

Exam Guide (MLS-C01)

AWS Certified Machine Learning - Specialty



AWS Certified Machine Learning - Specialty: Exam Guide (MLS-C01)

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AWS Certified Machine Learning - Specialty (MLS-C01)

The AWS Certified Machine Learning - Specialty (MLS-C01) exam is intended for individuals who perform an artificial intelligence and machine learning (AI/ML) development or data science role. The exam validates a candidate's ability to design, build, deploy, optimize, train, tune, and maintain ML solutions for given business problems by using the AWS Cloud.

Topics

- [Introduction](#)
- [Target Candidate Description](#)
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Introduction

The [AWS Certified Machine Learning - Specialty \(MLS-C01\)](#) exam is intended for individuals who perform an artificial intelligence and machine learning (AI/ML) development or data science role. The exam validates a candidate's ability to design, build, deploy, optimize, train, tune, and maintain ML solutions for given business problems by using the AWS Cloud.

The exam also validates a candidate's ability to complete the following tasks:

- Select and justify the appropriate ML approach for a given business problem.
- Identify appropriate AWS services to implement ML solutions.
- Design and implement scalable, cost-optimized, reliable, and secure ML solutions.

Target Candidate Description

The target candidate should have 2 or more years of experience developing, architecting, and running ML or deep learning workloads in the AWS Cloud.

Recommended AWS knowledge

The target candidate should have the following AWS knowledge:

- Experience performing basic hyperparameter optimization
- Experience with ML and deep learning frameworks

Job tasks that are out of scope for the target candidate

The following list contains knowledge that the target candidate is not expected to have. This list is non-exhaustive. Knowledge in the following areas is out of scope for the exam:

- Extensive or complex algorithm development
- Extensive hyperparameter optimization
- Complex mathematical proofs and computations
- Advanced networking and network design
- Advanced database, security, and DevOps concepts
- DevOps-related tasks for Amazon EMR

Exam Content

There are two types of questions on the exam:

- Multiple choice: Has one correct response and three incorrect responses (distractors)
- Multiple response: Has two or more correct responses out of five or more response options

Select one or more responses that best complete the statement or answer the question.

Distractors, or incorrect answers, are response options that a candidate with incomplete knowledge or skill might choose. Distractors are generally plausible responses that match the content area.

Unanswered questions are scored as incorrect; there is no penalty for guessing. The exam includes 50 questions that affect your score.

The exam includes 15 unscored questions that do not affect your score. AWS collects information about performance on these unscored questions to evaluate these questions for future use as scored questions. These unscored questions are not identified on the exam.

The AWS Certified Machine Learning - Specialty (MLS-C01) exam has a pass or fail designation. The exam is scored against a minimum standard established by AWS professionals who follow certification industry best practices and guidelines.

Your results for the exam are reported as a scaled score of 100–1,000. The minimum passing score is 750. Your score shows how you performed on the exam as a whole and whether you passed. Scaled scoring models help equate scores across multiple exam forms that might have slightly different difficulty levels.

Your score report could contain a table of classifications of your performance at each section level. The exam uses a compensatory scoring model, which means that you do not need to achieve a passing score in each section. You need to pass only the overall exam.

Each section of the exam has a specific weighting, so some sections have more questions than other sections have. The table of classifications contains general information that highlights your strengths and weaknesses. Use caution when you interpret section-level feedback.

Content outline

This exam guide includes weightings, content domains, and task statements for the exam. This guide does not provide a comprehensive list of the content on the exam. However, additional context for each task statement is available to help you prepare for the exam.

The exam has the following content domains and weightings:

- [Content Domain 1: Data Engineering \(20% of scored content\)](#)
- [Content Domain 2: Exploratory Data Analysis \(24% of scored content\)](#)
- [Content Domain 3: Modeling \(36% of scored content\)](#)
- [Content Domain 4: Machine Learning Implementation and Operations \(20% of scored content\)](#)

Service References

The following sections provide detailed information about AWS services, technologies, and concepts relevant to this certification exam:

- [In-Scope AWS Services](#)
- [Out-of-Scope AWS Services](#)
- [Technologies and Concepts](#)

Content Domain 1: Data Engineering

Tasks

- [Task 1.1: Create data repositories for ML](#)
- [Task 1.2: Identify and implement a data ingestion solution](#)
- [Task 1.3: Identify and implement a data transformation solution](#)

Task 1.1: Create data repositories for ML

- Identify data sources (for example, content and location, primary sources such as user data).
- Determine storage mediums (for example, databases, Amazon S3, Amazon Elastic File System [Amazon EFS], Amazon Elastic Block Store [Amazon EBS]).

Task 1.2: Identify and implement a data ingestion solution

- Identify data job styles and job types (for example, batch load, streaming).
- Orchestrate data ingestion pipelines (batch-based ML workloads and streaming-based ML workloads).
 - Amazon Kinesis
 - Amazon Data Firehose
 - Amazon EMR
 - AWS Glue
 - Amazon Managed Service for Apache Flink
- Schedule jobs.

Task 1.3: Identify and implement a data transformation solution

- Transform data in transit (ETL, AWS Glue, Amazon EMR, AWS Batch).
- Handle ML-specific data by using MapReduce (for example, Apache Hadoop, Apache Spark, Apache Hive).

Content Domain 2: Exploratory Data Analysis

Tasks

- [Task 2.1: Sanitize and prepare data for modeling](#)
- [Task 2.2: Perform feature engineering](#)
- [Task 2.3: Analyze and visualize data for ML](#)

Task 2.1: Sanitize and prepare data for modeling

- Identify and handle missing data, corrupt data, and stop words.
- Format, normalize, augment, and scale data.
- Determine whether there is sufficient labeled data.
 - Identify mitigation strategies.
 - Use data labelling tools (for example, Amazon Mechanical Turk).

Task 2.2: Perform feature engineering

- Identify and extract features from datasets, including from data sources such as text, speech, images, and public datasets.
- Analyze and evaluate feature engineering concepts (for example, binning, tokenization, outliers, synthetic features, one-hot encoding, reducing dimensionality of data).

Task 2.3: Analyze and visualize data for ML

- Create graphs (for example, scatter plots, time series, histograms, box plots).
- Interpret descriptive statistics (for example, correlation, summary statistics, p-value).
- Perform cluster analysis (for example, hierarchical, diagnosis, elbow plot, cluster size).

Content Domain 3: Modeling

Tasks

- [Task 3.1: Frame business problems as ML problems](#)
- [Task 3.2: Select the appropriate model\(s\) for a given ML problem](#)
- [Task 3.3: Train ML models](#)
- [Task 3.4: Perform hyperparameter optimization](#)
- [Task 3.5: Evaluate ML models](#)

Task 3.1: Frame business problems as ML problems

- Determine when to use and when not to use ML.
- Know the difference between supervised and unsupervised learning.
- Select from among classification, regression, forecasting, clustering, recommendation, and foundation models.

Task 3.2: Select the appropriate model(s) for a given ML problem

- XGBoost, logistic regression, k-means, linear regression, decision trees, random forests, RNN, CNN, ensemble, transfer learning, and large language models (LLMs)
- Express the intuition behind models.

Task 3.3: Train ML models

- Split data between training and validation (for example, cross validation).
- Understand optimization techniques for ML training (for example, gradient descent, loss functions, convergence).
- Choose appropriate compute resources (for example GPU or CPU, distributed or non-distributed).
 - Choose appropriate compute platforms (Spark or non-Spark).
- Update and retrain models.
 - Batch or real-time/online

Task 3.4: Perform hyperparameter optimization

- Perform regularization.
 - Dropout
 - L1/L2
- Perform cross-validation.
- Initialize models.
- Understand neural network architecture (layers and nodes), learning rate, and activation functions.
- Understand tree-based models (number of trees, number of levels).
- Understand linear models (learning rate).

Task 3.5: Evaluate ML models

- Avoid overfitting or underfitting.
 - Detect and handle bias and variance.
- Evaluate metrics (for example, area under curve [AUC]-receiver operating characteristics [ROC], accuracy, precision, recall, Root Mean Square Error [RMSE], F1 score).
- Interpret confusion matrices.
- Perform offline and online model evaluation (A/B testing).
- Compare models by using metrics (for example, time to train a model, quality of model, engineering costs).
- Perform cross-validation.

Content Domain 4: Machine Learning Implementation and Operations

Tasks

- [Task 4.1: Build ML solutions for performance, availability, scalability, resiliency, and fault tolerance](#)
- [Task 4.2: Recommend and implement the appropriate ML services and features for a given problem](#)

- [Task 4.3: Apply basic AWS security practices to ML solutions](#)
- [Task 4.4: Deploy and operationalize ML solutions](#)

Task 4.1: Build ML solutions for performance, availability, scalability, resiliency, and fault tolerance

- Log and monitor AWS environments.
 - AWS CloudTrail and Amazon CloudWatch
 - Build error monitoring solutions.
- Deploy to multiple AWS Regions and multiple Availability Zones.
- Create AMIs and golden images.
- Create Docker containers.
- Deploy Auto Scaling groups.
- Rightsize resources (for example, instances, Provisioned IOPS, volumes).
- Perform load balancing.
- Follow AWS best practices.

Task 4.2: Recommend and implement the appropriate ML services and features for a given problem

- ML on AWS (application services), for example:
 - Amazon Polly
 - Amazon Lex
 - Amazon Transcribe
 - Amazon Q
- Understand AWS service quotas.
- Determine when to build custom models and when to use Amazon SageMaker built-in algorithms.
- Understand AWS infrastructure (for example, instance types) and cost considerations.
 - Use Spot Instances to train deep learning models by using AWS Batch.

Task 4.3: Apply basic AWS security practices to ML solutions

- AWS Identity and Access Management (IAM)
- S3 bucket policies
- Security groups
- VPCs
- Encryption and anonymization

Task 4.4: Deploy and operationalize ML solutions

- Expose endpoints and interact with them.
- Understand ML models.
- Perform A/B testing.
- Retrain pipelines.
- Debug and troubleshoot ML models.
 - Detect and mitigate drops in performance.
 - Monitor performance of the model.

In-Scope AWS Services

The following list contains AWS services and features that are in scope for the AWS Certified Machine Learning - Specialty (MLS-C01) exam. This list is non-exhaustive and is subject to change. AWS offerings appear in categories that align with the offerings' primary functions.

Topics

- [Analytics](#)
- [Compute](#)
- [Containers](#)
- [Database](#)
- [Internet of Things](#)
- [Machine Learning](#)
- [Management and Governance](#)
- [Networking and Content Delivery](#)

- [Security, Identity, and Compliance](#)
- [Storage](#)

Analytics

- Amazon Athena
- Amazon Data Firehose
- Amazon EMR
- AWS Glue
- Amazon Kinesis
- Amazon Kinesis Data Streams
- AWS Lake Formation
- Amazon Managed Service for Apache Flink
- Amazon OpenSearch Service
- Amazon QuickSight

Compute

- AWS Batch
- Amazon EC2
- AWS Lambda

Containers

- Amazon Elastic Container Registry (Amazon ECR)
- Amazon Elastic Container Service (Amazon ECS)
- Amazon Elastic Kubernetes Service (Amazon EKS)
- AWS Fargate

Database

- Amazon Redshift

Internet of Things

- AWS IoT Greengrass

Machine Learning

- Amazon Bedrock
- Amazon Comprehend
- AWS Deep Learning AMIs (DLAMI)
- Amazon Forecast
- Amazon Fraud Detector
- Amazon Lex
- Amazon Kendra
- Amazon Mechanical Turk
- Amazon Polly
- Amazon Q
- Amazon Rekognition
- Amazon SageMaker
- Amazon Textract
- Amazon Transcribe
- Amazon Translate

Management and Governance

- AWS CloudTrail
- Amazon CloudWatch

Networking and Content Delivery

- Amazon VPC

Security, Identity, and Compliance

- AWS Identity and Access Management (IAM)

Storage

- Amazon Elastic Block Store (Amazon EBS)
- Amazon Elastic File System (Amazon EFS)
- Amazon FSx
- Amazon S3

Out-of-Scope AWS Services

The following list contains AWS services and features that are out of scope for the AWS Certified Machine Learning - Specialty (MLS-C01) exam. This list is non-exhaustive and is subject to change. AWS offerings that are entirely unrelated to the target job roles for the exam are excluded from this list.

Topics

- [Analytics](#)
- [Machine Learning](#)

Analytics

- AWS Data Pipeline

Machine Learning

- AWS DeepRacer
- Amazon Machine Learning (Amazon ML)

Technologies and Concepts

The following list contains technologies and concepts that might appear on the exam. This list is non-exhaustive and is subject to change. The order and placement of the items in this list is no indication of their relative weight or importance on the exam:

- Ingestion and collection
- Processing and ETL
- Data analysis and visualization
- Model training
- Model deployment and inference
- Operationalizing ML
- AWS ML application services
- Language relevant to ML (for example, Python, Java, Scala, R, SQL)
- Notebooks and integrated development environments (IDEs)

Survey

How useful was this exam guide? Let us know by [taking our survey](#).