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Amazon MLS-C01 exam is a certification that validates the skills and knowledge of individuals in the field of machine learning. It is designed for professionals who want to demonstrate their expertise in building, training, and deploying machine learning models using Amazon Web Services (AWS). AWS Certified Machine Learning - Specialty certification is ideal for data scientists, machine learning engineers, and developers who use AWS services to build and deploy machine learning solutions.

The AWS Certified Machine Learning - Specialty exam is an excellent opportunity for professionals to validate their skills and expertise in machine learning. It is a challenging exam that requires a deep understanding of machine learning concepts and their practical applications in real-world scenarios. AWS Certified Machine Learning - Specialty certification is recognized globally by top employers in the industry and can help professionals advance their careers and increase their earning potential.

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Amazon MLS-C01 exam covers a range of topics such as data engineering, exploratory data analysis, feature engineering, model selection and training, tuning and optimization, machine learning algorithms, and deploying and maintaining machine learning models. Candidates are expected to have a deep understanding of these topics and be able to apply their knowledge to real-world scenarios. AWS-Certified-Machine-Learning-Specialty Exam is designed to test the candidate's ability to create efficient and effective machine learning solutions on AWS. Successful candidates will be able to demonstrate their expertise in the field and show that they are capable of designing and deploying machine learning models that meet business requirements.

## Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q21-Q26):

### NEW QUESTION # 21

An automotive company uses computer vision in its autonomous cars. The company trained its object detection models successfully by using transfer learning from a convolutional neural network (CNN). The company trained the models by using PyTorch through the Amazon SageMaker SDK.

The vehicles have limited hardware and compute power. The company wants to optimize the model to reduce memory, battery, and hardware consumption without a significant sacrifice in accuracy.

Which solution will improve the computational efficiency of the models?

- A. Use Amazon CloudWatch metrics to gain visibility into the SageMaker training weights, gradients, biases, and activation outputs. Compute the filter ranks based on the training information. Apply pruning to remove the low-ranking filters. Set new weights based on the pruned set of filters. Run a new training job with the pruned model.
- B. Use Amazon SageMaker Debugger to gain visibility into the training weights, gradients, biases, and activation outputs. Compute the filter ranks based on the training information. Apply pruning to remove the low-ranking filters. Set the new weights based on the pruned set of filters. Run a new training job with the pruned model.
- C. Use Amazon SageMaker Ground Truth to build and run data labeling workflows. Collect a larger labeled dataset with the labelling workflows. Run a new training job that uses the new labeled data with previous training data.
- D. Use Amazon SageMaker Model Monitor to gain visibility into the ModelLatency metric and OverheadLatency metric of the model after the company deploys the model. Increase the model learning rate. Run a new training job.

### Answer: B

Explanation:

Explanation

The solution C will improve the computational efficiency of the models because it uses Amazon SageMaker Debugger and pruning, which are techniques that can reduce the size and complexity of the convolutional neural network (CNN) models. The solution C involves the following steps:

Use Amazon SageMaker Debugger to gain visibility into the training weights, gradients, biases, and activation outputs. Amazon SageMaker Debugger is a service that can capture and analyze the tensors that are emitted during the training process of machine learning models. Amazon SageMaker Debugger can provide insights into the model performance, quality, and convergence. Amazon SageMaker Debugger can also help to identify and diagnose issues such as overfitting, underfitting, vanishing gradients, and exploding gradients<sup>1</sup>.

Compute the filter ranks based on the training information. Filter ranking is a technique that can measure the importance of each filter in a convolutional layer based on some criterion, such as the average percentage of zero activations or the L1-norm of the filter weights. Filter ranking can help to identify the filters that have little or no contribution to the model output, and thus can be removed without affecting the model accuracy<sup>2</sup>.

Apply pruning to remove the low-ranking filters. Pruning is a technique that can reduce the size and complexity of a neural network by removing the redundant or irrelevant parts of the network, such as neurons, connections, or filters. Pruning can help to improve the computational efficiency, memory usage, and inference speed of the model, as well as to prevent overfitting and improve generalization<sup>3</sup>.

Set the new weights based on the pruned set of filters. After pruning, the model will have a smaller and simpler architecture, with fewer filters in each convolutional layer. The new weights of the model can be set based on the pruned set of filters, either by initializing them randomly or by fine-tuning them from the original weights<sup>4</sup>.

Run a new training job with the pruned model. The pruned model can be trained again with the same or a different dataset, using the same or a different framework or algorithm. The new training job can use the same or a different configuration of Amazon SageMaker, such as the instance type, the hyperparameters, or the data ingestion mode. The new training job can also use Amazon SageMaker Debugger to monitor and analyze the training process and the model quality<sup>5</sup>.

The other options are not suitable because:

Option A: Using Amazon CloudWatch metrics to gain visibility into the SageMaker training weights, gradients, biases, and activation outputs will not be as effective as using Amazon SageMaker Debugger.

Amazon CloudWatch is a service that can monitor and observe the operational health and performance of AWS resources and applications. Amazon CloudWatch can provide metrics, alarms, dashboards, and logs for various AWS services, including Amazon SageMaker. However, Amazon CloudWatch does not provide the same level of granularity and detail as Amazon SageMaker Debugger for the tensors that are emitted during the training process of machine learning models. Amazon CloudWatch metrics are mainly focused on the resource utilization and the training progress, not on the model performance, quality, and convergence<sup>6</sup>.

Option B: Using Amazon SageMaker Ground Truth to build and run data labeling workflows and collecting a larger labeled dataset with the labeling workflows will not improve the computational efficiency of the models. Amazon SageMaker Ground Truth is a service that can create high-quality training datasets for machine learning by using human labelers. A larger labeled dataset can help to improve the model accuracy and generalization, but it will not reduce the memory, battery, and hardware consumption of the

model. Moreover, a larger labeled dataset may increase the training time and cost of the model7.

Option D: Using Amazon SageMaker Model Monitor to gain visibility into the ModelLatency metric and OverheadLatency metric of the model after the company deploys the model and increasing the model learning rate will not improve the computational efficiency of the models. Amazon SageMaker Model Monitor is a service that can monitor and analyze the quality and performance of machine learning models that are deployed on Amazon SageMaker endpoints. The ModelLatency metric and the OverheadLatency metric can measure the inference latency of the model and the endpoint, respectively.

However, these metrics do not provide any information about the training weights, gradients, biases, and activation outputs of the model, which are needed for pruning. Moreover, increasing the model learning rate will not reduce the size and complexity of the model, but it may affect the model convergence and accuracy.

References:

- 1: Amazon SageMaker Debugger
- 2: Pruning Convolutional Neural Networks for Resource Efficient Inference
- 3: Pruning Neural Networks: A Survey
- 4: Learning both Weights and Connections for Efficient Neural Networks
- 5: Amazon SageMaker Training Jobs
- 6: Amazon CloudWatch Metrics for Amazon SageMaker
- 7: Amazon SageMaker Ground Truth
- 8: Amazon SageMaker Model Monitor

## NEW QUESTION # 22

A real estate company wants to create a machine learning model for predicting housing prices based on a historical dataset. The dataset contains 32 features.

Which model will meet the business requirement?

- A. Linear regression
- B. K-means
- C. Logistic regression
- D. Principal component analysis (PCA)

Answer: A

## NEW QUESTION # 23

A university wants to develop a targeted recruitment strategy to increase new student enrollment. A data scientist gathers information about the academic performance history of students. The data scientist wants to use the data to build student profiles. The university will use the profiles to direct resources to recruit students who are likely to enroll in the university.

Which combination of steps should the data scientist take to predict whether a particular student applicant is likely to enroll in the university? (Select TWO)

- A. Use a forecasting algorithm to run predictions.
- B. Use a regression algorithm to run predictions.
- C. Use Amazon SageMaker Ground Truth to sort the data into two groups named "enrolled" or "not enrolled."
- D. Use the built-in Amazon SageMaker k-means algorithm to cluster the data into two groups named "enrolled" or "not enrolled."
- E. Use a classification algorithm to run predictions

Answer: C,E

Explanation:

Explanation

The data scientist should use Amazon SageMaker Ground Truth to sort the data into two groups named "enrolled" or "not enrolled." This will create a labeled dataset that can be used for supervised learning. The data scientist should then use a classification algorithm to run predictions on the test data. A classification algorithm is a suitable choice for predicting a binary outcome, such as enrollment status, based on the input features, such as academic performance. A classification algorithm will output a probability for each class label and assign the most likely label to each observation.

References:

- Use Amazon SageMaker Ground Truth to Label Data
- Classification Algorithm in Machine Learning

## NEW QUESTION # 24

A data scientist wants to use Amazon Forecast to build a forecasting model for inventory demand for a retail company. The company has provided a dataset of historic inventory demand for its products as a .csv file stored in an Amazon S3 bucket. The table below shows a sample of the dataset.

□ How should the data scientist transform the data?

- A. Use a Jupyter notebook in Amazon SageMaker to transform the data into the optimized protobuf recordIO format. Upload the dataset in this format to Amazon S3.
- B. Use a Jupyter notebook in Amazon SageMaker to separate the dataset into a related time series dataset and an item metadata dataset. Upload both datasets as tables in Amazon Aurora.
- C. Use AWS Batch jobs to separate the dataset into a target time series dataset, a related time series dataset, and an item metadata dataset. Upload them directly to Forecast from a local machine.
- D. Use ETL jobs in AWS Glue to separate the dataset into a target time series dataset and an item metadata dataset. Upload both datasets as .csv files to Amazon S3.

### Answer: D

Explanation:

<https://docs.aws.amazon.com/forecast/latest/dg/dataset-import-guidelines-troubleshooting.html>

## NEW QUESTION # 25

A company is building a new version of a recommendation engine. Machine learning (ML) specialists need to keep adding new data from users to improve personalized recommendations. The ML specialists gather data from the users' interactions on the platform and from sources such as external websites and social media.

The pipeline cleans, transforms, enriches, and compresses terabytes of data daily, and this data is stored in Amazon S3. A set of Python scripts was coded to do the job and is stored in a large Amazon EC2 instance.

The whole process takes more than 20 hours to finish, with each script taking at least an hour. The company wants to move the scripts out of Amazon EC2 into a more managed solution that will eliminate the need to maintain servers.

Which approach will address all of these requirements with the LEAST development effort?

- A. Create an AWS Glue job. Convert the scripts to PySpark. Execute the pipeline. Store the results in Amazon S3.
- B. Load the data into an Amazon Redshift cluster. Execute the pipeline by using SQL. Store the results in Amazon S3.
- C. Load the data into Amazon DynamoDB. Convert the scripts to an AWS Lambda function. Execute the pipeline by triggering Lambda executions. Store the results in Amazon S3.
- D. Create a set of individual AWS Lambda functions to execute each of the scripts. Build a step function by using the AWS Step Functions Data Science SDK. Store the results in Amazon S3.

### Answer: A

Explanation:

Explanation

The best approach to address all of the requirements with the least development effort is to create an AWS Glue job, convert the scripts to PySpark, execute the pipeline, and store the results in Amazon S3. This is because:

AWS Glue is a fully managed extract, transform, and load (ETL) service that makes it easy to prepare and load data for analytics 1. AWS Glue can run Python and Scala scripts to process data from various sources, such as Amazon S3, Amazon DynamoDB, Amazon Redshift, and more 2. AWS Glue also provides a serverless Apache Spark environment to run ETL jobs, eliminating the need to provision and manage servers 3.

PySpark is the Python API for Apache Spark, a unified analytics engine for large-scale data processing 4. PySpark can perform various data transformations and manipulations on structured and unstructured data, such as cleaning, enriching, and compressing 5.

PySpark can also leverage the distributed computing power of Spark to handle terabytes of data efficiently and scalably 6.

By creating an AWS Glue job and converting the scripts to PySpark, the company can move the scripts out of Amazon EC2 into a more managed solution that will eliminate the need to maintain servers. The company can also reduce the development effort by using the AWS Glue console, AWS SDK, or AWS CLI to create and run the job 7. Moreover, the company can use the AWS Glue Data Catalog to store and manage the metadata of the data sources and targets 8.

The other options are not as suitable as option C for the following reasons:

Option A is not optimal because loading the data into an Amazon Redshift cluster and executing the pipeline by using SQL will incur additional costs and complexity for the company. Amazon Redshift is a fully managed data warehouse service that enables fast and scalable analysis of structured data .

However, it is not designed for ETL purposes, such as cleaning, transforming, enriching, and compressing data. Moreover, using SQL to perform these tasks may not be as expressive and flexible as using Python scripts. Furthermore, the company will have to

provision and configure the Amazon Redshift cluster, and load and unload the data from Amazon S3, which will increase the development effort and time.

Option B is not feasible because loading the data into Amazon DynamoDB and converting the scripts to an AWS Lambda function will not work for the company's use case. Amazon DynamoDB is a fully managed key-value and document database service that provides fast and consistent performance at any scale. However, it is not suitable for storing and processing terabytes of data daily, as it has limits on the size and throughput of each table and item. Moreover, using AWS Lambda to execute the pipeline will not be efficient or cost-effective, as Lambda has limits on the memory, CPU, and execution time of each function. Therefore, using Amazon DynamoDB and AWS Lambda will not meet the company's requirements for processing large amounts of data quickly and reliably.

Option D is not relevant because creating a set of individual AWS Lambda functions to execute each of the scripts and building a step function by using the AWS Step Functions Data Science SDK will not address the main issue of moving the scripts out of Amazon EC2. AWS Step Functions is a fully managed service that lets you coordinate multiple AWS services into serverless workflows. The AWS Step Functions Data Science SDK is an open source library that allows data scientists to easily create workflows that process and publish machine learning models using Amazon SageMaker and AWS Step Functions. However, these services and tools are not designed for ETL purposes, such as cleaning, transforming, enriching, and compressing data. Moreover, as mentioned in option B, using AWS Lambda to execute the scripts will not be efficient or cost-effective for the company's use case.

References:

What Is AWS Glue?

AWS Glue Components

AWS Glue Serverless Spark ETL

PySpark - Overview

PySpark - RDD

PySpark - SparkContext

Adding Jobs in AWS Glue

Populating the AWS Glue Data Catalog

[What Is Amazon Redshift?]

[What Is Amazon DynamoDB?]

[Service, Account, and Table Quotas in DynamoDB]

[AWS Lambda quotas]

[What Is AWS Step Functions?]

[AWS Step Functions Data Science SDK for Python]

## NEW QUESTION # 26

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