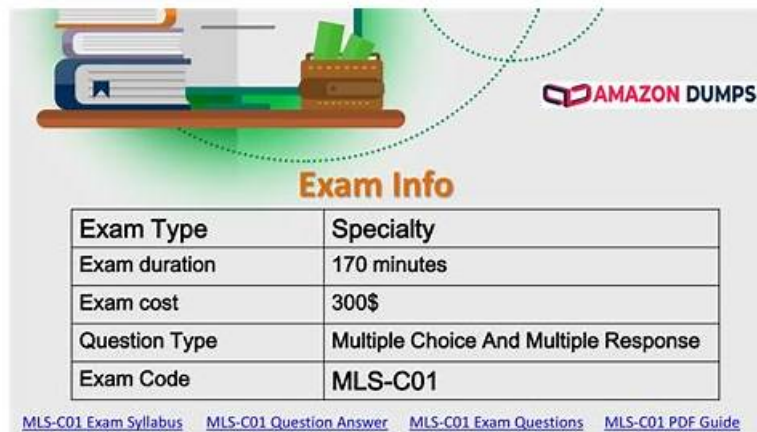


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Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q141-Q146):

NEW QUESTION # 141

A Machine Learning Specialist kicks off a hyperparameter tuning job for a tree-based ensemble model using Amazon SageMaker with Area Under the ROC Curve (AUC) as the objective metric. This workflow will eventually be deployed in a pipeline that retrains and tunes hyperparameters each night to model click-through on data that goes stale every 24 hours. With the goal of decreasing the amount of time it takes to train these models, and ultimately to decrease costs, the Specialist wants to reconfigure the input hyperparameter range(s). Which visualization will accomplish this?

- A. A histogram showing whether the most important input feature is Gaussian.
- B. A scatter plot showing the performance of the objective metric over each training iteration.
- C. A scatter plot showing the correlation between maximum tree depth and the objective metric.
- D. A scatter plot with points colored by target variable that uses (-Distributed Stochastic Neighbor Embedding (t-SNE) to visualize the large number of input variables in an easier-to-read dimension.

Answer: C

Explanation:

Explanation

A scatter plot showing the correlation between maximum tree depth and the objective metric is a visualization that can help the Machine Learning Specialist reconfigure the input hyperparameter range(s) for the tree-based ensemble model. A scatter plot is a type of graph that displays the relationship between two variables using dots, where each dot represents one observation. A scatter plot can show the direction, strength, and shape of the correlation between the variables, as well as any outliers or clusters. In this case, the scatter plot can show how the maximum tree depth, which is a hyperparameter that controls the complexity and depth of the decision trees in the ensemble model, affects the AUC, which is the objective metric that measures the performance of the model in terms of the trade-off between true positive rate and false positive rate. By looking at the scatter plot, the Machine Learning Specialist can see if there is a positive, negative, or no correlation between the maximum tree depth and the AUC, and how strong or weak the correlation is. The Machine Learning Specialist can also see if there is an optimal value or range of values for the maximum tree depth that maximizes the AUC, or if there is a point of diminishing returns or overfitting where increasing the maximum tree depth does not improve or even worsens the AUC. Based on the scatter plot, the Machine Learning Specialist can reconfigure the input hyperparameter range(s) for the maximum tree depth to focus on the values that yield the best AUC, and avoid the values that result in poor AUC. This can decrease the amount of time and cost it takes to train the model, as the hyperparameter tuning job can explore fewer and more promising combinations of values. A scatter plot can be created using various tools and libraries, such as Matplotlib, Seaborn, Plotly, etc.¹² The other options are not valid or relevant for reconfiguring the input hyperparameter range(s) for the tree-based ensemble model. A histogram showing whether the most important input feature is Gaussian is a visualization that can help the Machine Learning Specialist understand the distribution and shape of the input data, but not the hyperparameters. A histogram is a type of graph that displays the frequency or count of values in a single variable using bars, where each bar represents a bin or interval of values. A histogram can show if the variable is symmetric, skewed, or multimodal, and if it follows a normal or Gaussian distribution, which is a bell-shaped curve that is often assumed by many machine learning algorithms. In this case, the histogram can show if the most important input feature, which is a variable that has the most influence or predictive power on the output variable, is Gaussian or not. However, this does not help the Machine Learning Specialist reconfigure the input hyperparameter range(s) for the tree-based ensemble model, as the input feature is not a hyperparameter that can be tuned or optimized. A histogram can be created using various tools and libraries, such as Matplotlib, Seaborn, Plotly, etc.³⁴ A scatter plot with points colored by target variable that uses t-Distributed Stochastic Neighbor Embedding (t-SNE) to visualize the large number of input variables in an easier-to-read dimension is a visualization that can help the Machine Learning Specialist understand the structure and clustering of the input data, but not the hyperparameters. t-SNE is a technique that can reduce the dimensionality of high-dimensional data, such as images, text, or gene expression, and project it onto a lower-dimensional space, such as two or three dimensions, while preserving the local similarities and distances between the data points. t-SNE can help visualize and explore the patterns and relationships in the data, such as the clusters, outliers, or separability of the classes. In this case, the scatter plot can show how the input variables, which are the features or predictors of the output variable, are mapped onto a two-dimensional space using t-SNE, and how the points are colored by the target variable, which is the output or response variable that the model tries to predict. However, this does not help the Machine Learning Specialist reconfigure the input hyperparameter range(s) for the tree-based ensemble model, as the input variables and the target variable are not hyperparameters that can be tuned or optimized. A scatter plot with t-SNE can be created using various tools and libraries, such as Scikit-learn, TensorFlow, PyTorch, etc.⁵ A scatter plot showing the performance of the objective metric over each training iteration is a visualization that can help the Machine Learning Specialist understand the learning curve and convergence of the model, but not the hyperparameters. A scatter plot is a type of graph that displays the relationship between two variables using dots, where each dot represents one observation. A scatter plot can show the direction, strength, and shape of the correlation between the variables, as well as any outliers or clusters. In this case, the scatter plot can show how the objective metric, which is the performance measure that the model tries to optimize, changes over each training iteration, which is the number of times that the model updates its parameters using a batch of data. A scatter plot can show if the objective metric improves, worsens, or stagnates over time, and if the model converges to a stable value or oscillates or diverges. However, this does not help the Machine Learning Specialist reconfigure the input hyperparameter range(s) for the tree-based ensemble model, as the objective metric and the training iteration are not hyperparameters that can be tuned or optimized. A scatter plot can be created using various tools and libraries, such as Matplotlib, Seaborn, Plotly, etc.

NEW QUESTION # 142

During mini-batch training of a neural network for a classification problem, a Data Scientist notices that training accuracy oscillates. What is the MOST likely cause of this issue?

- A. The class distribution in the dataset is imbalanced
- B. The batch size is too big
- C. The learning rate is very high
- D. Dataset shuffling is disabled

Answer: C

Explanation:

Explanation

Mini-batch gradient descent is a variant of gradient descent that updates the model parameters using a subset of the training data (called a mini-batch) at each iteration. The learning rate is a hyperparameter that controls how much the model parameters change in response to the gradient. If the learning rate is very high, the model parameters may overshoot the optimal values and oscillate around the minimum of the cost function. This can cause the training accuracy to fluctuate and prevent the model from converging to a stable solution. To avoid this issue, the learning rate should be chosen carefully, such as by using a learning rate decay schedule or an adaptive learning rate algorithm¹. Alternatively, the batch size can be increased to reduce the variance of the gradient estimates². However, the batch size should not be too big, as this can slow down the training process and reduce the generalization ability of the model³. Dataset shuffling and class distribution are not likely to cause oscillations in training accuracy, as they do not affect the gradient updates directly. Dataset shuffling can help avoid getting stuck in local minima and improve the convergence speed of mini-batch gradient descent⁴.

Class distribution can affect the performance and fairness of the model, especially if the dataset is imbalanced, but it does not necessarily cause fluctuations in training accuracy.

NEW QUESTION # 143

A network security vendor needs to ingest telemetry data from thousands of endpoints that run all over the world. The data is transmitted every 30 seconds in the form of records that contain 50 fields. Each record is up to 1 KB in size. The security vendor uses Amazon Kinesis Data Streams to ingest the data. The vendor requires hourly summaries of the records that Kinesis Data Streams ingests. The vendor will use Amazon Athena to query the records and to generate the summaries. The Athena queries will target 7 to 12 of the available data fields.

Which solution will meet these requirements with the LEAST amount of customization to transform and store the ingested data?

- **A. Use Amazon Kinesis Data Analytics to read and aggregate the data hourly. Transform the data and store it in Amazon S3 by using Amazon Kinesis Data Firehose.**
- B. Use AWS Lambda to read and aggregate the data hourly. Transform the data and store it in Amazon S3 by using Amazon Kinesis Data Firehose.
- C. Use Amazon Kinesis Data Firehose to read and aggregate the data hourly. Transform the data and store it in Amazon S3 by using a short-lived Amazon EMR cluster.
- D. Use Amazon Kinesis Data Firehose to read and aggregate the data hourly. Transform the data and store it in Amazon S3 by using AWS Lambda.

Answer: A

Explanation:

Explanation

The solution that will meet the requirements with the least amount of customization to transform and store the ingested data is to use Amazon Kinesis Data Analytics to read and aggregate the data hourly, transform the data and store it in Amazon S3 by using Amazon Kinesis Data Firehose. This solution leverages the built-in features of Kinesis Data Analytics to perform SQL queries on streaming data and generate hourly summaries.

Kinesis Data Analytics can also output the transformed data to Kinesis Data Firehose, which can then deliver the data to S3 in a specified format and partitioning scheme. This solution does not require any custom code or additional infrastructure to process the data. The other solutions either require more customization (such as using Lambda or EMR) or do not meet the requirement of aggregating the data hourly (such as using Lambda to read the data from Kinesis Data Streams). References:

1: Boosting Resiliency with an ML-based Telemetry Analytics Architecture | AWS Architecture Blog

2: AWS Cloud Data Ingestion Patterns and Practices

3: IoT ingestion and Machine Learning analytics pipeline with AWS IoT ...

4: AWS IoT Data Ingestion Simplified 101: The Complete Guide - Hevo Data

NEW QUESTION # 144

A data engineer needs to provide a team of data scientists with the appropriate dataset to run machine learning training jobs. The data will be stored in Amazon S3. The data engineer is obtaining the data from an Amazon Redshift database and is using join queries to extract a single tabular dataset. A portion of the schema is as follows:

...traction Timestamp (Timestamp)

...JName(Varchar)

...JNo (Varchar)

The data engineer must provide the data so that any row with a CardNo value of NULL is removed. Also, the TransactionTimestamp column must be separated into a TransactionDate column and a TransactionTime column. Finally, the CardName column must be

renamed to NameOnCard.

The data will be extracted on a monthly basis and will be loaded into an S3 bucket. The solution must minimize the effort that is needed to set up infrastructure for the ingestion and transformation. The solution must be automated and must minimize the load on the Amazon Redshift cluster. Which solution meets these requirements?

- A. Use Amazon Redshift Spectrum to run a query that writes the data directly to the S3 bucket. Create an AWS Lambda function to run the query monthly.
- **B. Set up an AWS Glue job that has the Amazon Redshift cluster as the source and the S3 bucket as the destination. Use the built-in transforms Filter, Map, and RenameField to perform the required transformations. Schedule the job to run monthly.**
- C. Set up an Amazon EMR cluster. Create an Apache Spark job to read the data from the Amazon Redshift cluster and transform the data. Load the data into the S3 bucket. Schedule the job to run monthly.
- D. Set up an Amazon EC2 instance with a SQL client tool, such as SQL Workbench/J, to query the data from the Amazon Redshift cluster directly. Export the resulting dataset into a file. Upload the file into the S3 bucket. Perform these tasks monthly.

Answer: B

Explanation:

Explanation

The best solution for this scenario is to set up an AWS Glue job that has the Amazon Redshift cluster as the source and the S3 bucket as the destination, and use the built-in transforms Filter, Map, and RenameField to perform the required transformations. This solution has the following advantages:

It minimizes the effort that is needed to set up infrastructure for the ingestion and transformation, as AWS Glue is a fully managed service that provides a serverless Apache Spark environment, a graphical interface to define data sources and targets, and a code generation feature to create and edit scripts¹.

It automates the extraction and transformation process, as AWS Glue can schedule the job to run monthly, and handle the connection, authentication, and configuration of the Amazon Redshift cluster and the S3 bucket².

It minimizes the load on the Amazon Redshift cluster, as AWS Glue can read the data from the cluster in parallel and use a JDBC connection that supports SSL encryption³.

It performs the required transformations, as AWS Glue can use the built-in transforms Filter, Map, and RenameField to remove the rows with NULL values, split the timestamp column into date and time columns, and rename the card name column, respectively⁴.

The other solutions are not optimal or suitable, because they have the following drawbacks:

A: Setting up an Amazon EMR cluster and creating an Apache Spark job to read the data from the Amazon Redshift cluster and transform the data is not the most efficient or convenient solution, as it requires more effort and resources to provision, configure, and manage the EMR cluster, and to write and maintain the Spark code⁵.

B: Setting up an Amazon EC2 instance with a SQL client tool to query the data from the Amazon Redshift cluster directly and export the resulting dataset into a CSV file is not a scalable or reliable solution, as it depends on the availability and performance of the EC2 instance, and the manual execution and upload of the SQL queries and the CSV file⁶.

D: Using Amazon Redshift Spectrum to run a query that writes the data directly to the S3 bucket and creating an AWS Lambda function to run the query monthly is not a feasible solution, as Amazon Redshift Spectrum does not support writing data to external tables or S3 buckets, only reading data from them⁷.

References:

1: What Is AWS Glue? - AWS Glue

2: Populating the Data Catalog - AWS Glue

3: Best Practices When Using AWS Glue with Amazon Redshift - AWS Glue

4: Built-In Transforms - AWS Glue

5: What Is Amazon EMR? - Amazon EMR

6: Amazon EC2 - Amazon Web Services (AWS)

7: Using Amazon Redshift Spectrum to Query External Data - Amazon Redshift

NEW QUESTION # 145

A company that promotes healthy sleep patterns by providing cloud-connected devices currently hosts a sleep tracking application on AWS. The application collects device usage information from device users. The company's Data Science team is building a machine learning model to predict if and when a user will stop utilizing the company's devices. Predictions from this model are used by a downstream application that determines the best approach for contacting users.

The Data Science team is building multiple versions of the machine learning model to evaluate each version against the company's business goals. To measure long-term effectiveness, the team wants to run multiple versions of the model in parallel for long periods of time, with the ability to control the portion of inferences served by the models.

Which solution satisfies these requirements with MINIMAL effort?

- A. Build and host multiple models in Amazon SageMaker. Create a single endpoint that accesses multiple models. Use Amazon SageMaker batch transform to control invoking the different models through the single endpoint.
- B. Build and host multiple models in Amazon SageMaker. Create multiple Amazon SageMaker endpoints, one for each model. Programmatically control invoking different models for inference at the application layer.
- C. Build and host multiple models in Amazon SageMaker Neo to take into account different types of medical devices. Programmatically control which model is invoked for inference based on the medical device type.
- D. Build and host multiple models in Amazon SageMaker. Create an Amazon SageMaker endpoint configuration with multiple production variants. Programmatically control the portion of the inferences served by the multiple models by updating the endpoint configuration.

Answer: D

Explanation:

Amazon SageMaker is a service that allows users to build, train, and deploy ML models on AWS. Amazon SageMaker endpoints are scalable and secure web services that can be used to perform real-time inference on ML models. An endpoint configuration defines the models that are deployed and the resources that are used by the endpoint. An endpoint configuration can have multiple production variants, each representing a different version or variant of a model. Users can specify the portion of the inferences served by each production variant using the `initialVariantWeight` parameter. Users can also programmatically update the endpoint configuration to change the portion of the inferences served by each production variant using the `UpdateEndpointWeightsAndCapacities` API. Therefore, option B is the best solution to satisfy the requirements with minimal effort. Option A is incorrect because creating multiple endpoints for each model would incur more cost and complexity than using a single endpoint with multiple production variants. Moreover, controlling the invocation of different models at the application layer would require more custom logic and coordination than using the `UpdateEndpointWeightsAndCapacities` API. Option C is incorrect because Amazon SageMaker Neo is a service that allows users to optimize ML models for different hardware platforms, such as edge devices. It is not relevant to the problem of running multiple versions of a model in parallel for long periods of time. Option D is incorrect because Amazon SageMaker batch transform is a service that allows users to perform asynchronous inference on large datasets. It is not suitable for the problem of performing real-time inference on streaming data from device users.

References:

- * Deploying models to Amazon SageMaker hosting services - Amazon SageMaker
- * Update an Amazon SageMaker endpoint to accommodate new models - Amazon SageMaker
- * `UpdateEndpointWeightsAndCapacities` - Amazon SageMaker

NEW QUESTION # 146

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