': image})
        lambda_response = {
            "statusCode": 200,
            "body": json.dumps(response)
        }
        labels = [label['Name'] for label in response['Labels']]
        print("Labels found:")
        print(labels)

    except ClientError as client_err:

       error_message = "Couldn't analyze image: " + client_err.response['Error']
['Message']

       lambda_response = {
            'statusCode': 400,
            'body': {
                "Error": client_err.response['Error']['Code'],
                "ErrorMessage": error_message
            }
       }
       logger.error("Error function %s: %s",
                    context.invoked_function_arn, error_message)
```

```
    except ValueError as val_error:

        lambda_response = {
            'statusCode': 400,
            'body': {
                "Error": "ValueError",
                "ErrorMessage": format(val_error)
            }
        }
        logger.error("Error function %s: %s",
                     context.invoked_function_arn, format(val_error))

    return lambda_response
```

3. Choose **Deploy** to deploy your Lambda function.

To add Python code (console)

Now that you've created your Lambda function, you can invoke it to detect labels in an image.

In this step, you run Python code on your computer, which passes a local image or an image in an Amazon S3 bucket, to your Lambda function.

Make sure you run the code in the same AWS Region in which you created the Lambda function. You can view the AWS Region for your Lambda function in the navigation bar of the function details page in the Lambda console.

If the Lambda function returns a timeout error, extend the timeout period for the Lambda function. For more information, see Configuring function timeout (console).

For more information about invoking a Lambda function from your code, see Invoking AWS Lambda Functions.

To try your Lambda function

1. If you haven't already done so, do the following:

    a. Make sure that the user has `lambda:InvokeFunction` permission. You can use the following policy:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "InvokeLambda",
            "Effect": "Allow",
            "Action": "lambda:InvokeFunction",
            "Resource": "ARN for lambda function"
        }
    ]
}
```

You can get the ARN for your Lambda function from the function overview in the Lambda console.

To provide access, add permissions to your users, groups, or roles:

- Users and groups in AWS IAM Identity Center:

  Create a permission set. Follow the instructions in Create a permission set in the *AWS IAM Identity Center User Guide*.

- Users managed in IAM through an identity provider:

  Create a role for identity federation. Follow the instructions in Create a role for a third-party identity provider (federation) in the *IAM User Guide*.

- IAM users:

  - Create a role that your user can assume. Follow the instructions in Create a role for an IAM user in the *IAM User Guide*.
  - (Not recommended) Attach a policy directly to a user or add a user to a user group. Follow the instructions in Adding permissions to a user (console) in the *IAM User Guide*.

b. Install and configure AWS SDK for Python. For more information, see Step 2: Set up the AWS CLI and AWS SDKs.

2. Save the following code to a file named `client.py`:

```
import boto3
import json
import base64
```

```
import pprint

# Replace with the name of your S3 bucket and image object key
bucket_name = "name of bucket"
object_key = "name of file in s3 bucket"
# If using a local file, supply the file name as the value of image_path below
image_path = ""

# Create session and establish connection to client['
session = boto3.Session(profile_name='developer-role')
s3 = session.client('s3', region_name="us-east-1")
lambda_client = session.client('lambda',  region_name="us-east-1")

# Replace with the name of your Lambda function
function_name = 'RekDetectLabels'

def analyze_image_local(img_path):

    print("Analyzing local image:")

    with open(img_path, 'rb') as image_file:
        image_bytes = image_file.read()
        data = base64.b64encode(image_bytes).decode("utf8")

        lambda_payload = {"image": data}

        # Invoke the Lambda function with the event payload
        response = lambda_client.invoke(
            FunctionName=function_name,
            Payload=(json.dumps(lambda_payload))
        )

        decoded = json.loads(response['Payload'].read().decode())
        pprint.pprint(decoded)

def analyze_image_s3(bucket_name, object_key):

    print("Analyzing image in S3 bucket:")

    # Load the image data from S3 into memory
    response = s3.get_object(Bucket=bucket_name, Key=object_key)
    image_data = response['Body'].read()
    image_data = base64.b64encode(image_data).decode("utf8")
```

```
     # Create the Lambda event payload
    event = {
        'S3Bucket': bucket_name,
        'S3Object': object_key,
        'ImageBytes': image_data
    }

    # Invoke the Lambda function with the event payload
    response = lambda_client.invoke(
            FunctionName=function_name,
            InvocationType='RequestResponse',
            Payload=json.dumps(event),
            )

    decoded = json.loads(response['Payload'].read().decode())
    pprint.pprint(decoded)

def main(path_to_image, name_s3_bucket, obj_key):

    if str(path_to_image) != "":
        analyze_image_local(path_to_image)
    else:
        analyze_image_s3(name_s3_bucket, obj_key)

if __name__ == "__main__":
    main(image_path, bucket_name, object_key)
```

3. Run the code. If the document is in an Amazon S3 bucket. make sure that it is the same bucket that you specified previously in step 12 of ???.

   If successful, your code returns a partial JSON response for each Block type detected in the document.

Code examples for Amazon Rekognition using AWS SDKs

The following code examples show how to use Amazon Rekognition with an AWS software development kit (SDK). The code examples in this chapter are intended to supplement the code examples found throughout the rest of this guide.

Actions are code excerpts from larger programs and must be run in context. While actions show you how to call individual service functions, you can see actions in context in their related scenarios.

Scenarios are code examples that show you how to accomplish specific tasks by calling multiple functions within a service or combined with other AWS services.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Get started

Hello Amazon Rekognition

The following code example shows how to get started using Amazon Rekognition.

C++

SDK for C++

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

Code for the CMakeLists.txt CMake file.

```
# Set the minimum required version of CMake for this project.
cmake_minimum_required(VERSION 3.13)

# Set the AWS service components used by this project.
set(SERVICE_COMPONENTS rekognition)
```

```
# Set this project's name.
project("hello_rekognition")

# Set the C++ standard to use to build this target.
# At least C++ 11 is required for the AWS SDK for C++.
set(CMAKE_CXX_STANDARD 11)

# Use the MSVC variable to determine if this is a Windows build.
set(WINDOWS_BUILD ${MSVC})

if (WINDOWS_BUILD) # Set the location where CMake can find the installed
 libraries for the AWS SDK.
    string(REPLACE ";" "/aws-cpp-sdk-all;" SYSTEM_MODULE_PATH
 "${CMAKE_SYSTEM_PREFIX_PATH}/aws-cpp-sdk-all")
    list(APPEND CMAKE_PREFIX_PATH ${SYSTEM_MODULE_PATH})
endif ()

# Find the AWS SDK for C++ package.
find_package(AWSSDK REQUIRED COMPONENTS ${SERVICE_COMPONENTS})

if (WINDOWS_BUILD AND AWSSDK_INSTALL_AS_SHARED_LIBS)
     # Copy relevant AWS SDK for C++ libraries into the current binary directory
 for running and debugging.

     # set(BIN_SUB_DIR "/Debug") # If you are building from the command line, you
 may need to uncomment this
                                 # and set the proper subdirectory to the
 executables' location.

     AWSSDK_CPY_DYN_LIBS(SERVICE_COMPONENTS ""
 ${CMAKE_CURRENT_BINARY_DIR}${BIN_SUB_DIR})
endif ()

add_executable(${PROJECT_NAME}
        hello_rekognition.cpp)

target_link_libraries(${PROJECT_NAME}
        ${AWSSDK_LINK_LIBRARIES})
```

Code for the hello_rekognition.cpp source file.

```
#include <aws/core/Aws.h>
```

```
#include <aws/rekognition/RekognitionClient.h>
#include <aws/rekognition/model/ListCollectionsRequest.h>
#include <iostream>

/*
 *  A "Hello Rekognition" starter application which initializes an Amazon
 Rekognition client and
 *  lists the Amazon Rekognition collections in the current account and region.
 *
 *  main function
 *
 *  Usage: 'hello_rekognition'
 *
 */

int main(int argc, char **argv) {
    Aws::SDKOptions options;
    //  Optional: change the log level for debugging.
    //  options.loggingOptions.logLevel = Aws::Utils::Logging::LogLevel::Debug;
    Aws::InitAPI(options); // Should only be called once.
    {
        Aws::Client::ClientConfiguration clientConfig;
        // Optional: Set to the AWS Region (overrides config file).
        // clientConfig.region = "us-east-1";

        Aws::Rekognition::RekognitionClient rekognitionClient(clientConfig);
        Aws::Rekognition::Model::ListCollectionsRequest request;
        Aws::Rekognition::Model::ListCollectionsOutcome outcome =
                rekognitionClient.ListCollections(request);

        if (outcome.IsSuccess()) {
            const Aws::Vector<Aws::String>& collectionsIds =
 outcome.GetResult().GetCollectionIds();
            if (!collectionsIds.empty()) {
                std::cout << "collectionsIds: " << std::endl;
                for (auto &collectionId : collectionsIds) {
                    std::cout << "- " << collectionId << std::endl;
                }
            } else {
                std::cout << "No collections found" << std::endl;
            }
        } else {
            std::cerr << "Error with ListCollections: " << outcome.GetError()
                      << std::endl;
```

```
        }
    }


    Aws::ShutdownAPI(options); // Should only be called once.
    return 0;
}
```

- For API details, see ListCollections in *AWS SDK for C++ API Reference*.

Code examples

- Basic examples for Amazon Rekognition using AWS SDKs
  - Hello Amazon Rekognition
  - Actions for Amazon Rekognition using AWS SDKs
    - Use CompareFaces with an AWS SDK or CLI
    - Use CreateCollection with an AWS SDK or CLI
    - Use DeleteCollection with an AWS SDK or CLI
    - Use DeleteFaces with an AWS SDK or CLI
    - Use DescribeCollection with an AWS SDK or CLI
    - Use DetectFaces with an AWS SDK or CLI
    - Use DetectLabels with an AWS SDK or CLI
    - Use DetectModerationLabels with an AWS SDK or CLI
    - Use DetectText with an AWS SDK or CLI
    - Use DisassociateFaces with an AWS SDK or CLI
    - Use GetCelebrityInfo with an AWS SDK or CLI
    - Use IndexFaces with an AWS SDK or CLI
    - Use ListCollections with an AWS SDK or CLI
    - Use ListFaces with an AWS SDK or CLI
    - Use RecognizeCelebrities with an AWS SDK or CLI
    - Use SearchFaces with an AWS SDK or CLI
    - Use SearchFacesByImage with an AWS SDK or CLI
- Scenarios for Amazon Rekognition using AWS SDKs

- Build an Amazon Rekognition collection and find faces in it using an AWS SDK
- Create a photo asset management application that lets users manage photos using labels
- Detect PPE in images with Amazon Rekognition using an AWS SDK
- Detect and display elements in images with Amazon Rekognition using an AWS SDK
- Detect faces in an image using an AWS SDK
- Detect information in videos using Amazon Rekognition and the AWS SDK
- Detect objects in images with Amazon Rekognition using an AWS SDK
- Detect people and objects in a video with Amazon Rekognition using an AWS SDK
- Save EXIF and other image information using an AWS SDK

Basic examples for Amazon Rekognition using AWS SDKs

The following code examples show how to use the basics of Amazon Rekognition with AWS SDKs.

Examples

- Hello Amazon Rekognition
- Actions for Amazon Rekognition using AWS SDKs
  - Use CompareFaces with an AWS SDK or CLI
  - Use CreateCollection with an AWS SDK or CLI
  - Use DeleteCollection with an AWS SDK or CLI
  - Use DeleteFaces with an AWS SDK or CLI
  - Use DescribeCollection with an AWS SDK or CLI
  - Use DetectFaces with an AWS SDK or CLI
  - Use DetectLabels with an AWS SDK or CLI
  - Use DetectModerationLabels with an AWS SDK or CLI
  - Use DetectText with an AWS SDK or CLI
  - Use DisassociateFaces with an AWS SDK or CLI
  - Use GetCelebrityInfo with an AWS SDK or CLI
  - Use IndexFaces with an AWS SDK or CLI
  - Use ListCollections with an AWS SDK or CLI
  - Use ListFaces with an AWS SDK or CLI

- Use RecognizeCelebrities with an AWS SDK or CLI
- Use SearchFaces with an AWS SDK or CLI
- Use SearchFacesByImage with an AWS SDK or CLI

Hello Amazon Rekognition

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```
# Set the minimum required version of CMake for this project.
cmake_minimum_required(VERSION 3.13)

# Set the AWS service components used by this project.
set(SERVICE_COMPONENTS rekognition)

# Set this project's name.
project("hello_rekognition")

# Set the C++ standard to use to build this target.
# At least C++ 11 is required for the AWS SDK for C++.
set(CMAKE_CXX_STANDARD 11)

# Use the MSVC variable to determine if this is a Windows build.
set(WINDOWS_BUILD ${MSVC})

if (WINDOWS_BUILD) # Set the location where CMake can find the installed
 libraries for the AWS SDK.
    string(REPLACE ";" "/aws-cpp-sdk-all;" SYSTEM_MODULE_PATH
 "${CMAKE_SYSTEM_PREFIX_PATH}/aws-cpp-sdk-all")
```

```
    list(APPEND CMAKE_PREFIX_PATH ${SYSTEM_MODULE_PATH})
endif ()

# Find the AWS SDK for C++ package.
find_package(AWSSDK REQUIRED COMPONENTS ${SERVICE_COMPONENTS})

if (WINDOWS_BUILD AND AWSSDK_INSTALL_AS_SHARED_LIBS)
     # Copy relevant AWS SDK for C++ libraries into the current binary directory
 for running and debugging.

     # set(BIN_SUB_DIR "/Debug") # If you are building from the command line, you
 may need to uncomment this
                                 # and set the proper subdirectory to the
 executables' location.

     AWSSDK_CPY_DYN_LIBS(SERVICE_COMPONENTS ""
 ${CMAKE_CURRENT_BINARY_DIR}${BIN_SUB_DIR})
endif ()

add_executable(${PROJECT_NAME}
        hello_rekognition.cpp)

target_link_libraries(${PROJECT_NAME}
        ${AWSSDK_LINK_LIBRARIES})
```

Code for the hello_rekognition.cpp source file.

```
#include <aws/core/Aws.h>
#include <aws/rekognition/RekognitionClient.h>
#include <aws/rekognition/model/ListCollectionsRequest.h>
#include <iostream>

/*
 *  A "Hello Rekognition" starter application which initializes an Amazon
 Rekognition client and
 *  lists the Amazon Rekognition collections in the current account and region.
 *
 *  main function
 *
 *  Usage: 'hello_rekognition'
 *
 */
```

```
int main(int argc, char **argv) {
    Aws::SDKOptions options;
    //  Optional: change the log level for debugging.
    //  options.loggingOptions.logLevel = Aws::Utils::Logging::LogLevel::Debug;
    Aws::InitAPI(options); // Should only be called once.
    {
        Aws::Client::ClientConfiguration clientConfig;
        // Optional: Set to the AWS Region (overrides config file).
        // clientConfig.region = "us-east-1";

        Aws::Rekognition::RekognitionClient rekognitionClient(clientConfig);
        Aws::Rekognition::Model::ListCollectionsRequest request;
        Aws::Rekognition::Model::ListCollectionsOutcome outcome =
                rekognitionClient.ListCollections(request);

        if (outcome.IsSuccess()) {
            const Aws::Vector<Aws::String>& collectionsIds =
 outcome.GetResult().GetCollectionIds();
            if (!collectionsIds.empty()) {
                std::cout << "collectionsIds: " << std::endl;
                for (auto &collectionId : collectionsIds) {
                    std::cout << "- " << collectionId << std::endl;
                }
            } else {
                std::cout << "No collections found" << std::endl;
            }
        } else {
            std::cerr << "Error with ListCollections: " << outcome.GetError()
                      << std::endl;
        }
    }


    Aws::ShutdownAPI(options); // Should only be called once.
    return 0;
}
```

- For API details, see ListCollections in *AWS SDK for C++ API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Actions for Amazon Rekognition using AWS SDKs

The following code examples demonstrate how to perform individual Amazon Rekognition actions with AWS SDKs. Each example includes a link to GitHub, where you can find instructions for setting up and running the code.

These excerpts call the Amazon Rekognition API and are code excerpts from larger programs that must be run in context. You can see actions in context in Scenarios for Amazon Rekognition using AWS SDKs .

The following examples include only the most commonly used actions. For a complete list, see the Amazon Rekognition API Reference.

Examples

- Use CompareFaces with an AWS SDK or CLI
- Use CreateCollection with an AWS SDK or CLI
- Use DeleteCollection with an AWS SDK or CLI
- Use DeleteFaces with an AWS SDK or CLI
- Use DescribeCollection with an AWS SDK or CLI
- Use DetectFaces with an AWS SDK or CLI
- Use DetectLabels with an AWS SDK or CLI
- Use DetectModerationLabels with an AWS SDK or CLI
- Use DetectText with an AWS SDK or CLI
- Use DisassociateFaces with an AWS SDK or CLI
- Use GetCelebrityInfo with an AWS SDK or CLI
- Use IndexFaces with an AWS SDK or CLI
- Use ListCollections with an AWS SDK or CLI
- Use ListFaces with an AWS SDK or CLI
- Use RecognizeCelebrities with an AWS SDK or CLI
- Use SearchFaces with an AWS SDK or CLI
- Use SearchFacesByImage with an AWS SDK or CLI

Use `CompareFaces` with an AWS SDK or CLI

The following code examples show how to use `CompareFaces`.

For more information, see Comparing faces in images.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
    using System;
    using System.IO;
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to compare faces in two images.
    /// </summary>
    public class CompareFaces
    {
        public static async Task Main()
        {
            float similarityThreshold = 70F;
            string sourceImage = "source.jpg";
            string targetImage = "target.jpg";

            var rekognitionClient = new AmazonRekognitionClient();

            Amazon.Rekognition.Model.Image imageSource = new
Amazon.Rekognition.Model.Image();

            try
            {
                using FileStream fs = new FileStream(sourceImage, FileMode.Open,
FileAccess.Read);
                byte[] data = new byte[fs.Length];
```

```
                fs.Read(data, 0, (int)fs.Length);
                imageSource.Bytes = new MemoryStream(data);
            }
            catch (Exception)
            {
                Console.WriteLine($"Failed to load source image: {sourceImage}");
                return;
            }

            Amazon.Rekognition.Model.Image imageTarget = new
Amazon.Rekognition.Model.Image();

            try
            {
                using FileStream fs = new FileStream(targetImage, FileMode.Open,
FileAccess.Read);
                byte[] data = new byte[fs.Length];
                data = new byte[fs.Length];
                fs.Read(data, 0, (int)fs.Length);
                imageTarget.Bytes = new MemoryStream(data);
            }
            catch (Exception ex)
            {
                Console.WriteLine($"Failed to load target image: {targetImage}");
                Console.WriteLine(ex.Message);
                return;
            }

            var compareFacesRequest = new CompareFacesRequest
            {
                SourceImage = imageSource,
                TargetImage = imageTarget,
                SimilarityThreshold = similarityThreshold,
            };

            // Call operation
            var compareFacesResponse = await
rekognitionClient.CompareFacesAsync(compareFacesRequest);

            // Display results
            compareFacesResponse.FaceMatches.ForEach(match =>
            {
                ComparedFace face = match.Face;
                BoundingBox position = face.BoundingBox;
```

```
                Console.WriteLine($"Face at {position.Left} {position.Top}
matches with {match.Similarity}% confidence.");
            });

            Console.WriteLine($"Found {compareFacesResponse.UnmatchedFaces.Count}
face(s) that did not match.");
        }
    }
```

- For API details, see CompareFaces in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To compare faces in two images

The following `compare-faces` command compares faces in two images stored in an Amazon S3 bucket.

```
aws rekognition compare-faces \
    --source-image '{"S3Object":
{"Bucket":"MyImageS3Bucket","Name":"source.jpg"}}' \
    --target-image '{"S3Object":
{"Bucket":"MyImageS3Bucket","Name":"target.jpg"}}'
```

Output:

```
{
    "UnmatchedFaces": [],
    "FaceMatches": [
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.12368916720151901,
                    "Top": 0.16007372736930847,
                    "Left": 0.5901257991790771,
                    "Height": 0.25140416622161865
                },
                "Confidence": 100.0,
```

```
                "Pose": {
                    "Yaw": -3.7351467609405518,
                    "Roll": -0.10309021919965744,
                    "Pitch": 0.8637830018997192
                },
                "Quality": {
                    "Sharpness": 95.51618957519531,
                    "Brightness": 65.29893493652344
                },
                "Landmarks": [
                    {
                        "Y": 0.26721030473709106,
                        "X": 0.6204193830490112,
                        "Type": "eyeLeft"
                    },
                    {
                        "Y": 0.26831310987472534,
                        "X": 0.6776827573776245,
                        "Type": "eyeRight"
                    },
                    {
                        "Y": 0.3514654338359833,
                        "X": 0.6241428852081299,
                        "Type": "mouthLeft"
                    },
                    {
                        "Y": 0.35258132219314575,
                        "X": 0.6713621020317078,
                        "Type": "mouthRight"
                    },
                    {
                        "Y": 0.3140771687030792,
                        "X": 0.6428444981575012,
                        "Type": "nose"
                    }
                ]
            },
            "Similarity": 100.0
        }
    ],
    "SourceImageFace": {
        "BoundingBox": {
            "Width": 0.12368916720151901,
            "Top": 0.16007372736930847,
```

```
            "Left": 0.5901257991790771,
            "Height": 0.25140416622161865
        },
        "Confidence": 100.0
    }
}
```

For more information, see Comparing Faces in Images in the *Amazon Rekognition Developer Guide*.

- For API details, see CompareFaces in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.*;
import software.amazon.awssdk.core.SdkBytes;

import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 * <p>
 * For more information, see the following documentation topic:
 * <p>
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
```

```
public class CompareFaces {
    public static void main(String[] args) {
        final String usage = """
            Usage: <bucketName> <sourceKey> <targetKey>

            Where:
                bucketName - The name of the S3 bucket where the images are
 stored.
                sourceKey  - The S3 key (file name) for the source image.
                targetKey  - The S3 key (file name) for the target image.
           """;

        if (args.length != 3) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucketName = args[0];
        String sourceKey = args[1];
        String targetKey = args[2];

        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();
        compareTwoFaces(rekClient, bucketName, sourceKey, targetKey);
    }

   /**
    * Compares two faces from images stored in an Amazon S3 bucket using AWS
 Rekognition.
    *
    * <p>This method takes two image keys from an S3 bucket and compares the
 faces within them.
    * It prints out the confidence level of matched faces and reports the number
 of unmatched faces.</p>
    *
    * @param rekClient   The {@link RekognitionClient} used to call AWS
 Rekognition.
    * @param bucketName  The name of the S3 bucket containing the images.
    * @param sourceKey   The object key (file path) for the source image in the
 S3 bucket.
    * @param targetKey   The object key (file path) for the target image in the
 S3 bucket.
```

```
     * @throws RuntimeException If the Rekognition service returns an error.
     */
    public static void compareTwoFaces(RekognitionClient rekClient, String
bucketName, String sourceKey, String targetKey) {
        try {
            Float similarityThreshold = 70F;
            S3Object s3ObjectSource = S3Object.builder()
                    .bucket(bucketName)
                    .name(sourceKey)
                    .build();

            Image sourceImage = Image.builder()
                    .s3Object(s3ObjectSource)
                    .build();

            S3Object s3ObjectTarget = S3Object.builder()
                    .bucket(bucketName)
                    .name(targetKey)
                    .build();

            Image targetImage = Image.builder()
                    .s3Object(s3ObjectTarget)
                    .build();

            CompareFacesRequest facesRequest = CompareFacesRequest.builder()
                    .sourceImage(sourceImage)
                    .targetImage(targetImage)
                    .similarityThreshold(similarityThreshold)
                    .build();

            // Compare the two images.
            CompareFacesResponse compareFacesResult =
rekClient.compareFaces(facesRequest);
            List<CompareFacesMatch> faceDetails =
compareFacesResult.faceMatches();

            for (CompareFacesMatch match : faceDetails) {
                ComparedFace face = match.face();
                BoundingBox position = face.boundingBox();
                System.out.println("Face at " + position.left().toString()
                        + " " + position.top()
                        + " matches with " + face.confidence().toString()
                        + "% confidence.");
            }
```

```
            List<ComparedFace> unmatchedFaces =
 compareFacesResult.unmatchedFaces();
            System.out.println("There were " + unmatchedFaces.size() + " face(s)
 that did not match.");

        } catch (RekognitionException e) {
            System.err.println("Error comparing faces: " +
 e.awsErrorDetails().errorMessage());
            throw new RuntimeException(e);
        }
    }
}
```

- For API details, see CompareFaces in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun compareTwoFaces(
    similarityThresholdVal: Float,
    sourceImageVal: String,
    targetImageVal: String,
) {
    val sourceBytes = (File(sourceImageVal).readBytes())
    val targetBytes = (File(targetImageVal).readBytes())

    // Create an Image object for the source image.
    val souImage =
        Image {
            bytes = sourceBytes
        }

    val tarImage =
```

```
        Image {
            bytes = targetBytes
        }

    val facesRequest =
        CompareFacesRequest {
            sourceImage = souImage
            targetImage = tarImage
            similarityThreshold = similarityThresholdVal
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->

        val compareFacesResult = rekClient.compareFaces(facesRequest)
        val faceDetails = compareFacesResult.faceMatches

        if (faceDetails != null) {
            for (match: CompareFacesMatch in faceDetails) {
                val face = match.face
                val position = face?.boundingBox
                if (position != null) {
                    println("Face at ${position.left} ${position.top} matches
 with ${face.confidence} % confidence.")
                }
            }
        }

        val uncompared = compareFacesResult.unmatchedFaces
        if (uncompared != null) {
            println("There was ${uncompared.size} face(s) that did not match")
        }

        println("Source image rotation:
 ${compareFacesResult.sourceImageOrientationCorrection}")
        println("target image rotation:
 ${compareFacesResult.targetImageOrientationCorrection}")
    }
}
```

- For API details, see CompareFaces in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionImage:
    """
    Encapsulates an Amazon Rekognition image. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, image, image_name, rekognition_client):
        """
        Initializes the image object.

        :param image: Data that defines the image, either the image bytes or
                      an Amazon S3 bucket and object key.
        :param image_name: The name of the image.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.image = image
        self.image_name = image_name
        self.rekognition_client = rekognition_client


    def compare_faces(self, target_image, similarity):
        """
        Compares faces in the image with the largest face in the target image.

        :param target_image: The target image to compare against.
        :param similarity: Faces in the image must have a similarity value
 greater
                           than this value to be included in the results.
        :return: A tuple. The first element is the list of faces that match the
                 reference image. The second element is the list of faces that
 have
                 a similarity value below the specified threshold.
```

```
        """
        try:
            response = self.rekognition_client.compare_faces(
                SourceImage=self.image,
                TargetImage=target_image.image,
                SimilarityThreshold=similarity,
            )
            matches = [
                RekognitionFace(match["Face"]) for match in
response["FaceMatches"]
            ]
            unmatches = [RekognitionFace(face) for face in
response["UnmatchedFaces"]]
            logger.info(
                "Found %s matched faces and %s unmatched faces.",
                len(matches),
                len(unmatches),
            )
        except ClientError:
            logger.exception(
                "Couldn't match faces from %s to %s.",
                self.image_name,
                target_image.image_name,
            )
            raise
        else:
            return matches, unmatches
```

- For API details, see CompareFaces in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `CreateCollection` with an AWS SDK or CLI

The following code examples show how to use `CreateCollection`.

For more information, see Creating a collection.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
using System;
using System.Threading.Tasks;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

/// <summary>
/// Uses Amazon Rekognition to create a collection to which you can add
/// faces using the IndexFaces operation.
/// </summary>
public class CreateCollection
{
    public static async Task Main()
    {
        var rekognitionClient = new AmazonRekognitionClient();

        string collectionId = "MyCollection";
        Console.WriteLine("Creating collection: " + collectionId);

        var createCollectionRequest = new CreateCollectionRequest
        {
            CollectionId = collectionId,
        };

        CreateCollectionResponse createCollectionResponse = await
rekognitionClient.CreateCollectionAsync(createCollectionRequest);
        Console.WriteLine($"CollectionArn :
{createCollectionResponse.CollectionArn}");
        Console.WriteLine($"Status code :
{createCollectionResponse.StatusCode}");
    }
}
```

- For API details, see CreateCollection in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To create a collection

The following `create-collection` command creates a collection with the specified name.

```
aws rekognition create-collection \
    --collection-id "MyCollection"
```

Output:

```
{
    "CollectionArn": "aws:rekognition:us-west-2:123456789012:collection/
MyCollection",
    "FaceModelVersion": "4.0",
    "StatusCode": 200
}
```

For more information, see Creating a Collection in the *Amazon Rekognition Developer Guide*.

- For API details, see CreateCollection in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
```

```
import
 software.amazon.awssdk.services.rekognition.model.CreateCollectionResponse;
import software.amazon.awssdk.services.rekognition.model.CreateCollectionRequest;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class CreateCollection {
    public static void main(String[] args) {
        final String usage = """

            Usage: <collectionName>\s

            Where:
                collectionName - The name of the collection.\s
            """;

        if (args.length != 1) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Creating collection: " + collectionId);
        createMyCollection(rekClient, collectionId);
        rekClient.close();
    }

    /**
     * Creates a new Amazon Rekognition collection.
     *
```

```
     * @param rekClient    the Amazon Rekognition client used to interact with
 the Rekognition service
     * @param collectionId the unique identifier for the collection to be created
     */
    public static void createMyCollection(RekognitionClient rekClient, String
 collectionId) {
        try {
            CreateCollectionRequest collectionRequest =
 CreateCollectionRequest.builder()
                    .collectionId(collectionId)
                    .build();

            CreateCollectionResponse collectionResponse =
 rekClient.createCollection(collectionRequest);
            System.out.println("CollectionArn: " +
 collectionResponse.collectionArn());
            System.out.println("Status code: " +
 collectionResponse.statusCode().toString());

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see CreateCollection in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun createMyCollection(collectionIdVal: String) {
    val request =
        CreateCollectionRequest {
```

```
            collectionId = collectionIdVal
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.createCollection(request)
        println("Collection ARN is ${response.collectionArn}")
        println("Status code is ${response.statusCode}")
    }
}
```

- For API details, see CreateCollection in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollectionManager:
    """
    Encapsulates Amazon Rekognition collection management functions.
    This class is a thin wrapper around parts of the Boto3 Amazon Rekognition
 API.
    """

    def __init__(self, rekognition_client):
        """
        Initializes the collection manager object.

        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.rekognition_client = rekognition_client


    def create_collection(self, collection_id):
        """
        Creates an empty collection.
```

```
        :param collection_id: Text that identifies the collection.
        :return: The newly created collection.
        """
        try:
            response = self.rekognition_client.create_collection(
                CollectionId=collection_id
            )
            response["CollectionId"] = collection_id
            collection = RekognitionCollection(response, self.rekognition_client)
            logger.info("Created collection %s.", collection_id)
        except ClientError:
            logger.exception("Couldn't create collection %s.", collection_id)
            raise
        else:
            return collection
```

- For API details, see CreateCollection in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `DeleteCollection` with an AWS SDK or CLI

The following code examples show how to use `DeleteCollection`.

For more information, see Deleting a collection.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
    using System;
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to delete an existing collection.
    /// </summary>
    public class DeleteCollection
    {
        public static async Task Main()
        {
            var rekognitionClient = new AmazonRekognitionClient();

            string collectionId = "MyCollection";
            Console.WriteLine("Deleting collection: " + collectionId);

            var deleteCollectionRequest = new DeleteCollectionRequest()
            {
                CollectionId = collectionId,
            };

            var deleteCollectionResponse = await
rekognitionClient.DeleteCollectionAsync(deleteCollectionRequest);
            Console.WriteLine($"{collectionId}:
{deleteCollectionResponse.StatusCode}");
        }
    }
```

- For API details, see DeleteCollection in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To delete a collection

The following `delete-collection` command deletes the specified collection.

```
aws rekognition delete-collection \
```

```
    --collection-id MyCollection
```

Output:

```
{
    "StatusCode": 200
}
```

For more information, see Deleting a Collection in the *Amazon Rekognition Developer Guide*.

- For API details, see DeleteCollection in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.DeleteCollectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.DeleteCollectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DeleteCollection {
    public static void main(String[] args) {
        final String usage = """
            Usage: <collectionId>\s
```

```
            Where:
                collectionId - The id of the collection to delete.\s
            """;

        if (args.length != 1) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Deleting collection: " + collectionId);
        deleteMyCollection(rekClient, collectionId);
        rekClient.close();
    }

    /**
     * Deletes an Amazon Rekognition collection.
     *
     * @param rekClient      An instance of the {@link RekognitionClient} class,
which is used to interact with the Amazon Rekognition service.
     * @param collectionId   The ID of the collection to be deleted.
     */
    public static void deleteMyCollection(RekognitionClient rekClient, String
collectionId) {
        try {
            DeleteCollectionRequest deleteCollectionRequest =
DeleteCollectionRequest.builder()
                    .collectionId(collectionId)
                    .build();

            DeleteCollectionResponse deleteCollectionResponse =
rekClient.deleteCollection(deleteCollectionRequest);
            System.out.println(collectionId + ": " +
deleteCollectionResponse.statusCode().toString());

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
```

```
        }
    }
}
```

- For API details, see DeleteCollection in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun deleteMyCollection(collectionIdVal: String) {
    val request =
        DeleteCollectionRequest {
            collectionId = collectionIdVal
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.deleteCollection(request)
        println("The collectionId status is ${response.statusCode}")
    }
}
```

- For API details, see DeleteCollection in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollection:
    """
    Encapsulates an Amazon Rekognition collection. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, collection, rekognition_client):
        """
        Initializes a collection object.

        :param collection: Collection data in the format returned by a call to
                           create_collection.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.collection_id = collection["CollectionId"]
        self.collection_arn, self.face_count, self.created =
 self._unpack_collection(
            collection
        )
        self.rekognition_client = rekognition_client

    @staticmethod
    def _unpack_collection(collection):
        """
        Unpacks optional parts of a collection that can be returned by
        describe_collection.

        :param collection: The collection data.
        :return: A tuple of the data in the collection.
        """
        return (
            collection.get("CollectionArn"),
```

```
            collection.get("FaceCount", 0),
            collection.get("CreationTimestamp"),
        )


    def delete_collection(self):
        """
        Deletes the collection.
        """
        try:

self.rekognition_client.delete_collection(CollectionId=self.collection_id)
            logger.info("Deleted collection %s.", self.collection_id)
            self.collection_id = None
        except ClientError:
            logger.exception("Couldn't delete collection %s.",
self.collection_id)
            raise
```

- For API details, see DeleteCollection in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `DeleteFaces` with an AWS SDK or CLI

The following code examples show how to use `DeleteFaces`.

For more information, see Deleting faces from a collection.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
    using System;
    using System.Collections.Generic;
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to delete one or more faces from
    /// a Rekognition collection.
    /// </summary>
    public class DeleteFaces
    {
        public static async Task Main()
        {
            string collectionId = "MyCollection";
            var faces = new List<string> { "xxxxxxxx-xxxx-xxxx-xxxx-
xxxxxxxxxxxx" };

            var rekognitionClient = new AmazonRekognitionClient();

            var deleteFacesRequest = new DeleteFacesRequest()
            {
                CollectionId = collectionId,
                FaceIds = faces,
            };

            DeleteFacesResponse deleteFacesResponse = await
 rekognitionClient.DeleteFacesAsync(deleteFacesRequest);
            deleteFacesResponse.DeletedFaces.ForEach(face =>
            {
                Console.WriteLine($"FaceID: {face}");
            });
        }
    }
```

- For API details, see DeleteFaces in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To delete faces from a collection

The following `delete-faces` command deletes the specified face from a collection.

```
aws rekognition delete-faces \
    --collection-id MyCollection
    --face-ids '["0040279c-0178-436e-b70a-e61b074e96b0"]'
```

Output:

```
{
    "DeletedFaces": [
        "0040279c-0178-436e-b70a-e61b074e96b0"
    ]
}
```

For more information, see Deleting Faces from a Collection in the *Amazon Rekognition Developer Guide*.

- For API details, see DeleteFaces in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.DeleteFacesRequest;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;

/**
```

```
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DeleteFacesFromCollection {
    public static void main(String[] args) {
        final String usage = """
            Usage: <collectionId> <faceId>\s

            Where:
                collectionId - The id of the collection from which faces are
 deleted.\s
                faceId - The id of the face to delete.\s
           """;

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        String faceId = args[1];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Deleting collection: " + collectionId);
        deleteFacesCollection(rekClient, collectionId, faceId);
        rekClient.close();
    }

    /**
     * Deletes a face from the specified Amazon Rekognition collection.
     *
     * @param rekClient     an instance of the Amazon Rekognition client
     * @param collectionId  the ID of the collection from which the face should
 be deleted
     * @param faceId        the ID of the face to be deleted
     * @throws RekognitionException if an error occurs while deleting the face
```

```
     */
    public static void deleteFacesCollection(RekognitionClient rekClient,
            String collectionId,
            String faceId) {

        try {
            DeleteFacesRequest deleteFacesRequest = DeleteFacesRequest.builder()
                    .collectionId(collectionId)
                    .faceIds(faceId)
                    .build();

            rekClient.deleteFaces(deleteFacesRequest);
            System.out.println("The face was deleted from the collection.");

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see DeleteFaces in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun deleteFacesCollection(
    collectionIdVal: String?,
    faceIdVal: String,
) {
    val deleteFacesRequest =
        DeleteFacesRequest {
            collectionId = collectionIdVal
            faceIds = listOf(faceIdVal)
```

```
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        rekClient.deleteFaces(deleteFacesRequest)
        println("$faceIdVal was deleted from the collection")
    }
}
```

- For API details, see DeleteFaces in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollection:
    """
    Encapsulates an Amazon Rekognition collection. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, collection, rekognition_client):
        """
        Initializes a collection object.

        :param collection: Collection data in the format returned by a call to
                           create_collection.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.collection_id = collection["CollectionId"]
        self.collection_arn, self.face_count, self.created =
 self._unpack_collection(
            collection
        )
        self.rekognition_client = rekognition_client
```

```
    @staticmethod
    def _unpack_collection(collection):
        """
        Unpacks optional parts of a collection that can be returned by
        describe_collection.

        :param collection: The collection data.
        :return: A tuple of the data in the collection.
        """
        return (
            collection.get("CollectionArn"),
            collection.get("FaceCount", 0),
            collection.get("CreationTimestamp"),
        )


    def delete_faces(self, face_ids):
        """
        Deletes faces from the collection.

        :param face_ids: The list of IDs of faces to delete.
        :return: The list of IDs of faces that were deleted.
        """
        try:
            response = self.rekognition_client.delete_faces(
                CollectionId=self.collection_id, FaceIds=face_ids
            )
            deleted_ids = response["DeletedFaces"]
            logger.info(
                "Deleted %s faces from %s.", len(deleted_ids), self.collection_id
            )
        except ClientError:
            logger.exception("Couldn't delete faces from %s.",
self.collection_id)
            raise
        else:
            return deleted_ids
```

- For API details, see DeleteFaces in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `DescribeCollection` with an AWS SDK or CLI

The following code examples show how to use `DescribeCollection`.

For more information, see Describing a collection.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
using System;
using System.Threading.Tasks;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

/// <summary>
/// Uses the Amazon Rekognition Service to describe the contents of a
/// collection.
/// </summary>
public class DescribeCollection
{
    public static async Task Main()
    {
        var rekognitionClient = new AmazonRekognitionClient();

        string collectionId = "MyCollection";
        Console.WriteLine($"Describing collection: {collectionId}");

        var describeCollectionRequest = new DescribeCollectionRequest()
        {
            CollectionId = collectionId,
        };
```

```
            var describeCollectionResponse = await
 rekognitionClient.DescribeCollectionAsync(describeCollectionRequest);
            Console.WriteLine($"Collection ARN:
 {describeCollectionResponse.CollectionARN}");
            Console.WriteLine($"Face count:
 {describeCollectionResponse.FaceCount}");
            Console.WriteLine($"Face model version:
 {describeCollectionResponse.FaceModelVersion}");
            Console.WriteLine($"Created:
 {describeCollectionResponse.CreationTimestamp}");
        }
    }
```

- For API details, see DescribeCollection in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To describe a collection

The following `describe-collection` example displays the details about the specified collection.

```
aws rekognition describe-collection \
    --collection-id MyCollection
```

Output:

```
{
    "FaceCount": 200,
    "CreationTimestamp": 1569444828.274,
    "CollectionARN": "arn:aws:rekognition:us-west-2:123456789012:collection/
MyCollection",
    "FaceModelVersion": "4.0"
}
```

For more information, see Describing a Collection in the *Amazon Rekognition Developer Guide*.

- For API details, see DescribeCollection in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.DescribeCollectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.DescribeCollectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DescribeCollection {
    public static void main(String[] args) {
        final String usage = """
            Usage:    <collectionName>

            Where:
                collectionName - The name of the Amazon Rekognition collection.\s
            """;

        if (args.length != 1) {
            System.out.println(usage);
            System.exit(1);
        }
```

```
        String collectionName = args[0];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        describeColl(rekClient, collectionName);
        rekClient.close();
    }

    /**
     * Describes an Amazon Rekognition collection.
     *
     * @param rekClient         The Amazon Rekognition client used to make the
 request.
     * @param collectionName    The name of the collection to describe.
     *
     * @throws RekognitionException If an error occurs while describing the
 collection.
     */
    public static void describeColl(RekognitionClient rekClient, String
 collectionName) {
        try {
            DescribeCollectionRequest describeCollectionRequest =
 DescribeCollectionRequest.builder()
                    .collectionId(collectionName)
                    .build();

            DescribeCollectionResponse describeCollectionResponse = rekClient
                    .describeCollection(describeCollectionRequest);
            System.out.println("Collection Arn : " +
 describeCollectionResponse.collectionARN());
            System.out.println("Created : " +
 describeCollectionResponse.creationTimestamp().toString());

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see DescribeCollection in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun describeColl(collectionName: String) {
    val request =
        DescribeCollectionRequest {
            collectionId = collectionName
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.describeCollection(request)
        println("The collection Arn is ${response.collectionArn}")
        println("The collection contains this many faces ${response.faceCount}")
    }
}
```

- For API details, see DescribeCollection in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollection:
```

```
    """
    Encapsulates an Amazon Rekognition collection. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, collection, rekognition_client):
        """
        Initializes a collection object.

        :param collection: Collection data in the format returned by a call to
                           create_collection.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.collection_id = collection["CollectionId"]
        self.collection_arn, self.face_count, self.created =
self._unpack_collection(
            collection
        )
        self.rekognition_client = rekognition_client

    @staticmethod
    def _unpack_collection(collection):
        """
        Unpacks optional parts of a collection that can be returned by
        describe_collection.

        :param collection: The collection data.
        :return: A tuple of the data in the collection.
        """
        return (
            collection.get("CollectionArn"),
            collection.get("FaceCount", 0),
            collection.get("CreationTimestamp"),
        )


    def describe_collection(self):
        """
        Gets data about the collection from the Amazon Rekognition service.

        :return: The collection rendered as a dict.
        """
        try:
            response = self.rekognition_client.describe_collection(
```

```
                CollectionId=self.collection_id
            )
            # Work around capitalization of Arn vs. ARN
            response["CollectionArn"] = response.get("CollectionARN")
            (
                self.collection_arn,
                self.face_count,
                self.created,
            ) = self._unpack_collection(response)
            logger.info("Got data for collection %s.", self.collection_id)
        except ClientError:
            logger.exception("Couldn't get data for collection %s.",
self.collection_id)
            raise
        else:
            return self.to_dict()
```

- For API details, see DescribeCollection in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `DetectFaces` with an AWS SDK or CLI

The following code examples show how to use `DetectFaces`.

For more information, see Detecting faces in an image.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
    using System;
    using System.Collections.Generic;
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to detect faces within an image
    /// stored in an Amazon Simple Storage Service (Amazon S3) bucket.
    /// </summary>
    public class DetectFaces
    {
        public static async Task Main()
        {
            string photo = "input.jpg";
            string bucket = "amzn-s3-demo-bucket";

            var rekognitionClient = new AmazonRekognitionClient();

            var detectFacesRequest = new DetectFacesRequest()
            {
                Image = new Image()
                {
                    S3Object = new S3Object()
                    {
                        Name = photo,
                        Bucket = bucket,
                    },
                },

                // Attributes can be "ALL" or "DEFAULT".
                // "DEFAULT": BoundingBox, Confidence, Landmarks, Pose, and
 Quality.
                // "ALL": See https://docs.aws.amazon.com/sdkfornet/v3/apidocs/
items/Rekognition/TFaceDetail.html
                Attributes = new List<string>() { "ALL" },
            };

            try
            {
                DetectFacesResponse detectFacesResponse = await
 rekognitionClient.DetectFacesAsync(detectFacesRequest);
                bool hasAll = detectFacesRequest.Attributes.Contains("ALL");
```

```
                foreach (FaceDetail face in detectFacesResponse.FaceDetails)
                {
                    Console.WriteLine($"BoundingBox: top={face.BoundingBox.Left}
left={face.BoundingBox.Top} width={face.BoundingBox.Width}
height={face.BoundingBox.Height}");
                    Console.WriteLine($"Confidence: {face.Confidence}");
                    Console.WriteLine($"Landmarks: {face.Landmarks.Count}");
                    Console.WriteLine($"Pose: pitch={face.Pose.Pitch}
roll={face.Pose.Roll} yaw={face.Pose.Yaw}");
                    Console.WriteLine($"Brightness:
{face.Quality.Brightness}\tSharpness: {face.Quality.Sharpness}");

                    if (hasAll)
                    {
                        Console.WriteLine($"Estimated age is between
{face.AgeRange.Low} and {face.AgeRange.High} years old.");
                    }
                }
            }
            catch (Exception ex)
            {
                Console.WriteLine(ex.Message);
            }
        }
    }
```

Display bounding box information for all faces in an image.

```
    using System;
    using System.Collections.Generic;
    using System.Drawing;
    using System.IO;
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to display the details of the
    /// bounding boxes around the faces detected in an image.
    /// </summary>
    public class ImageOrientationBoundingBox
```

```
    {
        public static async Task Main()
        {
            string photo = @"D:\Development\AWS-Examples\Rekognition
\target.jpg"; // "photo.jpg";

            var rekognitionClient = new AmazonRekognitionClient();

            var image = new Amazon.Rekognition.Model.Image();
            try
            {
                using var fs = new FileStream(photo, FileMode.Open,
 FileAccess.Read);
                byte[] data = null;
                data = new byte[fs.Length];
                fs.Read(data, 0, (int)fs.Length);
                image.Bytes = new MemoryStream(data);
            }
            catch (Exception)
            {
                Console.WriteLine("Failed to load file " + photo);
                return;
            }

            int height;
            int width;

            // Used to extract original photo width/height
            using (var imageBitmap = new Bitmap(photo))
            {
                height = imageBitmap.Height;
                width = imageBitmap.Width;
            }

            Console.WriteLine("Image Information:");
            Console.WriteLine(photo);
            Console.WriteLine("Image Height: " + height);
            Console.WriteLine("Image Width: " + width);

            try
            {
                var detectFacesRequest = new DetectFacesRequest()
                {
                    Image = image,
```

```
                    Attributes = new List<string>() { "ALL" },
                };

                DetectFacesResponse detectFacesResponse = await
 rekognitionClient.DetectFacesAsync(detectFacesRequest);
                detectFacesResponse.FaceDetails.ForEach(face =>
                {
                    Console.WriteLine("Face:");
                    ShowBoundingBoxPositions(
                        height,
                        width,
                        face.BoundingBox,
                        detectFacesResponse.OrientationCorrection);

                    Console.WriteLine($"BoundingBox: top={face.BoundingBox.Left}
 left={face.BoundingBox.Top} width={face.BoundingBox.Width}
 height={face.BoundingBox.Height}");
                    Console.WriteLine($"The detected face is estimated to be
 between {face.AgeRange.Low} and {face.AgeRange.High} years old.\n");
                });
            }
            catch (Exception ex)
            {
                Console.WriteLine(ex.Message);
            }
        }

        /// <summary>
        /// Display the bounding box information for an image.
        /// </summary>
        /// <param name="imageHeight">The height of the image.</param>
        /// <param name="imageWidth">The width of the image.</param>
        /// <param name="box">The bounding box for a face found within the
 image.</param>
        /// <param name="rotation">The rotation of the face's bounding box.</
param>
        public static void ShowBoundingBoxPositions(int imageHeight, int
 imageWidth, BoundingBox box, string rotation)
        {
            float left;
            float top;

            if (rotation == null)
            {
```

```
                Console.WriteLine("No estimated orientation. Check Exif data.");
                return;
            }

            // Calculate face position based on image orientation.
            switch (rotation)
            {
                case "ROTATE_0":
                    left = imageWidth * box.Left;
                    top = imageHeight * box.Top;
                    break;
                case "ROTATE_90":
                    left = imageHeight * (1 - (box.Top + box.Height));
                    top = imageWidth * box.Left;
                    break;
                case "ROTATE_180":
                    left = imageWidth - (imageWidth * (box.Left + box.Width));
                    top = imageHeight * (1 - (box.Top + box.Height));
                    break;
                case "ROTATE_270":
                    left = imageHeight * box.Top;
                    top = imageWidth * (1 - box.Left - box.Width);
                    break;
                default:
                    Console.WriteLine("No estimated orientation information.
Check Exif data.");
                    return;
            }

            // Display face location information.
            Console.WriteLine($"Left: {left}");
            Console.WriteLine($"Top: {top}");
            Console.WriteLine($"Face Width: {imageWidth * box.Width}");
            Console.WriteLine($"Face Height: {imageHeight * box.Height}");
        }
    }
```

- For API details, see DetectFaces in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To detect faces in an image

The following `detect-faces` command detects faces in the specified image stored in an Amazon S3 bucket.

```
aws rekognition detect-faces \
    --image '{"S3Object":{"Bucket":"MyImageS3Bucket","Name":"MyFriend.jpg"}}' \
    --attributes "ALL"
```

Output:

```
{
    "FaceDetails": [
        {
            "Confidence": 100.0,
            "Eyeglasses": {
                "Confidence": 98.91107940673828,
                "Value": false
            },
            "Sunglasses": {
                "Confidence": 99.7966537475586,
                "Value": false
            },
            "Gender": {
                "Confidence": 99.56611633300781,
                "Value": "Male"
            },
            "Landmarks": [
                {
                    "Y": 0.26721030473709106,
                    "X": 0.6204193830490112,
                    "Type": "eyeLeft"
                },
                {
                    "Y": 0.26831310987472534,
                    "X": 0.6776827573776245,
                    "Type": "eyeRight"
                },
                {
```

```
                    "Y": 0.3514654338359833,
                    "X": 0.6241428852081299,
                    "Type": "mouthLeft"
                },
                {
                    "Y": 0.35258132219314575,
                    "X": 0.6713621020317078,
                    "Type": "mouthRight"
                },
                {
                    "Y": 0.3140771687030792,
                    "X": 0.6428444981575012,
                    "Type": "nose"
                },
                {
                    "Y": 0.24662546813488007,
                    "X": 0.6001564860343933,
                    "Type": "leftEyeBrowLeft"
                },
                {
                    "Y": 0.24326619505882263,
                    "X": 0.6303644776344299,
                    "Type": "leftEyeBrowRight"
                },
                {
                    "Y": 0.23818562924861908,
                    "X": 0.6146903038024902,
                    "Type": "leftEyeBrowUp"
                },
                {
                    "Y": 0.24373626708984375,
                    "X": 0.6640064716339111,
                    "Type": "rightEyeBrowLeft"
                },
                {
                    "Y": 0.24877218902111053,
                    "X": 0.7025929093360901,
                    "Type": "rightEyeBrowRight"
                },
                {
                    "Y": 0.23938551545143127,
                    "X": 0.6823262572288513,
                    "Type": "rightEyeBrowUp"
                },
```

```
                {
                    "Y": 0.265746533870697,
                    "X": 0.6112898588180542,
                    "Type": "leftEyeLeft"
                },
                {
                    "Y": 0.2676128149032593,
                    "X": 0.6317071914672852,
                    "Type": "leftEyeRight"
                },
                {
                    "Y": 0.262735515832901,
                    "X": 0.6201658248901367,
                    "Type": "leftEyeUp"
                },
                {
                    "Y": 0.27025148272514343,
                    "X": 0.6206279993057251,
                    "Type": "leftEyeDown"
                },
                {
                    "Y": 0.268223375082016,
                    "X": 0.6658390760421753,
                    "Type": "rightEyeLeft"
                },
                {
                    "Y": 0.2672517001628876,
                    "X": 0.687832236289978,
                    "Type": "rightEyeRight"
                },
                {
                    "Y": 0.26383838057518005,
                    "X": 0.6769183874130249,
                    "Type": "rightEyeUp"
                },
                {
                    "Y": 0.27138751745224,
                    "X": 0.676596462726593,
                    "Type": "rightEyeDown"
                },
                {
                    "Y": 0.32283174991607666,
                    "X": 0.6350004076957703,
                    "Type": "noseLeft"
```

```
                },
                {
                    "Y": 0.3219289481639862,
                    "X": 0.6567046642303467,
                    "Type": "noseRight"
                },
                {
                    "Y": 0.3420318365097046,
                    "X": 0.6450609564781189,
                    "Type": "mouthUp"
                },
                {
                    "Y": 0.3664324879646301,
                    "X": 0.6455618143081665,
                    "Type": "mouthDown"
                },
                {
                    "Y": 0.26721030473709106,
                    "X": 0.6204193830490112,
                    "Type": "leftPupil"
                },
                {
                    "Y": 0.26831310987472534,
                    "X": 0.6776827573776245,
                    "Type": "rightPupil"
                },
                {
                    "Y": 0.26343393325805664,
                    "X": 0.5946047306060791,
                    "Type": "upperJawlineLeft"
                },
                {
                    "Y": 0.3543180525302887,
                    "X": 0.6044883728027344,
                    "Type": "midJawlineLeft"
                },
                {
                    "Y": 0.4084877669811249,
                    "X": 0.6477024555206299,
                    "Type": "chinBottom"
                },
                {
                    "Y": 0.3562754988670349,
                    "X": 0.707981526851654,
```

```
                    "Type": "midJawlineRight"
                },
                {
                    "Y": 0.26580461859703064,
                    "X": 0.7234612107276917,
                    "Type": "upperJawlineRight"
                }
            ],
            "Pose": {
                "Yaw": -3.7351467609405518,
                "Roll": -0.10309021919965744,
                "Pitch": 0.8637830018997192
            },
            "Emotions": [
                {
                    "Confidence": 8.74203109741211,
                    "Type": "SURPRISED"
                },
                {
                    "Confidence": 2.501944065093994,
                    "Type": "ANGRY"
                },
                {
                    "Confidence": 0.7378743290901184,
                    "Type": "DISGUSTED"
                },
                {
                    "Confidence": 3.5296201705932617,
                    "Type": "HAPPY"
                },
                {
                    "Confidence": 1.7162904739379883,
                    "Type": "SAD"
                },
                {
                    "Confidence": 9.518536567687988,
                    "Type": "CONFUSED"
                },
                {
                    "Confidence": 0.45474427938461304,
                    "Type": "FEAR"
                },
                {
                    "Confidence": 72.79895782470703,
```

```
                    "Type": "CALM"
                }
            ],
            "AgeRange": {
                "High": 48,
                "Low": 32
            },
            "EyesOpen": {
                "Confidence": 98.93987274169922,
                "Value": true
            },
            "BoundingBox": {
                "Width": 0.12368916720151901,
                "Top": 0.16007372736930847,
                "Left": 0.5901257991790771,
                "Height": 0.25140416622161865
            },
            "Smile": {
                "Confidence": 93.4493179321289,
                "Value": false
            },
            "MouthOpen": {
                "Confidence": 90.53053283691406,
                "Value": false
            },
            "Quality": {
                "Sharpness": 95.51618957519531,
                "Brightness": 65.29893493652344
            },
            "Mustache": {
                "Confidence": 89.85221099853516,
                "Value": false
            },
            "Beard": {
                "Confidence": 86.1991195678711,
                "Value": true
            }
        }
    ]
}
```


For more information, see Detecting Faces in an Image in the *Amazon Rekognition Developer Guide*.

- For API details, see DetectFaces in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.*;

import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 * <p>
 * For more information, see the following documentation topic:
 * <p>
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DetectFaces {
    public static void main(String[] args) {
        final String usage = """

            Usage:   <bucketName> <sourceImage>

            Where:
                bucketName = The name of the Amazon S3 bucket where the source
 image is stored.
                sourceImage - The name of the source image file in the Amazon S3
 bucket. (for example, pic1.png).\s
            """;

        if (args.length != 2) {
```

```
            System.out.println(usage);
            System.exit(1);
        }

        String bucketName = args[0];
        String sourceImage = args[1];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        detectFacesinImage(rekClient, bucketName, sourceImage);
        rekClient.close();
    }

    /**
     * Detects faces in an image stored in an Amazon S3 bucket using the Amazon
Rekognition service.
     *
     * @param rekClient    The Amazon Rekognition client used to interact with
the Rekognition service.
     * @param bucketName   The name of the Amazon S3 bucket where the source
image is stored.
     * @param sourceImage  The name of the source image file in the Amazon S3
bucket.
     */
    public static void detectFacesinImage(RekognitionClient rekClient, String
bucketName, String sourceImage) {
        try {
            S3Object s3ObjectTarget = S3Object.builder()
                .bucket(bucketName)
                .name(sourceImage)
                .build();

            Image targetImage = Image.builder()
                .s3Object(s3ObjectTarget)
                .build();

            DetectFacesRequest facesRequest = DetectFacesRequest.builder()
                .attributes(Attribute.ALL)
                .image(targetImage)
                .build();
```

```
            DetectFacesResponse facesResponse =
 rekClient.detectFaces(facesRequest);
            List<FaceDetail> faceDetails = facesResponse.faceDetails();
            for (FaceDetail face : faceDetails) {
                AgeRange ageRange = face.ageRange();
                System.out.println("The detected face is estimated to be between
 "
                        + ageRange.low().toString() + " and " +
 ageRange.high().toString()
                        + " years old.");

                System.out.println("There is a smile : " +
 face.smile().value().toString());
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see DetectFaces in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun detectFacesinImage(sourceImage: String?) {
    val souImage =
        Image {
            bytes = (File(sourceImage).readBytes())
        }

    val request =
```

```
        DetectFacesRequest {
            attributes = listOf(Attribute.All)
            image = souImage
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.detectFaces(request)
        response.faceDetails?.forEach { face ->
            val ageRange = face.ageRange
            println("The detected face is estimated to be between
 ${ageRange?.low} and ${ageRange?.high} years old.")
            println("There is a smile ${face.smile?.value}")
        }
    }
}
```

- For API details, see DetectFaces in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionImage:
    """
    Encapsulates an Amazon Rekognition image. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, image, image_name, rekognition_client):
        """
        Initializes the image object.

        :param image: Data that defines the image, either the image bytes or
                      an Amazon S3 bucket and object key.
        :param image_name: The name of the image.
```

```
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.image = image
        self.image_name = image_name
        self.rekognition_client = rekognition_client


    def detect_faces(self):
        """
        Detects faces in the image.

        :return: The list of faces found in the image.
        """
        try:
            response = self.rekognition_client.detect_faces(
                Image=self.image, Attributes=["ALL"]
            )
            faces = [RekognitionFace(face) for face in response["FaceDetails"]]
            logger.info("Detected %s faces.", len(faces))
        except ClientError:
            logger.exception("Couldn't detect faces in %s.", self.image_name)
            raise
        else:
            return faces
```

- For API details, see DetectFaces in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `DetectLabels` with an AWS SDK or CLI

The following code examples show how to use `DetectLabels`.

For more information, see Detecting labels in an image.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
using System;
using System.Threading.Tasks;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

/// <summary>
/// Uses the Amazon Rekognition Service to detect labels within an image
/// stored in an Amazon Simple Storage Service (Amazon S3) bucket.
/// </summary>
public class DetectLabels
{
    public static async Task Main()
    {
        string photo = "del_river_02092020_01.jpg"; // "input.jpg";
        string bucket = "amzn-s3-demo-bucket"; // "bucket";

        var rekognitionClient = new AmazonRekognitionClient();

        var detectlabelsRequest = new DetectLabelsRequest
        {
            Image = new Image()
            {
                S3Object = new S3Object()
                {
                    Name = photo,
                    Bucket = bucket,
                },
            },
            MaxLabels = 10,
            MinConfidence = 75F,
        };
```

```
            try
            {
                DetectLabelsResponse detectLabelsResponse = await
rekognitionClient.DetectLabelsAsync(detectlabelsRequest);
                Console.WriteLine("Detected labels for " + photo);
                foreach (Label label in detectLabelsResponse.Labels)
                {
                    Console.WriteLine($"Name: {label.Name} Confidence:
{label.Confidence}");
                }
            }
            catch (Exception ex)
            {
                Console.WriteLine(ex.Message);
            }
        }
    }
```

Detect labels in an image file stored on your computer.

```
    using System;
    using System.IO;
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to detect labels within an image
    /// stored locally.
    /// </summary>
    public class DetectLabelsLocalFile
    {
        public static async Task Main()
        {
            string photo = "input.jpg";

            var image = new Amazon.Rekognition.Model.Image();
            try
            {
                using var fs = new FileStream(photo, FileMode.Open,
FileAccess.Read);
```

```
                byte[] data = null;
                data = new byte[fs.Length];
                fs.Read(data, 0, (int)fs.Length);
                image.Bytes = new MemoryStream(data);
            }
            catch (Exception)
            {
                Console.WriteLine("Failed to load file " + photo);
                return;
            }

            var rekognitionClient = new AmazonRekognitionClient();

            var detectlabelsRequest = new DetectLabelsRequest
            {
                Image = image,
                MaxLabels = 10,
                MinConfidence = 77F,
            };

            try
            {
                DetectLabelsResponse detectLabelsResponse = await
rekognitionClient.DetectLabelsAsync(detectlabelsRequest);
                Console.WriteLine($"Detected labels for {photo}");
                foreach (Label label in detectLabelsResponse.Labels)
                {
                    Console.WriteLine($"{label.Name}: {label.Confidence}");
                }
            }
            catch (Exception ex)
            {
                Console.WriteLine(ex.Message);
            }
        }
    }
```

- For API details, see DetectLabels in *AWS SDK for .NET API Reference*.

C++

SDK for C++

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
//! Detect instances of real-world entities within an image by using Amazon
 Rekognition
/*!
  \param imageBucket: The Amazon Simple Storage Service (Amazon S3) bucket
 containing an image.
  \param imageKey: The Amazon S3 key of an image object.
  \param clientConfiguration: AWS client configuration.
  \return bool: Function succeeded.
 */
bool AwsDoc::Rekognition::detectLabels(const Aws::String &imageBucket,
                                       const Aws::String &imageKey,
                                       const Aws::Client::ClientConfiguration
 &clientConfiguration) {
    Aws::Rekognition::RekognitionClient rekognitionClient(clientConfiguration);

    Aws::Rekognition::Model::DetectLabelsRequest request;
    Aws::Rekognition::Model::S3Object s3Object;
    s3Object.SetBucket(imageBucket);
    s3Object.SetName(imageKey);

    Aws::Rekognition::Model::Image image;
    image.SetS3Object(s3Object);

    request.SetImage(image);

    const Aws::Rekognition::Model::DetectLabelsOutcome outcome =
 rekognitionClient.DetectLabels(request);

    if (outcome.IsSuccess()) {
        const Aws::Vector<Aws::Rekognition::Model::Label> &labels =
 outcome.GetResult().GetLabels();
        if (labels.empty()) {
```

```
            std::cout << "No labels detected" << std::endl;
        } else {
            for (const Aws::Rekognition::Model::Label &label: labels) {
                std::cout << label.GetName() << ": " << label.GetConfidence() <<
 std::endl;
            }
        }
    } else {
        std::cerr << "Error while detecting labels: '"
                  << outcome.GetError().GetMessage()
                  << "'" << std::endl;
    }

    return outcome.IsSuccess();
}
```

- For API details, see DetectLabels in *AWS SDK for C++ API Reference*.

CLI

AWS CLI

To detect a label in an image

The following `detect-labels` example detects scenes and objects in an image stored in an Amazon S3 bucket.

```
aws rekognition detect-labels \
    --image '{"S3Object":{"Bucket":"bucket","Name":"image"}}'
```

Output:

```
{
    "Labels": [
        {
            "Instances": [],
            "Confidence": 99.15271759033203,
            "Parents": [
                {
                    "Name": "Vehicle"
```

```
                },
                {
                    "Name": "Transportation"
                }
            ],
            "Name": "Automobile"
        },
        {
            "Instances": [],
            "Confidence": 99.15271759033203,
            "Parents": [
                {
                    "Name": "Transportation"
                }
            ],
            "Name": "Vehicle"
        },
        {
            "Instances": [],
            "Confidence": 99.15271759033203,
            "Parents": [],
            "Name": "Transportation"
        },
        {
            "Instances": [
                {
                    "BoundingBox": {
                        "Width": 0.10616336017847061,
                        "Top": 0.5039216876029968,
                        "Left": 0.0037978808395564556,
                        "Height": 0.18528179824352264
                    },
                    "Confidence": 99.15271759033203
                },
                {
                    "BoundingBox": {
                        "Width": 0.2429988533258438,
                        "Top": 0.5251884460449219,
                        "Left": 0.7309805154800415,
                        "Height": 0.21577216684818268
                    },
                    "Confidence": 99.1286392211914
                },
                {
```

```
            "BoundingBox": {
                "Width": 0.14233611524105072,
                "Top": 0.5333095788955688,
                "Left": 0.6494812965393066,
                "Height": 0.15528248250484467
            },
            "Confidence": 98.48368072509766
        },
        {
            "BoundingBox": {
                "Width": 0.11086395382881165,
                "Top": 0.5354844927787781,
                "Left": 0.10355594009160995,
                "Height": 0.10271988064050674
            },
            "Confidence": 96.45606231689453
        },
        {
            "BoundingBox": {
                "Width": 0.06254628300666809,
                "Top": 0.5573825240135193,
                "Left": 0.46083059906959534,
                "Height": 0.053911514580249786
            },
            "Confidence": 93.65448760986328
        },
        {
            "BoundingBox": {
                "Width": 0.10105438530445099,
                "Top": 0.534368634223938,
                "Left": 0.5743985772132874,
                "Height": 0.12226245552301407
            },
            "Confidence": 93.06217193603516
        },
        {
            "BoundingBox": {
                "Width": 0.056389667093753815,
                "Top": 0.5235804319381714,
                "Left": 0.9427769780158997,
                "Height": 0.17163699865341187
            },
            "Confidence": 92.6864013671875
        },
```

```
                {
                    "BoundingBox": {
                        "Width": 0.06003860384225845,
                        "Top": 0.5441341400146484,
                        "Left": 0.22409997880458832,
                        "Height": 0.06737709045410156
                    },
                    "Confidence": 90.4227066040039
                },
                {
                    "BoundingBox": {
                        "Width": 0.02848697081208229,
                        "Top": 0.5107086896896362,
                        "Left": 0,
                        "Height": 0.19150497019290924
                    },
                    "Confidence": 86.65286254882812
                },
                {
                    "BoundingBox": {
                        "Width": 0.04067881405353546,
                        "Top": 0.5566273927688599,
                        "Left": 0.316415935754776,
                        "Height": 0.03428703173995018
                    },
                    "Confidence": 85.36471557617188
                },
                {
                    "BoundingBox": {
                        "Width": 0.043411049991846085,
                        "Top": 0.5394920110702515,
                        "Left": 0.18293385207653046,
                        "Height": 0.0893595889210701
                    },
                    "Confidence": 82.21705627441406
                },
                {
                    "BoundingBox": {
                        "Width": 0.031183116137981415,
                        "Top": 0.5579366683959961,
                        "Left": 0.2853088080883026,
                        "Height": 0.03989990055561066
                    },
                    "Confidence": 81.0157470703125
```

```
                },
                {
                    "BoundingBox": {
                        "Width": 0.031113790348172188,
                        "Top": 0.5504819750785828,
                        "Left": 0.2580395042896271,
                        "Height": 0.056484755128622055
                    },
                    "Confidence": 56.13441467285156
                },
                {
                    "BoundingBox": {
                        "Width": 0.08586374670267105,
                        "Top": 0.5438792705535889,
                        "Left": 0.5128012895584106,
                        "Height": 0.08550430089235306
                    },
                    "Confidence": 52.37760925292969
                }
            ],
            "Confidence": 99.15271759033203,
            "Parents": [
                {
                    "Name": "Vehicle"
                },
                {
                    "Name": "Transportation"
                }
            ],
            "Name": "Car"
        },
        {
            "Instances": [],
            "Confidence": 98.9914321899414,
            "Parents": [],
            "Name": "Human"
        },
        {
            "Instances": [
                {
                    "BoundingBox": {
                        "Width": 0.19360728561878204,
                        "Top": 0.35072067379951477,
                        "Left": 0.43734854459762573,
```

```
                    "Height": 0.2742200493812561
                },
                "Confidence": 98.9914321899414
            },
            {
                "BoundingBox": {
                    "Width": 0.03801717236638069,
                    "Top": 0.5010883808135986,
                    "Left": 0.9155802130699158,
                    "Height": 0.06597328186035156
                },
                "Confidence": 85.02790832519531
            }
        ],
        "Confidence": 98.9914321899414,
        "Parents": [],
        "Name": "Person"
    },
    {
        "Instances": [],
        "Confidence": 93.24951934814453,
        "Parents": [],
        "Name": "Machine"
    },
    {
        "Instances": [
            {
                "BoundingBox": {
                    "Width": 0.03561960905790329,
                    "Top": 0.6468243598937988,
                    "Left": 0.7850857377052307,
                    "Height": 0.08878646790981293
                },
                "Confidence": 93.24951934814453
            },
            {
                "BoundingBox": {
                    "Width": 0.02217046171426773,
                    "Top": 0.6149078607559204,
                    "Left": 0.04757237061858177,
                    "Height": 0.07136218994855881
                },
                "Confidence": 91.5025863647461
            },
```

```
                {
                    "BoundingBox": {
                        "Width": 0.016197510063648224,
                        "Top": 0.6274210214614868,
                        "Left": 0.6472989320755005,
                        "Height": 0.04955997318029404
                    },
                    "Confidence": 85.14686584472656
                },
                {
                    "BoundingBox": {
                        "Width": 0.020207518711686134,
                        "Top": 0.6348286867141724,
                        "Left": 0.7295016646385193,
                        "Height": 0.07059963047504425
                    },
                    "Confidence": 83.34547424316406
                },
                {
                    "BoundingBox": {
                        "Width": 0.020280985161662102,
                        "Top": 0.6171894669532776,
                        "Left": 0.08744934946298599,
                        "Height": 0.05297485366463661
                    },
                    "Confidence": 79.9981460571289
                },
                {
                    "BoundingBox": {
                        "Width": 0.018318990245461464,
                        "Top": 0.623889148235321,
                        "Left": 0.6836880445480347,
                        "Height": 0.06730121374130249
                    },
                    "Confidence": 78.87144470214844
                },
                {
                    "BoundingBox": {
                        "Width": 0.021310249343514442,
                        "Top": 0.6167286038398743,
                        "Left": 0.004064912907779217,
                        "Height": 0.08317798376083374
                    },
                    "Confidence": 75.89361572265625
```

```
                },
                {
                    "BoundingBox": {
                        "Width": 0.03604431077837944,
                        "Top": 0.7030032277107239,
                        "Left": 0.9254803657531738,
                        "Height": 0.04569442570209503
                    },
                    "Confidence": 64.402587890625
                },
                {
                    "BoundingBox": {
                        "Width": 0.009834849275648594,
                        "Top": 0.5821820497512817,
                        "Left": 0.28094568848609924,
                        "Height": 0.01964157074689865
                    },
                    "Confidence": 62.79907989501953
                },
                {
                    "BoundingBox": {
                        "Width": 0.01475677452981472,
                        "Top": 0.6137543320655823,
                        "Left": 0.5950819253921509,
                        "Height": 0.039063986390829086
                    },
                    "Confidence": 59.40483474731445
                }
            ],
            "Confidence": 93.24951934814453,
            "Parents": [
                {
                    "Name": "Machine"
                }
            ],
            "Name": "Wheel"
        },
        {
            "Instances": [],
            "Confidence": 92.61514282226562,
            "Parents": [],
            "Name": "Road"
        },
        {
```

```
            "Instances": [],
            "Confidence": 92.37877655029297,
            "Parents": [
                {
                    "Name": "Person"
                }
            ],
            "Name": "Sport"
        },
        {
            "Instances": [],
            "Confidence": 92.37877655029297,
            "Parents": [
                {
                    "Name": "Person"
                }
            ],
            "Name": "Sports"
        },
        {
            "Instances": [
                {
                    "BoundingBox": {
                        "Width": 0.12326609343290329,
                        "Top": 0.6332163214683533,
                        "Left": 0.44815489649772644,
                        "Height": 0.058117982000112534
                    },
                    "Confidence": 92.37877655029297
                }
            ],
            "Confidence": 92.37877655029297,
            "Parents": [
                {
                    "Name": "Person"
                },
                {
                    "Name": "Sport"
                }
            ],
            "Name": "Skateboard"
        },
        {
            "Instances": [],
```

```
            "Confidence": 90.62931060791016,
            "Parents": [
                {
                    "Name": "Person"
                }
            ],
            "Name": "Pedestrian"
        },
        {
            "Instances": [],
            "Confidence": 88.81334686279297,
            "Parents": [],
            "Name": "Asphalt"
        },
        {
            "Instances": [],
            "Confidence": 88.81334686279297,
            "Parents": [],
            "Name": "Tarmac"
        },
        {
            "Instances": [],
            "Confidence": 88.23201751708984,
            "Parents": [],
            "Name": "Path"
        },
        {
            "Instances": [],
            "Confidence": 80.26520538330078,
            "Parents": [],
            "Name": "Urban"
        },
        {
            "Instances": [],
            "Confidence": 80.26520538330078,
            "Parents": [
                {
                    "Name": "Building"
                },
                {
                    "Name": "Urban"
                }
            ],
            "Name": "Town"
```

```
        },
        {
            "Instances": [],
            "Confidence": 80.26520538330078,
            "Parents": [],
            "Name": "Building"
        },
        {
            "Instances": [],
            "Confidence": 80.26520538330078,
            "Parents": [
                {
                    "Name": "Building"
                },
                {
                    "Name": "Urban"
                }
            ],
            "Name": "City"
        },
        {
            "Instances": [],
            "Confidence": 78.37934875488281,
            "Parents": [
                {
                    "Name": "Car"
                },
                {
                    "Name": "Vehicle"
                },
                {
                    "Name": "Transportation"
                }
            ],
            "Name": "Parking Lot"
        },
        {
            "Instances": [],
            "Confidence": 78.37934875488281,
            "Parents": [
                {
                    "Name": "Car"
                },
                {
```

```
                    "Name": "Vehicle"
                },
                {
                    "Name": "Transportation"
                }
            ],
            "Name": "Parking"
        },
        {
            "Instances": [],
            "Confidence": 74.37590026855469,
            "Parents": [
                {
                    "Name": "Building"
                },
                {
                    "Name": "Urban"
                },
                {
                    "Name": "City"
                }
            ],
            "Name": "Downtown"
        },
        {
            "Instances": [],
            "Confidence": 69.84622955322266,
            "Parents": [
                {
                    "Name": "Road"
                }
            ],
            "Name": "Intersection"
        },
        {
            "Instances": [],
            "Confidence": 57.68518829345703,
            "Parents": [
                {
                    "Name": "Sports Car"
                },
                {
                    "Name": "Car"
                },
```

```
                {
                    "Name": "Vehicle"
                },
                {
                    "Name": "Transportation"
                }
            ],
            "Name": "Coupe"
        },
        {
            "Instances": [],
            "Confidence": 57.68518829345703,
            "Parents": [
                {
                    "Name": "Car"
                },
                {
                    "Name": "Vehicle"
                },
                {
                    "Name": "Transportation"
                }
            ],
            "Name": "Sports Car"
        },
        {
            "Instances": [],
            "Confidence": 56.59492111206055,
            "Parents": [
                {
                    "Name": "Path"
                }
            ],
            "Name": "Sidewalk"
        },
        {
            "Instances": [],
            "Confidence": 56.59492111206055,
            "Parents": [
                {
                    "Name": "Path"
                }
            ],
            "Name": "Pavement"
```

```
        },
        {
            "Instances": [],
            "Confidence": 55.58770751953125,
            "Parents": [
                {
                    "Name": "Building"
                },
                {
                    "Name": "Urban"
                }
            ],
            "Name": "Neighborhood"
        }
    ],
    "LabelModelVersion": "2.0"
}
```

For more information, see Detecting Labels in an Image in the *Amazon Rekognition Developer Guide*.

- For API details, see DetectLabels in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.*;

import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;
```

```
/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DetectLabels {
    public static void main(String[] args) {
        final String usage = """
            Usage: <bucketName> <sourceImage>

            Where:
                bucketName - The name of the Amazon S3 bucket where the image is
 stored
                sourceImage - The name of the image file (for example, pic1.png).
\s
            """;

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucketName = args[0] ;
        String sourceImage = args[1] ;
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        detectImageLabels(rekClient, bucketName, sourceImage);
        rekClient.close();
    }

    /**
     * Detects the labels in an image stored in an Amazon S3 bucket using the
 Amazon Rekognition service.
     *
     * @param rekClient     the Amazon Rekognition client used to make the
 detection request
```

```
    * @param bucketName    the name of the Amazon S3 bucket where the image is
 stored
    * @param sourceImage   the name of the image file to be analyzed
    */
   public static void detectImageLabels(RekognitionClient rekClient, String
 bucketName, String sourceImage) {
       try {
           S3Object s3ObjectTarget = S3Object.builder()
                   .bucket(bucketName)
                   .name(sourceImage)
                   .build();

           Image souImage = Image.builder()
                   .s3Object(s3ObjectTarget)
                   .build();

           DetectLabelsRequest detectLabelsRequest =
 DetectLabelsRequest.builder()
                   .image(souImage)
                   .maxLabels(10)
                   .build();

           DetectLabelsResponse labelsResponse =
 rekClient.detectLabels(detectLabelsRequest);
           List<Label> labels = labelsResponse.labels();
           System.out.println("Detected labels for the given photo");
           for (Label label : labels) {
               System.out.println(label.name() + ": " +
 label.confidence().toString());
           }

       } catch (RekognitionException e) {
           System.out.println(e.getMessage());
           System.exit(1);
       }
   }
}
```

- For API details, see DetectLabels in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun detectImageLabels(sourceImage: String) {
    val souImage =
        Image {
            bytes = (File(sourceImage).readBytes())
        }
    val request =
        DetectLabelsRequest {
            image = souImage
            maxLabels = 10
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.detectLabels(request)
        response.labels?.forEach { label ->
            println("${label.name} : ${label.confidence}")
        }
    }
}
```

- For API details, see DetectLabels in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionImage:
    """
    Encapsulates an Amazon Rekognition image. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, image, image_name, rekognition_client):
        """
        Initializes the image object.

        :param image: Data that defines the image, either the image bytes or
                      an Amazon S3 bucket and object key.
        :param image_name: The name of the image.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.image = image
        self.image_name = image_name
        self.rekognition_client = rekognition_client


    def detect_labels(self, max_labels):
        """
        Detects labels in the image. Labels are objects and people.

        :param max_labels: The maximum number of labels to return.
        :return: The list of labels detected in the image.
        """
        try:
            response = self.rekognition_client.detect_labels(
                Image=self.image, MaxLabels=max_labels
            )
            labels = [RekognitionLabel(label) for label in response["Labels"]]
            logger.info("Found %s labels in %s.", len(labels), self.image_name)
        except ClientError:
            logger.info("Couldn't detect labels in %s.", self.image_name)
            raise
        else:
            return labels
```

- For API details, see DetectLabels in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `DetectModerationLabels` with an AWS SDK or CLI

The following code examples show how to use `DetectModerationLabels`.

For more information, see Detecting inappropriate images.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
    using System;
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to detect unsafe content in a
    /// JPEG or PNG format image.
    /// </summary>
    public class DetectModerationLabels
    {
        public static async Task Main(string[] args)
        {
            string photo = "input.jpg";
            string bucket = "amzn-s3-demo-bucket";

            var rekognitionClient = new AmazonRekognitionClient();

            var detectModerationLabelsRequest = new
DetectModerationLabelsRequest()
            {
                Image = new Image()
```

```
                {
                    S3Object = new S3Object()
                    {
                        Name = photo,
                        Bucket = bucket,
                    },
                },
                MinConfidence = 60F,
            };

            try
            {
                var detectModerationLabelsResponse = await
rekognitionClient.DetectModerationLabelsAsync(detectModerationLabelsRequest);
                Console.WriteLine("Detected labels for " + photo);
                foreach (ModerationLabel label in
detectModerationLabelsResponse.ModerationLabels)
                {
                    Console.WriteLine($"Label: {label.Name}");
                    Console.WriteLine($"Confidence: {label.Confidence}");
                    Console.WriteLine($"Parent: {label.ParentName}");
                }
            }
            catch (Exception ex)
            {
                Console.WriteLine(ex.Message);
            }
        }
    }
```

- For API details, see DetectModerationLabels in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To detect unsafe content in an image

The following `detect-moderation-labels` command detects unsafe content in the specified image stored in an Amazon S3 bucket.

```
aws rekognition detect-moderation-labels \
    --image "S3Object={Bucket=MyImageS3Bucket,Name=gun.jpg}"
```

Output:

```
{
    "ModerationModelVersion": "3.0",
    "ModerationLabels": [
        {
            "Confidence": 97.29618072509766,
            "ParentName": "Violence",
            "Name": "Weapon Violence"
        },
        {
            "Confidence": 97.29618072509766,
            "ParentName": "",
            "Name": "Violence"
        }
    ]
}
```

For more information, see Detecting Unsafe Images in the *Amazon Rekognition Developer Guide*.

- For API details, see DetectModerationLabels in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.*;

import java.io.FileInputStream;
```

```
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DetectModerationLabels {

    public static void main(String[] args) {
        final String usage = """
            Usage:  <bucketName>  <sourceImage>

            Where:
                bucketName - The name of the S3 bucket where the images are
 stored.
                sourceImage - The name of the image (for example, pic1.png).\s
            """;

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucketName = args[0];
        String sourceImage = args[1];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        detectModLabels(rekClient, bucketName, sourceImage);
        rekClient.close();
    }

    /**
     * Detects moderation labels in an image stored in an Amazon S3 bucket.
     *
```

```
    * @param rekClient      the Amazon Rekognition client to use for the
 detection
    * @param bucketName     the name of the Amazon S3 bucket where the image is
 stored
    * @param sourceImage    the name of the image file to be analyzed
    *
    * @throws RekognitionException if there is an error during the image
 detection process
    */
   public static void detectModLabels(RekognitionClient rekClient, String
 bucketName, String sourceImage) {
       try {
           S3Object s3ObjectTarget = S3Object.builder()
                   .bucket(bucketName)
                   .name(sourceImage)
                   .build();

           Image targetImage = Image.builder()
                   .s3Object(s3ObjectTarget)
                   .build();

           DetectModerationLabelsRequest moderationLabelsRequest =
 DetectModerationLabelsRequest.builder()
                   .image(targetImage)
                   .minConfidence(60F)
                   .build();

           DetectModerationLabelsResponse moderationLabelsResponse = rekClient
                   .detectModerationLabels(moderationLabelsRequest);
           List<ModerationLabel> labels =
 moderationLabelsResponse.moderationLabels();
           System.out.println("Detected labels for image");
           for (ModerationLabel label : labels) {
               System.out.println("Label: " + label.name()
                       + "\n Confidence: " + label.confidence().toString() + "%"
                       + "\n Parent:" + label.parentName());
           }

       } catch (RekognitionException e) {
           e.printStackTrace();
           System.exit(1);
       }
   }
}
```

- For API details, see DetectModerationLabels in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun detectModLabels(sourceImage: String) {
    val myImage =
        Image {
            this.bytes = (File(sourceImage).readBytes())
        }

    val request =
        DetectModerationLabelsRequest {
            image = myImage
            minConfidence = 60f
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.detectModerationLabels(request)
        response.moderationLabels?.forEach { label ->
            println("Label: ${label.name} - Confidence: ${label.confidence} %
 Parent: ${label.parentName}")
        }
    }
}
```

- For API details, see DetectModerationLabels in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionImage:
    """
    Encapsulates an Amazon Rekognition image. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, image, image_name, rekognition_client):
        """
        Initializes the image object.

        :param image: Data that defines the image, either the image bytes or
                      an Amazon S3 bucket and object key.
        :param image_name: The name of the image.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.image = image
        self.image_name = image_name
        self.rekognition_client = rekognition_client


    def detect_moderation_labels(self):
        """
        Detects moderation labels in the image. Moderation labels identify
 content
        that may be inappropriate for some audiences.

        :return: The list of moderation labels found in the image.
        """
        try:
            response = self.rekognition_client.detect_moderation_labels(
                Image=self.image
            )
```

```
            labels = [
                RekognitionModerationLabel(label)
                for label in response["ModerationLabels"]
            ]
            logger.info(
                "Found %s moderation labels in %s.", len(labels), self.image_name
            )
        except ClientError:
            logger.exception(
                "Couldn't detect moderation labels in %s.", self.image_name
            )
            raise
        else:
            return labels
```

- For API details, see DetectModerationLabels in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `DetectText` with an AWS SDK or CLI

The following code examples show how to use `DetectText`.

For more information, see Detecting text in an image.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
using System;
using System.Threading.Tasks;
```

```
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to detect text in an image. The
    /// example was created using the AWS SDK for .NET version 3.7 and .NET
    /// Core 5.0.
    /// </summary>
    public class DetectText
    {
        public static async Task Main()
        {
            string photo = "Dad_photographer.jpg"; // "input.jpg";
            string bucket = "amzn-s3-demo-bucket"; // "bucket";

            var rekognitionClient = new AmazonRekognitionClient();

            var detectTextRequest = new DetectTextRequest()
            {
                Image = new Image()
                {
                    S3Object = new S3Object()
                    {
                        Name = photo,
                        Bucket = bucket,
                    },
                },
            };

            try
            {
                DetectTextResponse detectTextResponse = await
rekognitionClient.DetectTextAsync(detectTextRequest);
                Console.WriteLine($"Detected lines and words for {photo}");
                detectTextResponse.TextDetections.ForEach(text =>
                {
                    Console.WriteLine($"Detected: {text.DetectedText}");
                    Console.WriteLine($"Confidence: {text.Confidence}");
                    Console.WriteLine($"Id : {text.Id}");
                    Console.WriteLine($"Parent Id: {text.ParentId}");
                    Console.WriteLine($"Type: {text.Type}");
                });
            }
            catch (Exception e)
```

```
            {
                Console.WriteLine(e.Message);
            }
        }
    }
```

- For API details, see DetectText in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To detect text in an image

The following `detect-text` command detects text in the specified image.

```
aws rekognition detect-text \
    --image '{"S3Object":
{"Bucket":"MyImageS3Bucket","Name":"ExamplePicture.jpg"}}'
```

Output:

```
{
    "TextDetections": [
        {
            "Geometry": {
                "BoundingBox": {
                    "Width": 0.24624845385551453,
                    "Top": 0.28288066387176514,
                    "Left": 0.391388863325119,
                    "Height": 0.022687450051307678
                },
                "Polygon": [
                    {
                        "Y": 0.28288066387176514,
                        "X": 0.391388863325119
                    },
                    {
                        "Y": 0.2826388478279114,
                        "X": 0.6376373171806335
                    },
```

```
                    {
                        "Y": 0.30532628297805786,
                        "X": 0.637677013874054
                    },
                    {
                        "Y": 0.305568128824234,
                        "X": 0.39142853021621704
                    }
                ]
            },
            "Confidence": 94.35709381103516,
            "DetectedText": "ESTD 1882",
            "Type": "LINE",
            "Id": 0
        },
        {
            "Geometry": {
                "BoundingBox": {
                    "Width": 0.33933889865875244,
                    "Top": 0.32603850960731506,
                    "Left": 0.34534579515457153,
                    "Height": 0.07126858830451965
                },
                "Polygon": [
                    {
                        "Y": 0.32603850960731506,
                        "X": 0.34534579515457153
                    },
                    {
                        "Y": 0.32633158564567566,
                        "X": 0.684684693813324
                    },
                    {
                        "Y": 0.3976001739501953,
                        "X": 0.684575080871582
                    },
                    {
                        "Y": 0.3973070979118347,
                        "X": 0.345236212015152
                    }
                ]
            },
            "Confidence": 99.95779418945312,
            "DetectedText": "BRAINS",
```

```
            "Type": "LINE",
            "Id": 1
        },
        {
            "Confidence": 97.22098541259766,
            "Geometry": {
                "BoundingBox": {
                    "Width": 0.061079490929841995,
                    "Top": 0.2843210697174072,
                    "Left": 0.391391396522522,
                    "Height": 0.021029088646173477
                },
                "Polygon": [
                    {
                        "Y": 0.2843210697174072,
                        "X": 0.391391396522522
                    },
                    {
                        "Y": 0.2828207015991211,
                        "X": 0.4524524509906769
                    },
                    {
                        "Y": 0.3038259446620941,
                        "X": 0.4534534513950348
                    },
                    {
                        "Y": 0.30532634258270264,
                        "X": 0.3923923969268799
                    }
                ]
            },
            "DetectedText": "ESTD",
            "ParentId": 0,
            "Type": "WORD",
            "Id": 2
        },
        {
            "Confidence": 91.49320983886719,
            "Geometry": {
                "BoundingBox": {
                    "Width": 0.07007007300853729,
                    "Top": 0.2828207015991211,
                    "Left": 0.5675675868988037,
                    "Height": 0.02250562608242035
```

```
                },
                "Polygon": [
                    {
                        "Y": 0.2828207015991211,
                        "X": 0.5675675868988037
                    },
                    {
                        "Y": 0.2828207015991211,
                        "X": 0.6376376152038574
                    },
                    {
                        "Y": 0.30532634258270264,
                        "X": 0.6376376152038574
                    },
                    {
                        "Y": 0.30532634258270264,
                        "X": 0.5675675868988037
                    }
                ]
            },
            "DetectedText": "1882",
            "ParentId": 0,
            "Type": "WORD",
            "Id": 3
        },
        {
            "Confidence": 99.95779418945312,
            "Geometry": {
                "BoundingBox": {
                    "Width": 0.33933934569358826,
                    "Top": 0.32633158564567566,
                    "Left": 0.3453453481197357,
                    "Height": 0.07127484679222107
                },
                "Polygon": [
                    {
                        "Y": 0.32633158564567566,
                        "X": 0.3453453481197357
                    },
                    {
                        "Y": 0.32633158564567566,
                        "X": 0.684684693813324
                    },
                    {
```

```
                        "Y": 0.39759939908981323,
                        "X": 0.6836836934089661
                    },
                    {
                        "Y": 0.39684921503067017,
                        "X": 0.3453453481197357
                    }
                ]
            },
            "DetectedText": "BRAINS",
            "ParentId": 1,
            "Type": "WORD",
            "Id": 4
        }
    ]
}
```

- For API details, see DetectText in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.*;

import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
```

```
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class DetectText {
    public static void main(String[] args) {
        final String usage = "\n" +
            "Usage:   <bucketName> <sourceImage>\n" +
            "\n" +
            "Where:\n" +
            "   bucketName - The name of the S3 bucket where the image is stored
\n" +
            "   sourceImage - The path to the image that contains text (for
 example, pic1.png). \n";

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucketName = args[0];
        String sourceImage = args[1];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        detectTextLabels(rekClient, bucketName, sourceImage);
        rekClient.close();
    }

    /**
     * Detects text labels in an image stored in an S3 bucket using Amazon
 Rekognition.
     *
     * @param rekClient    an instance of the Amazon Rekognition client
     * @param bucketName   the name of the S3 bucket where the image is stored
     * @param sourceImage  the name of the image file in the S3 bucket
     * @throws RekognitionException if an error occurs while calling the Amazon
 Rekognition API
     */
```

```
    public static void detectTextLabels(RekognitionClient rekClient, String
 bucketName, String sourceImage) {
        try {
            S3Object s3ObjectTarget = S3Object.builder()
                    .bucket(bucketName)
                    .name(sourceImage)
                    .build();

            Image souImage = Image.builder()
                    .s3Object(s3ObjectTarget)
                    .build();

            DetectTextRequest textRequest = DetectTextRequest.builder()
                    .image(souImage)
                    .build();

            DetectTextResponse textResponse = rekClient.detectText(textRequest);
            List<TextDetection> textCollection = textResponse.textDetections();
            System.out.println("Detected lines and words");
            for (TextDetection text : textCollection) {
                System.out.println("Detected: " + text.detectedText());
                System.out.println("Confidence: " +
 text.confidence().toString());
                System.out.println("Id : " + text.id());
                System.out.println("Parent Id: " + text.parentId());
                System.out.println("Type: " + text.type());
                System.out.println();
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see DetectText in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun detectTextLabels(sourceImage: String?) {
    val souImage =
        Image {
            bytes = (File(sourceImage).readBytes())
        }

    val request =
        DetectTextRequest {
            image = souImage
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.detectText(request)
        response.textDetections?.forEach { text ->
            println("Detected: ${text.detectedText}")
            println("Confidence: ${text.confidence}")
            println("Id: ${text.id}")
            println("Parent Id:  ${text.parentId}")
            println("Type: ${text.type}")
        }
    }
}
```

- For API details, see DetectText in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionImage:
    """
    Encapsulates an Amazon Rekognition image. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, image, image_name, rekognition_client):
        """
        Initializes the image object.

        :param image: Data that defines the image, either the image bytes or
                      an Amazon S3 bucket and object key.
        :param image_name: The name of the image.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.image = image
        self.image_name = image_name
        self.rekognition_client = rekognition_client


    def detect_text(self):
        """
        Detects text in the image.

        :return The list of text elements found in the image.
        """
        try:
            response = self.rekognition_client.detect_text(Image=self.image)
            texts = [RekognitionText(text) for text in
 response["TextDetections"]]
            logger.info("Found %s texts in %s.", len(texts), self.image_name)
        except ClientError:
```

```
            logger.exception("Couldn't detect text in %s.", self.image_name)
            raise
        else:
            return texts
```

- For API details, see DetectText in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `DisassociateFaces` with an AWS SDK or CLI

The following code examples show how to use `DisassociateFaces`.

CLI

AWS CLI

```
aws rekognition disassociate-faces --face-ids list-of-face-ids
  --user-id user-id --collection-id collection-name --region region-name
```

- For API details, see DisassociateFaces in *AWS CLI Command Reference*.

Python

SDK for Python (Boto3)

```
from botocore.exceptions import ClientError
import boto3
import logging

logger = logging.getLogger(__name__)
session = boto3.Session(profile_name='profile-name')
client = session.client('rekognition')

def disassociate_faces(collection_id, user_id, face_ids):
    """
```

```
    Disassociate stored faces within collection to the given user

    :param collection_id: The ID of the collection where user and faces are
 stored.
    :param user_id: The ID of the user that we want to disassociate faces from
    :param face_ids: The list of face IDs to be disassociated from the given user

    :return: response of AssociateFaces API
    """
    logger.info(f'Disssociating faces from user: {user_id}, {face_ids}')
    try:
        response = client.disassociate_faces(
            CollectionId=collection_id,
            UserId=user_id,
            FaceIds=face_ids
        )
        print(f'- disassociated {len(response["DisassociatedFaces"])} faces')
    except ClientError:
        logger.exception("Failed to disassociate faces from the given user")
        raise
    else:
        print(response)
        return response

def main():
    face_ids = ["faceId1", "faceId2"]
    collection_id = "collection-id"
    user_id = "user-id"
    disassociate_faces(collection_id, user_id, face_ids)

if __name__ == "__main__":
    main()
```

- For API details, see DisassociateFaces in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `GetCelebrityInfo` with an AWS SDK or CLI

The following code examples show how to use `GetCelebrityInfo`.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
    using System;
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Shows how to use Amazon Rekognition to retrieve information about the
    /// celebrity identified by the supplied celebrity Id.
    /// </summary>
    public class CelebrityInfo
    {
        public static async Task Main()
        {
            string celebId = "nnnnnnnn";

            var rekognitionClient = new AmazonRekognitionClient();

            var celebrityInfoRequest = new GetCelebrityInfoRequest
            {
                Id = celebId,
            };

            Console.WriteLine($"Getting information for celebrity: {celebId}");

            var celebrityInfoResponse = await
rekognitionClient.GetCelebrityInfoAsync(celebrityInfoRequest);

            // Display celebrity information.
            Console.WriteLine($"celebrity name: {celebrityInfoResponse.Name}");
            Console.WriteLine("Further information (if available):");
            celebrityInfoResponse.Urls.ForEach(url =>
            {
```

```
                Console.WriteLine(url);
            });
        }
    }
```

- For API details, see GetCelebrityInfo in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To get information about a celebrity

The following `get-celebrity-info` command displays information about the specified celebrity. The `id` parameter comes from a previous call to `recognize-celebrities`.

```
aws rekognition get-celebrity-info --id nnnnnnn
```

Output:

```
{
    "Name": "Celeb A",
    "Urls": [
        "www.imdb.com/name/aaaaaaaaa"
    ]
}
```

For more information, see Getting Information About a Celebrity in the *Amazon Rekognition Developer Guide*.

- For API details, see GetCelebrityInfo in *AWS CLI Command Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `IndexFaces` with an AWS SDK or CLI

The following code examples show how to use `IndexFaces`.

For more information, see Adding faces to a collection.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
using System;
using System.Collections.Generic;
using System.Threading.Tasks;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

/// <summary>
/// Uses the Amazon Rekognition Service to detect faces in an image
/// that has been uploaded to an Amazon Simple Storage Service (Amazon S3)
/// bucket and then adds the information to a collection.
/// </summary>
public class AddFaces
{
    public static async Task Main()
    {
        string collectionId = "MyCollection2";
        string bucket = "amzn-s3-demo-bucket";
        string photo = "input.jpg";

        var rekognitionClient = new AmazonRekognitionClient();

        var image = new Image
        {
            S3Object = new S3Object
            {
                Bucket = bucket,
                Name = photo,
            },
        };
```

```
            var indexFacesRequest = new IndexFacesRequest
            {
                Image = image,
                CollectionId = collectionId,
                ExternalImageId = photo,
                DetectionAttributes = new List<string>() { "ALL" },
            };

            IndexFacesResponse indexFacesResponse = await
 rekognitionClient.IndexFacesAsync(indexFacesRequest);

            Console.WriteLine($"{photo} added");
            foreach (FaceRecord faceRecord in indexFacesResponse.FaceRecords)
            {
                Console.WriteLine($"Face detected: Faceid is
 {faceRecord.Face.FaceId}");
            }
        }
    }
```

- For API details, see IndexFaces in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To add faces to a collection

The following `index-faces` command adds the faces found in an image to the specified collection.

```
aws rekognition index-faces \
    --image '{"S3Object":{"Bucket":"MyVideoS3Bucket","Name":"MyPicture.jpg"}}' \
    --collection-id MyCollection \
    --max-faces 1 \
    --quality-filter "AUTO" \
    --detection-attributes "ALL" \
    --external-image-id "MyPicture.jpg"
```

Output:

```
{
    "FaceRecords": [
        {
            "FaceDetail": {
                "Confidence": 99.993408203125,
                "Eyeglasses": {
                    "Confidence": 99.11750030517578,
                    "Value": false
                },
                "Sunglasses": {
                    "Confidence": 99.98249053955078,
                    "Value": false
                },
                "Gender": {
                    "Confidence": 99.92769622802734,
                    "Value": "Male"
                },
                "Landmarks": [
                    {
                        "Y": 0.26750367879867554,
                        "X": 0.6202793717384338,
                        "Type": "eyeLeft"
                    },
                    {
                        "Y": 0.26642778515815735,
                        "X": 0.6787431836128235,
                        "Type": "eyeRight"
                    },
                    {
                        "Y": 0.31361380219459534,
                        "X": 0.6421601176261902,
                        "Type": "nose"
                    },
                    {
                        "Y": 0.3495299220085144,
                        "X": 0.6216195225715637,
                        "Type": "mouthLeft"
                    },
                    {
                        "Y": 0.35194727778434753,
                        "X": 0.669899046421051,
                        "Type": "mouthRight"
                    },
```

```
                    {
                        "Y": 0.26844894886016846,
                        "X": 0.6210268139839172,
                        "Type": "leftPupil"
                    },
                    {
                        "Y": 0.26707562804222107,
                        "X": 0.6817160844802856,
                        "Type": "rightPupil"
                    },
                    {
                        "Y": 0.24834522604942322,
                        "X": 0.6018546223640442,
                        "Type": "leftEyeBrowLeft"
                    },
                    {
                        "Y": 0.24397172033786774,
                        "X": 0.6172008514404297,
                        "Type": "leftEyeBrowUp"
                    },
                    {
                        "Y": 0.24677404761314392,
                        "X": 0.6339119076728821,
                        "Type": "leftEyeBrowRight"
                    },
                    {
                        "Y": 0.24582654237747192,
                        "X": 0.6619398593902588,
                        "Type": "rightEyeBrowLeft"
                    },
                    {
                        "Y": 0.23973053693771362,
                        "X": 0.6804757118225098,
                        "Type": "rightEyeBrowUp"
                    },
                    {
                        "Y": 0.24441994726657867,
                        "X": 0.6978968977928162,
                        "Type": "rightEyeBrowRight"
                    },
                    {
                        "Y": 0.2695908546447754,
                        "X": 0.6085202693939209,
                        "Type": "leftEyeLeft"
```

```
                    },
                    {
                        "Y": 0.26716896891593933,
                        "X": 0.6315826177597046,
                        "Type": "leftEyeRight"
                    },
                    {
                        "Y": 0.26289820671081543,
                        "X": 0.6202316880226135,
                        "Type": "leftEyeUp"
                    },
                    {
                        "Y": 0.27123287320137024,
                        "X": 0.6205548048019409,
                        "Type": "leftEyeDown"
                    },
                    {
                        "Y": 0.2668408751487732,
                        "X": 0.6663622260093689,
                        "Type": "rightEyeLeft"
                    },
                    {
                        "Y": 0.26741549372673035,
                        "X": 0.6910083889961243,
                        "Type": "rightEyeRight"
                    },
                    {
                        "Y": 0.2614026665687561,
                        "X": 0.6785826086997986,
                        "Type": "rightEyeUp"
                    },
                    {
                        "Y": 0.27075251936912537,
                        "X": 0.6789616942405701,
                        "Type": "rightEyeDown"
                    },
                    {
                        "Y": 0.3211299479007721,
                        "X": 0.6324167847633362,
                        "Type": "noseLeft"
                    },
                    {
                        "Y": 0.32276326417922974,
                        "X": 0.6558475494384766,
```

```
                        "Type": "noseRight"
                    },
                    {
                        "Y": 0.34385165572166443,
                        "X": 0.6444970965385437,
                        "Type": "mouthUp"
                    },
                    {
                        "Y": 0.3671635091304779,
                        "X": 0.6459195017814636,
                        "Type": "mouthDown"
                    }
                ],
                "Pose": {
                    "Yaw": -9.54541015625,
                    "Roll": -0.5709401965141296,
                    "Pitch": 0.6045494675636292
                },
                "Emotions": [
                    {
                        "Confidence": 39.90074157714844,
                        "Type": "HAPPY"
                    },
                    {
                        "Confidence": 23.38753890991211,
                        "Type": "CALM"
                    },
                    {
                        "Confidence": 5.840933322906494,
                        "Type": "CONFUSED"
                    }
                ],
                "AgeRange": {
                    "High": 63,
                    "Low": 45
                },
                "EyesOpen": {
                    "Confidence": 99.80887603759766,
                    "Value": true
                },
                "BoundingBox": {
                    "Width": 0.18562500178813934,
                    "Top": 0.1618015021085739,
                    "Left": 0.5575000047683716,
```

```
                    "Height": 0.24770642817020416
                },
                "Smile": {
                    "Confidence": 99.69740295410156,
                    "Value": false
                },
                "MouthOpen": {
                    "Confidence": 99.97393798828125,
                    "Value": false
                },
                "Quality": {
                    "Sharpness": 95.54405975341797,
                    "Brightness": 63.867706298828125
                },
                "Mustache": {
                    "Confidence": 97.05007934570312,
                    "Value": false
                },
                "Beard": {
                    "Confidence": 87.34505462646484,
                    "Value": false
                }
            },
            "Face": {
                "BoundingBox": {
                    "Width": 0.18562500178813934,
                    "Top": 0.1618015021085739,
                    "Left": 0.5575000047683716,
                    "Height": 0.24770642817020416
                },
                "FaceId": "ce7ed422-2132-4a11-ab14-06c5c410f29f",
                "ExternalImageId": "example-image.jpg",
                "Confidence": 99.993408203125,
                "ImageId": "8d67061e-90d2-598f-9fbd-29c8497039c0"
            }
        }
    ],
    "UnindexedFaces": [],
    "FaceModelVersion": "3.0",
    "OrientationCorrection": "ROTATE_0"
}
```

For more information, see Adding Faces to a Collection in the *Amazon Rekognition Developer Guide*.

- For API details, see IndexFaces in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.*;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class AddFacesToCollection {
    public static void main(String[] args) {
        final String usage = """
            Usage: <collectionId> <sourceImage> <bucketName>

            Where:
                collectionName - The name of the collection.
                sourceImage - The name of the image (for example, pic1.png).
                bucketName - The name of the S3 bucket.
            """;

        if (args.length != 3) {
            System.out.println(usage);
```

```
            System.exit(1);
        }

        String collectionId = args[0];
        String sourceImage = args[1];
        String bucketName = args[2];;
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        addToCollection(rekClient, collectionId, bucketName, sourceImage);
        rekClient.close();
    }

    /**
     * Adds a face from an image to an Amazon Rekognition collection.
     *
     * @param rekClient     the Amazon Rekognition client
     * @param collectionId  the ID of the collection to add the face to
     * @param bucketName    the name of the Amazon S3 bucket containing the image
     * @param sourceImage   the name of the image file to add to the collection
     * @throws RekognitionException if there is an error while interacting with
the Amazon Rekognition service
     */
    public static void addToCollection(RekognitionClient rekClient, String
collectionId, String bucketName, String sourceImage) {
        try {
            S3Object s3ObjectTarget = S3Object.builder()
                    .bucket(bucketName)
                    .name(sourceImage)
                    .build();

            Image targetImage = Image.builder()
                    .s3Object(s3ObjectTarget)
                    .build();

            IndexFacesRequest facesRequest = IndexFacesRequest.builder()
                    .collectionId(collectionId)
                    .image(targetImage)
                    .maxFaces(1)
                    .qualityFilter(QualityFilter.AUTO)
                    .detectionAttributes(Attribute.DEFAULT)
                    .build();
```

```
            IndexFacesResponse facesResponse =
 rekClient.indexFaces(facesRequest);
            System.out.println("Results for the image");
            System.out.println("\n Faces indexed:");
            List<FaceRecord> faceRecords = facesResponse.faceRecords();
            for (FaceRecord faceRecord : faceRecords) {
                System.out.println("  Face ID: " + faceRecord.face().faceId());
                System.out.println("  Location:" +
 faceRecord.faceDetail().boundingBox().toString());
            }

            List<UnindexedFace> unindexedFaces = facesResponse.unindexedFaces();
            System.out.println("Faces not indexed:");
            for (UnindexedFace unindexedFace : unindexedFaces) {
                System.out.println("  Location:" +
 unindexedFace.faceDetail().boundingBox().toString());
                System.out.println("  Reasons:");
                for (Reason reason : unindexedFace.reasons()) {
                    System.out.println("Reason:  " + reason);
                }
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see IndexFaces in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun addToCollection(
    collectionIdVal: String?,
    sourceImage: String,
) {
    val souImage =
        Image {
            bytes = (File(sourceImage).readBytes())
        }

    val request =
        IndexFacesRequest {
            collectionId = collectionIdVal
            image = souImage
            maxFaces = 1
            qualityFilter = QualityFilter.Auto
            detectionAttributes = listOf(Attribute.Default)
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val facesResponse = rekClient.indexFaces(request)

        // Display the results.
        println("Results for the image")
        println("\n Faces indexed:")
        facesResponse.faceRecords?.forEach { faceRecord ->
            println("Face ID: ${faceRecord.face?.faceId}")
            println("Location: ${faceRecord.faceDetail?.boundingBox}")
        }

        println("Faces not indexed:")
        facesResponse.unindexedFaces?.forEach { unindexedFace ->
            println("Location: ${unindexedFace.faceDetail?.boundingBox}")
            println("Reasons:")

            unindexedFace.reasons?.forEach { reason ->
                println("Reason:  $reason")
            }
        }
    }
}
```

- For API details, see IndexFaces in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollection:
    """
    Encapsulates an Amazon Rekognition collection. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, collection, rekognition_client):
        """
        Initializes a collection object.

        :param collection: Collection data in the format returned by a call to
                           create_collection.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.collection_id = collection["CollectionId"]
        self.collection_arn, self.face_count, self.created =
 self._unpack_collection(
            collection
        )
        self.rekognition_client = rekognition_client

    @staticmethod
    def _unpack_collection(collection):
        """
        Unpacks optional parts of a collection that can be returned by
        describe_collection.

        :param collection: The collection data.
        :return: A tuple of the data in the collection.
        """
        return (
            collection.get("CollectionArn"),
```

```
            collection.get("FaceCount", 0),
            collection.get("CreationTimestamp"),
        )


    def index_faces(self, image, max_faces):
        """
        Finds faces in the specified image, indexes them, and stores them in the
        collection.

        :param image: The image to index.
        :param max_faces: The maximum number of faces to index.
        :return: A tuple. The first element is a list of indexed faces.
                 The second element is a list of faces that couldn't be indexed.
        """
        try:
            response = self.rekognition_client.index_faces(
                CollectionId=self.collection_id,
                Image=image.image,
                ExternalImageId=image.image_name,
                MaxFaces=max_faces,
                DetectionAttributes=["ALL"],
            )
            indexed_faces = [
                RekognitionFace({**face["Face"], **face["FaceDetail"]})
                for face in response["FaceRecords"]
            ]
            unindexed_faces = [
                RekognitionFace(face["FaceDetail"])
                for face in response["UnindexedFaces"]
            ]
            logger.info(
                "Indexed %s faces in %s. Could not index %s faces.",
                len(indexed_faces),
                image.image_name,
                len(unindexed_faces),
            )
        except ClientError:
            logger.exception("Couldn't index faces in image %s.",
image.image_name)
            raise
        else:
            return indexed_faces, unindexed_faces
```

- For API details, see IndexFaces in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `ListCollections` with an AWS SDK or CLI

The following code examples show how to use `ListCollections`.

For more information, see Listing collections.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
using System;
using System.Threading.Tasks;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

/// <summary>
/// Uses Amazon Rekognition to list the collection IDs in the
/// current account.
/// </summary>
public class ListCollections
{
    public static async Task Main()
    {
        var rekognitionClient = new AmazonRekognitionClient();

        Console.WriteLine("Listing collections");
        int limit = 10;
```

```
            var listCollectionsRequest = new ListCollectionsRequest
            {
                MaxResults = limit,
            };

            var listCollectionsResponse = new ListCollectionsResponse();

            do
            {
                if (listCollectionsResponse is not null)
                {
                    listCollectionsRequest.NextToken =
listCollectionsResponse.NextToken;
                }

                listCollectionsResponse = await
rekognitionClient.ListCollectionsAsync(listCollectionsRequest);

                listCollectionsResponse.CollectionIds.ForEach(id =>
                {
                    Console.WriteLine(id);
                });
            }
            while (listCollectionsResponse.NextToken is not null);
        }
    }
```

- For API details, see ListCollections in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To list the available collections

The following `list-collections` command lists the available collections in the AWS account.

```
aws rekognition list-collections
```

Output:

```
{
    "FaceModelVersions": [
        "2.0",
        "3.0",
        "3.0",
        "3.0",
        "4.0",
        "1.0",
        "3.0",
        "4.0",
        "4.0",
        "4.0"
    ],
    "CollectionIds": [
        "MyCollection1",
        "MyCollection2",
        "MyCollection3",
        "MyCollection4",
        "MyCollection5",
        "MyCollection6",
        "MyCollection7",
        "MyCollection8",
        "MyCollection9",
        "MyCollection10"
    ]
}
```

For more information, see Listing Collections in the *Amazon Rekognition Developer Guide*.

- For API details, see ListCollections in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.ListCollectionsRequest;
import software.amazon.awssdk.services.rekognition.model.ListCollectionsResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class ListCollections {
    public static void main(String[] args) {
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Listing collections");
        listAllCollections(rekClient);
        rekClient.close();
    }

    public static void listAllCollections(RekognitionClient rekClient) {
        try {
            ListCollectionsRequest listCollectionsRequest =
 ListCollectionsRequest.builder()
                    .maxResults(10)
                    .build();

            ListCollectionsResponse response =
 rekClient.listCollections(listCollectionsRequest);
            List<String> collectionIds = response.collectionIds();
            for (String resultId : collectionIds) {
                System.out.println(resultId);
            }

        } catch (RekognitionException e) {
```

```
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see ListCollections in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun listAllCollections() {
    val request =
        ListCollectionsRequest {
            maxResults = 10
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.listCollections(request)
        response.collectionIds?.forEach { resultId ->
            println(resultId)
        }
    }
}
```

- For API details, see ListCollections in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollectionManager:
    """
    Encapsulates Amazon Rekognition collection management functions.
    This class is a thin wrapper around parts of the Boto3 Amazon Rekognition
 API.
    """

    def __init__(self, rekognition_client):
        """
        Initializes the collection manager object.

        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.rekognition_client = rekognition_client


    def list_collections(self, max_results):
        """
        Lists collections for the current account.

        :param max_results: The maximum number of collections to return.
        :return: The list of collections for the current account.
        """
        try:
            response =
 self.rekognition_client.list_collections(MaxResults=max_results)
            collections = [
                RekognitionCollection({"CollectionId": col_id},
 self.rekognition_client)
                for col_id in response["CollectionIds"]
            ]
        except ClientError:
```

```
            logger.exception("Couldn't list collections.")
            raise
        else:
            return collections
```

- For API details, see ListCollections in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `ListFaces` with an AWS SDK or CLI

The following code examples show how to use `ListFaces`.

For more information, see Listing faces in a collection.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
using System;
using System.Threading.Tasks;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

/// <summary>
/// Uses the Amazon Rekognition Service to retrieve the list of faces
/// stored in a collection.
/// </summary>
public class ListFaces
{
```

```
        public static async Task Main()
        {
            string collectionId = "MyCollection2";

            var rekognitionClient = new AmazonRekognitionClient();

            var listFacesResponse = new ListFacesResponse();
            Console.WriteLine($"Faces in collection {collectionId}");

            var listFacesRequest = new ListFacesRequest
            {
                CollectionId = collectionId,
                MaxResults = 1,
            };

            do
            {
                listFacesResponse = await
rekognitionClient.ListFacesAsync(listFacesRequest);
                listFacesResponse.Faces.ForEach(face =>
                {
                    Console.WriteLine(face.FaceId);
                });

                listFacesRequest.NextToken = listFacesResponse.NextToken;
            }
            while (!string.IsNullOrEmpty(listFacesResponse.NextToken));
        }
    }
```

- For API details, see ListFaces in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To list the faces in a collection

The following `list-faces` command lists the faces in the specified collection.

```
aws rekognition list-faces \
```

```
    --collection-id MyCollection
```

Output:


```
{
    "FaceModelVersion": "3.0",
    "Faces": [
        {
            "BoundingBox": {
                "Width": 0.5216310024261475,
                "Top": 0.3256250023841858,
                "Left": 0.13394300639629364,
                "Height": 0.3918749988079071
            },
            "FaceId": "0040279c-0178-436e-b70a-e61b074e96b0",
            "ExternalImageId": "image1.jpg",
            "Confidence": 100.0,
            "ImageId": "f976e487-3719-5e2d-be8b-ea2724c26991"
        },
        {
            "BoundingBox": {
                "Width": 0.5074880123138428,
                "Top": 0.3774999976158142,
                "Left": 0.18302799761295319,
                "Height": 0.3812499940395355
            },
            "FaceId": "086261e8-6deb-4bc0-ac73-ab22323cc38d",
            "ExternalImageId": "image2.jpg",
            "Confidence": 99.99930572509766,
            "ImageId": "ae1593b0-a8f6-5e24-a306-abf529e276fa"
        },
        {
            "BoundingBox": {
                "Width": 0.5574039816856384,
                "Top": 0.37187498807907104,
                "Left": 0.14559100568294525,
                "Height": 0.4181250035762787
            },
            "FaceId": "11c4bd3c-19c5-4eb8-aecc-24feb93a26e1",
            "ExternalImageId": "image3.jpg",
            "Confidence": 99.99960327148438,
            "ImageId": "80739b4d-883f-5b78-97cf-5124038e26b9"
        },
```

```
        {
            "BoundingBox": {
                "Width": 0.18562500178813934,
                "Top": 0.1618019938468933,
                "Left": 0.5575000047683716,
                "Height": 0.24770599603652954
            },
            "FaceId": "13692fe4-990a-4679-b14a-5ac23d135eab",
            "ExternalImageId": "image4.jpg",
            "Confidence": 99.99340057373047,
            "ImageId": "8df18239-9ad1-5acd-a46a-6581ff98f51b"
        },
        {
            "BoundingBox": {
                "Width": 0.5307819843292236,
                "Top": 0.2862499952316284,
                "Left": 0.1564060002565384,
                "Height": 0.3987500071525574
            },
            "FaceId": "2eb5f3fd-e2a9-4b1c-a89f-afa0a518fe06",
            "ExternalImageId": "image5.jpg",
            "Confidence": 99.99970245361328,
            "ImageId": "3c314792-197d-528d-bbb6-798ed012c150"
        },
        {
            "BoundingBox": {
                "Width": 0.5773710012435913,
                "Top": 0.34437501430511475,
                "Left": 0.12396000325679779,
                "Height": 0.4337500035762787
            },
            "FaceId": "57189455-42b0-4839-a86c-abda48b13174",
            "ExternalImageId": "image6.jpg",
            "Confidence": 100.0,
            "ImageId": "0aff2f37-e7a2-5dbc-a3a3-4ef6ec18eaa0"
        },
        {
            "BoundingBox": {
                "Width": 0.5349419713020325,
                "Top": 0.29124999046325684,
                "Left": 0.16389399766921997,
                "Height": 0.40187498927116394
            },
            "FaceId": "745f7509-b1fa-44e0-8b95-367b1359638a",
```

```
            "ExternalImageId": "image7.jpg",
            "Confidence": 99.99979400634766,
            "ImageId": "67a34327-48d1-5179-b042-01e52ccfeada"
        },
        {
            "BoundingBox": {
                "Width": 0.41499999165534973,
                "Top": 0.09187500178813934,
                "Left": 0.28083300590515137,
                "Height": 0.3112500011920929
            },
            "FaceId": "8d3cfc70-4ba8-4b36-9644-90fba29c2dac",
            "ExternalImageId": "image8.jpg",
            "Confidence": 99.99769592285156,
            "ImageId": "a294da46-2cb1-5cc4-9045-61d7ca567662"
        },
        {
            "BoundingBox": {
                "Width": 0.48166701197624207,
                "Top": 0.20999999344348907,
                "Left": 0.21250000596046448,
                "Height": 0.36125001311302185
            },
            "FaceId": "bd4ceb4d-9acc-4ab7-8ef8-1c2d2ba0a66a",
            "ExternalImageId": "image9.jpg",
            "Confidence": 99.99949645996094,
            "ImageId": "5e1a7588-e5a0-5ee3-bd00-c642518dfe3a"
        },
        {
            "BoundingBox": {
                "Width": 0.18562500178813934,
                "Top": 0.1618019938468933,
                "Left": 0.5575000047683716,
                "Height": 0.24770599603652954
            },
            "FaceId": "ce7ed422-2132-4a11-ab14-06c5c410f29f",
            "ExternalImageId": "image10.jpg",
            "Confidence": 99.99340057373047,
            "ImageId": "8d67061e-90d2-598f-9fbd-29c8497039c0"
        }
    ]
}
```

For more information, see Listing Faces in a Collection in the *Amazon Rekognition Developer Guide*.

- For API details, see ListFaces in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.Face;
import software.amazon.awssdk.services.rekognition.model.ListFacesRequest;
import software.amazon.awssdk.services.rekognition.model.ListFacesResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class ListFacesInCollection {
    public static void main(String[] args) {
        final String usage = """

                Usage:    <collectionId>

                Where:
                   collectionId - The name of the collection.\s
                """;
```

```
        if (args.length < 1) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Faces in collection " + collectionId);
        listFacesCollection(rekClient, collectionId);
        rekClient.close();
    }

    public static void listFacesCollection(RekognitionClient rekClient, String
 collectionId) {
        try {
            ListFacesRequest facesRequest = ListFacesRequest.builder()
                    .collectionId(collectionId)
                    .maxResults(10)
                    .build();

            ListFacesResponse facesResponse = rekClient.listFaces(facesRequest);
            List<Face> faces = facesResponse.faces();
            for (Face face : faces) {
                System.out.println("Confidence level there is a face: " +
 face.confidence());
                System.out.println("The face Id value is " + face.faceId());
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see ListFaces in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun listFacesCollection(collectionIdVal: String?) {
    val request =
        ListFacesRequest {
            collectionId = collectionIdVal
            maxResults = 10
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.listFaces(request)
        response.faces?.forEach { face ->
            println("Confidence level there is a face: ${face.confidence}")
            println("The face Id value is ${face.faceId}")
        }
    }
}
```

- For API details, see ListFaces in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollection:
```

```
    """
    Encapsulates an Amazon Rekognition collection. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, collection, rekognition_client):
        """
        Initializes a collection object.

        :param collection: Collection data in the format returned by a call to
                           create_collection.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.collection_id = collection["CollectionId"]
        self.collection_arn, self.face_count, self.created =
self._unpack_collection(
            collection
        )
        self.rekognition_client = rekognition_client

    @staticmethod
    def _unpack_collection(collection):
        """
        Unpacks optional parts of a collection that can be returned by
        describe_collection.

        :param collection: The collection data.
        :return: A tuple of the data in the collection.
        """
        return (
            collection.get("CollectionArn"),
            collection.get("FaceCount", 0),
            collection.get("CreationTimestamp"),
        )


    def list_faces(self, max_results):
        """
        Lists the faces currently indexed in the collection.

        :param max_results: The maximum number of faces to return.
        :return: The list of faces in the collection.
        """
        try:
```

```
            response = self.rekognition_client.list_faces(
                CollectionId=self.collection_id, MaxResults=max_results
            )
            faces = [RekognitionFace(face) for face in response["Faces"]]
            logger.info(
                "Found %s faces in collection %s.", len(faces),
self.collection_id
            )
        except ClientError:
            logger.exception(
                "Couldn't list faces in collection %s.", self.collection_id
            )
            raise
        else:
            return faces
```

- For API details, see ListFaces in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `RecognizeCelebrities` with an AWS SDK or CLI

The following code examples show how to use `RecognizeCelebrities`.

For more information, see Recognizing celebrities in an image.

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
    using System;
```

```
   using System.IO;
   using System.Threading.Tasks;
   using Amazon.Rekognition;
   using Amazon.Rekognition.Model;

   /// <summary>
   /// Shows how to use Amazon Rekognition to identify celebrities in a photo.
   /// </summary>
   public class CelebritiesInImage
   {
       public static async Task Main(string[] args)
       {
           string photo = "moviestars.jpg";

           var rekognitionClient = new AmazonRekognitionClient();

           var recognizeCelebritiesRequest = new RecognizeCelebritiesRequest();

           var img = new Amazon.Rekognition.Model.Image();
           byte[] data = null;
           try
           {
               using var fs = new FileStream(photo, FileMode.Open,
FileAccess.Read);
               data = new byte[fs.Length];
               fs.Read(data, 0, (int)fs.Length);
           }
           catch (Exception)
           {
               Console.WriteLine($"Failed to load file {photo}");
               return;
           }

           img.Bytes = new MemoryStream(data);
           recognizeCelebritiesRequest.Image = img;

           Console.WriteLine($"Looking for celebrities in image {photo}\n");

           var recognizeCelebritiesResponse = await
rekognitionClient.RecognizeCelebritiesAsync(recognizeCelebritiesRequest);


Console.WriteLine($"{recognizeCelebritiesResponse.CelebrityFaces.Count}
celebrity(s) were recognized.\n");
```

```
            recognizeCelebritiesResponse.CelebrityFaces.ForEach(celeb =>
            {
                Console.WriteLine($"Celebrity recognized: {celeb.Name}");
                Console.WriteLine($"Celebrity ID: {celeb.Id}");
                BoundingBox boundingBox = celeb.Face.BoundingBox;
                Console.WriteLine($"position: {boundingBox.Left}
{boundingBox.Top}");
                Console.WriteLine("Further information (if available):");
                celeb.Urls.ForEach(url =>
                {
                    Console.WriteLine(url);
                });
            });


Console.WriteLine($"{recognizeCelebritiesResponse.UnrecognizedFaces.Count}
face(s) were unrecognized.");
        }
    }
```

- For API details, see RecognizeCelebrities in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To recognize celebrities in an image

The following `recognize-celebrities` command recognizes celebrities in the specified image stored in an Amazon S3 bucket.:

```
aws rekognition recognize-celebrities \
    --image "S3Object={Bucket=MyImageS3Bucket,Name=moviestars.jpg}"
```

Output:

```
{
    "UnrecognizedFaces": [
        {
            "BoundingBox": {
```

```
                "Width": 0.14416666328907013,
                "Top": 0.07777778059244156,
                "Left": 0.625,
                "Height": 0.2746031880378723
            },
            "Confidence": 99.9990234375,
            "Pose": {
                "Yaw": 10.80408763885498,
                "Roll": -12.761146545410156,
                "Pitch": 10.96889877319336
            },
            "Quality": {
                "Sharpness": 94.1185531616211,
                "Brightness": 79.18367004394531
            },
            "Landmarks": [
                {
                    "Y": 0.18220913410186768,
                    "X": 0.6702951788902283,
                    "Type": "eyeLeft"
                },
                {
                    "Y": 0.16337193548679352,
                    "X": 0.7188183665275574,
                    "Type": "eyeRight"
                },
                {
                    "Y": 0.20739148557186127,
                    "X": 0.7055801749229431,
                    "Type": "nose"
                },
                {
                    "Y": 0.2889308035373688,
                    "X": 0.687512218952179,
                    "Type": "mouthLeft"
                },
                {
                    "Y": 0.2706988751888275,
                    "X": 0.7250053286552429,
                    "Type": "mouthRight"
                }
            ]
        }
    ],
```

```
    "CelebrityFaces": [
        {
            "MatchConfidence": 100.0,
            "Face": {
                "BoundingBox": {
                    "Width": 0.14000000059604645,
                    "Top": 0.1190476194024086,
                    "Left": 0.82833331823349,
                    "Height": 0.2666666805744171
                },
                "Confidence": 99.99359130859375,
                "Pose": {
                    "Yaw": -10.509642601013184,
                    "Roll": -14.51749324798584,
                    "Pitch": 13.799399375915527
                },
                "Quality": {
                    "Sharpness": 78.74752044677734,
                    "Brightness": 42.201324462890625
                },
                "Landmarks": [
                    {
                        "Y": 0.2290833294391632,
                        "X": 0.8709492087364197,
                        "Type": "eyeLeft"
                    },
                    {
                        "Y": 0.20639978349208832,
                        "X": 0.9153988361358643,
                        "Type": "eyeRight"
                    },
                    {
                        "Y": 0.25417643785476685,
                        "X": 0.8907724022865295,
                        "Type": "nose"
                    },
                    {
                        "Y": 0.32729196548461914,
                        "X": 0.8876466155052185,
                        "Type": "mouthLeft"
                    },
                    {
                        "Y": 0.3115464746952057,
                        "X": 0.9238573312759399,
```

```
                    "Type": "mouthRight"
                }
            ]
        },
        "Name": "Celeb A",
        "Urls": [
            "www.imdb.com/name/aaaaaaaaa"
        ],
        "Id": "1111111"
    },
    {
        "MatchConfidence": 97.0,
        "Face": {
            "BoundingBox": {
                "Width": 0.13333334028720856,
                "Top": 0.24920634925365448,
                "Left": 0.4449999928474426,
                "Height": 0.2539682686328888
            },
            "Confidence": 99.99979400634766,
            "Pose": {
                "Yaw": 6.557040691375732,
                "Roll": -7.316643714904785,
                "Pitch": 9.272967338562012
            },
            "Quality": {
                "Sharpness": 83.23492431640625,
                "Brightness": 78.83267974853516
            },
            "Landmarks": [
                {
                    "Y": 0.3625510632991791,
                    "X": 0.48898839950561523,
                    "Type": "eyeLeft"
                },
                {
                    "Y": 0.35366007685661316,
                    "X": 0.5313721299171448,
                    "Type": "eyeRight"
                },
                {
                    "Y": 0.3894785940647125,
                    "X": 0.5173314809799194,
                    "Type": "nose"
```

```
                    },
                    {
                        "Y": 0.44889405369758606,
                        "X": 0.5020005702972412,
                        "Type": "mouthLeft"
                    },
                    {
                        "Y": 0.4408611059188843,
                        "X": 0.5351271629333496,
                        "Type": "mouthRight"
                    }
                ]
            },
            "Name": "Celeb B",
            "Urls": [
                "www.imdb.com/name/bbbbbbbbb"
            ],
            "Id": "2222222"
        },
        {
            "MatchConfidence": 100.0,
            "Face": {
                "BoundingBox": {
                    "Width": 0.12416666746139526,
                    "Top": 0.2968254089355469,
                    "Left": 0.2150000035762787,
                    "Height": 0.23650793731212616
                },
                "Confidence": 99.99958801269531,
                "Pose": {
                    "Yaw": 7.801797866821289,
                    "Roll": -8.326810836791992,
                    "Pitch": 7.844768047332764
                },
                "Quality": {
                    "Sharpness": 86.93206024169922,
                    "Brightness": 79.81291198730469
                },
                "Landmarks": [
                    {
                        "Y": 0.4027804136276245,
                        "X": 0.2575301229953766,
                        "Type": "eyeLeft"
                    },
```

```
                    {
                        "Y": 0.3934555947780609,
                        "X": 0.2956969439983368,
                        "Type": "eyeRight"
                    },
                    {
                        "Y": 0.4309830069541931,
                        "X": 0.2837020754814148,
                        "Type": "nose"
                    },
                    {
                        "Y": 0.48186683654785156,
                        "X": 0.26812544465065,
                        "Type": "mouthLeft"
                    },
                    {
                        "Y": 0.47338807582855225,
                        "X": 0.29905644059181213,
                        "Type": "mouthRight"
                    }
                ]
            },
            "Name": "Celeb C",
            "Urls": [
                "www.imdb.com/name/ccccccccc"
            ],
            "Id": "3333333"
        },
        {
            "MatchConfidence": 97.0,
            "Face": {
                "BoundingBox": {
                    "Width": 0.11916666477918625,
                    "Top": 0.3698412775993347,
                    "Left": 0.008333333767950535,
                    "Height": 0.22698412835597992
                },
                "Confidence": 99.99999237060547,
                "Pose": {
                    "Yaw": 16.38478660583496,
                    "Roll": -1.0260354280471802,
                    "Pitch": 5.975185394287109
                },
                "Quality": {
```

```
                    "Sharpness": 83.23492431640625,
                    "Brightness": 61.408443450927734
                },
                "Landmarks": [
                    {
                        "Y": 0.4632347822189331,
                        "X": 0.049406956881284714,
                        "Type": "eyeLeft"
                    },
                    {
                        "Y": 0.46388113498687744,
                        "X": 0.08722897619009018,
                        "Type": "eyeRight"
                    },
                    {
                        "Y": 0.5020678639411926,
                        "X": 0.0758260041475296,
                        "Type": "nose"
                    },
                    {
                        "Y": 0.544157862663269,
                        "X": 0.054029736667871475,
                        "Type": "mouthLeft"
                    },
                    {
                        "Y": 0.5463630557060242,
                        "X": 0.08464983850717545,
                        "Type": "mouthRight"
                    }
                ]
            },
            "Name": "Celeb D",
            "Urls": [
                "www.imdb.com/name/ddddddddd"
            ],
            "Id": "4444444"
        }
    ]
}
```


For more information, see Recognizing Celebrities in an Image in the *Amazon Rekognition Developer Guide*.

- For API details, see RecognizeCelebrities in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.core.SdkBytes;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;

import software.amazon.awssdk.services.rekognition.model.*;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class RecognizeCelebrities {
    public static void main(String[] args) {
        final String usage = """
                Usage:   <bucketName> <sourceImage>

                Where:
                   bucketName - The name of the S3 bucket where the images are
 stored.
                   sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png).\s
                """;

        if (args.length != 2) {
```

```
            System.out.println(usage);
            System.exit(1);
        }

        String bucketName = args[0];;
        String sourceImage = args[1];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Locating celebrities in " + sourceImage);
        recognizeAllCelebrities(rekClient, bucketName, sourceImage);
        rekClient.close();
    }

    /**
     * Recognizes all celebrities in an image stored in an Amazon S3 bucket.
     *
     * @param rekClient    the Amazon Rekognition client used to perform the
celebrity recognition operation
     * @param bucketName   the name of the Amazon S3 bucket where the source
image is stored
     * @param sourceImage  the name of the source image file stored in the Amazon
S3 bucket
     */
    public static void recognizeAllCelebrities(RekognitionClient rekClient,
String bucketName, String sourceImage) {
        try {
            S3Object s3ObjectTarget = S3Object.builder()
                .bucket(bucketName)
                .name(sourceImage)
                .build();

            Image souImage = Image.builder()
                    .s3Object(s3ObjectTarget)
                    .build();

            RecognizeCelebritiesRequest request =
RecognizeCelebritiesRequest.builder()
                    .image(souImage)
                    .build();
```

```
            RecognizeCelebritiesResponse result =
 rekClient.recognizeCelebrities(request);
            List<Celebrity> celebs = result.celebrityFaces();
            System.out.println(celebs.size() + " celebrity(s) were recognized.
\n");
            for (Celebrity celebrity : celebs) {
                System.out.println("Celebrity recognized: " + celebrity.name());
                System.out.println("Celebrity ID: " + celebrity.id());

                System.out.println("Further information (if available):");
                for (String url : celebrity.urls()) {
                    System.out.println(url);
                }
                System.out.println();
            }
            System.out.println(result.unrecognizedFaces().size() + " face(s) were
 unrecognized.");

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see RecognizeCelebrities in *AWS SDK for Java 2.x API Reference*.

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
suspend fun recognizeAllCelebrities(sourceImage: String?) {
    val souImage =
        Image {
            bytes = (File(sourceImage).readBytes())
```

```
        }

    val request =
        RecognizeCelebritiesRequest {
            image = souImage
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val response = rekClient.recognizeCelebrities(request)
        response.celebrityFaces?.forEach { celebrity ->
            println("Celebrity recognized: ${celebrity.name}")
            println("Celebrity ID:${celebrity.id}")
            println("Further information (if available):")
            celebrity.urls?.forEach { url ->
                println(url)
            }
        }
        println("${response.unrecognizedFaces?.size} face(s) were unrecognized.")
    }
}
```

- For API details, see RecognizeCelebrities in *AWS SDK for Kotlin API reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionImage:
    """
    Encapsulates an Amazon Rekognition image. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, image, image_name, rekognition_client):
        """
```

```
        Initializes the image object.

        :param image: Data that defines the image, either the image bytes or
                      an Amazon S3 bucket and object key.
        :param image_name: The name of the image.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.image = image
        self.image_name = image_name
        self.rekognition_client = rekognition_client


    def recognize_celebrities(self):
        """
        Detects celebrities in the image.

        :return: A tuple. The first element is the list of celebrities found in
                 the image. The second element is the list of faces that were
                 detected but did not match any known celebrities.
        """
        try:
            response =
self.rekognition_client.recognize_celebrities(Image=self.image)
            celebrities = [
                RekognitionCelebrity(celeb) for celeb in
response["CelebrityFaces"]
            ]
            other_faces = [
                RekognitionFace(face) for face in response["UnrecognizedFaces"]
            ]
            logger.info(
                "Found %s celebrities and %s other faces in %s.",
                len(celebrities),
                len(other_faces),
                self.image_name,
            )
        except ClientError:
            logger.exception("Couldn't detect celebrities in %s.",
self.image_name)
            raise
        else:
            return celebrities, other_faces
```

- For API details, see RecognizeCelebrities in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `SearchFaces` with an AWS SDK or CLI

The following code examples show how to use `SearchFaces`.

For more information, see Searching for a face (face ID).

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
using System;
using System.Threading.Tasks;
using Amazon.Rekognition;
using Amazon.Rekognition.Model;

/// <summary>
/// Uses the Amazon Rekognition Service to find faces in an image that
/// match the face Id provided in the method request.
/// </summary>
public class SearchFacesMatchingId
{
    public static async Task Main()
    {
        string collectionId = "MyCollection";
        string faceId = "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx";

        var rekognitionClient = new AmazonRekognitionClient();
```

```
            // Search collection for faces matching the face id.
            var searchFacesRequest = new SearchFacesRequest
            {
                CollectionId = collectionId,
                FaceId = faceId,
                FaceMatchThreshold = 70F,
                MaxFaces = 2,
            };

            SearchFacesResponse searchFacesResponse = await
rekognitionClient.SearchFacesAsync(searchFacesRequest);

            Console.WriteLine("Face matching faceId " + faceId);

            Console.WriteLine("Matche(s): ");
            searchFacesResponse.FaceMatches.ForEach(face =>
            {
                Console.WriteLine($"FaceId: {face.Face.FaceId} Similarity:
{face.Similarity}");
            });
        }
    }
```

- For API details, see SearchFaces in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To search for faces in a collection that match a face ID.

The following `search-faces` command searches for faces in a collection that match the specified face ID.

```
aws rekognition search-faces \
    --face-id 8d3cfc70-4ba8-4b36-9644-90fba29c2dac \
    --collection-id MyCollection
```

Output:

```
{
    "SearchedFaceId": "8d3cfc70-4ba8-4b36-9644-90fba29c2dac",
    "FaceModelVersion": "3.0",
    "FaceMatches": [
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.48166701197624207,
                    "Top": 0.20999999344348907,
                    "Left": 0.21250000596046448,
                    "Height": 0.36125001311302185
                },
                "FaceId": "bd4ceb4d-9acc-4ab7-8ef8-1c2d2ba0a66a",
                "ExternalImageId": "image1.jpg",
                "Confidence": 99.99949645996094,
                "ImageId": "5e1a7588-e5a0-5ee3-bd00-c642518dfe3a"
            },
            "Similarity": 99.30997467041016
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.18562500178813934,
                    "Top": 0.1618019938468933,
                    "Left": 0.5575000047683716,
                    "Height": 0.24770599603652954
                },
                "FaceId": "ce7ed422-2132-4a11-ab14-06c5c410f29f",
                "ExternalImageId": "example-image.jpg",
                "Confidence": 99.99340057373047,
                "ImageId": "8d67061e-90d2-598f-9fbd-29c8497039c0"
            },
            "Similarity": 99.24862670898438
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.18562500178813934,
                    "Top": 0.1618019938468933,
                    "Left": 0.5575000047683716,
                    "Height": 0.24770599603652954
                },
                "FaceId": "13692fe4-990a-4679-b14a-5ac23d135eab",
```

```
                "ExternalImageId": "image3.jpg",
                "Confidence": 99.99340057373047,
                "ImageId": "8df18239-9ad1-5acd-a46a-6581ff98f51b"
            },
            "Similarity": 99.24862670898438
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.5349419713020325,
                    "Top": 0.29124999046325684,
                    "Left": 0.16389399766921997,
                    "Height": 0.40187498927116394
                },
                "FaceId": "745f7509-b1fa-44e0-8b95-367b1359638a",
                "ExternalImageId": "image9.jpg",
                "Confidence": 99.99979400634766,
                "ImageId": "67a34327-48d1-5179-b042-01e52ccfeada"
            },
            "Similarity": 96.73158264160156
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.5307819843292236,
                    "Top": 0.2862499952316284,
                    "Left": 0.1564060002565384,
                    "Height": 0.3987500071525574
                },
                "FaceId": "2eb5f3fd-e2a9-4b1c-a89f-afa0a518fe06",
                "ExternalImageId": "image10.jpg",
                "Confidence": 99.99970245361328,
                "ImageId": "3c314792-197d-528d-bbb6-798ed012c150"
            },
            "Similarity": 96.48291015625
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.5074880123138428,
                    "Top": 0.3774999976158142,
                    "Left": 0.18302799761295319,
                    "Height": 0.3812499940395355
                },
```

```
                "FaceId": "086261e8-6deb-4bc0-ac73-ab22323cc38d",
                "ExternalImageId": "image6.jpg",
                "Confidence": 99.99930572509766,
                "ImageId": "ae1593b0-a8f6-5e24-a306-abf529e276fa"
            },
            "Similarity": 96.43287658691406
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.5574039816856384,
                    "Top": 0.37187498807907104,
                    "Left": 0.14559100568294525,
                    "Height": 0.4181250035762787
                },
                "FaceId": "11c4bd3c-19c5-4eb8-aecc-24feb93a26e1",
                "ExternalImageId": "image5.jpg",
                "Confidence": 99.99960327148438,
                "ImageId": "80739b4d-883f-5b78-97cf-5124038e26b9"
            },
            "Similarity": 95.25305938720703
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.5773710012435913,
                    "Top": 0.34437501430511475,
                    "Left": 0.12396000325679779,
                    "Height": 0.4337500035762787
                },
                "FaceId": "57189455-42b0-4839-a86c-abda48b13174",
                "ExternalImageId": "image8.jpg",
                "Confidence": 100.0,
                "ImageId": "0aff2f37-e7a2-5dbc-a3a3-4ef6ec18eaa0"
            },
            "Similarity": 95.22837829589844
        }
    ]
}
```

For more information, see Searching for a Face Using Its Face ID in the *Amazon Rekognition Developer Guide*.

- For API details, see SearchFaces in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.core.SdkBytes;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.SearchFacesByImageRequest;
import software.amazon.awssdk.services.rekognition.model.Image;
import
 software.amazon.awssdk.services.rekognition.model.SearchFacesByImageResponse;
import software.amazon.awssdk.services.rekognition.model.FaceMatch;
import java.io.File;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.InputStream;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class SearchFaceMatchingImageCollection {
    public static void main(String[] args) {
        final String usage = """

                Usage:    <collectionId> <sourceImage>

                Where:
```

```
                    collectionId - The id of the collection. \s
                    sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png).\s

                """;

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        String sourceImage = args[1];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Searching for a face in a collections");
        searchFaceInCollection(rekClient, collectionId, sourceImage);
        rekClient.close();
    }

    public static void searchFaceInCollection(RekognitionClient rekClient, String
 collectionId, String sourceImage) {
        try {
            InputStream sourceStream = new FileInputStream(new
 File(sourceImage));
            SdkBytes sourceBytes = SdkBytes.fromInputStream(sourceStream);
            Image souImage = Image.builder()
                    .bytes(sourceBytes)
                    .build();

            SearchFacesByImageRequest facesByImageRequest =
 SearchFacesByImageRequest.builder()
                    .image(souImage)
                    .maxFaces(10)
                    .faceMatchThreshold(70F)
                    .collectionId(collectionId)
                    .build();

            SearchFacesByImageResponse imageResponse =
 rekClient.searchFacesByImage(facesByImageRequest);
            System.out.println("Faces matching in the collection");
```

```
            List<FaceMatch> faceImageMatches = imageResponse.faceMatches();
            for (FaceMatch face : faceImageMatches) {
                System.out.println("The similarity level is  " +
 face.similarity());
                System.out.println();
            }

        } catch (RekognitionException | FileNotFoundException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see SearchFaces in *AWS SDK for Java 2.x API Reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollection:
    """
    Encapsulates an Amazon Rekognition collection. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, collection, rekognition_client):
        """
        Initializes a collection object.

        :param collection: Collection data in the format returned by a call to
                           create_collection.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.collection_id = collection["CollectionId"]
```

```
        self.collection_arn, self.face_count, self.created =
self._unpack_collection(
            collection
        )
        self.rekognition_client = rekognition_client

    @staticmethod
    def _unpack_collection(collection):
        """
        Unpacks optional parts of a collection that can be returned by
        describe_collection.

        :param collection: The collection data.
        :return: A tuple of the data in the collection.
        """
        return (
            collection.get("CollectionArn"),
            collection.get("FaceCount", 0),
            collection.get("CreationTimestamp"),
        )


    def search_faces(self, face_id, threshold, max_faces):
        """
        Searches for faces in the collection that match another face from the
        collection.

        :param face_id: The ID of the face in the collection to search for.
        :param threshold: The match confidence must be greater than this value
                          for a face to be included in the results.
        :param max_faces: The maximum number of faces to return.
        :return: The list of matching faces found in the collection. This list
does
                 not contain the face specified by `face_id`.
        """
        try:
            response = self.rekognition_client.search_faces(
                CollectionId=self.collection_id,
                FaceId=face_id,
                FaceMatchThreshold=threshold,
                MaxFaces=max_faces,
            )
            faces = [RekognitionFace(face["Face"]) for face in
response["FaceMatches"]]
```

```
            logger.info(
                "Found %s faces in %s that match %s.",
                len(faces),
                self.collection_id,
                face_id,
            )
        except ClientError:
            logger.exception(
                "Couldn't search for faces in %s that match %s.",
                self.collection_id,
                face_id,
            )
            raise
        else:
            return faces
```

- For API details, see SearchFaces in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Use `SearchFacesByImage` with an AWS SDK or CLI

The following code examples show how to use `SearchFacesByImage`.

For more information, see Searching for a face (image).

.NET

SDK for .NET

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
    using System;
```

```
    using System.Threading.Tasks;
    using Amazon.Rekognition;
    using Amazon.Rekognition.Model;

    /// <summary>
    /// Uses the Amazon Rekognition Service to search for images matching those
    /// in a collection.
    /// </summary>
    public class SearchFacesMatchingImage
    {
        public static async Task Main()
        {
            string collectionId = "MyCollection";
            string bucket = "amzn-s3-demo-bucket";
            string photo = "input.jpg";

            var rekognitionClient = new AmazonRekognitionClient();

            // Get an image object from S3 bucket.
            var image = new Image()
            {
                S3Object = new S3Object()
                {
                    Bucket = bucket,
                    Name = photo,
                },
            };

            var searchFacesByImageRequest = new SearchFacesByImageRequest()
            {
                CollectionId = collectionId,
                Image = image,
                FaceMatchThreshold = 70F,
                MaxFaces = 2,
            };

            SearchFacesByImageResponse searchFacesByImageResponse = await
rekognitionClient.SearchFacesByImageAsync(searchFacesByImageRequest);

            Console.WriteLine("Faces matching largest face in image from " +
photo);
            searchFacesByImageResponse.FaceMatches.ForEach(face =>
            {
```

```
                Console.WriteLine($"FaceId: {face.Face.FaceId}, Similarity:
 {face.Similarity}");
            });
        }
    }
```

- For API details, see SearchFacesByImage in *AWS SDK for .NET API Reference*.

CLI

AWS CLI

To search for faces in a collection that match the largest face in an image.

The following `search-faces-by-image` command searches for faces in a collection that match the largest face in the specified image.:

```
aws rekognition search-faces-by-image \
    --image '{"S3Object":
{"Bucket":"MyImageS3Bucket","Name":"ExamplePerson.jpg"}}' \
    --collection-id MyFaceImageCollection

{
    "SearchedFaceBoundingBox": {
        "Width": 0.18562500178813934,
        "Top": 0.1618015021085739,
        "Left": 0.5575000047683716,
        "Height": 0.24770642817020416
    },
    "SearchedFaceConfidence": 99.993408203125,
    "FaceMatches": [
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.18562500178813934,
                    "Top": 0.1618019938468933,
                    "Left": 0.5575000047683716,
                    "Height": 0.24770599603652954
                },
                "FaceId": "ce7ed422-2132-4a11-ab14-06c5c410f29f",
                "ExternalImageId": "example-image.jpg",
```

```
            "Confidence": 99.99340057373047,
            "ImageId": "8d67061e-90d2-598f-9fbd-29c8497039c0"
        },
        "Similarity": 99.97913360595703
    },
    {
        "Face": {
            "BoundingBox": {
                "Width": 0.18562500178813934,
                "Top": 0.1618019938468933,
                "Left": 0.5575000047683716,
                "Height": 0.24770599603652954
            },
            "FaceId": "13692fe4-990a-4679-b14a-5ac23d135eab",
            "ExternalImageId": "image3.jpg",
            "Confidence": 99.99340057373047,
            "ImageId": "8df18239-9ad1-5acd-a46a-6581ff98f51b"
        },
        "Similarity": 99.97913360595703
    },
    {
        "Face": {
            "BoundingBox": {
                "Width": 0.41499999165534973,
                "Top": 0.09187500178813934,
                "Left": 0.28083300590515137,
                "Height": 0.3112500011920929
            },
            "FaceId": "8d3cfc70-4ba8-4b36-9644-90fba29c2dac",
            "ExternalImageId": "image2.jpg",
            "Confidence": 99.99769592285156,
            "ImageId": "a294da46-2cb1-5cc4-9045-61d7ca567662"
        },
        "Similarity": 99.18069458007812
    },
    {
        "Face": {
            "BoundingBox": {
                "Width": 0.48166701197624207,
                "Top": 0.20999999344348907,
                "Left": 0.21250000596046448,
                "Height": 0.36125001311302185
            },
            "FaceId": "bd4ceb4d-9acc-4ab7-8ef8-1c2d2ba0a66a",
```

```
            "ExternalImageId": "image1.jpg",
            "Confidence": 99.99949645996094,
            "ImageId": "5e1a7588-e5a0-5ee3-bd00-c642518dfe3a"
        },
        "Similarity": 98.66607666015625
    },
    {
        "Face": {
            "BoundingBox": {
                "Width": 0.5349419713020325,
                "Top": 0.29124999046325684,
                "Left": 0.16389399766921997,
                "Height": 0.40187498927116394
            },
            "FaceId": "745f7509-b1fa-44e0-8b95-367b1359638a",
            "ExternalImageId": "image9.jpg",
            "Confidence": 99.99979400634766,
            "ImageId": "67a34327-48d1-5179-b042-01e52ccfeada"
        },
        "Similarity": 98.24278259277344
    },
    {
        "Face": {
            "BoundingBox": {
                "Width": 0.5307819843292236,
                "Top": 0.2862499952316284,
                "Left": 0.1564060002565384,
                "Height": 0.3987500071525574
            },
            "FaceId": "2eb5f3fd-e2a9-4b1c-a89f-afa0a518fe06",
            "ExternalImageId": "image10.jpg",
            "Confidence": 99.99970245361328,
            "ImageId": "3c314792-197d-528d-bbb6-798ed012c150"
        },
        "Similarity": 98.10665893554688
    },
    {
        "Face": {
            "BoundingBox": {
                "Width": 0.5074880123138428,
                "Top": 0.3774999976158142,
                "Left": 0.18302799761295319,
                "Height": 0.3812499940395355
            },
```

```
                "FaceId": "086261e8-6deb-4bc0-ac73-ab22323cc38d",
                "ExternalImageId": "image6.jpg",
                "Confidence": 99.99930572509766,
                "ImageId": "ae1593b0-a8f6-5e24-a306-abf529e276fa"
            },
            "Similarity": 98.10526275634766
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.5574039816856384,
                    "Top": 0.37187498807907104,
                    "Left": 0.14559100568294525,
                    "Height": 0.4181250035762787
                },
                "FaceId": "11c4bd3c-19c5-4eb8-aecc-24feb93a26e1",
                "ExternalImageId": "image5.jpg",
                "Confidence": 99.99960327148438,
                "ImageId": "80739b4d-883f-5b78-97cf-5124038e26b9"
            },
            "Similarity": 97.94659423828125
        },
        {
            "Face": {
                "BoundingBox": {
                    "Width": 0.5773710012435913,
                    "Top": 0.34437501430511475,
                    "Left": 0.12396000325679779,
                    "Height": 0.4337500035762787
                },
                "FaceId": "57189455-42b0-4839-a86c-abda48b13174",
                "ExternalImageId": "image8.jpg",
                "Confidence": 100.0,
                "ImageId": "0aff2f37-e7a2-5dbc-a3a3-4ef6ec18eaa0"
            },
            "Similarity": 97.93476867675781
        }
    ],

 "FaceModelVersion": "3.0"
}
```

For more information, see Searching for a Face Using an Image in the *Amazon Rekognition Developer Guide*.

- For API details, see SearchFacesByImage in *AWS CLI Command Reference*.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.SearchFacesRequest;
import software.amazon.awssdk.services.rekognition.model.SearchFacesResponse;
import software.amazon.awssdk.services.rekognition.model.FaceMatch;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class SearchFaceMatchingIdCollection {
    public static void main(String[] args) {
        final String usage = """

                Usage:    <collectionId> <sourceImage>

                Where:
                   collectionId - The id of the collection. \s
                   sourceImage - The path to the image (for example, C:\\AWS\
\pic1.png).\s
```

```
                """;

        if (args.length != 2) {
            System.out.println(usage);
            System.exit(1);
        }

        String collectionId = args[0];
        String faceId = args[1];
        Region region = Region.US_WEST_2;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        System.out.println("Searching for a face in a collections");
        searchFacebyId(rekClient, collectionId, faceId);
        rekClient.close();
    }

    public static void searchFacebyId(RekognitionClient rekClient, String
collectionId, String faceId) {
        try {
            SearchFacesRequest searchFacesRequest = SearchFacesRequest.builder()
                    .collectionId(collectionId)
                    .faceId(faceId)
                    .faceMatchThreshold(70F)
                    .maxFaces(2)
                    .build();

            SearchFacesResponse imageResponse =
rekClient.searchFaces(searchFacesRequest);
            System.out.println("Faces matching in the collection");
            List<FaceMatch> faceImageMatches = imageResponse.faceMatches();
            for (FaceMatch face : faceImageMatches) {
                System.out.println("The similarity level is  " +
face.similarity());
                System.out.println();
            }

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
```

```
}
```

- For API details, see SearchFacesByImage in *AWS SDK for Java 2.x API Reference*.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

```
class RekognitionCollection:
    """
    Encapsulates an Amazon Rekognition collection. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, collection, rekognition_client):
        """
        Initializes a collection object.

        :param collection: Collection data in the format returned by a call to
                           create_collection.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.collection_id = collection["CollectionId"]
        self.collection_arn, self.face_count, self.created =
 self._unpack_collection(
            collection
        )
        self.rekognition_client = rekognition_client

    @staticmethod
    def _unpack_collection(collection):
        """
        Unpacks optional parts of a collection that can be returned by
        describe_collection.
```

```
        :param collection: The collection data.
        :return: A tuple of the data in the collection.
        """
        return (
            collection.get("CollectionArn"),
            collection.get("FaceCount", 0),
            collection.get("CreationTimestamp"),
        )


    def search_faces_by_image(self, image, threshold, max_faces):
        """
        Searches for faces in the collection that match the largest face in the
        reference image.

        :param image: The image that contains the reference face to search for.
        :param threshold: The match confidence must be greater than this value
                          for a face to be included in the results.
        :param max_faces: The maximum number of faces to return.
        :return: A tuple. The first element is the face found in the reference
image.
                 The second element is the list of matching faces found in the
                 collection.
        """
        try:
            response = self.rekognition_client.search_faces_by_image(
                CollectionId=self.collection_id,
                Image=image.image,
                FaceMatchThreshold=threshold,
                MaxFaces=max_faces,
            )
            image_face = RekognitionFace(
                {
                    "BoundingBox": response["SearchedFaceBoundingBox"],
                    "Confidence": response["SearchedFaceConfidence"],
                }
            )
            collection_faces = [
                RekognitionFace(face["Face"]) for face in response["FaceMatches"]
            ]
            logger.info(
                "Found %s faces in the collection that match the largest "
                "face in %s.",
                len(collection_faces),
```

```
                image.image_name,
            )
        except ClientError:
            logger.exception(
                "Couldn't search for faces in %s that match %s.",
                self.collection_id,
                image.image_name,
            )
            raise
        else:
            return image_face, collection_faces
```

- For API details, see SearchFacesByImage in *AWS SDK for Python (Boto3) API Reference*.

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Scenarios for Amazon Rekognition using AWS SDKs

The following code examples show you how to implement common scenarios in Amazon Rekognition with AWS SDKs. These scenarios show you how to accomplish specific tasks by calling multiple functions within Amazon Rekognition or combined with other AWS services. Each scenario includes a link to the complete source code, where you can find instructions on how to set up and run the code.

Scenarios target an intermediate level of experience to help you understand service actions in context.

Examples

- Build an Amazon Rekognition collection and find faces in it using an AWS SDK
- Create a photo asset management application that lets users manage photos using labels
- Detect PPE in images with Amazon Rekognition using an AWS SDK
- Detect and display elements in images with Amazon Rekognition using an AWS SDK
- Detect faces in an image using an AWS SDK
- Detect information in videos using Amazon Rekognition and the AWS SDK

- Detect objects in images with Amazon Rekognition using an AWS SDK
- Detect people and objects in a video with Amazon Rekognition using an AWS SDK
- Save EXIF and other image information using an AWS SDK

Build an Amazon Rekognition collection and find faces in it using an AWS SDK

The following code example shows how to:

- Create an Amazon Rekognition collection.
- Add images to the collection and detect faces in it.
- Search the collection for faces that match a reference image.
- Delete a collection.

For more information, see Searching faces in a collection.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

Create classes that wrap Amazon Rekognition functions.

```
import logging
from pprint import pprint
import boto3
from botocore.exceptions import ClientError
from rekognition_objects import RekognitionFace
from rekognition_image_detection import RekognitionImage

logger = logging.getLogger(__name__)
```

```
class RekognitionImage:
    """
    Encapsulates an Amazon Rekognition image. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, image, image_name, rekognition_client):
        """
        Initializes the image object.

        :param image: Data that defines the image, either the image bytes or
                      an Amazon S3 bucket and object key.
        :param image_name: The name of the image.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.image = image
        self.image_name = image_name
        self.rekognition_client = rekognition_client


    @classmethod
    def from_file(cls, image_file_name, rekognition_client, image_name=None):
        """
        Creates a RekognitionImage object from a local file.

        :param image_file_name: The file name of the image. The file is opened
 and its
                                bytes are read.
        :param rekognition_client: A Boto3 Rekognition client.
        :param image_name: The name of the image. If this is not specified, the
                           file name is used as the image name.
        :return: The RekognitionImage object, initialized with image bytes from
 the
                 file.
        """
        with open(image_file_name, "rb") as img_file:
            image = {"Bytes": img_file.read()}
        name = image_file_name if image_name is None else image_name
        return cls(image, name, rekognition_client)


class RekognitionCollectionManager:
    """
    Encapsulates Amazon Rekognition collection management functions.
```

```
    This class is a thin wrapper around parts of the Boto3 Amazon Rekognition
API.
    """

    def __init__(self, rekognition_client):
        """
        Initializes the collection manager object.

        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.rekognition_client = rekognition_client


    def create_collection(self, collection_id):
        """
        Creates an empty collection.

        :param collection_id: Text that identifies the collection.
        :return: The newly created collection.
        """
        try:
            response = self.rekognition_client.create_collection(
                CollectionId=collection_id
            )
            response["CollectionId"] = collection_id
            collection = RekognitionCollection(response, self.rekognition_client)
            logger.info("Created collection %s.", collection_id)
        except ClientError:
            logger.exception("Couldn't create collection %s.", collection_id)
            raise
        else:
            return collection


    def list_collections(self, max_results):
        """
        Lists collections for the current account.

        :param max_results: The maximum number of collections to return.
        :return: The list of collections for the current account.
        """
        try:
            response =
self.rekognition_client.list_collections(MaxResults=max_results)
```

```
            collections = [
                RekognitionCollection({"CollectionId": col_id},
 self.rekognition_client)
                for col_id in response["CollectionIds"]
            ]
        except ClientError:
            logger.exception("Couldn't list collections.")
            raise
        else:
            return collections



class RekognitionCollection:
    """
    Encapsulates an Amazon Rekognition collection. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, collection, rekognition_client):
        """
        Initializes a collection object.

        :param collection: Collection data in the format returned by a call to
                           create_collection.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.collection_id = collection["CollectionId"]
        self.collection_arn, self.face_count, self.created =
 self._unpack_collection(
            collection
        )
        self.rekognition_client = rekognition_client

    @staticmethod
    def _unpack_collection(collection):
        """
        Unpacks optional parts of a collection that can be returned by
        describe_collection.

        :param collection: The collection data.
        :return: A tuple of the data in the collection.
        """
        return (
```

```
            collection.get("CollectionArn"),
            collection.get("FaceCount", 0),
            collection.get("CreationTimestamp"),
        )


    def to_dict(self):
        """
        Renders parts of the collection data to a dict.

        :return: The collection data as a dict.
        """
        rendering = {
            "collection_id": self.collection_id,
            "collection_arn": self.collection_arn,
            "face_count": self.face_count,
            "created": self.created,
        }
        return rendering


    def describe_collection(self):
        """
        Gets data about the collection from the Amazon Rekognition service.

        :return: The collection rendered as a dict.
        """
        try:
            response = self.rekognition_client.describe_collection(
                CollectionId=self.collection_id
            )
            # Work around capitalization of Arn vs. ARN
            response["CollectionArn"] = response.get("CollectionARN")
            (
                self.collection_arn,
                self.face_count,
                self.created,
            ) = self._unpack_collection(response)
            logger.info("Got data for collection %s.", self.collection_id)
        except ClientError:
            logger.exception("Couldn't get data for collection %s.",
self.collection_id)
            raise
        else:
```

```
            return self.to_dict()


    def delete_collection(self):
        """
        Deletes the collection.
        """
        try:

self.rekognition_client.delete_collection(CollectionId=self.collection_id)
            logger.info("Deleted collection %s.", self.collection_id)
            self.collection_id = None
        except ClientError:
            logger.exception("Couldn't delete collection %s.",
self.collection_id)
            raise


    def index_faces(self, image, max_faces):
        """
        Finds faces in the specified image, indexes them, and stores them in the
        collection.

        :param image: The image to index.
        :param max_faces: The maximum number of faces to index.
        :return: A tuple. The first element is a list of indexed faces.
                 The second element is a list of faces that couldn't be indexed.
        """
        try:
            response = self.rekognition_client.index_faces(
                CollectionId=self.collection_id,
                Image=image.image,
                ExternalImageId=image.image_name,
                MaxFaces=max_faces,
                DetectionAttributes=["ALL"],
            )
            indexed_faces = [
                RekognitionFace({**face["Face"], **face["FaceDetail"]})
                for face in response["FaceRecords"]
            ]
            unindexed_faces = [
                RekognitionFace(face["FaceDetail"])
                for face in response["UnindexedFaces"]
            ]
```

```
            logger.info(
                "Indexed %s faces in %s. Could not index %s faces.",
                len(indexed_faces),
                image.image_name,
                len(unindexed_faces),
            )
        except ClientError:
            logger.exception("Couldn't index faces in image %s.",
image.image_name)
            raise
        else:
            return indexed_faces, unindexed_faces


    def list_faces(self, max_results):
        """
        Lists the faces currently indexed in the collection.

        :param max_results: The maximum number of faces to return.
        :return: The list of faces in the collection.
        """
        try:
            response = self.rekognition_client.list_faces(
                CollectionId=self.collection_id, MaxResults=max_results
            )
            faces = [RekognitionFace(face) for face in response["Faces"]]
            logger.info(
                "Found %s faces in collection %s.", len(faces),
self.collection_id
            )
        except ClientError:
            logger.exception(
                "Couldn't list faces in collection %s.", self.collection_id
            )
            raise
        else:
            return faces


    def search_faces(self, face_id, threshold, max_faces):
        """
        Searches for faces in the collection that match another face from the
        collection.
```

```
        :param face_id: The ID of the face in the collection to search for.
        :param threshold: The match confidence must be greater than this value
                          for a face to be included in the results.
        :param max_faces: The maximum number of faces to return.
        :return: The list of matching faces found in the collection. This list
does
                 not contain the face specified by `face_id`.
        """
        try:
            response = self.rekognition_client.search_faces(
                CollectionId=self.collection_id,
                FaceId=face_id,
                FaceMatchThreshold=threshold,
                MaxFaces=max_faces,
            )
            faces = [RekognitionFace(face["Face"]) for face in
response["FaceMatches"]]
            logger.info(
                "Found %s faces in %s that match %s.",
                len(faces),
                self.collection_id,
                face_id,
            )
        except ClientError:
            logger.exception(
                "Couldn't search for faces in %s that match %s.",
                self.collection_id,
                face_id,
            )
            raise
        else:
            return faces


    def search_faces_by_image(self, image, threshold, max_faces):
        """
        Searches for faces in the collection that match the largest face in the
        reference image.

        :param image: The image that contains the reference face to search for.
        :param threshold: The match confidence must be greater than this value
                          for a face to be included in the results.
        :param max_faces: The maximum number of faces to return.
```

```
        :return: A tuple. The first element is the face found in the reference
 image.
                 The second element is the list of matching faces found in the
                 collection.
        """
        try:
            response = self.rekognition_client.search_faces_by_image(
                CollectionId=self.collection_id,
                Image=image.image,
                FaceMatchThreshold=threshold,
                MaxFaces=max_faces,
            )
            image_face = RekognitionFace(
                {
                    "BoundingBox": response["SearchedFaceBoundingBox"],
                    "Confidence": response["SearchedFaceConfidence"],
                }
            )
            collection_faces = [
                RekognitionFace(face["Face"]) for face in response["FaceMatches"]
            ]
            logger.info(
                "Found %s faces in the collection that match the largest "
                "face in %s.",
                len(collection_faces),
                image.image_name,
            )
        except ClientError:
            logger.exception(
                "Couldn't search for faces in %s that match %s.",
                self.collection_id,
                image.image_name,
            )
            raise
        else:
            return image_face, collection_faces


class RekognitionFace:
    """Encapsulates an Amazon Rekognition face."""

    def __init__(self, face, timestamp=None):
        """
        Initializes the face object.
```

```
        :param face: Face data, in the format returned by Amazon Rekognition
                     functions.
        :param timestamp: The time when the face was detected, if the face was
                          detected in a video.
        """
        self.bounding_box = face.get("BoundingBox")
        self.confidence = face.get("Confidence")
        self.landmarks = face.get("Landmarks")
        self.pose = face.get("Pose")
        self.quality = face.get("Quality")
        age_range = face.get("AgeRange")
        if age_range is not None:
            self.age_range = (age_range.get("Low"), age_range.get("High"))
        else:
            self.age_range = None
        self.smile = face.get("Smile", {}).get("Value")
        self.eyeglasses = face.get("Eyeglasses", {}).get("Value")
        self.sunglasses = face.get("Sunglasses", {}).get("Value")
        self.gender = face.get("Gender", {}).get("Value", None)
        self.beard = face.get("Beard", {}).get("Value")
        self.mustache = face.get("Mustache", {}).get("Value")
        self.eyes_open = face.get("EyesOpen", {}).get("Value")
        self.mouth_open = face.get("MouthOpen", {}).get("Value")
        self.emotions = [
            emo.get("Type")
            for emo in face.get("Emotions", [])
            if emo.get("Confidence", 0) > 50
        ]
        self.face_id = face.get("FaceId")
        self.image_id = face.get("ImageId")
        self.timestamp = timestamp

    def to_dict(self):
        """
        Renders some of the face data to a dict.

        :return: A dict that contains the face data.
        """
        rendering = {}
        if self.bounding_box is not None:
            rendering["bounding_box"] = self.bounding_box
        if self.age_range is not None:
            rendering["age"] = f"{self.age_range[0]} - {self.age_range[1]}"
```

```
        if self.gender is not None:
            rendering["gender"] = self.gender
        if self.emotions:
            rendering["emotions"] = self.emotions
        if self.face_id is not None:
            rendering["face_id"] = self.face_id
        if self.image_id is not None:
            rendering["image_id"] = self.image_id
        if self.timestamp is not None:
            rendering["timestamp"] = self.timestamp
        has = []
        if self.smile:
            has.append("smile")
        if self.eyeglasses:
            has.append("eyeglasses")
        if self.sunglasses:
            has.append("sunglasses")
        if self.beard:
            has.append("beard")
        if self.mustache:
            has.append("mustache")
        if self.eyes_open:
            has.append("open eyes")
        if self.mouth_open:
            has.append("open mouth")
        if has:
            rendering["has"] = has
        return rendering
```

Use the wrapper classes to build a collection of faces from a set of images and then search for faces in the collection.

```
def usage_demo():
    print("-" * 88)
    print("Welcome to the Amazon Rekognition face collection demo!")
    print("-" * 88)

    logging.basicConfig(level=logging.INFO, format="%(levelname)s: %(message)s")

    rekognition_client = boto3.client("rekognition")
```

```
    images = [
        RekognitionImage.from_file(
            ".media/pexels-agung-pandit-wiguna-1128316.jpg",
            rekognition_client,
            image_name="sitting",
        ),
        RekognitionImage.from_file(
            ".media/pexels-agung-pandit-wiguna-1128317.jpg",
            rekognition_client,
            image_name="hopping",
        ),
        RekognitionImage.from_file(
            ".media/pexels-agung-pandit-wiguna-1128318.jpg",
            rekognition_client,
            image_name="biking",
        ),
    ]

    collection_mgr = RekognitionCollectionManager(rekognition_client)
    collection = collection_mgr.create_collection("doc-example-collection-demo")
    print(f"Created collection {collection.collection_id}:")
    pprint(collection.describe_collection())

    print("Indexing faces from three images:")
    for image in images:
        collection.index_faces(image, 10)
    print("Listing faces in collection:")
    faces = collection.list_faces(10)
    for face in faces:
        pprint(face.to_dict())
    input("Press Enter to continue.")

    print(
        f"Searching for faces in the collection that match the first face in the
"
        f"list (Face ID: {faces[0].face_id}."
    )
    found_faces = collection.search_faces(faces[0].face_id, 80, 10)
    print(f"Found {len(found_faces)} matching faces.")
    for face in found_faces:
        pprint(face.to_dict())
    input("Press Enter to continue.")

    print(
```

```
        f"Searching for faces in the collection that match the largest face in "
        f"{images[0].image_name}."
    )
    image_face, match_faces = collection.search_faces_by_image(images[0], 80, 10)
    print(f"The largest face in {images[0].image_name} is:")
    pprint(image_face.to_dict())
    print(f"Found {len(match_faces)} matching faces.")
    for face in match_faces:
        pprint(face.to_dict())
    input("Press Enter to continue.")

    collection.delete_collection()
    print("Thanks for watching!")
    print("-" * 88)
```

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Create a photo asset management application that lets users manage photos using labels

The following code examples show how to create a serverless application that lets users manage photos using labels.

.NET

SDK for .NET

Shows how to develop a photo asset management application that detects labels in images using Amazon Rekognition and stores them for later retrieval.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

For a deep dive into the origin of this example see the post on AWS Community.

Services used in this example

- API Gateway
- DynamoDB
- Lambda
- Amazon Rekognition
- Amazon S3
- Amazon SNS

C++

SDK for C++

Shows how to develop a photo asset management application that detects labels in images using Amazon Rekognition and stores them for later retrieval.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

For a deep dive into the origin of this example see the post on AWS Community.

Services used in this example

- API Gateway
- DynamoDB
- Lambda
- Amazon Rekognition
- Amazon S3
- Amazon SNS

Java

SDK for Java 2.x

Shows how to develop a photo asset management application that detects labels in images using Amazon Rekognition and stores them for later retrieval.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

For a deep dive into the origin of this example see the post on AWS Community.

Services used in this example

- API Gateway
- DynamoDB
- Lambda
- Amazon Rekognition
- Amazon S3
- Amazon SNS

JavaScript

SDK for JavaScript (v3)

Shows how to develop a photo asset management application that detects labels in images using Amazon Rekognition and stores them for later retrieval.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

For a deep dive into the origin of this example see the post on AWS Community.

Services used in this example

- API Gateway
- DynamoDB
- Lambda
- Amazon Rekognition
- Amazon S3
- Amazon SNS

Kotlin

SDK for Kotlin

Shows how to develop a photo asset management application that detects labels in images using Amazon Rekognition and stores them for later retrieval.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

For a deep dive into the origin of this example see the post on AWS Community.

Services used in this example

- API Gateway
- DynamoDB
- Lambda
- Amazon Rekognition
- Amazon S3
- Amazon SNS

PHP

SDK for PHP

Shows how to develop a photo asset management application that detects labels in images using Amazon Rekognition and stores them for later retrieval.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

For a deep dive into the origin of this example see the post on AWS Community.

Services used in this example

- API Gateway
- DynamoDB
- Lambda
- Amazon Rekognition
- Amazon S3
- Amazon SNS

Rust

SDK for Rust

Shows how to develop a photo asset management application that detects labels in images using Amazon Rekognition and stores them for later retrieval.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

For a deep dive into the origin of this example see the post on AWS Community.

Services used in this example

- API Gateway
- DynamoDB
- Lambda
- Amazon Rekognition
- Amazon S3
- Amazon SNS

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Detect PPE in images with Amazon Rekognition using an AWS SDK

The following code example shows how to build an app that uses Amazon Rekognition to detect Personal Protective Equipment (PPE) in images.

Java

SDK for Java 2.x

Shows how to create an AWS Lambda function that detects images with Personal Protective Equipment.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- DynamoDB
- Amazon Rekognition
- Amazon S3
- Amazon SES

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Detect and display elements in images with Amazon Rekognition using an AWS SDK

The following code example shows how to:

- Detect elements in images by using Amazon Rekognition.
- Display images and draw bounding boxes around detected elements.

For more information, see Displaying bounding boxes.

Python

SDK for Python (Boto3)

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

Create classes to wrap Amazon Rekognition functions.

```
import logging
from pprint import pprint
import boto3
from botocore.exceptions import ClientError
import requests
```

```
from rekognition_objects import (
    RekognitionFace,
    RekognitionCelebrity,
    RekognitionLabel,
    RekognitionModerationLabel,
    RekognitionText,
    show_bounding_boxes,
    show_polygons,
)

logger = logging.getLogger(__name__)


class RekognitionImage:
    """
    Encapsulates an Amazon Rekognition image. This class is a thin wrapper
    around parts of the Boto3 Amazon Rekognition API.
    """

    def __init__(self, image, image_name, rekognition_client):
        """
        Initializes the image object.

        :param image: Data that defines the image, either the image bytes or
                      an Amazon S3 bucket and object key.
        :param image_name: The name of the image.
        :param rekognition_client: A Boto3 Rekognition client.
        """
        self.image = image
        self.image_name = image_name
        self.rekognition_client = rekognition_client


    @classmethod
    def from_file(cls, image_file_name, rekognition_client, image_name=None):
        """
        Creates a RekognitionImage object from a local file.

        :param image_file_name: The file name of the image. The file is opened
 and its
                                bytes are read.
        :param rekognition_client: A Boto3 Rekognition client.
        :param image_name: The name of the image. If this is not specified, the
                           file name is used as the image name.
```

```
        :return: The RekognitionImage object, initialized with image bytes from
the
                 file.
        """
        with open(image_file_name, "rb") as img_file:
            image = {"Bytes": img_file.read()}
        name = image_file_name if image_name is None else image_name
        return cls(image, name, rekognition_client)


    @classmethod
    def from_bucket(cls, s3_object, rekognition_client):
        """
        Creates a RekognitionImage object from an Amazon S3 object.

        :param s3_object: An Amazon S3 object that identifies the image. The
image
                          is not retrieved until needed for a later call.
        :param rekognition_client: A Boto3 Rekognition client.
        :return: The RekognitionImage object, initialized with Amazon S3 object
data.
        """
        image = {"S3Object": {"Bucket": s3_object.bucket_name, "Name":
s3_object.key}}
        return cls(image, s3_object.key, rekognition_client)


    def detect_faces(self):
        """
        Detects faces in the image.

        :return: The list of faces found in the image.
        """
        try:
            response = self.rekognition_client.detect_faces(
                Image=self.image, Attributes=["ALL"]
            )
            faces = [RekognitionFace(face) for face in response["FaceDetails"]]
            logger.info("Detected %s faces.", len(faces))
        except ClientError:
            logger.exception("Couldn't detect faces in %s.", self.image_name)
            raise
        else:
            return faces
```

```
    def detect_labels(self, max_labels):
        """
        Detects labels in the image. Labels are objects and people.

        :param max_labels: The maximum number of labels to return.
        :return: The list of labels detected in the image.
        """
        try:
            response = self.rekognition_client.detect_labels(
                Image=self.image, MaxLabels=max_labels
            )
            labels = [RekognitionLabel(label) for label in response["Labels"]]
            logger.info("Found %s labels in %s.", len(labels), self.image_name)
        except ClientError:
            logger.info("Couldn't detect labels in %s.", self.image_name)
            raise
        else:
            return labels


    def recognize_celebrities(self):
        """
        Detects celebrities in the image.

        :return: A tuple. The first element is the list of celebrities found in
                 the image. The second element is the list of faces that were
                 detected but did not match any known celebrities.
        """
        try:
            response =
self.rekognition_client.recognize_celebrities(Image=self.image)
            celebrities = [
                RekognitionCelebrity(celeb) for celeb in
response["CelebrityFaces"]
            ]
            other_faces = [
                RekognitionFace(face) for face in response["UnrecognizedFaces"]
            ]
            logger.info(
                "Found %s celebrities and %s other faces in %s.",
                len(celebrities),
                len(other_faces),
```

```
                self.image_name,
            )
        except ClientError:
            logger.exception("Couldn't detect celebrities in %s.",
self.image_name)
            raise
        else:
            return celebrities, other_faces



    def compare_faces(self, target_image, similarity):
        """
        Compares faces in the image with the largest face in the target image.

        :param target_image: The target image to compare against.
        :param similarity: Faces in the image must have a similarity value
greater
                           than this value to be included in the results.
        :return: A tuple. The first element is the list of faces that match the
                 reference image. The second element is the list of faces that
have
                 a similarity value below the specified threshold.
        """
        try:
            response = self.rekognition_client.compare_faces(
                SourceImage=self.image,
                TargetImage=target_image.image,
                SimilarityThreshold=similarity,
            )
            matches = [
                RekognitionFace(match["Face"]) for match in
response["FaceMatches"]
            ]
            unmatches = [RekognitionFace(face) for face in
response["UnmatchedFaces"]]
            logger.info(
                "Found %s matched faces and %s unmatched faces.",
                len(matches),
                len(unmatches),
            )
        except ClientError:
            logger.exception(
                "Couldn't match faces from %s to %s.",
```

```
                self.image_name,
                target_image.image_name,
            )
            raise
        else:
            return matches, unmatches


    def detect_moderation_labels(self):
        """
        Detects moderation labels in the image. Moderation labels identify
content
        that may be inappropriate for some audiences.

        :return: The list of moderation labels found in the image.
        """
        try:
            response = self.rekognition_client.detect_moderation_labels(
                Image=self.image
            )
            labels = [
                RekognitionModerationLabel(label)
                for label in response["ModerationLabels"]
            ]
            logger.info(
                "Found %s moderation labels in %s.", len(labels), self.image_name
            )
        except ClientError:
            logger.exception(
                "Couldn't detect moderation labels in %s.", self.image_name
            )
            raise
        else:
            return labels


    def detect_text(self):
        """
        Detects text in the image.

        :return The list of text elements found in the image.
        """
        try:
            response = self.rekognition_client.detect_text(Image=self.image)
```

```
            texts = [RekognitionText(text) for text in
 response["TextDetections"]]
            logger.info("Found %s texts in %s.", len(texts), self.image_name)
        except ClientError:
            logger.exception("Couldn't detect text in %s.", self.image_name)
            raise
        else:
            return texts
```

Create helper functions to draw bounding boxes and polygons.

```
import io
import logging
from PIL import Image, ImageDraw

logger = logging.getLogger(__name__)


def show_bounding_boxes(image_bytes, box_sets, colors):
    """
    Draws bounding boxes on an image and shows it with the default image viewer.

    :param image_bytes: The image to draw, as bytes.
    :param box_sets: A list of lists of bounding boxes to draw on the image.
    :param colors: A list of colors to use to draw the bounding boxes.
    """
    image = Image.open(io.BytesIO(image_bytes))
    draw = ImageDraw.Draw(image)
    for boxes, color in zip(box_sets, colors):
        for box in boxes:
            left = image.width * box["Left"]
            top = image.height * box["Top"]
            right = (image.width * box["Width"]) + left
            bottom = (image.height * box["Height"]) + top
            draw.rectangle([left, top, right, bottom], outline=color, width=3)
    image.show()



def show_polygons(image_bytes, polygons, color):
    """
```

```
    Draws polygons on an image and shows it with the default image viewer.

    :param image_bytes: The image to draw, as bytes.
    :param polygons: The list of polygons to draw on the image.
    :param color: The color to use to draw the polygons.
    """
    image = Image.open(io.BytesIO(image_bytes))
    draw = ImageDraw.Draw(image)
    for polygon in polygons:
        draw.polygon(
            [
                (image.width * point["X"], image.height * point["Y"])
                for point in polygon
            ],
            outline=color,
        )
    image.show()
```

Create classes to parse objects returned by Amazon Rekognition.

```
class RekognitionFace:
    """Encapsulates an Amazon Rekognition face."""

    def __init__(self, face, timestamp=None):
        """
        Initializes the face object.

        :param face: Face data, in the format returned by Amazon Rekognition
                     functions.
        :param timestamp: The time when the face was detected, if the face was
                          detected in a video.
        """
        self.bounding_box = face.get("BoundingBox")
        self.confidence = face.get("Confidence")
        self.landmarks = face.get("Landmarks")
        self.pose = face.get("Pose")
        self.quality = face.get("Quality")
        age_range = face.get("AgeRange")
        if age_range is not None:
            self.age_range = (age_range.get("Low"), age_range.get("High"))
```

```
        else:
            self.age_range = None
        self.smile = face.get("Smile", {}).get("Value")
        self.eyeglasses = face.get("Eyeglasses", {}).get("Value")
        self.sunglasses = face.get("Sunglasses", {}).get("Value")
        self.gender = face.get("Gender", {}).get("Value", None)
        self.beard = face.get("Beard", {}).get("Value")
        self.mustache = face.get("Mustache", {}).get("Value")
        self.eyes_open = face.get("EyesOpen", {}).get("Value")
        self.mouth_open = face.get("MouthOpen", {}).get("Value")
        self.emotions = [
            emo.get("Type")
            for emo in face.get("Emotions", [])
            if emo.get("Confidence", 0) > 50
        ]
        self.face_id = face.get("FaceId")
        self.image_id = face.get("ImageId")
        self.timestamp = timestamp

    def to_dict(self):
        """
        Renders some of the face data to a dict.

        :return: A dict that contains the face data.
        """
        rendering = {}
        if self.bounding_box is not None:
            rendering["bounding_box"] = self.bounding_box
        if self.age_range is not None:
            rendering["age"] = f"{self.age_range[0]} - {self.age_range[1]}"
        if self.gender is not None:
            rendering["gender"] = self.gender
        if self.emotions:
            rendering["emotions"] = self.emotions
        if self.face_id is not None:
            rendering["face_id"] = self.face_id
        if self.image_id is not None:
            rendering["image_id"] = self.image_id
        if self.timestamp is not None:
            rendering["timestamp"] = self.timestamp
        has = []
        if self.smile:
            has.append("smile")
        if self.eyeglasses:
```

```
            has.append("eyeglasses")
        if self.sunglasses:
            has.append("sunglasses")
        if self.beard:
            has.append("beard")
        if self.mustache:
            has.append("mustache")
        if self.eyes_open:
            has.append("open eyes")
        if self.mouth_open:
            has.append("open mouth")
        if has:
            rendering["has"] = has
        return rendering



class RekognitionCelebrity:
    """Encapsulates an Amazon Rekognition celebrity."""

    def __init__(self, celebrity, timestamp=None):
        """
        Initializes the celebrity object.

        :param celebrity: Celebrity data, in the format returned by Amazon
 Rekognition
                          functions.
        :param timestamp: The time when the celebrity was detected, if the
 celebrity
                          was detected in a video.
        """
        self.info_urls = celebrity.get("Urls")
        self.name = celebrity.get("Name")
        self.id = celebrity.get("Id")
        self.face = RekognitionFace(celebrity.get("Face"))
        self.confidence = celebrity.get("MatchConfidence")
        self.bounding_box = celebrity.get("BoundingBox")
        self.timestamp = timestamp

    def to_dict(self):
        """
        Renders some of the celebrity data to a dict.

        :return: A dict that contains the celebrity data.
```

```
        """
        rendering = self.face.to_dict()
        if self.name is not None:
            rendering["name"] = self.name
        if self.info_urls:
            rendering["info URLs"] = self.info_urls
        if self.timestamp is not None:
            rendering["timestamp"] = self.timestamp
        return rendering



class RekognitionPerson:
    """Encapsulates an Amazon Rekognition person."""

    def __init__(self, person, timestamp=None):
        """
        Initializes the person object.

        :param person: Person data, in the format returned by Amazon Rekognition
                       functions.
        :param timestamp: The time when the person was detected, if the person
                          was detected in a video.
        """
        self.index = person.get("Index")
        self.bounding_box = person.get("BoundingBox")
        face = person.get("Face")
        self.face = RekognitionFace(face) if face is not None else None
        self.timestamp = timestamp

    def to_dict(self):
        """
        Renders some of the person data to a dict.

        :return: A dict that contains the person data.
        """
        rendering = self.face.to_dict() if self.face is not None else {}
        if self.index is not None:
            rendering["index"] = self.index
        if self.bounding_box is not None:
            rendering["bounding_box"] = self.bounding_box
        if self.timestamp is not None:
            rendering["timestamp"] = self.timestamp
        return rendering
```

```
class RekognitionLabel:
    """Encapsulates an Amazon Rekognition label."""

    def __init__(self, label, timestamp=None):
        """
        Initializes the label object.

        :param label: Label data, in the format returned by Amazon Rekognition
                      functions.
        :param timestamp: The time when the label was detected, if the label
                          was detected in a video.
        """
        self.name = label.get("Name")
        self.confidence = label.get("Confidence")
        self.instances = label.get("Instances")
        self.parents = label.get("Parents")
        self.timestamp = timestamp

    def to_dict(self):
        """
        Renders some of the label data to a dict.

        :return: A dict that contains the label data.
        """
        rendering = {}
        if self.name is not None:
            rendering["name"] = self.name
        if self.timestamp is not None:
            rendering["timestamp"] = self.timestamp
        return rendering



class RekognitionModerationLabel:
    """Encapsulates an Amazon Rekognition moderation label."""

    def __init__(self, label, timestamp=None):
        """
        Initializes the moderation label object.

        :param label: Label data, in the format returned by Amazon Rekognition
```

```
                        functions.
        :param timestamp: The time when the moderation label was detected, if the
                          label was detected in a video.
        """
        self.name = label.get("Name")
        self.confidence = label.get("Confidence")
        self.parent_name = label.get("ParentName")
        self.timestamp = timestamp

    def to_dict(self):
        """
        Renders some of the moderation label data to a dict.

        :return: A dict that contains the moderation label data.
        """
        rendering = {}
        if self.name is not None:
            rendering["name"] = self.name
        if self.parent_name is not None:
            rendering["parent_name"] = self.parent_name
        if self.timestamp is not None:
            rendering["timestamp"] = self.timestamp
        return rendering



class RekognitionText:
    """Encapsulates an Amazon Rekognition text element."""

    def __init__(self, text_data):
        """
        Initializes the text object.

        :param text_data: Text data, in the format returned by Amazon Rekognition
                          functions.
        """
        self.text = text_data.get("DetectedText")
        self.kind = text_data.get("Type")
        self.id = text_data.get("Id")
        self.parent_id = text_data.get("ParentId")
        self.confidence = text_data.get("Confidence")
        self.geometry = text_data.get("Geometry")

    def to_dict(self):
```

```
        """
        Renders some of the text data to a dict.

        :return: A dict that contains the text data.
        """
        rendering = {}
        if self.text is not None:
            rendering["text"] = self.text
        if self.kind is not None:
            rendering["kind"] = self.kind
        if self.geometry is not None:
            rendering["polygon"] = self.geometry.get("Polygon")
        return rendering
```

Use the wrapper classes to detect elements in images and display their bounding boxes. The images used in this example can be found on GitHub along with instructions and more code.

```
def usage_demo():
    print("-" * 88)
    print("Welcome to the Amazon Rekognition image detection demo!")
    print("-" * 88)

    logging.basicConfig(level=logging.INFO, format="%(levelname)s: %(message)s")
    rekognition_client = boto3.client("rekognition")
    street_scene_file_name = ".media/pexels-kaique-rocha-109919.jpg"
    celebrity_file_name = ".media/pexels-pixabay-53370.jpg"
    one_girl_url = "https://dhei5unw3vrsx.cloudfront.net/images/
source3_resized.jpg"
    three_girls_url = "https://dhei5unw3vrsx.cloudfront.net/images/
target3_resized.jpg"
    swimwear_object = boto3.resource("s3").Object(
        "console-sample-images-pdx", "yoga_swimwear.jpg"
    )
    book_file_name = ".media/pexels-christina-morillo-1181671.jpg"

    street_scene_image = RekognitionImage.from_file(
        street_scene_file_name, rekognition_client
    )
    print(f"Detecting faces in {street_scene_image.image_name}...")
    faces = street_scene_image.detect_faces()
```

```
    print(f"Found {len(faces)} faces, here are the first three.")
    for face in faces[:3]:
        pprint(face.to_dict())
    show_bounding_boxes(
        street_scene_image.image["Bytes"],
        [[face.bounding_box for face in faces]],
        ["aqua"],
    )
    input("Press Enter to continue.")

    print(f"Detecting labels in {street_scene_image.image_name}...")
    labels = street_scene_image.detect_labels(100)
    print(f"Found {len(labels)} labels.")
    for label in labels:
        pprint(label.to_dict())
    names = []
    box_sets = []
    colors = ["aqua", "red", "white", "blue", "yellow", "green"]
    for label in labels:
        if label.instances:
            names.append(label.name)
            box_sets.append([inst["BoundingBox"] for inst in label.instances])
    print(f"Showing bounding boxes for {names} in {colors[:len(names)]}.")
    show_bounding_boxes(
        street_scene_image.image["Bytes"], box_sets, colors[: len(names)]
    )
    input("Press Enter to continue.")

    celebrity_image = RekognitionImage.from_file(
        celebrity_file_name, rekognition_client
    )
    print(f"Detecting celebrities in {celebrity_image.image_name}...")
    celebs, others = celebrity_image.recognize_celebrities()
    print(f"Found {len(celebs)} celebrities.")
    for celeb in celebs:
        pprint(celeb.to_dict())
    show_bounding_boxes(
        celebrity_image.image["Bytes"],
        [[celeb.face.bounding_box for celeb in celebs]],
        ["aqua"],
    )
    input("Press Enter to continue.")

    girl_image_response = requests.get(one_girl_url)
```

```
    girl_image = RekognitionImage(
        {"Bytes": girl_image_response.content}, "one-girl", rekognition_client
    )
    group_image_response = requests.get(three_girls_url)
    group_image = RekognitionImage(
        {"Bytes": group_image_response.content}, "three-girls",
rekognition_client
    )
    print("Comparing reference face to group of faces...")
    matches, unmatches = girl_image.compare_faces(group_image, 80)
    print(f"Found {len(matches)} face matching the reference face.")
    show_bounding_boxes(
        group_image.image["Bytes"],
        [[match.bounding_box for match in matches]],
        ["aqua"],
    )
    input("Press Enter to continue.")

    swimwear_image = RekognitionImage.from_bucket(swimwear_object,
rekognition_client)
    print(f"Detecting suggestive content in {swimwear_object.key}...")
    labels = swimwear_image.detect_moderation_labels()
    print(f"Found {len(labels)} moderation labels.")
    for label in labels:
        pprint(label.to_dict())
    input("Press Enter to continue.")

    book_image = RekognitionImage.from_file(book_file_name, rekognition_client)
    print(f"Detecting text in {book_image.image_name}...")
    texts = book_image.detect_text()
    print(f"Found {len(texts)} text instances. Here are the first seven:")
    for text in texts[:7]:
        pprint(text.to_dict())
    show_polygons(
        book_image.image["Bytes"], [text.geometry["Polygon"] for text in texts],
"aqua"
    )

    print("Thanks for watching!")
    print("-" * 88)
```

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Detect faces in an image using an AWS SDK

The following code example shows how to:

- Save an image in an Amazon S3 bucket.
- Use Amazon Rekognition to detect facial details, such as age range, gender, and emotion (such as smiling).
- Display those details.

Rust

SDK for Rust

Save the image in an Amazon S3 bucket with an **uploads** prefix, use Amazon Rekognition to detect facial details, such as age range, gender, and emotion (smiling, etc.), and display those details.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- Amazon Rekognition
- Amazon S3

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Detect information in videos using Amazon Rekognition and the AWS SDK

The following code examples show how to:

- Start Amazon Rekognition jobs to detect elements like people, objects, and text in videos.

- Check job status until jobs finish.
- Output the list of elements detected by each job.

Java

SDK for Java 2.x

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

Get celebrity results from a video located in an Amazon S3 bucket.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartCelebrityRecognitionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.CelebrityRecognitionSortBy;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.CelebrityRecognition;
import software.amazon.awssdk.services.rekognition.model.CelebrityDetail;
import
 software.amazon.awssdk.services.rekognition.model.StartCelebrityRecognitionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetCelebrityRecognitionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetCelebrityRecognitionResponse;
import java.util.List;

/**
 * To run this code example, ensure that you perform the Prerequisites as stated
 * in the Amazon Rekognition Guide:
 * https://docs.aws.amazon.com/rekognition/latest/dg/video-analyzing-with-
sqs.html
```

```
 *
 * Also, ensure that set up your development environment, including your
 * credentials.
 *
 * For information, see this documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */

public class VideoCelebrityDetection {
    private static String startJobId = "";

    public static void main(String[] args) {
        final String usage = """

                Usage:    <bucket> <video> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of video (for example, people.mp4).\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
                   roleArn - The ARN of the AWS Identity and Access Management
 (IAM) role to use.\s
                """;

        if (args.length != 4) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
        String topicArn = args[2];
        String roleArn = args[3];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
```

```
                .roleArn(roleArn)
                .build();

        startCelebrityDetection(rekClient, channel, bucket, video);
        getCelebrityDetectionResults(rekClient);
        System.out.println("This example is done!");
        rekClient.close();
    }

    public static void startCelebrityDetection(RekognitionClient rekClient,
            NotificationChannel channel,
            String bucket,
            String video) {
        try {
            S3Object s3Obj = S3Object.builder()
                    .bucket(bucket)
                    .name(video)
                    .build();

            Video vidOb = Video.builder()
                    .s3Object(s3Obj)
                    .build();

            StartCelebrityRecognitionRequest recognitionRequest =
StartCelebrityRecognitionRequest.builder()
                    .jobTag("Celebrities")
                    .notificationChannel(channel)
                    .video(vidOb)
                    .build();

            StartCelebrityRecognitionResponse startCelebrityRecognitionResult =
rekClient
                    .startCelebrityRecognition(recognitionRequest);
            startJobId = startCelebrityRecognitionResult.jobId();

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }

    public static void getCelebrityDetectionResults(RekognitionClient rekClient)
{
        try {
```

```
            String paginationToken = null;
            GetCelebrityRecognitionResponse recognitionResponse = null;
            boolean finished = false;
            String status;
            int yy = 0;

            do {
                if (recognitionResponse != null)
                    paginationToken = recognitionResponse.nextToken();

                GetCelebrityRecognitionRequest recognitionRequest =
GetCelebrityRecognitionRequest.builder()
                        .jobId(startJobId)
                        .nextToken(paginationToken)
                        .sortBy(CelebrityRecognitionSortBy.TIMESTAMP)
                        .maxResults(10)
                        .build();

                // Wait until the job succeeds
                while (!finished) {
                    recognitionResponse =
rekClient.getCelebrityRecognition(recognitionRequest);
                    status = recognitionResponse.jobStatusAsString();

                    if (status.compareTo("SUCCEEDED") == 0)
                        finished = true;
                    else {
                        System.out.println(yy + " status is: " + status);
                        Thread.sleep(1000);
                    }
                    yy++;
                }

                finished = false;

                // Proceed when the job is done - otherwise VideoMetadata is
null.
                VideoMetadata videoMetaData =
recognitionResponse.videoMetadata();
                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());
```

```
                System.out.println("Job");

                List<CelebrityRecognition> celebs =
 recognitionResponse.celebrities();
                for (CelebrityRecognition celeb : celebs) {
                    long seconds = celeb.timestamp() / 1000;
                    System.out.print("Sec: " + seconds + " ");
                    CelebrityDetail details = celeb.celebrity();
                    System.out.println("Name: " + details.name());
                    System.out.println("Id: " + details.id());
                    System.out.println();
                }

            } while (recognitionResponse.nextToken() != null);

        } catch (RekognitionException | InterruptedException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

Detect labels in a video by a label detection operation.

```
import com.fasterxml.jackson.core.JsonProcessingException;
import com.fasterxml.jackson.databind.JsonMappingException;
import com.fasterxml.jackson.databind.JsonNode;
import com.fasterxml.jackson.databind.ObjectMapper;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.StartLabelDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartLabelDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetLabelDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetLabelDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
```

```
import software.amazon.awssdk.services.rekognition.model.LabelDetectionSortBy;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.LabelDetection;
import software.amazon.awssdk.services.rekognition.model.Label;
import software.amazon.awssdk.services.rekognition.model.Instance;
import software.amazon.awssdk.services.rekognition.model.Parent;
import software.amazon.awssdk.services.sqs.SqsClient;
import software.amazon.awssdk.services.sqs.model.Message;
import software.amazon.awssdk.services.sqs.model.ReceiveMessageRequest;
import software.amazon.awssdk.services.sqs.model.DeleteMessageRequest;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class VideoDetect {
    private static String startJobId = "";

    public static void main(String[] args) {
        final String usage = """

                Usage:    <bucket> <video> <queueUrl> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of the video (for example, people.mp4).\s
                   queueUrl- The URL of a SQS queue.\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
                   roleArn - The ARN of the AWS Identity and Access Management
 (IAM) role to use.\s
                """;

        if (args.length != 5) {
            System.out.println(usage);
            System.exit(1);
        }
```

```
        String bucket = args[0];
        String video = args[1];
        String queueUrl = args[2];
        String topicArn = args[3];
        String roleArn = args[4];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        SqsClient sqs = SqsClient.builder()
                .region(Region.US_EAST_1)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
                .roleArn(roleArn)
                .build();

        startLabels(rekClient, channel, bucket, video);
        getLabelJob(rekClient, sqs, queueUrl);
        System.out.println("This example is done!");
        sqs.close();
        rekClient.close();
    }

    public static void startLabels(RekognitionClient rekClient,
            NotificationChannel channel,
            String bucket,
            String video) {
        try {
            S3Object s3Obj = S3Object.builder()
                    .bucket(bucket)
                    .name(video)
                    .build();

            Video vidOb = Video.builder()
                    .s3Object(s3Obj)
                    .build();

            StartLabelDetectionRequest labelDetectionRequest =
StartLabelDetectionRequest.builder()
                    .jobTag("DetectingLabels")
```

```
                    .notificationChannel(channel)
                    .video(vidOb)
                    .minConfidence(50F)
                    .build();

            StartLabelDetectionResponse labelDetectionResponse =
rekClient.startLabelDetection(labelDetectionRequest);
            startJobId = labelDetectionResponse.jobId();

            boolean ans = true;
            String status = "";
            int yy = 0;
            while (ans) {

                GetLabelDetectionRequest detectionRequest =
GetLabelDetectionRequest.builder()
                        .jobId(startJobId)
                        .maxResults(10)
                        .build();

                GetLabelDetectionResponse result =
rekClient.getLabelDetection(detectionRequest);
                status = result.jobStatusAsString();

                if (status.compareTo("SUCCEEDED") == 0)
                    ans = false;
                else
                    System.out.println(yy + " status is: " + status);

                Thread.sleep(1000);
                yy++;
            }

            System.out.println(startJobId + " status is: " + status);

        } catch (RekognitionException | InterruptedException e) {
            e.getMessage();
            System.exit(1);
        }
    }

    public static void getLabelJob(RekognitionClient rekClient, SqsClient sqs,
String queueUrl) {
        List<Message> messages;
```

```
        ReceiveMessageRequest messageRequest = ReceiveMessageRequest.builder()
                .queueUrl(queueUrl)
                .build();

        try {
            messages = sqs.receiveMessage(messageRequest).messages();

            if (!messages.isEmpty()) {
                for (Message message : messages) {
                    String notification = message.body();

                    // Get the status and job id from the notification
                    ObjectMapper mapper = new ObjectMapper();
                    JsonNode jsonMessageTree = mapper.readTree(notification);
                    JsonNode messageBodyText = jsonMessageTree.get("Message");
                    ObjectMapper operationResultMapper = new ObjectMapper();
                    JsonNode jsonResultTree =
operationResultMapper.readTree(messageBodyText.textValue());
                    JsonNode operationJobId = jsonResultTree.get("JobId");
                    JsonNode operationStatus = jsonResultTree.get("Status");
                    System.out.println("Job found in JSON is " + operationJobId);

                    DeleteMessageRequest deleteMessageRequest =
DeleteMessageRequest.builder()
                            .queueUrl(queueUrl)
                            .build();

                    String jobId = operationJobId.textValue();
                    if (startJobId.compareTo(jobId) == 0) {
                        System.out.println("Job id: " + operationJobId);
                        System.out.println("Status : " +
operationStatus.toString());

                        if (operationStatus.asText().equals("SUCCEEDED"))
                            getResultsLabels(rekClient);
                        else
                            System.out.println("Video analysis failed");

                        sqs.deleteMessage(deleteMessageRequest);
                    } else {
                        System.out.println("Job received was not job " +
startJobId);
                        sqs.deleteMessage(deleteMessageRequest);
                    }
```

```
                }
            }

        } catch (RekognitionException e) {
            e.getMessage();
            System.exit(1);
        } catch (JsonMappingException e) {
            e.printStackTrace();
        } catch (JsonProcessingException e) {
            e.printStackTrace();
        }
    }

    // Gets the job results by calling GetLabelDetection
    private static void getResultsLabels(RekognitionClient rekClient) {

        int maxResults = 10;
        String paginationToken = null;
        GetLabelDetectionResponse labelDetectionResult = null;

        try {
            do {
                if (labelDetectionResult != null)
                    paginationToken = labelDetectionResult.nextToken();

                GetLabelDetectionRequest labelDetectionRequest =
GetLabelDetectionRequest.builder()
                        .jobId(startJobId)
                        .sortBy(LabelDetectionSortBy.TIMESTAMP)
                        .maxResults(maxResults)
                        .nextToken(paginationToken)
                        .build();

                labelDetectionResult =
rekClient.getLabelDetection(labelDetectionRequest);
                VideoMetadata videoMetaData =
labelDetectionResult.videoMetadata();
                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());
```

```
                List<LabelDetection> detectedLabels =
labelDetectionResult.labels();
                for (LabelDetection detectedLabel : detectedLabels) {
                    long seconds = detectedLabel.timestamp();
                    Label label = detectedLabel.label();
                    System.out.println("Millisecond: " + seconds + " ");

                    System.out.println("   Label:" + label.name());
                    System.out.println("   Confidence:" +
detectedLabel.label().confidence().toString());

                    List<Instance> instances = label.instances();
                    System.out.println("   Instances of " + label.name());

                    if (instances.isEmpty()) {
                        System.out.println("        " + "None");
                    } else {
                        for (Instance instance : instances) {
                            System.out.println("        Confidence: " +
instance.confidence().toString());
                            System.out.println("        Bounding box: " +
instance.boundingBox().toString());
                        }
                    }
                    System.out.println("   Parent labels for " + label.name() +
":");
                    List<Parent> parents = label.parents();

                    if (parents.isEmpty()) {
                        System.out.println("        None");
                    } else {
                        for (Parent parent : parents) {
                            System.out.println("   " + parent.name());
                        }
                    }
                    System.out.println();
                }
            } while (labelDetectionResult != null &&
labelDetectionResult.nextToken() != null);

        } catch (RekognitionException e) {
            e.getMessage();
            System.exit(1);
        }
```

```
    }
}
```

Detect faces in a video stored in an Amazon S3 bucket.

```
import com.fasterxml.jackson.core.JsonProcessingException;
import com.fasterxml.jackson.databind.JsonMappingException;
import com.fasterxml.jackson.databind.JsonNode;
import com.fasterxml.jackson.databind.ObjectMapper;
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import
 software.amazon.awssdk.services.rekognition.model.StartLabelDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartLabelDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetLabelDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.GetLabelDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import software.amazon.awssdk.services.rekognition.model.LabelDetectionSortBy;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.LabelDetection;
import software.amazon.awssdk.services.rekognition.model.Label;
import software.amazon.awssdk.services.rekognition.model.Instance;
import software.amazon.awssdk.services.rekognition.model.Parent;
import software.amazon.awssdk.services.sqs.SqsClient;
import software.amazon.awssdk.services.sqs.model.Message;
import software.amazon.awssdk.services.sqs.model.ReceiveMessageRequest;
import software.amazon.awssdk.services.sqs.model.DeleteMessageRequest;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
```

```
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class VideoDetect {
    private static String startJobId = "";

    public static void main(String[] args) {
        final String usage = """

                Usage:    <bucket> <video> <queueUrl> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of the video (for example, people.mp4).\s
                   queueUrl- The URL of a SQS queue.\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
                   roleArn - The ARN of the AWS Identity and Access Management
 (IAM) role to use.\s
                """;

        if (args.length != 5) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
        String queueUrl = args[2];
        String topicArn = args[3];
        String roleArn = args[4];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        SqsClient sqs = SqsClient.builder()
                .region(Region.US_EAST_1)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
                .roleArn(roleArn)
```

```
                .build();

        startLabels(rekClient, channel, bucket, video);
        getLabelJob(rekClient, sqs, queueUrl);
        System.out.println("This example is done!");
        sqs.close();
        rekClient.close();
    }

    public static void startLabels(RekognitionClient rekClient,
            NotificationChannel channel,
            String bucket,
            String video) {
        try {
            S3Object s3Obj = S3Object.builder()
                    .bucket(bucket)
                    .name(video)
                    .build();

            Video vidOb = Video.builder()
                    .s3Object(s3Obj)
                    .build();

            StartLabelDetectionRequest labelDetectionRequest =
StartLabelDetectionRequest.builder()
                    .jobTag("DetectingLabels")
                    .notificationChannel(channel)
                    .video(vidOb)
                    .minConfidence(50F)
                    .build();

            StartLabelDetectionResponse labelDetectionResponse =
rekClient.startLabelDetection(labelDetectionRequest);
            startJobId = labelDetectionResponse.jobId();

            boolean ans = true;
            String status = "";
            int yy = 0;
            while (ans) {

                GetLabelDetectionRequest detectionRequest =
GetLabelDetectionRequest.builder()
                        .jobId(startJobId)
                        .maxResults(10)
```

```
                        .build();

                GetLabelDetectionResponse result =
rekClient.getLabelDetection(detectionRequest);
                status = result.jobStatusAsString();

                if (status.compareTo("SUCCEEDED") == 0)
                    ans = false;
                else
                    System.out.println(yy + " status is: " + status);

                Thread.sleep(1000);
                yy++;
            }

            System.out.println(startJobId + " status is: " + status);

        } catch (RekognitionException | InterruptedException e) {
            e.getMessage();
            System.exit(1);
        }
    }

    public static void getLabelJob(RekognitionClient rekClient, SqsClient sqs,
String queueUrl) {
        List<Message> messages;
        ReceiveMessageRequest messageRequest = ReceiveMessageRequest.builder()
                .queueUrl(queueUrl)
                .build();

        try {
            messages = sqs.receiveMessage(messageRequest).messages();

            if (!messages.isEmpty()) {
                for (Message message : messages) {
                    String notification = message.body();

                    // Get the status and job id from the notification
                    ObjectMapper mapper = new ObjectMapper();
                    JsonNode jsonMessageTree = mapper.readTree(notification);
                    JsonNode messageBodyText = jsonMessageTree.get("Message");
                    ObjectMapper operationResultMapper = new ObjectMapper();
                    JsonNode jsonResultTree =
operationResultMapper.readTree(messageBodyText.textValue());
```

```
                    JsonNode operationJobId = jsonResultTree.get("JobId");
                    JsonNode operationStatus = jsonResultTree.get("Status");
                    System.out.println("Job found in JSON is " + operationJobId);

                    DeleteMessageRequest deleteMessageRequest =
DeleteMessageRequest.builder()
                            .queueUrl(queueUrl)
                            .build();

                    String jobId = operationJobId.textValue();
                    if (startJobId.compareTo(jobId) == 0) {
                        System.out.println("Job id: " + operationJobId);
                        System.out.println("Status : " +
operationStatus.toString());

                        if (operationStatus.asText().equals("SUCCEEDED"))
                            getResultsLabels(rekClient);
                        else
                            System.out.println("Video analysis failed");

                        sqs.deleteMessage(deleteMessageRequest);
                    } else {
                        System.out.println("Job received was not job " +
startJobId);
                        sqs.deleteMessage(deleteMessageRequest);
                    }
                }
            }

        } catch (RekognitionException e) {
            e.getMessage();
            System.exit(1);
        } catch (JsonMappingException e) {
            e.printStackTrace();
        } catch (JsonProcessingException e) {
            e.printStackTrace();
        }
    }

    // Gets the job results by calling GetLabelDetection
    private static void getResultsLabels(RekognitionClient rekClient) {

        int maxResults = 10;
        String paginationToken = null;
```

```
        GetLabelDetectionResponse labelDetectionResult = null;

        try {
            do {
                if (labelDetectionResult != null)
                    paginationToken = labelDetectionResult.nextToken();

                GetLabelDetectionRequest labelDetectionRequest =
GetLabelDetectionRequest.builder()
                        .jobId(startJobId)
                        .sortBy(LabelDetectionSortBy.TIMESTAMP)
                        .maxResults(maxResults)
                        .nextToken(paginationToken)
                        .build();

                labelDetectionResult =
rekClient.getLabelDetection(labelDetectionRequest);
                VideoMetadata videoMetaData =
labelDetectionResult.videoMetadata();
                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());

                List<LabelDetection> detectedLabels =
labelDetectionResult.labels();
                for (LabelDetection detectedLabel : detectedLabels) {
                    long seconds = detectedLabel.timestamp();
                    Label label = detectedLabel.label();
                    System.out.println("Millisecond: " + seconds + " ");

                    System.out.println("   Label:" + label.name());
                    System.out.println("   Confidence:" +
detectedLabel.label().confidence().toString());

                    List<Instance> instances = label.instances();
                    System.out.println("   Instances of " + label.name());

                    if (instances.isEmpty()) {
                        System.out.println("        " + "None");
                    } else {
                        for (Instance instance : instances) {
```

```
                            System.out.println("        Confidence: " +
 instance.confidence().toString());
                            System.out.println("        Bounding box: " +
 instance.boundingBox().toString());
                        }
                    }
                    System.out.println("   Parent labels for " + label.name() +
 ":");
                    List<Parent> parents = label.parents();

                    if (parents.isEmpty()) {
                        System.out.println("        None");
                    } else {
                        for (Parent parent : parents) {
                            System.out.println("   " + parent.name());
                        }
                    }
                    System.out.println();
                }
            } while (labelDetectionResult != null &&
 labelDetectionResult.nextToken() != null);

        } catch (RekognitionException e) {
            e.getMessage();
            System.exit(1);
        }
    }
}
```

Detect inappropriate or offensive content in a video stored in an Amazon S3 bucket.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartContentModerationRequest;
import
 software.amazon.awssdk.services.rekognition.model.StartContentModerationResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
```

```
import
 software.amazon.awssdk.services.rekognition.model.GetContentModerationResponse;
import
 software.amazon.awssdk.services.rekognition.model.GetContentModerationRequest;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import
 software.amazon.awssdk.services.rekognition.model.ContentModerationDetection;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class VideoDetectInappropriate {
    private static String startJobId = "";

    public static void main(String[] args) {

        final String usage = """

                Usage:    <bucket> <video> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of video (for example, people.mp4).\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
                   roleArn - The ARN of the AWS Identity and Access Management
 (IAM) role to use.\s
                """;

        if (args.length != 4) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
```

```
        String topicArn = args[2];
        String roleArn = args[3];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
                .roleArn(roleArn)
                .build();

        startModerationDetection(rekClient, channel, bucket, video);
        getModResults(rekClient);
        System.out.println("This example is done!");
        rekClient.close();
    }

    public static void startModerationDetection(RekognitionClient rekClient,
            NotificationChannel channel,
            String bucket,
            String video) {

        try {
            S3Object s3Obj = S3Object.builder()
                    .bucket(bucket)
                    .name(video)
                    .build();

            Video vidOb = Video.builder()
                    .s3Object(s3Obj)
                    .build();

            StartContentModerationRequest modDetectionRequest =
StartContentModerationRequest.builder()
                    .jobTag("Moderation")
                    .notificationChannel(channel)
                    .video(vidOb)
                    .build();

            StartContentModerationResponse startModDetectionResult = rekClient
                    .startContentModeration(modDetectionRequest);
            startJobId = startModDetectionResult.jobId();
```

```
        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }

    public static void getModResults(RekognitionClient rekClient) {
        try {
            String paginationToken = null;
            GetContentModerationResponse modDetectionResponse = null;
            boolean finished = false;
            String status;
            int yy = 0;

            do {
                if (modDetectionResponse != null)
                    paginationToken = modDetectionResponse.nextToken();

                GetContentModerationRequest modRequest =
GetContentModerationRequest.builder()
                        .jobId(startJobId)
                        .nextToken(paginationToken)
                        .maxResults(10)
                        .build();

                // Wait until the job succeeds.
                while (!finished) {
                    modDetectionResponse =
rekClient.getContentModeration(modRequest);
                    status = modDetectionResponse.jobStatusAsString();

                    if (status.compareTo("SUCCEEDED") == 0)
                        finished = true;
                    else {
                        System.out.println(yy + " status is: " + status);
                        Thread.sleep(1000);
                    }
                    yy++;
                }

                finished = false;

                // Proceed when the job is done - otherwise VideoMetadata is
null.
```

```
                VideoMetadata videoMetaData =
 modDetectionResponse.videoMetadata();
                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
 videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());
                System.out.println("Job");

                List<ContentModerationDetection> mods =
 modDetectionResponse.moderationLabels();
                for (ContentModerationDetection mod : mods) {
                    long seconds = mod.timestamp() / 1000;
                    System.out.print("Mod label: " + seconds + " ");
                    System.out.println(mod.moderationLabel().toString());
                    System.out.println();
                }

            } while (modDetectionResponse != null &&
 modDetectionResponse.nextToken() != null);

        } catch (RekognitionException | InterruptedException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

Detect technical cue segments and shot detection segments in a video stored in an Amazon S3 bucket.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartShotDetectionFilter;
import
 software.amazon.awssdk.services.rekognition.model.StartTechnicalCueDetectionFilter;
import
 software.amazon.awssdk.services.rekognition.model.StartSegmentDetectionFilters;
```

```
import
 software.amazon.awssdk.services.rekognition.model.StartSegmentDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.StartSegmentDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.GetSegmentDetectionResponse;
import
 software.amazon.awssdk.services.rekognition.model.GetSegmentDetectionRequest;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.SegmentDetection;
import software.amazon.awssdk.services.rekognition.model.TechnicalCueSegment;
import software.amazon.awssdk.services.rekognition.model.ShotSegment;
import software.amazon.awssdk.services.rekognition.model.SegmentType;
import software.amazon.awssdk.services.sqs.SqsClient;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class VideoDetectSegment {
    private static String startJobId = "";

    public static void main(String[] args) {
        final String usage = """

                Usage:    <bucket> <video> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of video (for example, people.mp4).\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
                   roleArn - The ARN of the AWS Identity and Access Management
 (IAM) role to use.\s
                """;
```

```
        if (args.length != 4) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
        String topicArn = args[2];
        String roleArn = args[3];

        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        SqsClient sqs = SqsClient.builder()
                .region(Region.US_EAST_1)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
                .roleArn(roleArn)
                .build();

        startSegmentDetection(rekClient, channel, bucket, video);
        getSegmentResults(rekClient);
        System.out.println("This example is done!");
        sqs.close();
        rekClient.close();
    }

    public static void startSegmentDetection(RekognitionClient rekClient,
            NotificationChannel channel,
            String bucket,
            String video) {
        try {
            S3Object s3Obj = S3Object.builder()
                    .bucket(bucket)
                    .name(video)
                    .build();

            Video vidOb = Video.builder()
                    .s3Object(s3Obj)
                    .build();
```

```
            StartShotDetectionFilter cueDetectionFilter =
StartShotDetectionFilter.builder()
                    .minSegmentConfidence(60F)
                    .build();

            StartTechnicalCueDetectionFilter technicalCueDetectionFilter =
StartTechnicalCueDetectionFilter.builder()
                    .minSegmentConfidence(60F)
                    .build();

            StartSegmentDetectionFilters filters =
StartSegmentDetectionFilters.builder()
                    .shotFilter(cueDetectionFilter)
                    .technicalCueFilter(technicalCueDetectionFilter)
                    .build();

            StartSegmentDetectionRequest segDetectionRequest =
StartSegmentDetectionRequest.builder()
                    .jobTag("DetectingLabels")
                    .notificationChannel(channel)
                    .segmentTypes(SegmentType.TECHNICAL_CUE, SegmentType.SHOT)
                    .video(vidOb)
                    .filters(filters)
                    .build();

            StartSegmentDetectionResponse segDetectionResponse =
rekClient.startSegmentDetection(segDetectionRequest);
            startJobId = segDetectionResponse.jobId();

        } catch (RekognitionException e) {
            e.getMessage();
            System.exit(1);
        }
    }

    public static void getSegmentResults(RekognitionClient rekClient) {
        try {
            String paginationToken = null;
            GetSegmentDetectionResponse segDetectionResponse = null;
            boolean finished = false;
            String status;
            int yy = 0;
```

```
            do {
                if (segDetectionResponse != null)
                    paginationToken = segDetectionResponse.nextToken();

                GetSegmentDetectionRequest recognitionRequest =
GetSegmentDetectionRequest.builder()
                        .jobId(startJobId)
                        .nextToken(paginationToken)
                        .maxResults(10)
                        .build();

                // Wait until the job succeeds.
                while (!finished) {
                    segDetectionResponse =
rekClient.getSegmentDetection(recognitionRequest);
                    status = segDetectionResponse.jobStatusAsString();

                    if (status.compareTo("SUCCEEDED") == 0)
                        finished = true;
                    else {
                        System.out.println(yy + " status is: " + status);
                        Thread.sleep(1000);
                    }
                    yy++;
                }
                finished = false;

                // Proceed when the job is done - otherwise VideoMetadata is
null.
                List<VideoMetadata> videoMetaData =
segDetectionResponse.videoMetadata();
                for (VideoMetadata metaData : videoMetaData) {
                    System.out.println("Format: " + metaData.format());
                    System.out.println("Codec: " + metaData.codec());
                    System.out.println("Duration: " + metaData.durationMillis());
                    System.out.println("FrameRate: " + metaData.frameRate());
                    System.out.println("Job");
                }

                List<SegmentDetection> detectedSegments =
segDetectionResponse.segments();
                for (SegmentDetection detectedSegment : detectedSegments) {
                    String type = detectedSegment.type().toString();
                    if (type.contains(SegmentType.TECHNICAL_CUE.toString())) {
```

```
                        System.out.println("Technical Cue");
                        TechnicalCueSegment segmentCue =
 detectedSegment.technicalCueSegment();
                        System.out.println("\tType: " + segmentCue.type());
                        System.out.println("\tConfidence: " +
 segmentCue.confidence().toString());
                    }

                    if (type.contains(SegmentType.SHOT.toString())) {
                        System.out.println("Shot");
                        ShotSegment segmentShot = detectedSegment.shotSegment();
                        System.out.println("\tIndex " + segmentShot.index());
                        System.out.println("\tConfidence: " +
 segmentShot.confidence().toString());
                    }

                    long seconds = detectedSegment.durationMillis();
                    System.out.println("\tDuration : " + seconds + "
 milliseconds");
                    System.out.println("\tStart time code: " +
 detectedSegment.startTimecodeSMPTE());
                    System.out.println("\tEnd time code: " +
 detectedSegment.endTimecodeSMPTE());
                    System.out.println("\tDuration time code: " +
 detectedSegment.durationSMPTE());
                    System.out.println();
                }

            } while (segDetectionResponse != null &&
 segDetectionResponse.nextToken() != null);

        } catch (RekognitionException | InterruptedException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

Detect text in a video stored in a video stored in an Amazon S3 bucket.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
```

```
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartTextDetectionRequest;
import
 software.amazon.awssdk.services.rekognition.model.StartTextDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.GetTextDetectionResponse;
import software.amazon.awssdk.services.rekognition.model.GetTextDetectionRequest;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.TextDetectionResult;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class VideoDetectText {
    private static String startJobId = "";

    public static void main(String[] args) {
        final String usage = """

                Usage:    <bucket> <video> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of video (for example, people.mp4).\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
                   roleArn - The ARN of the AWS Identity and Access Management
 (IAM) role to use.\s
                """;

        if (args.length != 4) {
            System.out.println(usage);
```

```
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
        String topicArn = args[2];
        String roleArn = args[3];

        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
                .roleArn(roleArn)
                .build();

        startTextLabels(rekClient, channel, bucket, video);
        getTextResults(rekClient);
        System.out.println("This example is done!");
        rekClient.close();
    }

    public static void startTextLabels(RekognitionClient rekClient,
            NotificationChannel channel,
            String bucket,
            String video) {
        try {
            S3Object s3Obj = S3Object.builder()
                    .bucket(bucket)
                    .name(video)
                    .build();

            Video vidOb = Video.builder()
                    .s3Object(s3Obj)
                    .build();

            StartTextDetectionRequest labelDetectionRequest =
StartTextDetectionRequest.builder()
                    .jobTag("DetectingLabels")
                    .notificationChannel(channel)
                    .video(vidOb)
                    .build();
```

```
            StartTextDetectionResponse labelDetectionResponse =
rekClient.startTextDetection(labelDetectionRequest);
            startJobId = labelDetectionResponse.jobId();

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }

    public static void getTextResults(RekognitionClient rekClient) {
        try {
            String paginationToken = null;
            GetTextDetectionResponse textDetectionResponse = null;
            boolean finished = false;
            String status;
            int yy = 0;

            do {
                if (textDetectionResponse != null)
                    paginationToken = textDetectionResponse.nextToken();

                GetTextDetectionRequest recognitionRequest =
GetTextDetectionRequest.builder()
                        .jobId(startJobId)
                        .nextToken(paginationToken)
                        .maxResults(10)
                        .build();

                // Wait until the job succeeds.
                while (!finished) {
                    textDetectionResponse =
rekClient.getTextDetection(recognitionRequest);
                    status = textDetectionResponse.jobStatusAsString();

                    if (status.compareTo("SUCCEEDED") == 0)
                        finished = true;
                    else {
                        System.out.println(yy + " status is: " + status);
                        Thread.sleep(1000);
                    }
                    yy++;
                }
```

```
                finished = false;

                // Proceed when the job is done - otherwise VideoMetadata is
 null.
                VideoMetadata videoMetaData =
 textDetectionResponse.videoMetadata();
                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
 videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());
                System.out.println("Job");

                List<TextDetectionResult> labels =
 textDetectionResponse.textDetections();
                for (TextDetectionResult detectedText : labels) {
                    System.out.println("Confidence: " +
 detectedText.textDetection().confidence().toString());
                    System.out.println("Id : " +
 detectedText.textDetection().id());
                    System.out.println("Parent Id: " +
 detectedText.textDetection().parentId());
                    System.out.println("Type: " +
 detectedText.textDetection().type());
                    System.out.println("Text: " +
 detectedText.textDetection().detectedText());
                    System.out.println();
                }

            } while (textDetectionResponse != null &&
 textDetectionResponse.nextToken() != null);

        } catch (RekognitionException | InterruptedException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

Detect people in a video stored in a video stored in an Amazon S3 bucket.

```
import software.amazon.awssdk.regions.Region;
import software.amazon.awssdk.services.rekognition.RekognitionClient;
import software.amazon.awssdk.services.rekognition.model.S3Object;
import software.amazon.awssdk.services.rekognition.model.NotificationChannel;
import
 software.amazon.awssdk.services.rekognition.model.StartPersonTrackingRequest;
import software.amazon.awssdk.services.rekognition.model.Video;
import
 software.amazon.awssdk.services.rekognition.model.StartPersonTrackingResponse;
import software.amazon.awssdk.services.rekognition.model.RekognitionException;
import
 software.amazon.awssdk.services.rekognition.model.GetPersonTrackingResponse;
import
 software.amazon.awssdk.services.rekognition.model.GetPersonTrackingRequest;
import software.amazon.awssdk.services.rekognition.model.VideoMetadata;
import software.amazon.awssdk.services.rekognition.model.PersonDetection;
import java.util.List;

/**
 * Before running this Java V2 code example, set up your development
 * environment, including your credentials.
 *
 * For more information, see the following documentation topic:
 *
 * https://docs.aws.amazon.com/sdk-for-java/latest/developer-guide/get-
started.html
 */
public class VideoPersonDetection {
    private static String startJobId = "";

    public static void main(String[] args) {

        final String usage = """

                Usage:    <bucket> <video> <topicArn> <roleArn>

                Where:
                   bucket - The name of the bucket in which the video is located
 (for example, (for example, myBucket).\s
                   video - The name of video (for example, people.mp4).\s
                   topicArn - The ARN of the Amazon Simple Notification Service
 (Amazon SNS) topic.\s
```

```
                    roleArn - The ARN of the AWS Identity and Access Management
(IAM) role to use.\s
                """;

        if (args.length != 4) {
            System.out.println(usage);
            System.exit(1);
        }

        String bucket = args[0];
        String video = args[1];
        String topicArn = args[2];
        String roleArn = args[3];
        Region region = Region.US_EAST_1;
        RekognitionClient rekClient = RekognitionClient.builder()
                .region(region)
                .build();

        NotificationChannel channel = NotificationChannel.builder()
                .snsTopicArn(topicArn)
                .roleArn(roleArn)
                .build();

        startPersonLabels(rekClient, channel, bucket, video);
        getPersonDetectionResults(rekClient);
        System.out.println("This example is done!");
        rekClient.close();
    }

    public static void startPersonLabels(RekognitionClient rekClient,
            NotificationChannel channel,
            String bucket,
            String video) {
        try {
            S3Object s3Obj = S3Object.builder()
                    .bucket(bucket)
                    .name(video)
                    .build();

            Video vidOb = Video.builder()
                    .s3Object(s3Obj)
                    .build();
```

```
            StartPersonTrackingRequest personTrackingRequest =
StartPersonTrackingRequest.builder()
                    .jobTag("DetectingLabels")
                    .video(vidOb)
                    .notificationChannel(channel)
                    .build();

            StartPersonTrackingResponse labelDetectionResponse =
rekClient.startPersonTracking(personTrackingRequest);
            startJobId = labelDetectionResponse.jobId();

        } catch (RekognitionException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }

    public static void getPersonDetectionResults(RekognitionClient rekClient) {
        try {
            String paginationToken = null;
            GetPersonTrackingResponse personTrackingResult = null;
            boolean finished = false;
            String status;
            int yy = 0;

            do {
                if (personTrackingResult != null)
                    paginationToken = personTrackingResult.nextToken();

                GetPersonTrackingRequest recognitionRequest =
GetPersonTrackingRequest.builder()
                        .jobId(startJobId)
                        .nextToken(paginationToken)
                        .maxResults(10)
                        .build();

                // Wait until the job succeeds
                while (!finished) {

                    personTrackingResult =
rekClient.getPersonTracking(recognitionRequest);
                    status = personTrackingResult.jobStatusAsString();

                    if (status.compareTo("SUCCEEDED") == 0)
```

```
                        finished = true;
                    else {
                        System.out.println(yy + " status is: " + status);
                        Thread.sleep(1000);
                    }
                    yy++;
                }

                finished = false;

                // Proceed when the job is done - otherwise VideoMetadata is
 null.
                VideoMetadata videoMetaData =
 personTrackingResult.videoMetadata();

                System.out.println("Format: " + videoMetaData.format());
                System.out.println("Codec: " + videoMetaData.codec());
                System.out.println("Duration: " +
 videoMetaData.durationMillis());
                System.out.println("FrameRate: " + videoMetaData.frameRate());
                System.out.println("Job");

                List<PersonDetection> detectedPersons =
 personTrackingResult.persons();
                for (PersonDetection detectedPerson : detectedPersons) {
                    long seconds = detectedPerson.timestamp() / 1000;
                    System.out.print("Sec: " + seconds + " ");
                    System.out.println("Person Identifier: " +
 detectedPerson.person().index());
                    System.out.println();
                }

            } while (personTrackingResult != null &&
 personTrackingResult.nextToken() != null);

        } catch (RekognitionException | InterruptedException e) {
            System.out.println(e.getMessage());
            System.exit(1);
        }
    }
}
```

- For API details, see the following topics in *AWS SDK for Java 2.x API Reference*.

- GetCelebrityRecognition
- GetContentModeration
- GetLabelDetection
- GetPersonTracking
- GetSegmentDetection
- GetTextDetection
- StartCelebrityRecognition
- StartContentModeration
- StartLabelDetection
- StartPersonTracking
- StartSegmentDetection
- StartTextDetection

Kotlin

SDK for Kotlin

> **Note**
>
> There's more on GitHub. Find the complete example and learn how to set up and run in the AWS Code Examples Repository.

Detect faces in a video stored in an Amazon S3 bucket.

```
suspend fun startFaceDetection(
    channelVal: NotificationChannel?,
    bucketVal: String,
    videoVal: String,
) {
    val s3Obj =
        S3Object {
            bucket = bucketVal
            name = videoVal
        }
    val vidOb =
        Video {
```

```
            s3Object = s3Obj
        }

    val request =
        StartFaceDetectionRequest {
            jobTag = "Faces"
            faceAttributes = FaceAttributes.All
            notificationChannel = channelVal
            video = vidOb
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val startLabelDetectionResult = rekClient.startFaceDetection(request)
        startJobId = startLabelDetectionResult.jobId.toString()
    }
}

suspend fun getFaceResults() {
    var finished = false
    var status: String
    var yy = 0
    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        var response: GetFaceDetectionResponse? = null

        val recognitionRequest =
            GetFaceDetectionRequest {
                jobId = startJobId
                maxResults = 10
            }

        // Wait until the job succeeds.
        while (!finished) {
            response = rekClient.getFaceDetection(recognitionRequest)
            status = response.jobStatus.toString()
            if (status.compareTo("Succeeded") == 0) {
                finished = true
            } else {
                println("$yy status is: $status")
                delay(1000)
            }
            yy++
        }

        // Proceed when the job is done - otherwise VideoMetadata is null.
```

```
        val videoMetaData = response?.videoMetadata
        println("Format: ${videoMetaData?.format}")
        println("Codec: ${videoMetaData?.codec}")
        println("Duration: ${videoMetaData?.durationMillis}")
        println("FrameRate: ${videoMetaData?.frameRate}")

        // Show face information.
        response?.faces?.forEach { face ->
            println("Age: ${face.face?.ageRange}")
            println("Face: ${face.face?.beard}")
            println("Eye glasses: ${face?.face?.eyeglasses}")
            println("Mustache: ${face.face?.mustache}")
            println("Smile: ${face.face?.smile}")
        }
    }
}
```

Detect inappropriate or offensive content in a video stored in an Amazon S3 bucket.

```
suspend fun startModerationDetection(
    channel: NotificationChannel?,
    bucketVal: String?,
    videoVal: String?,
) {
    val s3Obj =
        S3Object {
            bucket = bucketVal
            name = videoVal
        }
    val vidOb =
        Video {
            s3Object = s3Obj
        }
    val request =
        StartContentModerationRequest {
            jobTag = "Moderation"
            notificationChannel = channel
            video = vidOb
        }

    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        val startModDetectionResult = rekClient.startContentModeration(request)
```

```
        startJobId = startModDetectionResult.jobId.toString()
    }
}

suspend fun getModResults() {
    var finished = false
    var status: String
    var yy = 0
    RekognitionClient { region = "us-east-1" }.use { rekClient ->
        var modDetectionResponse: GetContentModerationResponse? = null

        val modRequest =
            GetContentModerationRequest {
                jobId = startJobId
                maxResults = 10
            }

        // Wait until the job succeeds.
        while (!finished) {
            modDetectionResponse = rekClient.getContentModeration(modRequest)
            status = modDetectionResponse.jobStatus.toString()
            if (status.compareTo("Succeeded") == 0) {
                finished = true
            } else {
                println("$yy status is: $status")
                delay(1000)
            }
            yy++
        }

        // Proceed when the job is done - otherwise VideoMetadata is null.
        val videoMetaData = modDetectionResponse?.videoMetadata
        println("Format: ${videoMetaData?.format}")
        println("Codec: ${videoMetaData?.codec}")
        println("Duration: ${videoMetaData?.durationMillis}")
        println("FrameRate: ${videoMetaData?.frameRate}")

        modDetectionResponse?.moderationLabels?.forEach { mod ->
            val seconds: Long = mod.timestamp / 1000
            print("Mod label: $seconds ")
            println(mod.moderationLabel)
        }
    }
}
```

- For API details, see the following topics in *AWS SDK for Kotlin API reference*.
  - GetCelebrityRecognition
  - GetContentModeration
  - GetLabelDetection
  - GetPersonTracking
  - GetSegmentDetection
  - GetTextDetection
  - StartCelebrityRecognition
  - StartContentModeration
  - StartLabelDetection
  - StartPersonTracking
  - StartSegmentDetection
  - StartTextDetection

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Detect objects in images with Amazon Rekognition using an AWS SDK

The following code examples show how to build an app that uses Amazon Rekognition to detect objects by category in images.

.NET

SDK for .NET

Shows how to use Amazon Rekognition .NET API to create an app that uses Amazon Rekognition to identify objects by category in images located in an Amazon Simple Storage Service (Amazon S3) bucket. The app sends the admin an email notification with the results using Amazon Simple Email Service (Amazon SES).

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- Amazon Rekognition
- Amazon S3
- Amazon SES

Java

SDK for Java 2.x

Shows how to use Amazon Rekognition Java API to create an app that uses Amazon Rekognition to identify objects by category in images located in an Amazon Simple Storage Service (Amazon S3) bucket. The app sends the admin an email notification with the results using Amazon Simple Email Service (Amazon SES).

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- Amazon Rekognition
- Amazon S3
- Amazon SES

JavaScript

SDK for JavaScript (v3)

Shows how to use Amazon Rekognition with the AWS SDK for JavaScript to create an app that uses Amazon Rekognition to identify objects by category in images located in an Amazon Simple Storage Service (Amazon S3) bucket. The app sends the admin an email notification with the results using Amazon Simple Email Service (Amazon SES).

Learn how to:

- Create an unauthenticated user using Amazon Cognito.
- Analyze images for objects using Amazon Rekognition.
- Verify an email address for Amazon SES.

- Send an email notification using Amazon SES.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- Amazon Rekognition
- Amazon S3
- Amazon SES

Kotlin

SDK for Kotlin

Shows how to use Amazon Rekognition Kotlin API to create an app that uses Amazon Rekognition to identify objects by category in images located in an Amazon Simple Storage Service (Amazon S3) bucket. The app sends the admin an email notification with the results using Amazon Simple Email Service (Amazon SES).

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- Amazon Rekognition
- Amazon S3
- Amazon SES

Python

SDK for Python (Boto3)

Shows you how to use the AWS SDK for Python (Boto3) to create a web application that lets you do the following:

- Upload photos to an Amazon Simple Storage Service (Amazon S3) bucket.
- Use Amazon Rekognition to analyze and label the photos.
- Use Amazon Simple Email Service (Amazon SES) to send email reports of image analysis.

This example contains two main components: a webpage written in JavaScript that is built with React, and a REST service written in Python that is built with Flask-RESTful.

You can use the React webpage to:

- Display a list of images that are stored in your S3 bucket.
- Upload images from your computer to your S3 bucket.
- Display images and labels that identify items that are detected in the image.
- Get a report of all images in your S3 bucket and send an email of the report.

The webpage calls the REST service. The service sends requests to AWS to perform the following actions:

- Get and filter the list of images in your S3 bucket.
- Upload photos to your S3 bucket.
- Use Amazon Rekognition to analyze individual photos and get a list of labels that identify items that are detected in the photo.
- Analyze all photos in your S3 bucket and use Amazon SES to email a report.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- Amazon Rekognition
- Amazon S3
- Amazon SES

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Detect people and objects in a video with Amazon Rekognition using an AWS SDK

The following code examples show how to detect people and objects in a video with Amazon Rekognition.

Java

SDK for Java 2.x

Shows how to use Amazon Rekognition Java API to create an app to detect faces and objects in videos located in an Amazon Simple Storage Service (Amazon S3) bucket. The app sends the admin an email notification with the results using Amazon Simple Email Service (Amazon SES).

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- Amazon Rekognition
- Amazon S3
- Amazon SES
- Amazon SNS
- Amazon SQS

Python

SDK for Python (Boto3)

Use Amazon Rekognition to detect faces, objects, and people in videos by starting asynchronous detection jobs. This example also configures Amazon Rekognition to notify an Amazon Simple Notification Service (Amazon SNS) topic when jobs complete and subscribes an Amazon Simple Queue Service (Amazon SQS) queue to the topic. When the queue receives a message about a job, the job is retrieved and the results are output.

This example is best viewed on GitHub. For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- Amazon Rekognition
- Amazon S3
- Amazon SES
- Amazon SNS

- Amazon SQS

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

Save EXIF and other image information using an AWS SDK

The following code example shows how to:

- Get EXIF information from a a JPG, JPEG, or PNG file.
- Upload the image file to an Amazon S3 bucket.
- Use Amazon Rekognition to identify the three top attributes (labels) in the file.
- Add the EXIF and label information to an Amazon DynamoDB table in the Region.

Rust

SDK for Rust

Get EXIF information from a JPG, JPEG, or PNG file, upload the image file to an Amazon S3 bucket, use Amazon Rekognition to identify the three top attributes (*labels* in Amazon Rekognition) in the file, and add the EXIF and label information to a Amazon DynamoDB table in the Region.

For complete source code and instructions on how to set up and run, see the full example on GitHub.

Services used in this example

- DynamoDB
- Amazon Rekognition
- Amazon S3

For a complete list of AWS SDK developer guides and code examples, see Using Rekognition with an AWS SDK. This topic also includes information about getting started and details about previous SDK versions.

API Reference

The Amazon Rekognition API reference is now located at Amazon Rekognition API Reference.

Amazon Rekognition Security

Cloud security at AWS is the highest priority. As an AWS customer, you benefit from a data center and network architecture that are built to meet the requirements of the most security-sensitive organizations.

Use the following topics to learn how to secure your Amazon Rekognition resources.

Topics

- Identity and access management for Amazon Rekognition
- Data protection in Amazon Rekognition
- Using Amazon Rekognition with Amazon VPC endpoints
- Compliance validation for Amazon Rekognition
- Resilience in Amazon Rekognition
- Configuration and vulnerability analysis in Amazon Rekognition
- Cross-service confused deputy prevention
- Infrastructure security in Amazon Rekognition

Identity and access management for Amazon Rekognition

AWS Identity and Access Management (IAM) is an AWS service that helps an administrator securely control access to AWS resources. IAM administrators control who can be *authenticated* (signed in) and *authorized* (have permissions) to use Amazon Rekognition resources. IAM is an AWS service that you can use with no additional charge.

Topics

- Audience
- Authenticating with identities
- Managing access using policies
- How Amazon Rekognition works with IAM
- AWS managed policies for Amazon Rekognition
- Policy best practices

- Using the Amazon Rekognition console
- Examples of using Amazon Rekognition identity-based policy examples
- Examples of Amazon Rekognition resource-based policy
- Troubleshooting Amazon Rekognition identity and access

Audience

How you use AWS Identity and Access Management (IAM) differs, depending on the work that you do in Amazon Rekognition.

Service user – If you use the Amazon Rekognition service to do your job, then your administrator provides you with the credentials and permissions that you need. As you use more Amazon Rekognition features to do your work, you might need additional permissions. Understanding how access is managed can help you request the right permissions from your administrator. If you cannot access a feature in Amazon Rekognition, see Troubleshooting Amazon Rekognition identity and access.

Service administrator – If you're in charge of Amazon Rekognition resources at your company, you probably have full access to Amazon Rekognition. It's your job to determine which Amazon Rekognition features and resources your service users should access. You must then submit requests to your IAM administrator to change the permissions of your service users. Review the information on this page to understand the basic concepts of IAM. To learn more about how your company can use IAM with Amazon Rekognition, see How Amazon Rekognition works with IAM.

IAM administrator – If you're an IAM administrator, you might want to learn details about how you can write policies to manage access to Amazon Rekognition. To view example Amazon Rekognition identity-based policies that you can use in IAM, see Examples of using Amazon Rekognition identity-based policy examples.

Authenticating with identities

Authentication is how you sign in to AWS using your identity credentials. You must be *authenticated* (signed in to AWS) as the AWS account root user, as an IAM user, or by assuming an IAM role.

You can sign in to AWS as a federated identity by using credentials provided through an identity source. AWS IAM Identity Center (IAM Identity Center) users, your company's single sign-on

authentication, and your Google or Facebook credentials are examples of federated identities. When you sign in as a federated identity, your administrator previously set up identity federation using IAM roles. When you access AWS by using federation, you are indirectly assuming a role.

Depending on the type of user you are, you can sign in to the AWS Management Console or the AWS access portal. For more information about signing in to AWS, see How to sign in to your AWS account in the *AWS Sign-In User Guide*.

If you access AWS programmatically, AWS provides a software development kit (SDK) and a command line interface (CLI) to cryptographically sign your requests by using your credentials. If you don't use AWS tools, you must sign requests yourself. For more information about using the recommended method to sign requests yourself, see AWS Signature Version 4 for API requests in the *IAM User Guide*.

Regardless of the authentication method that you use, you might be required to provide additional security information. For example, AWS recommends that you use multi-factor authentication (MFA) to increase the security of your account. To learn more, see Multi-factor authentication in the *AWS IAM Identity Center User Guide* and AWS Multi-factor authentication in IAM in the *IAM User Guide*.

IAM Users and groups

An *IAM user* is an identity within your AWS account that has specific permissions for a single person or application. Where possible, we recommend relying on temporary credentials instead of creating IAM users who have long-term credentials such as passwords and access keys. However, if you have specific use cases that require long-term credentials with IAM users, we recommend that you rotate access keys. For more information, see Rotate access keys regularly for use cases that require long-term credentials in the *IAM User Guide*.

An *IAM group* is an identity that specifies a collection of IAM users. You can't sign in as a group. You can use groups to specify permissions for multiple users at a time. Groups make permissions easier to manage for large sets of users. For example, you could have a group named *IAMAdmins* and give that group permissions to administer IAM resources.

Users are different from roles. A user is uniquely associated with one person or application, but a role is intended to be assumable by anyone who needs it. Users have permanent long-term credentials, but roles provide temporary credentials. To learn more, see Use cases for IAM users in the *IAM User Guide*.

IAM roles

An *IAM role* is an identity within your AWS account that has specific permissions. It is similar to an IAM user, but is not associated with a specific person. To temporarily assume an IAM role in the AWS Management Console, you can switch from a user to an IAM role (console). You can assume a role by calling an AWS CLI or AWS API operation or by using a custom URL. For more information about methods for using roles, see Methods to assume a role in the *IAM User Guide*.

IAM roles with temporary credentials are useful in the following situations:

- **Federated user access** – To assign permissions to a federated identity, you create a role and define permissions for the role. When a federated identity authenticates, the identity is associated with the role and is granted the permissions that are defined by the role. For information about roles for federation, see Create a role for a third-party identity provider (federation) in the *IAM User Guide*. If you use IAM Identity Center, you configure a permission set. To control what your identities can access after they authenticate, IAM Identity Center correlates the permission set to a role in IAM. For information about permissions sets, see Permission sets in the *AWS IAM Identity Center User Guide*.
- **Temporary IAM user permissions** – An IAM user or role can assume an IAM role to temporarily take on different permissions for a specific task.
- **Cross-account access** – You can use an IAM role to allow someone (a trusted principal) in a different account to access resources in your account. Roles are the primary way to grant cross-account access. However, with some AWS services, you can attach a policy directly to a resource (instead of using a role as a proxy). To learn the difference between roles and resource-based policies for cross-account access, see Cross account resource access in IAM in the *IAM User Guide*.
- **Cross-service access** – Some AWS services use features in other AWS services. For example, when you make a call in a service, it's common for that service to run applications in Amazon EC2 or store objects in Amazon S3. A service might do this using the calling principal's permissions, using a service role, or using a service-linked role.
  - **Forward access sessions (FAS)** – When you use an IAM user or role to perform actions in AWS, you are considered a principal. When you use some services, you might perform an action that then initiates another action in a different service. FAS uses the permissions of the principal calling an AWS service, combined with the requesting AWS service to make requests to downstream services. FAS requests are only made when a service receives a request that requires interactions with other AWS services or resources to complete. In this case, you must have permissions to perform both actions. For policy details when making FAS requests, see Forward access sessions.

- **Service role** – A service role is an IAM role that a service assumes to perform actions on your behalf. An IAM administrator can create, modify, and delete a service role from within IAM. For more information, see Create a role to delegate permissions to an AWS service in the *IAM User Guide*.
- **Service-linked role** – A service-linked role is a type of service role that is linked to an AWS service. The service can assume the role to perform an action on your behalf. Service-linked roles appear in your AWS account and are owned by the service. An IAM administrator can view, but not edit the permissions for service-linked roles.

- **Applications running on Amazon EC2** – You can use an IAM role to manage temporary credentials for applications that are running on an EC2 instance and making AWS CLI or AWS API requests. This is preferable to storing access keys within the EC2 instance. To assign an AWS role to an EC2 instance and make it available to all of its applications, you create an instance profile that is attached to the instance. An instance profile contains the role and enables programs that are running on the EC2 instance to get temporary credentials. For more information, see Use an IAM role to grant permissions to applications running on Amazon EC2 instances in the *IAM User Guide*.

Managing access using policies

You control access in AWS by creating policies and attaching them to AWS identities or resources. A policy is an object in AWS that, when associated with an identity or resource, defines their permissions. AWS evaluates these policies when a principal (user, root user, or role session) makes a request. Permissions in the policies determine whether the request is allowed or denied. Most policies are stored in AWS as JSON documents. For more information about the structure and contents of JSON policy documents, see Overview of JSON policies in the *IAM User Guide*.

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

By default, users and roles have no permissions. To grant users permission to perform actions on the resources that they need, an IAM administrator can create IAM policies. The administrator can then add the IAM policies to roles, and users can assume the roles.

IAM policies define permissions for an action regardless of the method that you use to perform the operation. For example, suppose that you have a policy that allows the `iam:GetRole` action. A user with that policy can get role information from the AWS Management Console, the AWS CLI, or the AWS API.

Using identity-based policies

Identity-based policies are JSON permissions policy documents that you can attach to an identity, such as an IAM user, group of users, or role. These policies control what actions users and roles can perform, on which resources, and under what conditions. To learn how to create an identity-based policy, see Define custom IAM permissions with customer managed policies in the *IAM User Guide*.

Identity-based policies can be further categorized as *inline policies* or *managed policies*. Inline policies are embedded directly into a single user, group, or role. Managed policies are standalone policies that you can attach to multiple users, groups, and roles in your AWS account. Managed policies include AWS managed policies and customer managed policies. To learn how to choose between a managed policy or an inline policy, see Choose between managed policies and inline policies in the *IAM User Guide*.

Using resource-based policies

Resource-based policies are JSON policy documents that you attach to a resource. Examples of resource-based policies are IAM *role trust policies* and Amazon S3 *bucket policies*. In services that support resource-based policies, service administrators can use them to control access to a specific resource. For the resource where the policy is attached, the policy defines what actions a specified principal can perform on that resource and under what conditions. You must specify a principal in a resource-based policy. Principals can include accounts, users, roles, federated users, or AWS services.

Resource-based policies are inline policies that are located in that service. You can't use AWS managed policies from IAM in a resource-based policy.

Access control lists (ACLs)

Access control lists (ACLs) control which principals (account members, users, or roles) have permissions to access a resource. ACLs are similar to resource-based policies, although they do not use the JSON policy document format.

Amazon S3, AWS WAF, and Amazon VPC are examples of services that support ACLs. To learn more about ACLs, see Access control list (ACL) overview in the *Amazon Simple Storage Service Developer Guide*.

Other policy types

AWS supports additional, less-common policy types. These policy types can set the maximum permissions granted to you by the more common policy types.

- **Permissions boundaries** – A permissions boundary is an advanced feature in which you set the maximum permissions that an identity-based policy can grant to an IAM entity (IAM user or role). You can set a permissions boundary for an entity. The resulting permissions are the intersection of an entity's identity-based policies and its permissions boundaries. Resource-based policies that specify the user or role in the `Principal` field are not limited by the permissions boundary. An explicit deny in any of these policies overrides the allow. For more information about permissions boundaries, see Permissions boundaries for IAM entities in the *IAM User Guide*.
- **Service control policies (SCPs)** – SCPs are JSON policies that specify the maximum permissions for an organization or organizational unit (OU) in AWS Organizations. AWS Organizations is a service for grouping and centrally managing multiple AWS accounts that your business owns. If you enable all features in an organization, then you can apply service control policies (SCPs) to any or all of your accounts. The SCP limits permissions for entities in member accounts, including each AWS account root user. For more information about Organizations and SCPs, see Service control policies in the *AWS Organizations User Guide*.
- **Resource control policies (RCPs)** – RCPs are JSON policies that you can use to set the maximum available permissions for resources in your accounts without updating the IAM policies attached to each resource that you own. The RCP limits permissions for resources in member accounts and can impact the effective permissions for identities, including the AWS account root user, regardless of whether they belong to your organization. For more information about Organizations and RCPs, including a list of AWS services that support RCPs, see Resource control policies (RCPs) in the *AWS Organizations User Guide*.
- **Session policies** – Session policies are advanced policies that you pass as a parameter when you programmatically create a temporary session for a role or federated user. The resulting session's permissions are the intersection of the user or role's identity-based policies and the session policies. Permissions can also come from a resource-based policy. An explicit deny in any of these policies overrides the allow. For more information, see Session policies in the *IAM User Guide*.

Multiple policy types

When multiple types of policies apply to a request, the resulting permissions are more complicated to understand. To learn how AWS determines whether to allow a request when multiple policy types are involved, see Policy evaluation logic in the *IAM User Guide*.

How Amazon Rekognition works with IAM

Before you use IAM to manage access to Amazon Rekognition, you should understand what IAM features are available to use with Amazon Rekognition. To get a high-level view of how Amazon Rekognition and other AWS services work with IAM, see AWS Services That Work with IAM in the *IAM User Guide*.

Topics

- Amazon Rekognition identity-based policies
- Amazon Rekognition resource-based policies
- Amazon Rekognition IAM roles

Amazon Rekognition identity-based policies

With IAM identity-based policies, you can specify allowed or denied actions and resources as well as the conditions under which actions are allowed or denied. Amazon Rekognition supports specific actions, resources, and condition keys. To learn about all of the elements that you use in a JSON policy, see IAM JSON Policy Elements Reference in the *IAM User Guide*.

Actions

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Action` element of a JSON policy describes the actions that you can use to allow or deny access in a policy. Policy actions usually have the same name as the associated AWS API operation. There are some exceptions, such as *permission-only actions* that don't have a matching API operation. There are also some operations that require multiple actions in a policy. These additional actions are called *dependent actions*.

Include actions in a policy to grant permissions to perform the associated operation.

Policy actions in Amazon Rekognition use the following prefix before the action: `rekognition:`. For example, to grant someone permission to detect objects, scenes, or concepts in an image with the Amazon Rekognition `DetectLabels` API operation, you include the `rekognition:DetectLabels` action in their policy. Policy statements must include either an `Action` or `NotAction` element. Amazon Rekognition defines its own set of actions that describe tasks that you can perform with this service.

To specify multiple actions in a single statement, separate them with commas as follows:

```
"Action": [
      "rekognition:action1",
      "rekognition:action2"
```

You can specify multiple actions using wildcards (*). For example, to specify all actions that begin with the word `Describe`, include the following action:

```
"Action": "rekognition:Describe*"
```

To see a list of Amazon Rekognition actions, see Actions Defined by Amazon Rekognition in the *IAM User Guide*.

Resources

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Resource` JSON policy element specifies the object or objects to which the action applies. Statements must include either a `Resource` or a `NotResource` element. As a best practice, specify a resource using its Amazon Resource Name (ARN). You can do this for actions that support a specific resource type, known as *resource-level permissions*.

For actions that don't support resource-level permissions, such as listing operations, use a wildcard (*) to indicate that the statement applies to all resources.

```
"Resource": "*"
```

For more information about the format of ARNs, see Amazon Resource Names (ARNs) and AWS Service Namespaces.

For example, to specify the `MyCollection` collection in your statement, use the following ARN:

```
"Resource": "arn:aws:rekognition:us-east-1:123456789012:collection/MyCollection"
```

To specify all instances that belong to a specific account, use the wildcard (*):

```
"Resource": "arn:aws:rekognition:us-east-1:123456789012:collection/*"
```

Some Amazon Rekognition actions, such as those for creating resources, cannot be performed on a specific resource. In those cases, you must use the wildcard (*).

```
"Resource": "*"
```

To see a list of Amazon Rekognition resource types and their ARNs, see Resources Defined by Amazon Rekognition in the *IAM User Guide*. To learn with which actions you can specify the ARN of each resource, see Actions Defined by Amazon Rekognition.

Condition keys

Amazon Rekognition does not provide any service-specific condition keys, but it does support using some global condition keys. To see all AWS global condition keys, see AWS Global Condition Context Keys in the *IAM User Guide*.

Amazon Rekognition resource-based policies

Amazon Rekognition supports resource-based policies for Custom Labels model copy operations. For more information, see Amazon Rekognition resource-based policy examples.

Other services, such as Amazon S3, also support resource-based permissions policies. For example, you can attach a policy to an S3 bucket to manage access permissions to that bucket.

To access images stored in an Amazon S3 bucket, you must have permission to access object in the S3 bucket. With this permission, Amazon Rekognition can download images from the S3 bucket. The following example policy allows the user to perform the `s3:GetObject` action on the S3 bucket named amzn-s3-demo-bucket3.

```
{
```

```
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "s3:GetObject",
            "Resource": [
                "arn:aws:s3:::amzn-s3-demo-bucket3/*"
            ]
        }
    ]
}
```

To use an S3 bucket with versioning enabled, add the `s3:GetObjectVersion` action, as shown in the following example.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetObject",
                "s3:GetObjectVersion"
            ],
            "Resource": [
                "arn:aws:s3:::amzn-s3-demo-bucket3/*"
            ]
        }
    ]
```

Amazon Rekognition IAM roles

An IAM role is an entity within your AWS account that has specific permissions.

Using temporary credentials with Amazon Rekognition

You can use temporary credentials to sign in with federation, assume an IAM role, or to assume a cross-account role. You obtain temporary security credentials by calling AWS STS API operations such as AssumeRole or GetFederationToken.

Amazon Rekognition supports using temporary credentials.

Service-linked roles

Service-linked roles allow AWS services to access resources in other services to complete an action on your behalf. Service-linked roles appear in your IAM account and are owned by the service. An IAM administrator can view but not edit the permissions for service-linked roles.

Amazon Rekognition doesn't support service-linked roles.

Service roles

This feature allows a service to assume a service role on your behalf. This role allows the service to access resources in other services to complete an action on your behalf. Service roles appear in your IAM account and are owned by the account. This means that an IAM administrator can change the permissions for this role. However, doing so might break the functionality of the service.

Amazon Rekognition supports service roles.

Using a service role may create a security issue where Amazon Rekognition is used to call another service and act on resources it shouldn't have access to. To keep your account secure, you should limit the scope of Amazon Rekognition's access to just the resources you are using. This can be done by attaching a trust policy to your IAM service role. For information on how to do this, see Cross-service confused deputy prevention.

Choosing an IAM role in Amazon Rekognition

When you configure Amazon Rekognition to analyze stored videos, you must choose a role to allow Amazon Rekognition to access Amazon SNS on your behalf. If you have previously created a service role or service-linked role, then Amazon Rekognition provides you with a list of roles to choose from. For more information, see the section called “Configuring Amazon Rekognition Video”.

Example: Configuring Amazon Rekognition to accsss images in an Amazon S3 bucket

The following is an example of how you might configure Amazon Rekognition for analyzing images in an Amazon S3 bucket. If you want to use Amazon Rekognition to analyze images in an Amazon S3 bucket you must do the following:

1. Ensure your IAM user/role (the client) has permission to call the relevant Amazon Rekognition API operations (like DetectLabels, DetectFaces etc.)

   Attach an identity-based policy that grants the appropriate permissions to invoke your desired API operations. For example, to give your role permissions to call `DetectLabels` and `DetectFaces`, you would attach to your role a policy that looks like this:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "rekognition:DetectLabels",
                "rekognition:DetectFaces"
                // other Rekognition permissions as needed
            ],
            "Resource": "*"
        }
    ]
}
```

2. The Amazon Rekognition service needs permission to access your Amazon S3 bucket. Create an IAM service role, which you will need to pass to Amazon Rekognition when making API calls. Ensure that the service role: Trusts the Amazon Rekognition service principal, has `s3:GetObject` permissions for your bucket.

   The trust policy might look like this:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "rekognition.amazonaws.com"
            },
            "Action": "sts:AssumeRole"
        }
    ]
}
```

   The identity-based policy attached to the service role might look like this:

```
{
```

```
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "s3:GetObject",
            "Resource": "arn:aws:s3:::amzn-s3-demo-bucket/*"
        }
    ]
}
```

AWS managed policies for Amazon Rekognition

To add permissions to users, groups, and roles, it is easier to use AWS managed policies than to write policies yourself. It takes time and expertise to create IAM customer managed policies that provide your team with only the permissions they need. To get started quickly, you can use our AWS managed policies. These policies cover common use cases and are available in your AWS account. For more information about AWS managed policies, see AWS managed policies in the *IAM User Guide*.

AWS services maintain and update AWS managed policies. You can't change the permissions in AWS managed policies. Services occasionally add additional permissions to an AWS managed policy to support new features. This type of update affects all identities (users, groups, and roles) where the policy is attached. Services are most likely to update an AWS managed policy when a new feature is launched or when new operations become available. Services do not remove permissions from an AWS managed policy, so policy updates won't break your existing permissions.

Additionally, AWS supports managed policies for job functions that span multiple services. For example, the **ReadOnlyAccess** AWS managed policy provides read-only access to all AWS services and resources. When a service launches a new feature, AWS adds read-only permissions for new operations and resources. For a list and descriptions of job function policies, see AWS managed policies for job functions in the *IAM User Guide*.

AWS managed policy: AmazonRekognitionFullAccess

AmazonRekognitionFullAccess grants full access to Amazon Rekognition resources including creating and deleting collections.

You can attach the AmazonRekognitionFullAccess policy to your IAM identities.

Permissions details

This policy includes the following permissions.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "rekognition:*"
            ],
            "Resource": "*"
        }
    ]
}
```

AWS managed policy: AmazonRekognitionReadOnlyAccess

AmazonRekognitionReadOnlyAccess grants read-only access to Amazon Rekognition resources.

You can attach the AmazonRekognitionReadOnlyAccess policy to your IAM identities.

Permissions details

This policy includes the following permissions.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "AmazonRekognitionReadOnlyAccess",
            "Effect": "Allow",
            "Action": [
                "rekognition:CompareFaces",
                "rekognition:DetectFaces",
```

```
                "rekognition:DetectLabels",
                "rekognition:ListCollections",
                "rekognition:ListFaces",
                "rekognition:SearchFaces",
                "rekognition:SearchFacesByImage",
                "rekognition:DetectText",
                "rekognition:GetCelebrityInfo",
                "rekognition:RecognizeCelebrities",
                "rekognition:DetectModerationLabels",
                "rekognition:GetLabelDetection",
                "rekognition:GetFaceDetection",
                "rekognition:GetContentModeration",
                "rekognition:GetPersonTracking",
                "rekognition:GetCelebrityRecognition",
                "rekognition:GetFaceSearch",
                "rekognition:GetTextDetection",
                "rekognition:GetSegmentDetection",
                "rekognition:DescribeStreamProcessor",
                "rekognition:ListStreamProcessors",
                "rekognition:DescribeProjects",
                "rekognition:DescribeProjectVersions",
                "rekognition:DetectCustomLabels",
                "rekognition:DetectProtectiveEquipment",
                "rekognition:ListTagsForResource",
                "rekognition:ListDatasetEntries",
                "rekognition:ListDatasetLabels",
                "rekognition:DescribeDataset",
                "rekognition:ListProjectPolicies",
                "rekognition:ListUsers",
                "rekognition:SearchUsers",
                "rekognition:SearchUsersByImage",
                "rekognition:GetMediaAnalysisJob",
                "rekognition:ListMediaAnalysisJobs"
            ],
            "Resource": "*"
        }
    ]
}
```

AWS managed policy: AmazonRekognitionServiceRole

AmazonRekognitionServiceRole allows Amazon Rekognition to call Amazon Kinesis Data Streams and Amazon SNS services on your behalf.

You can attach the `AmazonRekognitionServiceRole` policy to your IAM identities.

If using this service role, you should keep your account secure by limiting the scope of Amazon Rekognition's access to just the resources you are using. This can be done by attaching a trust policy to your IAM service role. For information on how to do this, see Cross-service confused deputy prevention.

Permissions details

This policy includes the following permissions.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "sns:Publish"
            ],
            "Resource": "arn:aws:sns:*:*:AmazonRekognition*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "kinesis:PutRecord",
                "kinesis:PutRecords"
            ],
            "Resource": "arn:aws:kinesis:*:*:stream/AmazonRekognition*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "kinesisvideo:GetDataEndpoint",
                "kinesisvideo:GetMedia"
            ],
            "Resource": "*"
        }
    ]
}
```

AWS managed policy: AmazonRekognitionCustomLabelsFullAccess

This policy is for Amazon Rekognition Custom Labels; users. Use the AmazonRekognitionCustomLabelsFullAccess policy to allow users full access to the Amazon Rekognition Custom Labels API and full access to the console buckets created by the Amazon Rekognition Custom Labels console.

Permissions details

This policy includes the following permissions.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:ListBucket",
                "s3:ListAllMyBuckets",
                "s3:GetBucketAcl",
                "s3:GetBucketLocation",
                "s3:GetObject",
                "s3:GetObjectAcl",
                "s3:GetObjectTagging",
                "s3:GetObjectVersion",
                "s3:PutObject"
            ],
            "Resource": "arn:aws:s3:::*custom-labels*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "rekognition:CopyProjectVersion",
                "rekognition:CreateProject",
                "rekognition:CreateProjectVersion",
                "rekognition:StartProjectVersion",
                "rekognition:StopProjectVersion",
                "rekognition:DescribeProjects",
                "rekognition:DescribeProjectVersions",
                "rekognition:DetectCustomLabels",
                "rekognition:DeleteProject",
                "rekognition:DeleteProjectVersion"
                "rekognition:TagResource",
```

```
                "rekognition:UntagResource",
                "rekognition:ListTagsForResource",
                "rekognition:CreateDataset",
                "rekognition:ListDatasetEntries",
                "rekognition:ListDatasetLabels",
                "rekognition:DescribeDataset",
                "rekognition:UpdateDatasetEntries",
                "rekognition:DistributeDatasetEntries",
                "rekognition:DeleteDataset",
                "rekognition:PutProjectPolicy",
                "rekognition:ListProjectPolicies",
                "rekognition:DeleteProjectPolicy"

            ],
            "Resource": "*"
        }
    ]
}
```

Amazon Rekognition updates to AWS managed policies

View details about updates to AWS managed policies for Amazon Rekognition since this service began tracking these changes. For automatic alerts about changes to this page, subscribe to the RSS feed on the Amazon Rekognition Document history page.

Change	Description	Date
Actions involving media analysis jobs have been added to the following managed policy: • AWS managed policy: AmazonRekognitionReadOnlyAccess	Amazon Rekognition added the following actions to the `AmazonRekognitionReadOnlyAccess` managed policy: • `GetMediaAnalysisJob` • `ListMediaAnalysisJob`	October 31st, 2023

Change	Description	Date
Actions involving managing users have been added to the following managed policy: • AWS managed policy: AmazonRekognitionReadOnlyAccess	Amazon Rekognition added the following actions to the `AmazonRekognitionReadOnlyAccess` managed policy: • `ListUsers` • `SearchUsers` • `SearchUsersByImage`	June 12th, 2023
Actions for ProjectPolicy and Custom Labels Model Copy have been added to the following managed policies: • AWS managed policy: AmazonRekognitionFullAccess • AWS managed policy: AmazonRekognitionCustomLabelsFullAccess	Amazon Rekognition added the following actions to the `AmazonRekognitionCustomLabelsFullAccess` and `AmazonRekognitionFullAccess` managed policies: • `CopyProjectVersion` • `PutProjectPolicy` • `ListProjectPolicies` • `DeleteProjectPolicy`	July 21st, 2022
Actions for ProjectPolicy and Custom Labels Model Copy have been added to the following managed policies: • AWS managed policy: AmazonRekognitionReadOnlyAccess	Amazon Rekognition added the following actions to the AmazonRekognitionReadOnlyAccess managed policy: • `ListProjectPolicies`	July 21st, 2022

Change	Description	Date
Dataset management update for the following managed policies: • AWS managed policy: AmazonRekognitionReadOnlyAccess • AWS managed policy: AmazonRekognitionFullAccess • AWS managed policy: AmazonRekognitionCustomLabelsFullAccess	Amazon Rekognition added the following actions to the AmazonRekognitionReadOnlyAccess, AmazonRekognitionFullOnlyAccess, and AmazonRekognitionCustomLabelsFullAccess managed policies • `CreateDataset` • `ListDatasetEntries` • `ListDatasetLabels` • `DescribeDataset` • `UpdateDatasetEntries` • `DistributeDatasetEntries` • `DeleteDataset`	November 1, 2021
Tagging update for AWS managed policy: AmazonRekognitionReadOnlyAccess and AWS managed policy: AmazonRekognitionFullAccess	Amazon Rekognition added new tagging actions to the AmazonRekognitionFullAccess and AmazonRekognitionReadOnlyAccess policies.	April 2, 2021
Amazon Rekognition started tracking changes	Amazon Rekognition started tracking changes for its AWS managed policies.	April 2, 2021

Policy best practices

Identity-based policies determine whether someone can create, access, or delete Amazon Rekognition resources in your account. These actions can incur costs for your AWS account. When you create or edit identity-based policies, follow these guidelines and recommendations:

- **Get started with AWS managed policies and move toward least-privilege permissions** – To get started granting permissions to your users and workloads, use the *AWS managed policies* that grant permissions for many common use cases. They are available in your AWS account. We recommend that you reduce permissions further by defining AWS customer managed policies that are specific to your use cases. For more information, see AWS managed policies or AWS managed policies for job functions in the *IAM User Guide*.
- **Apply least-privilege permissions** – When you set permissions with IAM policies, grant only the permissions required to perform a task. You do this by defining the actions that can be taken on specific resources under specific conditions, also known as *least-privilege permissions*. For more information about using IAM to apply permissions, see Policies and permissions in IAM in the *IAM User Guide*.
- **Use conditions in IAM policies to further restrict access** – You can add a condition to your policies to limit access to actions and resources. For example, you can write a policy condition to specify that all requests must be sent using SSL. You can also use conditions to grant access to service actions if they are used through a specific AWS service, such as AWS CloudFormation. For more information, see IAM JSON policy elements: Condition in the *IAM User Guide*.
- **Use IAM Access Analyzer to validate your IAM policies to ensure secure and functional permissions** – IAM Access Analyzer validates new and existing policies so that the policies adhere to the IAM policy language (JSON) and IAM best practices. IAM Access Analyzer provides more than 100 policy checks and actionable recommendations to help you author secure and functional policies. For more information, see Validate policies with IAM Access Analyzer in the *IAM User Guide*.
- **Require multi-factor authentication (MFA)** – If you have a scenario that requires IAM users or a root user in your AWS account, turn on MFA for additional security. To require MFA when API operations are called, add MFA conditions to your policies. For more information, see Secure API access with MFA in the *IAM User Guide*.

For more information about best practices in IAM, see Security best practices in IAM in the *IAM User Guide*.

Using the Amazon Rekognition console

With the exception of the Amazon Rekognition Custom Labels feature, Amazon Rekognition doesn't require any addition permissions when using the Amazon Rekognition console. For information about Amazon Rekognition Custom Labels, see Step 5: Set Up Amazon Rekognition Custom Labels Console Permissions.

You don't need to allow minimum console permissions for users that are making calls only to the AWS CLI or the AWS API. Instead, allow access to only the actions that match the API operation that you're trying to perform.

Examples of using Amazon Rekognition identity-based policy examples

By default, users and roles don't have permission to create or modify Amazon Rekognition resources. They also can't perform tasks using the AWS Management Console, AWS CLI, or AWS API. An IAM administrator must create IAM policies that grant users and roles permission to perform specific API operations on the specified resources they need. The administrator must then attach those policies to the users or groups that require those permissions.

To learn how to create an IAM identity-based policy using these example JSON policy documents, see Creating Policies on the JSON Tab in the *IAM User Guide*.

Topics

- Example Amazon Rekognition Custom Labels policies
- Example 1: Allow a user read-only access to resources
- Example 2: Allow a user full access to resources
- Allow users to view their own permissions

Example Amazon Rekognition Custom Labels policies

You can create identity-based policies for Amazon Rekognition Custom Labels. For more information, see Security.

Example 1: Allow a user read-only access to resources

The following example grants read-only access to Amazon Rekognition resources.

```
{
    "Version": "2012-10-17",
```

```
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "rekognition:CompareFaces",
                "rekognition:DetectFaces",
                "rekognition:DetectLabels",
                "rekognition:ListCollections",
                "rekognition:ListFaces",
                "rekognition:SearchFaces",
                "rekognition:SearchFacesByImage",
                "rekognition:DetectText",
                "rekognition:GetCelebrityInfo",
                "rekognition:RecognizeCelebrities",
                "rekognition:DetectModerationLabels",
                "rekognition:GetLabelDetection",
                "rekognition:GetFaceDetection",
                "rekognition:GetContentModeration",
                "rekognition:GetPersonTracking",
                "rekognition:GetCelebrityRecognition",
                "rekognition:GetFaceSearch",
                "rekognition:GetTextDetection",
                "rekognition:GetSegmentDetection",
                "rekognition:DescribeStreamProcessor",
                "rekognition:ListStreamProcessors",
                "rekognition:DescribeProjects",
                "rekognition:DescribeProjectVersions",
                "rekognition:DetectCustomLabels",
                "rekognition:DetectProtectiveEquipment",
                "rekognition:ListTagsForResource",
               "rekognition:ListDatasetEntries",
                "rekognition:ListDatasetLabels",
                "rekognition:DescribeDataset"

            ],
            "Resource": "*"
        }
    ]
}
```

Example 2: Allow a user full access to resources

The following example grants full access to Amazon Rekognition resources.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "rekognition:*"
            ],
            "Resource": "*"
        }
    ]
}
```

Allow users to view their own permissions

This example shows how you might create a policy that allows IAM users to view the inline and managed policies that are attached to their user identity. This policy includes permissions to complete this action on the console or programmatically using the AWS CLI or AWS API.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "ViewOwnUserInfo",
            "Effect": "Allow",
            "Action": [
                "iam:GetUserPolicy",
                "iam:ListGroupsForUser",
                "iam:ListAttachedUserPolicies",
                "iam:ListUserPolicies",
                "iam:GetUser"
            ],
            "Resource": ["arn:aws:iam::*:user/${aws:username}"]
        },
        {
            "Sid": "NavigateInConsole",
            "Effect": "Allow",
            "Action": [
                "iam:GetGroupPolicy",
                "iam:GetPolicyVersion",
                "iam:GetPolicy",
                "iam:ListAttachedGroupPolicies",
```

```
                "iam:ListGroupPolicies",
                "iam:ListPolicyVersions",
                "iam:ListPolicies",
                "iam:ListUsers"
            ],
            "Resource": "*"
        }
    ]
}
```

Examples of Amazon Rekognition resource-based policy

Amazon Rekognition Custom Labels uses resource-based polices, known as *project policies*, to manage copy permissions for a model version.

A project policy gives or denies permission to copy a model version from a source project to a destination project. You need a project policy if the destination project is in a different AWS account or if you want to restrict access within an AWS account, For example, you might want to deny copy permissions to a specific IAM role. For more information, see Copying a model.

Giving permission to copy a model version

The following example allows the principal `arn:aws:iam::123456789012:role/Admin` to copy the model version `arn:aws:rekognition:us-east-1:123456789012:project/my_project/version/test_1/1627045542080`.

```
{
  "Version":"2012-10-17",
  "Statement":[
    {
      "Effect":"Allow",
      "Principal":{
        "AWS":"arn:aws:iam::123456789012:role/Admin"
      },
      "Action":"rekognition:CopyProjectVersion",
      "Resource":"arn:aws:rekognition:us-east-1:123456789012:project/my_project/
version/test_1/1627045542080"
    }
  ]
}
```

Troubleshooting Amazon Rekognition identity and access

Use the following information to help you diagnose and fix common issues that you might encounter when working with Amazon Rekognition and IAM.

Topics

- I am not authorized to perform an action in Amazon Rekognition
- I am not authorized to perform iam:PassRole
- I'm an administrator and want to allow others to access Amazon Rekognition
- I want to allow people outside of my AWS account to access my Amazon Rekognition resources

I am not authorized to perform an action in Amazon Rekognition

If the AWS Management Console tells you that you're not authorized to perform an action, then you must contact your administrator for assistance. Your administrator is the person that provided you with your sign-in credentials.

The following example error occurs when the `mateojackson` IAM user tries to use the console to view details about a *`widget`* but does not have `rekognition:`*`GetWidget`* permissions.

```
User: arn:aws:iam::123456789012:user/mateojackson is not authorized to perform:
 rekognition:GetWidget on resource: my-example-widget
```

In this case, Mateo asks his administrator to update his policies to allow him to access the *`my-example-widget`* resource using the `rekognition:`*`GetWidget`* action.

I am not authorized to perform iam:PassRole

If you receive an error that you're not authorized to perform the `iam:PassRole` action, your policies must be updated to allow you to pass a role to Amazon Rekognition.

Some AWS services allow you to pass an existing role to that service instead of creating a new service role or service-linked role. To do this, you must have permissions to pass the role to the service.

The following example error occurs when an IAM user named `marymajor` tries to use the console to perform an action in Amazon Rekognition. However, the action requires the service to have

permissions that are granted by a service role. Mary does not have permissions to pass the role to the service.

```
User: arn:aws:iam::123456789012:user/marymajor is not authorized to perform:
 iam:PassRole
```

In this case, Mary's policies must be updated to allow her to perform the `iam:PassRole` action.

If you need help, contact your AWS administrator. Your administrator is the person who provided you with your sign-in credentials.

I'm an administrator and want to allow others to access Amazon Rekognition

To allow others to access Amazon Rekognition, you must grant permission to the people or applications that need access. If you are using AWS IAM Identity Center to manage people and applications, you assign permission sets to users or groups to define their level of access. Permission sets automatically create and assign IAM policies to IAM roles that are associated with the person or application. For more information, see Permission sets in the *AWS IAM Identity Center User Guide*.

If you are not using IAM Identity Center, you must create IAM entities (users or roles) for the people or applications that need access. You must then attach a policy to the entity that grants them the correct permissions in Amazon Rekognition. After the permissions are granted, provide the credentials to the user or application developer. They will use those credentials to access AWS. To learn more about creating IAM users, groups, policies, and permissions, see IAM Identities and Policies and permissions in IAM in the *IAM User Guide*.

I want to allow people outside of my AWS account to access my Amazon Rekognition resources

You can create a role that users in other accounts or people outside of your organization can use to access your resources. You can specify who is trusted to assume the role. For services that support resource-based policies or access control lists (ACLs), you can use those policies to grant people access to your resources.

To learn more, consult the following:

- To learn whether Amazon Rekognition supports these features, see How Amazon Rekognition works with IAM.

- To learn how to provide access to your resources across AWS accounts that you own, see Providing access to an IAM user in another AWS account that you own in the *IAM User Guide*.
- To learn how to provide access to your resources to third-party AWS accounts, see Providing access to AWS accounts owned by third parties in the *IAM User Guide*.
- To learn how to provide access through identity federation, see Providing access to externally authenticated users (identity federation) in the *IAM User Guide*.
- To learn the difference between using roles and resource-based policies for cross-account access, see Cross account resource access in IAM in the *IAM User Guide*.

Data protection in Amazon Rekognition

The AWS shared responsibility model applies to data protection in Amazon Rekognition. As described in this model, AWS is responsible for protecting the global infrastructure that runs all of the AWS Cloud. You are responsible for maintaining control over your content that is hosted on this infrastructure. You are also responsible for the security configuration and management tasks for the AWS services that you use. For more information about data privacy, see the Data Privacy FAQ. For information about data protection in Europe, see the AWS Shared Responsibility Model and GDPR blog post on the *AWS Security Blog*.

For data protection purposes, we recommend that you protect AWS account credentials and set up individual users with AWS IAM Identity Center or AWS Identity and Access Management (IAM). That way, each user is given only the permissions necessary to fulfill their job duties. We also recommend that you secure your data in the following ways:

- Use multi-factor authentication (MFA) with each account.
- Use SSL/TLS to communicate with AWS resources. We require TLS 1.2 and recommend TLS 1.3.
- Set up API and user activity logging with AWS CloudTrail. For information about using CloudTrail trails to capture AWS activities, see Working with CloudTrail trails in the *AWS CloudTrail User Guide*.
- Use AWS encryption solutions, along with all default security controls within AWS services.
- Use advanced managed security services such as Amazon Macie, which assists in discovering and securing sensitive data that is stored in Amazon S3.
- If you require FIPS 140-3 validated cryptographic modules when accessing AWS through a command line interface or an API, use a FIPS endpoint. For more information about the available FIPS endpoints, see Federal Information Processing Standard (FIPS) 140-3.

We strongly recommend that you never put confidential or sensitive information, such as your customers' email addresses, into tags or free-form text fields such as a **Name** field. This includes when you work with Rekognition or other AWS services using the console, API, AWS CLI, or AWS SDKs. Any data that you enter into tags or free-form text fields used for names may be used for billing or diagnostic logs. If you provide a URL to an external server, we strongly recommend that you do not include credentials information in the URL to validate your request to that server.

Data encryption

The following information explains where Amazon Rekognition uses data encryption to protect your data.

Encryption at rest

Amazon Rekognition Image

Images

Images passed to Amazon Rekognition API operations may be stored and used to improve the service unless you have opted out by visiting the AI services opt-out policy page and following the process explained there. The stored images are encrypted at rest (Amazon S3) using AWS Key Management Service (SSE-KMS).

Collections

For face comparison operations that store information in a collection, the underlying detection algorithm first detects the faces in the input image, extracts a vector for each face, and then stores the facial vectors in the collection. Amazon Rekognition uses these facial vectors when performing face comparison. Facial vectors are stored as an array of floats and encrypted at rest.

Amazon Rekognition Video

Videos

To analyze a video, Amazon Rekognition copies your videos into the service for processing. The video may be stored and used to improve the service unless you have opted out by visiting the AI services opt-out policy page and following the process explained there. The videos are encrypted at rest (Amazon S3) using AWS Key Management Service (SSE-KMS).

Amazon Rekognition Custom Labels

Amazon Rekognition Custom Labels encrypts your data at rest.

Images

To train your model, Amazon Rekognition Custom Labels makes a copy of your source training and test images. The copied images are encrypted at rest in Amazon Simple Storage Service (S3) using server-side encryption with an AWS KMS key that you provide or an AWS owned KMS key. Amazon Rekognition Custom Labels only supports symmetric KMS keys. Your source images are unaffected. For more information, see Training an Amazon Rekognition Custom Labels Model.

Models

By default, Amazon Rekognition Custom Labels encrypts trained models and manifest files stored in Amazon S3 buckets using server-side encryption with an AWS owned key. For more information, see Protecting Data Using Server-Side Encryption. Training results are written to the bucket specified in the `OutputConfig` input parameter to CreateProjectVersion. The training results are encrypted using the configured encryption settings for the bucket (`OutputConfig`).

Console bucket

The Amazon Rekognition Custom Labels console creates an Amazon S3 bucket (console bucket) that you can use to manage your projects. The console bucket is encrypted using the default Amazon S3 encryption. For more information, see Amazon Simple Storage Service default encryption for S3 buckets. If you are using your own KMS key, configure the console bucket after it is created. For more information, see Protecting Data Using Server-Side Encryption. Amazon Rekognition Custom Labels blocks public access to the console bucket.

Rekognition Face Liveness

All session related data stored in Rekognition Face Liveness service's account is fully encrypted at rest. By default, reference and audit images are encrypted using an AWS owned key in the service account. However, you can choose to provide your own AWS KMS keys for encrypting these images.

Encryption in transit

Amazon Rekognition API endpoints only support secure connections over HTTPS. All communication is encrypted with Transport Layer Security (TLS).

Key management

You can use AWS Key Management Service (KMS) to manage keys for the input images and videos you store in Amazon S3 buckets. For more information, see AWS Key Management Service concepts.

Customer Managed Key Encryption for Face Liveness

The CreateFaceLivenessSession API takes in an optional `KmsKeyId` parameter. You can provide the `id` of the KMS key you have created in your account. This key will be used to encrypt reference and audit images obtained during StartFaceLivenessSession API, and during GetFaceLivenessSessionResults API the images will be decrypted using this key before returning the results. If CreateFaceLivenessSession request included an OutputConfig, the reference and audit images will be uploaded to the specified Amazon S3 paths. We recommend enabling Server Side Encryption (SSE-S3) in your Amazon S3 buckets so that the data continues to remain encrypted at rest.

When you provide your own AWS KMS key id, Rekognition Face Liveness service gets permission to use the customer managed key on behalf of the principal that invokes the APIs. The principals (users or roles) used to invoke the APIs from customer backend (APIs `CreateFaceLivenessSession` and `GetFaceLivenessSessionResults`) must have access to perform the following:

- kms:DescribeKey
- kms:GenerateDataKey
- kms:Decrypt

Internetwork traffic privacy

An Amazon Virtual Private Cloud (Amazon VPC) endpoint for Amazon Rekognition is a logical entity within a VPC that allows connectivity only to Amazon Rekognition. Amazon VPC routes requests to Amazon Rekognition and routes responses back to the VPC. For more information, see VPC Endpoints in the *Amazon VPC User Guide*. For information about using Amazon VPC endpoints with Amazon Rekognition see Using Amazon Rekognition with Amazon VPC endpoints.

Using Amazon Rekognition with Amazon VPC endpoints

If you use Amazon Virtual Private Cloud (Amazon VPC) to host your AWS resources, you can establish a private connection between your VPC and Amazon Rekognition. You can use this connection to enable Amazon Rekognition to communicate with your resources on your VPC without going through the public internet.

Amazon VPC is an AWS service that you can use to launch AWS resources in a virtual network that you define. With a VPC, you have control over your network settings, such the IP address range,

subnets, route tables, and network gateways. With VPC endpoints, the AWS network handles the routing between the VPC and AWS services.

To connect your VPC to Amazon Rekognition, you define an interface VPC endpoint for Amazon Rekognition. An interface endpoint is an elastic network interface with a private IP address that serves as an entry point for traffic destined to a supported AWS service. The endpoint provides reliable, scalable connectivity to Amazon Rekognition—and it doesn't require an internet gateway, a network address translation (NAT) instance, or a VPN connection. For more information, see What Is Amazon VPC in the *Amazon VPC User Guide*.

Interface VPC endpoints are enabled by AWS PrivateLink. This AWS technology enables private communication between AWS services by using an elastic network interface with private IP addresses.

> **Note**
>
> All Amazon Rekognition Federal Information Processing Standard (FIPS) endpoints are supported by AWS PrivateLink.

Creating Amazon VPC endpoints for Amazon Rekognition

You can create two types of Amazon VPC endpoints to use with Amazon Rekognition.

- A VPC endpoint to use with Amazon Rekognition operations. For most users, this is the most suitable type of VPC endpoint.
- A VPC endpoint for Amazon Rekognition operations with endpoints that comply with the Federal Information Processing Standard (FIPS) Publication 140-2 US government standard.

To start using Amazon Rekognition with your VPC, use the Amazon VPC console to create an interface VPC endpoint for Amazon Rekognition. For instructions, see the procedure "To create an interface endpoint to an AWS service using the console" in Creating an Interface Endpoint. Note the following procedure steps:

- Step 3 –For **Service category**, choose *AWS services*.
- Step 4 – For **Service Name**, choose one of the following options:
  - *com.amazonaws.region.rekognition* – Creates a VPC endpoint for Amazon Rekognition operations.

- *com.amazonaws.region.rekognition-fips* – Creates a VPC endpoint for Amazon Rekognition operations with endpoints that comply with the Federal Information Processing Standard (FIPS) Publication 140-2 US government standard.

For more information, see Getting Started in the *Amazon VPC User Guide*.

Create a VPC endpoint policy for Amazon Rekognition

You can create a policy for Amazon VPC endpoints for Amazon Rekognition to specify the following:

- The principal that can perform actions.
- The actions that can be performed.
- The resources on which actions can be performed.

For more information, see Controlling Access to Services with VPC Endpoints in the *Amazon VPC User Guide*.

The following example policy enables users connecting to Amazon Rekognition through the VPC endpoint to call the `DetectFaces` API operation. The policy prevents users from performing other Amazon Rekognition API operations through the VPC endpoint.

Users can still call other Amazon Rekognition API operations from outside the VPC. For information about how to deny access to Amazon Rekognition API operations that are outside the VPC, see Amazon Rekognition identity-based policies.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": [
                "rekognition:DetectFaces"
            ],
            "Resource": "*",
            "Effect": "Allow",
            "Principal": "*"
        }
    ]
```

```
}
```

To modify the VPC endpoint policy for Amazon Rekognition

1. Open the Amazon VPC console at https://console.aws.amazon.com/vpc/.
2. If you have not already created the endpoint for Amazon Rekognition choose **Create Endpoint**. Then select **com.amazonaws.*Region*.rekognition** and choose **Create endpoint**.
3. In the navigation pane, choose **Endpoints**.
4. Select the **com.amazonaws.*Region*.rekognition** endpoint and choose the **Policy** tab in the lower half of the screen.
5. Choose **Edit Policy** and make the changes to the policy.

Compliance validation for Amazon Rekognition

Third-party auditors assess the security and compliance of Amazon Rekognition as part of multiple AWS compliance programs. These include SOC, PCI, FedRAMP, HIPAA, and others.

For a list of AWS services in scope of specific compliance programs, see AWS Services in Scope by Compliance Program. For general information, see AWS Compliance Programs.

You can download third-party audit reports using AWS Artifact. For more information, see Downloading Reports in AWS Artifact.

Your compliance responsibility when using Amazon Rekognition is determined by the sensitivity of your data, your company's compliance objectives, and applicable laws and regulations. AWS provides the following resources to help with compliance:

- Security and Compliance Quick Start Guides – These deployment guides discuss architectural considerations and provide steps for deploying security- and compliance-focused baseline environments on AWS.
- Architecting for HIPAA Security and Compliance Whitepaper – This whitepaper describes how companies can use AWS to create HIPAA-compliant applications.
- AWS Compliance Resources – This collection of workbooks and guides might apply to your industry and location.
- AWS Config – This AWS service assesses how well your resource configurations comply with internal practices, industry guidelines, and regulations.

- AWS Security Hub – This AWS service provides a comprehensive view of your security state within AWS that helps you check your compliance with security industry standards and best practices.

Resilience in Amazon Rekognition

The AWS global infrastructure is built around AWS Regions and Availability Zones. AWS Regions provide multiple physically separated and isolated Availability Zones, which are connected with low-latency, high-throughput, and highly redundant networking. With Availability Zones, you can design and operate applications and databases that automatically fail over between zones without interruption. Availability Zones are more highly available, fault tolerant, and scalable than traditional single or multiple data center infrastructures.

For more information about AWS Regions and Availability Zones, see AWS Global Infrastructure.

In addition to the AWS global infrastructure, Amazon Rekognition offers several features to help support your data resiliency and backup needs.

Configuration and vulnerability analysis in Amazon Rekognition

Configuration and IT controls are a shared responsibility between AWS and you, our customer. For more information, see the AWS shared responsibility model.

Cross-service confused deputy prevention

In AWS, cross-service impersonation can occur when one service (the *calling service*) calls another service (the *called service*). The calling service can be manipulated to act on another customer's resources even though it shouldn't have the proper permissions, resulting in the confused deputy problem.

To prevent this, AWS provides tools that help you protect your data for all services with service principals that have been given access to resources in your account.

We recommend using the `aws:SourceArn` and `aws:SourceAccount` global condition context keys in resource policies to limit the permissions that Amazon Rekognition gives another service to the resource.

If the value of `aws:SourceArn` does not contain the account ID, such as an Amazon S3 bucket ARN, you must use both keys to limit permissions. If you use both keys and the `aws:SourceArn` value contains the account ID, the `aws:SourceAccount` value and the account in the `aws:SourceArn` value must use the same account ID when used in the same policy statement.

Use `aws:SourceArn` if you want only one resource to be associated with the cross-service access. Use `aws:SourceAccount` if you want to allow any resource in that account to be associated with the cross-service use.

The value of `aws:SourceArn` must be the ARN of the resource used by Rekognition, which is specified with the following format: `arn:aws:rekognition:region:account:resource`.

The value of `arn:User` ARN should be the ARN of the user that will call the video analysis operation (the user that assumes a role).

The recommended approach to the confused deputy problem is to use the `aws:SourceArn` global condition context key with the full resource ARN.

If you don't know the full ARN of the resource or if you are specifying multiple resources, use the `aws:SourceArn` key with wildcard characters (*) for the unknown portions of the ARN. For example, `arn:aws:rekognition:*:111122223333:*`.

In order to protect against the confused deputy problem, carry out the following steps:

1. In the navigation pane of the IAM console choose the **Roles** option. The console will display the roles for your current account.
2. Choose the name of the role that you want to modify. The role you modify should have the **AmazonRekognitionServiceRole** permissions policy. Select the **Trust relationships** tab.
3. Choose **Edit trust policy**.
4. On the **Edit trust policy** page, replace the default JSON policy with a policy that utilizes one or both of the `aws:SourceArn` and `aws:SourceAccount` global condition context keys. See the following example policies.
5. Choose **Update policy**.

The following examples are trust policies that show how you can use the `aws:SourceArn` and `aws:SourceAccount` global condition context keys in Amazon Rekognition to prevent the confused deputy problem.

If you are working stored and streaming videos, you could use a policy like the following in your IAM role:

```
{
   "Version":"2012-10-17",
   "Statement":[
      {
         "Effect":"Allow",
         "Principal":{
            "Service":"rekognition.amazonaws.com",
            "AWS":"arn:User ARN"
         },
         "Action":"sts:AssumeRole",
         "Condition":{
            "StringEquals":{
               "aws:SourceAccount":"Account ID"
            },
            "StringLike":{

 "aws:SourceArn":"arn:aws:rekognition:region:111122223333:streamprocessor/*"
            }
         }
      }
   ]
}
```

If you are working exclusively with stored video, you could use a policy like the following in your IAM role (note that you don't have to include the `StringLike` argument that specifies the `streamprocessor`):

```
{
   "Version":"2012-10-17",
   "Statement":[
      {
         "Effect":"Allow",
         "Principal":{
            "Service":"rekognition.amazonaws.com",
            "AWS":"arn:User ARN"
         },
         "Action":"sts:AssumeRole",
         "Condition":{
            "StringEquals":{
```

```
                "aws:SourceAccount":"Account ID"
            }
         }
      }
   ]
}
```

Infrastructure security in Amazon Rekognition

As a managed service, Amazon Rekognition is protected by AWS global network security. For information about AWS security services and how AWS protects infrastructure, see AWS Cloud Security. To design your AWS environment using the best practices for infrastructure security, see Infrastructure Protection in *Security Pillar AWS Well-Architected Framework*.

You use AWS published API calls to access Amazon Rekognition through the network. Clients must support the following:

- Transport Layer Security (TLS). We require TLS 1.2 and recommend TLS 1.3.
- Cipher suites with perfect forward secrecy (PFS) such as DHE (Ephemeral Diffie-Hellman) or ECDHE (Elliptic Curve Ephemeral Diffie-Hellman). Most modern systems such as Java 7 and later support these modes.

Additionally, requests must be signed by using an access key ID and a secret access key that is associated with an IAM principal. Or you can use the AWS Security Token Service (AWS STS) to generate temporary security credentials to sign requests.

Monitoring Amazon Rekognition

Monitoring is an important part of maintaining the reliability, availability, and performance of Amazon Rekognition and your other AWS solutions. AWS provides the following monitoring tools to watch Rekognition, report when something is wrong, and take automatic actions when appropriate:

- *Amazon CloudWatch* monitors your AWS resources and and the applications you run on AWS in real time. You can collect and track metrics, create customized dashboards, and set alarms that notify you or take actions when a specified metric reaches a threshold that you specify. For example, you can have CloudWatch track CPU usage or other metrics of your Amazon EC2 instances and automatically launch new instances when needed. For more information, see the Amazon CloudWatch User Guide.
- *Amazon CloudWatch Logs* enables you to monitor, store, and access your log files from Amazon EC2 instances, CloudTrail, and other sources. CloudWatch Logs can monitor information in the log files and notify you when certain thresholds are met. You can also archive your log data in highly durable storage. For more information, see the Amazon CloudWatch Logs User Guide.
- *Amazon EventBridge* can be used to automate your AWS services and respond automatically to system events, such as application availability issues or resource changes. Events from AWS services are delivered to EventBridge in near real time. You can write simple rules to indicate which events are of interest to you and which automated actions to take when an event matches a rule. For more information, see Amazon EventBridge User Guide.
- *AWS CloudTrail* captures API calls and related events made by or on behalf of your AWS account and delivers the log files to an Amazon S3 bucket that you specify. You can identify which users and accounts called AWS, the source IP address from which the calls were made, and when the calls occurred. For more information, see the AWS CloudTrail User Guide.

Monitoring Rekognition with Amazon CloudWatch

With CloudWatch, you can get metrics for individual Rekognition operations or global Rekognition metrics for your account, You can use metrics to track the health of your Rekognition-based solution and set up alarms to notify you when one or more metrics fall outside a defined threshold. For example, you can see metrics for the number of server errors that have occurred, or metrics for the number of faces that have been detected. You can also see metrics for the number of times a

specific Rekognition operation has succeeded. To see metrics, you can use Amazon CloudWatch, Amazon AWS Command Line Interface, or the CloudWatch API.

You can also see aggregated metrics, for a chosen period of time, by using the Rekognition console. For more information, see Exercise 4: See aggregated metrics (console).

Using CloudWatch metrics for Rekognition

To use metrics, you must specify the following information:

- The metric dimension, or no dimension. A *dimension* is a name-value pair that helps you to uniquely identify a metric. Rekognition has one dimension, named *Operation*. It provides metrics for a specific operation. If you do not specify a dimension, the metric is scoped to all Rekognition operations within your account.
- The metric name, such as `UserErrorCount`.

You can get monitoring data for Rekognition using the AWS Management Console, the AWS CLI, or the CloudWatch API. You can also use the CloudWatch API through one of the Amazon AWS Software Development Kits (SDKs) or the CloudWatch API tools. The console displays a series of graphs based on the raw data from the CloudWatch API. Depending on your needs, you might prefer to use either the graphs displayed in the console or retrieved from the API.

The following list shows some common uses for the metrics. These are suggestions to get you started, not a comprehensive list.

How Do I?	Relevant Metrics
How do I track the numbers of faces recognized?	Monitor the `Sum` statistic of the `DetectedFaceCount` metric.
How do I know if my application has reached the maximum number of requests per second?	Monitor the `Sum` statistic of the `ThrottledCount` metric.
How can I monitor the request errors?	Use the `Sum` statistic of the `UserErrorCount` metric.
How can I find the total number of requests?	Use the `ResponseTime` and `Data Samples` statistic of the `ResponseTime` metric. This

How Do I?	Relevant Metrics
	includes any request that results in an error. If you want to see only successful operation calls, use the `SuccessfulRequestCount` metric.
How can I monitor the latency of `Rekognition` operation calls?	Use the `ResponseTime` metric.
How can I monitor how many times `IndexFaces` successfully added faces to Rekognition collections?	Monitor the `Sum` statistic with the `SuccessfulRequestCount` metric and `IndexFaces` operation. Use the `Operation` dimension to select the operation and metric.

You must have the appropriate CloudWatch permissions to monitor Rekognition with CloudWatch. For more information, see Authentication and Access Control for Amazon CloudWatch.

Access Rekognition metrics

The following examples show how to access Rekognition metrics using the CloudWatch console, the AWS CLI, and the CloudWatch API.

To view metrics (console)

1. Open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. Choose **Metrics**, choose the **All Metrics** tab, and then choose **Rekognition**.
3. Choose **Metrics with no dimensions**, and then choose a metric.

   For example, choose the **DetectedFace** metric to measure how many faces have been detected.
4. Choose a value for the date range. The metric count displayed in the graph.

To view metrics successful `DetectFaces` operation calls have been made over a period of time (CLI).

- Open the AWS CLI and enter the following command:

```
aws cloudwatch get-metric-statistics --metric-name
SuccessfulRequestCount --start-time 2017-1-1T19:46:20 --end-time
2017-1-6T19:46:57 --period 3600 --namespace AWS/Rekognition --
statistics Sum --dimensions Name=Operation,Value=DetectFaces --region
us-west-2
```

This example shows the successful `DetectFaces` operation calls made over a period of time. For more information, see get-metric-statistics.

To access metrics (CloudWatch API)

- Call `GetMetricStatistics`. For more information, see the Amazon CloudWatch API Reference.

Create an alarm

You can create a CloudWatch alarm that sends an Amazon Simple Notification Service (Amazon SNS) message when the alarm changes state. An alarm watches a single metric over a time period you specify, and performs one or more actions based on the value of the metric relative to a given threshold over a number of time periods. The action is a notification sent to an Amazon SNS topic or an Auto Scaling policy.

Alarms invoke actions for sustained state changes only. CloudWatch alarms do not invoke actions simply because they are in a particular state. The state must have changed and been maintained for a specified number of time periods.

To set an alarm (console)

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. Choose **Create Alarm**. This launches the **Create Alarm Wizard**.
3. In the **Metrics with no dimensions** metric list, choose **Rekognition Metrics**, and then choose a metric.

   For example, choose **DetectedFaceCount** to set an alarm for a maximum number of detected faces.

4. In the **Time Range** area, select a date range value that includes face detection operations that you have called. Choose **Next**
5. Fill in the **Name** and **Description**. For **Whenever**, choose **>=**, and enter a maximum value of your choice.
6. If you want CloudWatch to send you email when the alarm state is reached, for **Whenever this alarm:**, choose **State is ALARM**. To send alarms to an existing Amazon SNS topic, for **Send notification to:**, choose an existing SNS topic. To set the name and email addresses for a new email subscription list, choose **Create topic** CloudWatch saves the list and displays it in the field so you can use it to set future alarms.

   > **Note**
   >
   > If you use **Create topic** to create a new Amazon SNS topic, the email addresses must be verified before the intended recipients receive notifications. Amazon SNS sends email only when the alarm enters an alarm state. If this alarm state change happens before the email addresses are verified, intended recipients do not receive a notification.

7. Preview the alarm in the **Alarm Preview** section. Choose **Create Alarm**.

To set an alarm (AWS CLI)

- Open the AWS CLI and enter the following command. Change value of the `alarm-actions` parameter to reference an Amazon SNS topic that you previously created.

  ```
  aws cloudwatch put-metric-alarm --alarm-name UserErrors --
  alarm-description "Alarm when more than 10 user errors occur"
  --metric-name UserErrorCount --namespace AWS/Rekognition --
  statistic Average --period 300 --threshold 10 --comparison-
  operator GreaterThanThreshold --evaluation-periods 2 --alarm-actions
  arn:aws:sns:us-west-2:111111111111:UserError --unit Count
  ```

  This example shows how to create an alarm for when more than 10 user errors occur within 5 minutes. For more information, see put-metric-alarm.

To set an alarm (CloudWatch API)

- Call `PutMetricAlarm`. For more information, see *Amazon CloudWatch API Reference*.

CloudWatch metrics for Rekognition

This section contains information about the Amazon CloudWatch metrics and the *Operation* dimension available for Amazon Rekognition.

You can also see an aggregate view of Rekognition metrics from the Rekognition console. For more information, see Exercise 4: See aggregated metrics (console).

CloudWatch metrics for Rekognition

The following table summarizes the Rekognition metrics.

Metric	Description
SuccessfulRequestCount	The number of successful requests. The response code range for a successful request is 200 to 299. Unit: Count Valid statistics: `Sum,Average`
ThrottledCount	The number of throttled requests. Rekognition throttles a request when it receives more requests than the limit of transactions per second set for your account. If the limit set for your account is frequently exceeded, you can request a limit increase. To request an increase, see AWS Service Limits. Unit: Count Valid statistics: `Sum,Average`
ResponseTime	The time in milliseconds for Rekognition to compute the response. Units: 1. Count for `Data Samples` statistics 2. Milliseconds for `Average` statistics Valid statistics: `Data Samples,Average`

Metric	Description
	Note The `ResponseTime` metric is not included in the Rekognition metric pane.
DetectedFaceCount	The number of faces detected with the `IndexFaces` or `DetectFaces` operation. Unit: Count Valid statistics: `Sum,Average`
DetectedLabelCount	The number of labels detected with the `DetectLabels` operation. Unit: Count Valid statistics: `Sum,Average`
ServerErrorCount	The number of server errors. The response code range for a server error is 500 to 599. Unit: Count Valid statistics: `Sum, Average`
UserErrorCount	The number of user errors (invalid parameters, invalid image, no permission, etc). The response code range for a user error is 400 to 499. Unit: Count Valid statistics: `Sum,Average`
MinInferenceUnits	The minimum number of inference units specified during the `StartProjectVersion` request. Unit: Count Valid statistics: `Average`

Metric	Description
MaxInferenceUnits	The maximum number of inference units specified during the `StartProjectVersion` request. Unit: Count Valid statistics: `Average`
DesiredInferenceUnits	The number of inference units to which Rekognition is scaling up or down. Unit: Count Valid statistics: `Average`
InServiceInferenceUnits	The number of inference units that the model is using. Unit: Count Valid statistics: `Average` It is recommended that you use the Average statistic to obtain the 1 minute average of how many instances are used.

CloudWatch metrics for Rekognition Streaming

Rekognition also has a second namespace used for streaming operations, "Rekognition Streaming". The following table summarizes the Rekognition Streaming metrics.

Metric	Description
SuccessfulRequestCount	The number of successful requests. The response code range for a successful request is 200 to 299. Unit: Count Valid statistics: `Sum`, `Average`
CallCount	The number of specified operations performed in your account.

Metric	Description
	Valid statistics: `Sum,Average`
ThrottledCount	The number of throttled requests. Rekognition throttles a request when it receives more requests than the limit of transactions per second set for your account. If the limit set for your account is frequently exceeded, you can request a limit increase. To request an increase, see AWS Service Limits. Unit: Count Valid statistics: `Sum,Average`
ServerErrorCount	The number of server errors. The response code range for a server error is 500 to 599. Unit: Count Valid statistics: `Sum, Average`
UserErrorCount	The number of user errors (invalid parameters, invalid image, no permission, etc). The response code range for a user error is 400 to 499. Unit: Count Valid statistics: `Sum,Average`
ConcurrentSessions	The number of concurrent sessions your account is currently using. Unit: Count Valid statistics: `Max,Average`

CloudWatch dimension for Rekognition

To retrieve operation-specific metrics, use the `Rekognition` namespace and provide an operation dimension.

For more information about dimensions, see Dimensions in the *Amazon CloudWatch User Guide*.

CloudWatch dimension for Rekognition Custom Labels

The following table displays the CloudWatch dimensions available for use with Rekognition Custom Labels:

Dimension	Description
ProjectName	The name of the Rekognition Custom Labels project you created with `CreateProject` .
VersionName	The name of the Rekognition Custom Labels project version you created with `CreateProjectVersion` .

For more information about dimensions, see Dimensions in the *Amazon CloudWatch User Guide*.

Logging Amazon Rekognition API calls with AWS CloudTrail

Amazon Rekognition is integrated with AWS CloudTrail, a service that provides a record of actions taken by a user, role, or an AWS service in Amazon Rekognition. CloudTrail captures all API calls for Amazon Rekognition as events. The calls captured include calls from the Amazon Rekognition console and code calls to the Amazon Rekognition API operations. If you create a trail, you can enable continuous delivery of CloudTrail events to an Amazon S3 bucket, including events for Amazon Rekognition. If you don't configure a trail, you can still view the most recent events in the CloudTrail console in **Event history**. Using the information collected by CloudTrail, you can determine the request that was made to Amazon Rekognition, the IP address from which the request was made, who made the request, when it was made, and additional details.

To learn more about CloudTrail, see the AWS CloudTrail User Guide.

Amazon Rekognition information in CloudTrail

CloudTrail is enabled on your AWS account when you create the account. When activity occurs in Amazon Rekognition, that activity is recorded in a CloudTrail event along with other AWS service events in **Event history**. You can view, search, and download recent events in your AWS account. For more information, see Viewing Events with CloudTrail Event History.

For an ongoing record of events in your AWS account, including events for Amazon Rekognition, create a trail. A *trail* enables CloudTrail to deliver log files to an Amazon S3 bucket. By default, when you create a trail in the console, the trail applies to all AWS Regions. The trail logs events from all Regions in the AWS partition and delivers the log files to the Amazon S3 bucket that you specify. Additionally, you can configure other AWS services to further analyze and act upon the event data collected in CloudTrail logs. For more information, see the following:

- Overview for Creating a Trail
- CloudTrail Supported Services and Integrations
- Configuring Amazon SNS Notifications for CloudTrail
- Receiving CloudTrail Log Files from Multiple Regions and Receiving CloudTrail Log Files from Multiple Accounts

All Amazon Rekognition actions are logged by CloudTrail and are documented in the Amazon Rekognition API reference. For example, calls to the `CreateCollection`, `CreateStreamProcessor` and `DetectCustomLabels` actions generate entries in the CloudTrail log files.

Every event or log entry contains information about who generated the request. The identity information helps you determine the following:

- Whether the request was made with root or AWS Identity and Access Management (IAM) user credentials.
- Whether the request was made with temporary security credentials for a role or federated user.
- Whether the request was made by another AWS service.

For more information, see the CloudTrail userIdentity Element.

Understanding Amazon Rekognition log file entries

A trail is a configuration that enables delivery of events as log files to an Amazon S3 bucket that you specify. CloudTrail log files contain one or more log entries. An event represents a single request from any source and includes information about the requested action, the date and time of the action, request parameters, and so on. CloudTrail log files aren't an ordered stack trace of the public API calls, so they don't appear in any specific order.

The following example shows a CloudTrail log entry with actions for the following API: `StartLabelDetection` and `DetectLabels`.


```
{
    "Records": [

        {
            "eventVersion": "1.05",
            "userIdentity": {
                "type": "AssumedRole",
                "principalId": "AIDAJ45Q7YFFAREXAMPLE",
                "arn": "arn:aws:sts::111122223333:assumed-role/Admin/JorgeSouza",
                "accountId": "111122223333",
                "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
                "sessionContext": {
                    "sessionIssuer": {
                        "type": "Role",
                        "principalId": "AIDAJ45Q7YFFAREXAMPLE",
                        "arn": "arn:aws:iam::111122223333:role/Admin",
                        "accountId": "111122223333",
                        "userName": "Admin"
                    },
                    "webIdFederationData": {},
                    "attributes": {
                        "mfaAuthenticated": "false",
                        "creationDate": "2020-06-30T20:10:09Z"
                    }
                }
            },
            "eventTime": "2020-06-30T20:42:14Z",
            "eventSource": "rekognition.amazonaws.com",
            "eventName": "StartLabelDetection",
            "awsRegion": "us-east-1",
            "sourceIPAddress": "192.0.2.0",
            "userAgent": "aws-cli/3",
            "requestParameters": {
                "video": {
                    "s3Object": {
                        "bucket": "my-bucket",
                        "name": "my-video.mp4"
                    }
                }
            },
```

```
            "responseElements": {
                "jobId":
 "653de5a7ee03bd5083edde98ea8fce5794fcea66d077bdd4cfb39d71aff8fc25"
            },
            "requestID": "dfcef8fc-479c-4c25-bef0-d83a7f9a7240",
            "eventID": "b602e460-c134-4ecb-ae78-6d383720f29d",
            "readOnly": false,
            "eventType": "AwsApiCall",
            "recipientAccountId": "111122223333"
        },
        {
            "eventVersion": "1.05",
            "userIdentity": {
                "type": "AssumedRole",
                "principalId": "AIDAJ45Q7YFFAREXAMPLE",
                "arn": "arn:aws:sts::111122223333:assumed-role/Admin/JorgeSouza",
                "accountId": "111122223333",
                "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
                "sessionContext": {
                    "sessionIssuer": {
                        "type": "Role",
                        "principalId": "AIDAJ45Q7YFFAREXAMPLE",
                        "arn": "arn:aws:iam::111122223333:role/Admin",
                        "accountId": "111122223333",
                        "userName": "Admin"
                    },
                    "webIdFederationData": {},
                    "attributes": {
                        "mfaAuthenticated": "false",
                        "creationDate": "2020-06-30T21:19:18Z"
                    }
                }
            },
            "eventTime": "2020-06-30T21:21:47Z",
            "eventSource": "rekognition.amazonaws.com",
            "eventName": "DetectLabels",
            "awsRegion": "us-east-1",
            "sourceIPAddress": "192.0.2.0",
            "userAgent": "aws-cli/3",
            "requestParameters": {
                "image": {
                    "s3Object": {
                        "bucket": "my-bucket",
                        "name": "my-image.jpg"
```

```
                    }
                }
            },
            "responseElements": null,
            "requestID": "5a683fb2-aec0-4af4-a7df-219018be2155",
            "eventID": "b356b0fd-ea01-436f-a9df-e1186b275bfa",
            "readOnly": true,
            "eventType": "AwsApiCall",
            "recipientAccountId": "111122223333"
        }
    ]
}
```

Guidelines and quotas in Amazon Rekognition

The following sections provide guidelines and quotas when using Amazon Rekognition. There are two kinds of quotas. *Set quotas* such as maximum image size cannot be changed. *Default quotas* listed on the AWS Service Quotas page can be changed by following the procedure described in the Default quotas section.

Topics

- Supported regions
- Set quotas
- Default quotas

Supported regions

For a list of AWS Regions where Amazon Rekognition is available, see AWS Regions and Endpoints in the *Amazon Web Services General Reference*.

Set quotas

The following is a list of limits in Amazon Rekognition that cannot be changed. For information about limits you can change, such as Transactions Per Second (TPS) limits, see Default quotas.

For Amazon Rekognition Custom Labels limits, see Guidelines and Quotas in Amazon Rekognition Custom Labels.

Amazon Rekognition Image

- Maximum image size stored as an Amazon S3 object is limited to 15 MB.
- The maximum image dimensions for `DetectModerationLabels` is 10K pixels for both width and height.
- The maximum image dimensions for `DetectLabels` is 10K pixels for both width and height.
- To be detected, a face must be no smaller than 40x40 pixels in an image with 1920X1080 pixels. Images with dimensions higher than 1920X1080 pixels will need a larger minimum face size proportionally.

- The minimum image dimensions is 80 pixels for both height and width. The minimum image dimension for `DetectProtectiveEquipment` is 64 pixels for both height and width.
- The maximum image dimensions for `DetectProtectiveEquipment` is 4096 pixels for both width and height.
- To be detected by `DetectProtectiveEquipment`, a person must be no smaller than 100x100 pixels in an image with 800x1300. Images with dimensions higher than 800x1300 pixels will need a larger minimum person size proportionally.
- The maximum images size as raw bytes passed in as parameter to an API is 5 MB. The limit is 4 MB for the `DetectProtectiveEquipment` API.
- Amazon Rekognition supports the PNG and JPEG image formats. That is, the images you provide as input to various API operations, such as `DetectLabels` and `IndexFaces` must be in one of the supported formats.
- The maximum number of face vectors you can store in a single face collection is 20 million.
- The default maximum number of user vectors you can store in a single face collection is 10 million.
- The maximum matching face vectors the search API returns is 4096.
- The maximum matching user vectors the search API returns is 4096.
- `DetectText` can detect up to 100 words in an image.
- `DetectProtectiveEquipment` can detect Personal Protective Equipment on up to 15 people.

For best practice information about images and facial comparison, see Best practices for sensors, input images, and videos.

Amazon Rekognition Image Bulk Analysis

- Amazon Rekognition Image Bulk Analysis can analyze image batches up to 10k images in size.
- Amazon Rekognition Image Bulk Analysis supports input manifests up to 50MB in size.

Amazon Rekognition Video stored video

- Amazon Rekognition Video can analyze stored videos up to 10GB in size.
- Amazon Rekognition Video can analyze stored videos up to 6 hours in length.
- Amazon Rekognition Video supports a maximum of 20 concurrent jobs per account.

- Stored videos must be encoded using the H.264 codec. The supported file formats are MPEG-4 and MOV.
- Any Amazon Rekognition Video API that analyzes audio data only supports AAC audio codecs.
- The Time To Live (TTL) period for pagination tokens is 24 hours. Pagination tokens are in the `NextToken` field retured by Get operations such as `GetLabeldetection`.

Amazon Rekognition Video streaming video

- A Kinesis Video input stream can be associated with at most 1 Amazon Rekognition Video stream processor.
- A Kinesis Data output stream can be associated with at most 1 Amazon Rekognition Video stream processor.
- The Kinesis Video input stream and Kinesis Data output stream associated with an Amazon Rekognition Video stream processor cannot be shared by multiple processors.
- Any Amazon Rekognition Video API that analyzes audio data only supports ACC audio codecs.

Default quotas

A list of default quotas can be found at AWS Service Quotas. These limits are defaults and can be changed. To request a limit increase, you create a case. To see your current quota limits (applied quota values), see Amazon Rekognition Service Quotas. To view your TPS utilization history for Amazon Rekognition Image APIs, see the Amazon Rekognition Service Quotas page and choose a specific API operation to see the history for that operation.

Topics

- Calculate TPS quota change
- Best practices for TPS quotas
- Create a case to change TPS quotas

Calculate TPS quota change

What is the new limit you are requesting? Transactions Per Second (TPS) are most relevant at the peak of an expected workload. It is important to understand the max concurrent API calls at the

peak of a workload and time for responses (5 - 15 seconds). Please note, 5 seconds should be the minimum. Below are two examples:

- Example 1: The max concurrent Face Authentication (CompareFaces API) users I expect at the beginning of my busiest hour is 1000. These responses will be spread over a period of 10 seconds. Therefore, the TPS required is 100 (1000/10) for the CompareFaces API in my relevant region.
- Example 2: The max concurrent Object Detection (DetectLabels API) calls that are expected at the beginning of my busiest hour is 250. These responses will be spread over a period of 5 seconds. Therefore, the TPS required is 50 (250/5) for the DetectLabels API in my relevant region.

Best practices for TPS quotas

Recommended best practices for Transactions Per Second (TPS) include smoothening spiky traffic, configuring retries, and configuring exponential backoff and jitter.

1. Smooth spiky traffic. Spiky traffic affects throughput. To get maximum throughput for the allotted transactions per second (TPS), use a queueing serverless architecture or another mechanism to “smooth” traffic so it is more consistent. For code samples and references for serverless large-scale image and video processing with Rekognition, see Large scale image and video processing with Amazon Rekognition.
2. Configure retries. Follow the guidelines at the section called “Error handling” to configure retries for the errors that allow them.
3. Configure exponential backoff and jitter. Configuring exponential backoff and jitter as you configure retries allows you to improve the achievable throughput. See Error retries and exponential backoff in AWS.

Create a case to change TPS quotas

To create a case, go to Create Case and answer the following questions:

- Have you implemented the the section called “Best practices for TPS quotas” for smoothening your traffic spikes and configuring retries, exponential backoff, and jitter?
- Have you calculated the TPS quota change you need? If not, see the section called “Calculate TPS quota change”.

- Have you checked your TPS usage history to more accurately predict your future needs? To view your TPS usage history, see the Amazon Rekognition Service Quotas page.
- What is your use case?
- What APIs do you plan to use?
- What regions do you plan to use these APIs in?
- Are you able to spread the load across multiple regions?
- How many images do you process daily?
- How long do you expect to sustain this volume (Is it a one-time spike or ongoing)?
- How are you blocked by the default limit? Review the following exception table to confirm the scenario that you are encountering.

Error Code	Exception	Message	What does it mean?	Can it be retried?
HTTP status code 400	ProvisionedThroughputExceededException	*Provisioned Rate exceeded.*	Indicates throttling. You can retry or evaluate a limit increase request.	Yes
HTTP status code 400	ThrottlingException	*Slow down; sudden increase in rate of requests.*	You might be sending spiky traffic and encountering throttling. You should shape the traffic and make it more smooth and consistent. Then configure additional retries. See best practices.	Yes

Error Code	Exception	Message	What does it mean?	Can it be retried?
HTTP status code 5xx	ThrottlingException (HTTP 500)	*Service Unavailable*	Indicates that the backend is scaling up to support the action. You should retry the request.	Yes

For a detailed understanding of the error codes, see the section called “Error handling”.

> **Note**
>
> These limits depend on the region you are in. Making a case to change a limit affects the API operation you request, in the region you request it. Other API operations and regions are not affected.

Document history for Amazon Rekognition

The following table describes important changes in each release of the *Amazon Rekognition Developer Guide*. For notification about updates to this documentation, you can subscribe to an RSS feed.

- **Latest documentation update:** June 15th, 2023

Change	Description	Date
Amazon Rekognition now supports new moderation labels and improved accuracy for content moderation of images	Amazon Rekognition's Content Moderation feature has been enhanced for improved accuracy, detection of new labels, and the ability to identify animated and/or illustrated content.	February 1, 2024
Amazon Rekognition now supports bulk image analysis	Amazon Rekognition now supports processing a large collection of images asynchronously by using a manifest file with the StartMediaAnalysisJob operation.	October 23, 2023
Amazon Rekognition now supports custom content moderation with adapters	Amazon Rekognition now supports enhanced accuracy of the DetectModerationLabels API by using adapters that extend capabilities of existing Rekognition deep learning models.	October 12, 2023
Rekognition now supports user vectors with collections	Rekognition face collections now support the creation of user vectors. User vectors	June 12, 2023

	aggregate multiple face vectors of the same user, improving accuracy with more robust depictions of a user.	
Actions for involving managing users have been added to the following managed policies: AmazonRekognitionReadOnlyAccess	Amazon Rekognition added the following actions to the `AmazonRekognitionReadOnlyAccess` managed policies: `ListUsers` , `SearchUsers` , `SearchUsersByImage`	June 12, 2023
Amazon Rekognition Image can now infer gaze direction	Improvements have been made to Amazon Rekognition Image's face detection operations, which can now infer gaze direction in a detected face.	May 31, 2023
Rekognition content moderation API improved	Rekognition improved the content moderation model for image and video moderation. The improvement significantly expands the detection of explicit, violence, and suggestive content. Customers can now detect explicit and violent content with higher accuracy to improve the end-user experience, protect their brand identity, and ensure that all content complies with their industry regulation and policies.	May 9, 2023

Amazon Rekognition Image can now detect occluded faces	Amazon Rekognition Image can now detected the occlusion of faces. A new FaceOccluded attribute is returned by Amazon Rekognition Image's DetectFaces and IndexFaces APIs, which indicates if the face in an image is partially captured or not fully visible due to overlapping objects, clothing, and body parts.	May 5, 2023
Rekognition can now detect face liveness	Amazon Rekognition Video can now be used to detect liveness in a video, verifying that a user in front of a camera is physically present. The Face Liveness detector also detects spoof attacks presented to a camera or trying to bypass a camera.	April 11, 2023
Update to Amazon Rekognition Video.	Amazon Rekognition Video can now detect more labels and return more information about attributes of images and labels. The GetLabelDetection API now returns information about aliases and categories. Returned label information can be filtered with inclusive and exclusive filter options. Results can be aggregated by Timestamps or video Segments.	December 7, 2022

Update to Amazon Rekognition Image.	Amazon Rekognition Image can now detect more labels and it now returns more information about attributes of images and labels. The DetectLabels API now returns information about aliases, categories, and image properties like dominant colors. Returned label information can be filtered with inclusive and exclusive filter options.	November 11, 2022
Actions for ProjectPolicy and Custom Labels Model Copy have been added to the following managed policies: AmazonRekognitionReadOnlyAccess	Amazon Rekognition added the following actions to the `AmazonRekognitionReadOnlyAccess` managed policy: `ListProjectPolicies`	July 21, 2022
Actions for ProjectPolicy and Custom Labels Model Copy have been added to the following managed policies: AmazonRekognitionFullAccess, AmazonRekognitionCustomLabelsFullAccess	Rekognition added the following actions to the `AmazonRekognitionCustomLabelsFullAccess` and `AmazonRekognitionFullAccess` managed policies: `CopyProjectVersion`, `PutProjectPolicy`, `ListProjectPolicies`, `DeleteProjectPolicy`	July 21, 2022

Amazon Rekognition Video can now detect labels in streaming video	Amazon Rekognition Video can detect labels such as pets and packages in streaming video. This is done using `ConnectedHome` settings on stream processors created with the `CreateStreamProcessor` operation.	April 28, 2022
API reference moved out of the Amazon Rekognition developer guide	The Amazon Rekognition API reference is now available at Amazon Rekognition API Reference.	February 24, 2022
Dataset management update for the following managed policies: AWS managed policy: AmazonRekognitionReadOnlyAccess,AWS managed policy: AmazonRekognitionFullAccess,AWS managed policy: AmazonRekognitionCustomLabelsFullAccess	Amazon Rekognition added the following actions to the `AmazonRekognitionReadOnlyAccess` , `AmazonRekognitionFullOnlyAccess` ,and `AmazonRekognitionCustomLabelsFullAccess` managed policies: `CreateDataset` , `ListDatasetEntries` ,`ListDatasetLabels` , `DescribeDataset` , `UpdateDatasetEntries` ,`DistributeDatasetEntries` ,DeleteDataset	November 1, 2021
A new node in the table of contents shows Amazon Rekognition examples hosted on GitHub	Updated code examples from the AWS Code Examples Repository now show up in a separate node in the Amazon Rekognition developer guide for easier access.	October 22, 2021

Amazon Rekognition can detect black frames and primary program content in video segments	Amazon Rekognition can identify black frames, color bars, opening credits, end credits, studio logos, and primary program content as technical cues in a video using the `StartSegmentDetection` and `GetSegmentDetection` operations.	June 7, 2021
Dataset management update for the following managed policies:	You can use the Amazon Rekognition `DetectText` operation to detect up to 100 words in an image.	May 21, 2021
Tagging update for AmazonRekognitionReadOnlyAccess and AmazonRekognitionFullAccess	Rekognition added new tagging actions to the `AmazonRekognitionFullAccess` and `AmazonRekognitionReadOnlyAccess` policies.	April 2, 2021
Amazon Rekognition now supports tagging	You can now use tags to identify, organize, search for, and filter Amazon Rekognition collections, stream processors, and Custom Labels models.	March 25, 2021
Amazon Rekognition can now detect personal protect equipment	Amazon Rekognition can now detect hand covers, face covers, and head covers on persons in an image.	October 15, 2020

Amazon Rekognition has new content moderation categories	Amazon Rekognition content moderation categories now include 6 new categories: Drugs, Tobacco, Alcohol, Gambling, Rude Gestures, and Hate Symbols.	October 12, 2020
New tutorial for displaying Amazon Rekognition Video results from Kinesis Video Streams locally	You can display the output of Amazon Rekognition Video from a streaming video in Kinesis Video Streams in a local video feed.	July 20, 2020
New Amazon Rekognition tutorial for using Gstreamer	Using Gstreamer, you can ingest a livestream video from a device camera source to Amazon Rekognition Video through Kinesis Video Streams.	July 17, 2020
Amazon Rekognition now supports segmentation of stored videos	With the asynchronous Amazon Rekognition Video segmentation API you can detect black frames, color bars, end credits, and shots in stored videos.	June 22, 2020
Amazon Rekognition now supports Amazon VPC endpoint policies	By specifying a policy you can restrict access to an Amazon Rekognition Amazon VPC endpoint.	March 3, 2020
Amazon Rekognition now supports the detection of text in stored videos	You can use the Amazon Rekognition Video API to asynchronously detect text in a stored video.	February 17, 2020

Amazon Rekognition now supports Augmented AI (Preview) and Amazon Rekognition Custom Labels	With Amazon Rekognition Custom Labels you can detect specialized objects, scenes, and concepts in images by creating your own machine learning model. DetectModerationLabels now supports Amazon Augmented AI (Preview).	December 3, 2019
Amazon Rekognition now supports AWS PrivateLink	With AWS PrivateLink you can establish a private connection between your VPC and Amazon Rekognition.	September 12, 2019
Amazon Rekognition face filtering	Amazon Rekognition adds enhanced face filtering support to the IndexFaces API operation, and introduces face filtering for the CompareFaces and SearchFacesByImage API operations.	September 12, 2019
Amazon Rekognition Video examples updated	Amazon Rekognition Video example code updated to create and configure the Amazon SNS topic and Amazon SQS queue.	September 5, 2019
Ruby and Node.js examples added	Amazon Rekognition Image Ruby and Node.js examples added for synchronous label and face detection.	August 19, 2019
Unsafe content detection updated	Amazon Rekognition unsafe content detection can now detect violent content.	August 9, 2019

GetContentModeration operation updated	GetContentModeration now returns the version of the moderation detection model used to detect unsafe content.	February 13, 2019
GetLabelDetection and DetectModerationLabels operations updated	GetLabelDetection now returns bounding box information for common objects and a hierarchical taxonomy of detected labels. The version of the model used for label detection is now returned. DetectModerationLabels now returns the version of the model used for detecting unsafe content.	January 17, 2019
DetectFaces and IndexFaces operation updated	This release updates the DetectFaces and IndexFaces operation. When the Attributes input parameter is set to ALL, the face location landmarks includes 5 new landmarks: upperJawlineLeft, midJawlineLeft, chinBottom, midJawlineRight, upperJawlineRight.	November 19, 2018
DetectLabels operation updated	Bounding boxes are now returned for certain objects. A hierarchical taxonomy is now available for labels. You can now get the version of the detection model used for detection.	November 1, 2018

IndexFaces operation updated	With IndexFaces you can now use the QualityFilter input parameter to filter out faces detected with low quality. You can also use the MaxFaces input parameter to reduce the number of faces returned based on the quality of the face detection, and the size of the detected face.	September 18, 2018
DescribeCollection operation added	You can now get informati on about an existing collectio n by calling the DescribeC ollection operation.	August 22, 2018
New Python examples	Python examples have been added to the Amazon Rekognition Video content along with some content reorganization.	June 26, 2018
Updated content layout	The Amazon Rekognition Image content has been reorganized along with new Python and C# examples.	May 29, 2018
Amazon Rekognition supports AWS CloudTrail	Amazon Rekognition is integrated with AWS CloudTrail, a service that provides a record of actions taken by a user, role, or an AWS service in Amazon Rekognition. For more information, see Logging Amazon Rekognition API Calls with AWS CloudTrail.	April 6, 2018

Analyze stored and streaming videos. New table of contents	For information about analyzing stored videos, see Working with Stored Videos. For information about analyzing streaming videos, see Working with Streaming Videos. The table of contents for the Amazon Rekogniti on documentation has been rearranged to accomodate image and video operations.	November 29, 2017
Text in image and face detection models	Amazon Rekognition can now detect text in images. For more information, see Detecting Text. Amazon Rekognition introduce s versioning for the face detection deep learning model. For more information, see Model Versioning.	November 21, 2017
Celebrity recognition	Amazon Rekognition can now analyze images for celebriti es. For more information, see Recognizing Celebrities.	June 8, 2017
Image moderation	Amazon Rekognition can now determine if an image contains explicit or suggestiv e adult content. For more information, see Detecting Unsafe Content.	April 19, 2017

Age range for detected faces. Aggregated Rekognition metrics pane	Amazon Rekognition now returns the estimated age range, in years, for faces detected by the Rekognition API. For more information, see AgeRange. The Rekogniti on console now has a metrics pane showing activity graphs for an aggregate of Amazon CloudWatch metrics for Rekognition over a specified period of time. For more information, see Exercise 4: See Aggregated Metrics (Console).	February 9, 2017
New service and guide	This is the initial release of the image analysis service, Amazon Rekognition, and the *Amazon Rekognition Developer Guide*.	November 30, 2016

AWS Glossary

For the latest AWS terminology, see the AWS glossary in the *AWS Glossary Reference*.