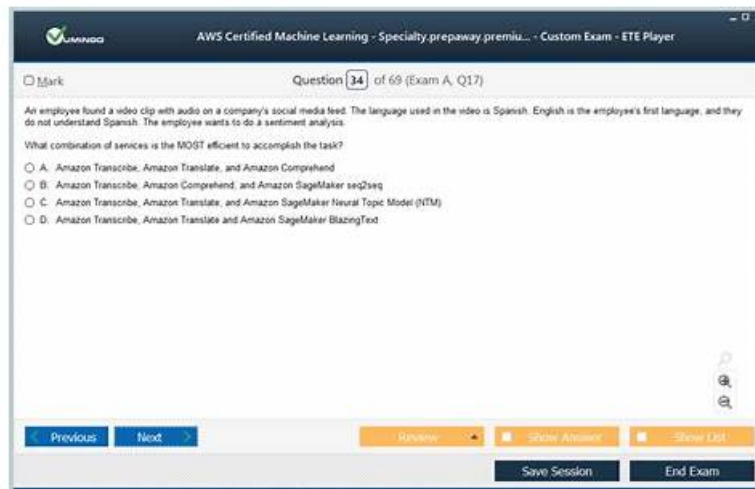


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To become an AWS Certified Machine Learning Specialist, candidates must demonstrate their ability to design, implement, and maintain machine learning solutions on AWS. This includes understanding the various tools and services offered by AWS for machine learning, such as Amazon SageMaker, Amazon Rekognition, and Amazon Comprehend. Candidates must also have experience working with data, such as data preprocessing, data visualization, and data analysis.

Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q138-Q143):

NEW QUESTION # 138

An e-commerce company wants to launch a new cloud-based product recommendation feature for its web application. Due to data

localization regulations, any sensitive data must not leave its on-premises data center, and the product recommendation model must be trained and tested using nonsensitive data only. Data transfer to the cloud must use IPsec. The web application is hosted on premises with a PostgreSQL database that contains all the data. The company wants the data to be uploaded securely to Amazon S3 each day for model retraining.

How should a machine learning specialist meet these requirements?

- A. Create an AWS Glue job to connect to the PostgreSQL DB instance. Ingest tables without sensitive data through an AWS Site-to-Site VPN connection directly into Amazon S3.
- **B. Use AWS Database Migration Service (AWS DMS) with table mapping to select PostgreSQL tables with no sensitive data through an SSL connection. Replicate data directly into Amazon S3.**
- C. Use PostgreSQL logical replication to replicate all data to PostgreSQL in Amazon EC2 through AWS Direct Connect with a VPN connection. Use AWS Glue to move data from Amazon EC2 to Amazon S3.
- D. Create an AWS Glue job to connect to the PostgreSQL DB instance. Ingest all data through an AWS Site-to-Site VPN connection into Amazon S3 while removing sensitive data using a PySpark job.

Answer: B

Explanation:

The best option is to use AWS Database Migration Service (AWS DMS) with table mapping to select PostgreSQL tables with no sensitive data through an SSL connection. Replicate data directly into Amazon S3.

This option meets the following requirements:

* It ensures that only nonsensitive data is transferred to the cloud by using table mapping to filter out the tables that contain sensitive data1.

* It uses IPsec to secure the data transfer by enabling SSL encryption for the AWS DMS endpoint2.

* It uploads the data to Amazon S3 each day for model retraining by using the ongoing replication feature of AWS DMS3.

The other options are not as effective or feasible as the option above. Creating an AWS Glue job to connect to the PostgreSQL DB instance and ingest data through an AWS Site-to-Site VPN connection directly into Amazon S3 is possible, but it requires more steps and resources than using AWS DMS. Also, it does not specify how to filter out the sensitive data from the tables. Creating an AWS Glue job to connect to the PostgreSQL DB instance and ingest all data through an AWS Site-to-Site VPN connection into Amazon S3 while removing sensitive data using a PySpark job is also possible, but it is more complex and error-prone than using AWS DMS. Also, it does not use IPsec as required. Using PostgreSQL logical replication to replicate all data to PostgreSQL in Amazon EC2 through AWS Direct Connect with a VPN connection, and then using AWS Glue to move data from Amazon EC2 to Amazon S3 is not feasible, because PostgreSQL logical replication does not support replicating only a subset of data4. Also, it involves unnecessary data movement and additional costs.

Table mapping - AWS Database Migration Service

Using SSL to encrypt a connection to a DB instance - AWS Database Migration Service Ongoing replication - AWS Database Migration Service Logical replication - PostgreSQL

NEW QUESTION # 139

A company wants to segment a large group of customers into subgroups based on shared characteristics. The company's data scientist is planning to use the Amazon SageMaker built-in k-means clustering algorithm for this task. The data scientist needs to determine the optimal number of subgroups (k) to use.

Which data visualization approach will MOST accurately determine the optimal value of k?

- A. Calculate the principal component analysis (PCA) components. Create a line plot of the number of components against the explained variance. The optimal value of k is the number of PCA components after which the curve starts decreasing in a linear fashion.
- B. Calculate the principal component analysis (PCA) components. Run the k-means clustering algorithm for a range of k by using only the first two PCA components. For each value of k, create a scatter plot with a different color for each cluster. The optimal value of k is the value where the clusters start to look reasonably separated.
- C. Create a t-distributed stochastic neighbor embedding (t-SNE) plot for a range of perplexity values. The optimal value of k is the value of perplexity, where the clusters start to look reasonably separated.
- **D. Run the k-means clustering algorithm for a range of k. For each value of k, calculate the sum of squared errors (SSE). Plot a line chart of the SSE for each value of k. The optimal value of k is the point after which the curve starts decreasing in a linear fashion.**

Answer: D

Explanation:

The solution D is the best data visualization approach to determine the optimal value of k for the k-means clustering algorithm. The

solution D involves the following steps:

Run the k-means clustering algorithm for a range of k. For each value of k, calculate the sum of squared errors (SSE). The SSE is a measure of how well the clusters fit the data. It is calculated by summing the squared distances of each data point to its closest cluster center. A lower SSE indicates a better fit, but it will always decrease as the number of clusters increases. Therefore, the goal is to find the smallest value of k that still has a low SSE1.

Plot a line chart of the SSE for each value of k. The line chart will show how the SSE changes as the value of k increases. Typically, the line chart will have a shape of an elbow, where the SSE drops rapidly at first and then levels off. The optimal value of k is the point after which the curve starts decreasing in a linear fashion. This point is also known as the elbow point, and it represents the balance between the number of clusters and the SSE1.

The other options are not suitable because:

Option A: Calculating the principal component analysis (PCA) components, running the k-means clustering algorithm for a range of k by using only the first two PCA components, and creating a scatter plot with a different color for each cluster will not accurately determine the optimal value of k. PCA is a technique that reduces the dimensionality of the data by transforming it into a new set of features that capture the most variance in the data. However, PCA may not preserve the original structure and distances of the data, and it may lose some information in the process. Therefore, running the k-means clustering algorithm on the PCA components may not reflect the true clusters in the data. Moreover, using only the first two PCA components may not capture enough variance to represent the data well. Furthermore, creating a scatter plot may not be reliable, as it depends on the subjective judgment of the data scientist to decide when the clusters look reasonably separated2.

Option B: Calculating the PCA components and creating a line plot of the number of components against the explained variance will not determine the optimal value of k. This approach is used to determine the optimal number of PCA components to use for dimensionality reduction, not for clustering. The explained variance is the ratio of the variance of each PCA component to the total variance of the data. The optimal number of PCA components is the point where adding more components does not significantly increase the explained variance. However, this number may not correspond to the optimal number of clusters, as PCA and k-means clustering have different objectives and assumptions2.

Option C: Creating a t-distributed stochastic neighbor embedding (t-SNE) plot for a range of perplexity values will not determine the optimal value of k. t-SNE is a technique that reduces the dimensionality of the data by embedding it into a lower-dimensional space, such as a two-dimensional plane. t-SNE preserves the local structure and distances of the data, and it can reveal clusters and patterns in the data. However, t-SNE does not assign labels or centroids to the clusters, and it does not provide a measure of how well the clusters fit the data. Therefore, t-SNE cannot determine the optimal number of clusters, as it only visualizes the data. Moreover, t-SNE depends on the perplexity parameter, which is a measure of how many neighbors each point considers. The perplexity parameter can affect the shape and size of the clusters, and there is no optimal value for it. Therefore, creating a t-SNE plot for a range of perplexity values may not be consistent or reliable3.

References:

- 1: How to Determine the Optimal K for K-Means?
- 2: Principal Component Analysis
- 3: t-Distributed Stochastic Neighbor Embedding

NEW QUESTION # 140

A manufacturer is operating a large number of factories with a complex supply chain relationship where unexpected downtime of a machine can cause production to stop at several factories. A data scientist wants to analyze sensor data from the factories to identify equipment in need of preemptive maintenance and then dispatch a service team to prevent unplanned downtime. The sensor readings from a single machine can include up to 200 data points including temperatures, voltages, vibrations, RPMs, and pressure readings. To collect this sensor data, the manufacturer deployed Wi-Fi and LANs across the factories. Even though many factory locations do not have reliable or high-speed internet connectivity, the manufacturer would like to maintain near-real-time inference capabilities. Which deployment architecture for the model will address these business requirements?

- A. Deploy the model to an Amazon SageMaker batch transformation job. Generate inferences in a daily batch report to identify machines that need maintenance.
- B. Deploy the model in Amazon SageMaker. Run sensor data through this model to predict which machines need maintenance.
- C. Deploy the model in Amazon SageMaker and use an IoT rule to write data to an Amazon DynamoDB table. Consume a DynamoDB stream from the table with an AWS Lambda function to invoke the endpoint.
- **D. Deploy the model on AWS IoT Greengrass in each factory. Run sensor data through this model to infer which machines need maintenance.**

Answer: D

Explanation:

AWS IoT Greengrass is a service that extends AWS to edge devices, such as sensors and machines, so they can act locally on the data they generate, while still using the cloud for management, analytics, and durable storage. AWS IoT Greengrass enables local

device messaging, secure data transfer, and local computing using AWS Lambda functions and machine learning models. AWS IoT Greengrass can run machine learning inference locally on devices using models that are created and trained in the cloud. This allows devices to respond quickly to local events, even when they are offline or have intermittent connectivity. Therefore, option B is the best deployment architecture for the model to address the business requirements of the manufacturer.

Option A is incorrect because deploying the model in Amazon SageMaker would require sending the sensor data to the cloud for inference, which would not work well for factory locations that do not have reliable or high-speed internet connectivity. Moreover, this option would not provide near-real-time inference capabilities, as there would be latency and bandwidth issues involved in transferring the data to and from the cloud. Option C is incorrect because deploying the model to an Amazon SageMaker batch transformation job would not provide near-real-time inference capabilities, as batch transformation is an asynchronous process that operates on large datasets. Batch transformation is not suitable for streaming data that requires low-latency responses. Option D is incorrect because deploying the model in Amazon SageMaker and using an IoT rule to write data to an Amazon DynamoDB table would also require sending the sensor data to the cloud for inference, which would have the same drawbacks as option A. Moreover, this option would introduce additional complexity and cost by involving multiple services, such as IoT Core, DynamoDB, and Lambda.

AWS Greengrass Machine Learning Inference - Amazon Web Services

Machine learning components - AWS IoT Greengrass

What is AWS Greengrass? | AWS IoT Core | Onica

GitHub - aws-samples/aws-greengrass-ml-deployment-sample

AWS IoT Greengrass Architecture and Its Benefits | Quick Guide - XenonStack

NEW QUESTION # 141

A Machine Learning Specialist must build out a process to query a dataset on Amazon S3 using Amazon Athena. The dataset contains more than 800,000 records stored as plaintext CSV files. Each record contains 200 columns and is approximately 1.5 MB in size. Most queries will span 5 to 10 columns only. How should the Machine Learning Specialist transform the dataset to minimize query runtime?

- A. Convert the records to XML format
- B. Convert the records to JSON format
- **C. Convert the records to Apache Parquet format**
- D. Convert the records to GZIP CSV format

Answer: C

Explanation:

To optimize the query performance of Athena, one of the best practices is to convert the data into a columnar format, such as Apache Parquet or Apache ORC. Columnar formats store data by columns rather than by rows, which allows Athena to scan only the columns that are relevant to the query, reducing the amount of data read and improving the query speed. Columnar formats also support compression and encoding schemes that can reduce the storage space and the data scanned per query, further enhancing the performance and reducing the cost.

In contrast, plaintext CSV files store data by rows, which means that Athena has to scan the entire row even if only a few columns are needed for the query. This increases the amount of data read and the query latency. Moreover, plaintext CSV files do not support compression or encoding, which means that they take up more storage space and incur higher query costs.

Therefore, the Machine Learning Specialist should transform the dataset to Apache Parquet format to minimize query runtime.

References:

Top 10 Performance Tuning Tips for Amazon Athena

Columnar Storage Formats

Using compressions will reduce the amount of data scanned by Amazon Athena, and also reduce your S3 bucket storage. It's a Win-Win for your AWS bill. Supported formats: GZIP, LZO, SNAPPY (Parquet) and ZLIB.

NEW QUESTION # 142

A Machine Learning Specialist is packaging a custom ResNet model into a Docker container so the company can leverage Amazon SageMaker for training. The Specialist is using Amazon EC2 P3 instances to train the model and needs to properly configure the Docker container to leverage the NVIDIA GPUs. What does the Specialist need to do?

- A. Organize the Docker container's file structure to execute on GPU instances.
- **B. Build the Docker container to be NVIDIA-Docker compatible**
- C. Bundle the NVIDIA drivers with the Docker image
- D. Set the GPU flag in the Amazon SageMaker Create TrainingJob request body

Answer: B

Explanation:

To leverage the NVIDIA GPUs on Amazon EC2 P3 instances, the Machine Learning Specialist needs to build the Docker container to be NVIDIA-Docker compatible. NVIDIA-Docker is a tool that enables GPU-accelerated containers to run on Docker. It automatically configures the container to access the NVIDIA drivers and libraries on the host system. The Specialist does not need to bundle the NVIDIA drivers with the Docker image, as they are already installed on the EC2 P3 instances. The Specialist does not need to organize the Docker container's file structure to execute on GPU instances, as this is not relevant for GPU compatibility. The Specialist does not need to set the GPU flag in the Amazon SageMaker Create TrainingJob request body, as this is only required for using Elastic Inference accelerators, not EC2 P3 instances.

References: NVIDIA-Docker, Using GPU-Accelerated Containers, Using Elastic Inference in Amazon SageMaker

NEW QUESTION # 143

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