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Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q33-Q38):

NEW QUESTION # 33

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. 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.
- B. 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.
- C. 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.
- D. 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.

Answer: C

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 # 34

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 AWS Lambda to read and aggregate the data hourly. Transform the data and store it in Amazon S3 by using Amazon Kinesis Data Firehose.
- B. 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.
- **C. 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.**
- 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: C

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 # 35

A Machine Learning Specialist is working with multiple data sources containing billions of records that need to be joined. What feature engineering and model development approach should the Specialist take with a dataset this large?

- **A. Use Amazon EMR for feature engineering and Amazon SageMaker SDK for model development**
- B. Use an Amazon SageMaker notebook for both feature engineering and model development
- C. Use Amazon ML for both feature engineering and model development.
- D. Use an Amazon SageMaker notebook for feature engineering and Amazon ML for model development

Answer: A

Explanation:

Amazon EMR is a service that can process large amounts of data efficiently and cost-effectively. It can run distributed frameworks such as Apache Spark, which can perform feature engineering on big data. Amazon SageMaker SDK is a Python library that can interact with Amazon SageMaker service to train and deploy machine learning models. It can also use Amazon EMR as a data source for training data. References:

Amazon EMR

Amazon SageMaker SDK

NEW QUESTION # 36

A Data Science team is designing a dataset repository where it will store a large amount of training data commonly used in its machine learning models. As Data Scientists may create an arbitrary number of new datasets every day the solution has to scale automatically and be cost-effective. Also, it must be possible to explore the data using SQL.

Which storage scheme is MOST adapted to this scenario?

- A. Store datasets as tables in a multi-node Amazon Redshift cluster.
- B. Store datasets as global tables in Amazon DynamoDB.
- C. Store datasets as files in an Amazon EBS volume attached to an Amazon EC2 instance.
- **D. Store datasets as files in Amazon S3.**

Answer: D

Explanation:

The best storage scheme for this scenario is to store datasets as files in Amazon S3. Amazon S3 is a scalable, cost-effective, and durable object storage service that can store any amount and type of data. Amazon S3 also supports querying data using SQL with Amazon Athena, a serverless interactive query service that can analyze data directly in S3. This way, the Data Science team can easily explore and analyze their datasets without having to load them into a database or a compute instance.

The other options are not as suitable for this scenario because:

Storing datasets as files in an Amazon EBS volume attached to an Amazon EC2 instance would limit the scalability and availability of the data, as EBS volumes are only accessible within a single availability zone and have a maximum size of 16 TiB. Also, EBS volumes are more expensive than S3 buckets and require provisioning and managing EC2 instances.

Storing datasets as tables in a multi-node Amazon Redshift cluster would incur higher costs and complexity than using S3 and Athena. Amazon Redshift is a data warehouse service that is optimized for analytical queries over structured or semi-structured data. However, it requires setting up and maintaining a cluster of nodes, loading data into tables, and choosing the right distribution and sort keys for optimal performance. Moreover, Amazon Redshift charges for both storage and compute, while S3 and Athena only charge for the amount of data stored and scanned, respectively.

Storing datasets as global tables in Amazon DynamoDB would not be feasible for large amounts of data, as DynamoDB is a key-value and document database service that is designed for fast and consistent performance at any scale. However, DynamoDB has a limit of 400 KB per item and 25 GB per partition key value, which may not be enough for storing large datasets. Also, DynamoDB does not support SQL queries natively, and would require using a service like Amazon EMR or AWS Glue to run SQL queries over DynamoDB data.

References:

Amazon S3 - Cloud Object Storage

Amazon Athena - Interactive SQL Queries for Data in Amazon S3

Amazon EBS - Amazon Elastic Block Store (EBS)

Amazon Redshift - Data Warehouse Solution - AWS

Amazon DynamoDB - NoSQL Cloud Database Service

NEW QUESTION # 37

An insurance company is developing a new device for vehicles that uses a camera to observe drivers' behavior and alert them when they appear distracted. The company created approximately 10,000 training images in a controlled environment that a Machine Learning Specialist will use to train and evaluate machine learning models. During the model evaluation, the Specialist notices that the training error rate diminishes faster as the number of epochs increases and the model is not accurately inferring on the unseen test images. Which of the following should be used to resolve this issue? (Select TWO)

- A. Add vanishing gradient to the model
- B. Make the neural network architecture complex.
- C. Use gradient checking in the model
- D. Add L2 regularization to the model
- E. Perform data augmentation on the training data

Answer: D,E

Explanation:

The issue described in the question is a sign of overfitting, which is a common problem in machine learning when the model learns the noise and details of the training data too well and fails to generalize to new and unseen data. Overfitting can result in a low training error rate but a high test error rate, which indicates poor performance and validity of the model. There are several techniques that can be used to prevent or reduce overfitting, such as data augmentation and regularization.

Data augmentation is a technique that applies various transformations to the original training data, such as rotation, scaling, cropping, flipping, adding noise, changing brightness, etc., to create new and diverse data samples. Data augmentation can increase the size and diversity of the training data, which can help the model learn more features and patterns and reduce the variance of the model. Data augmentation is especially useful for image data, as it can simulate different scenarios and perspectives that the model may encounter in real life. For example, in the question, the device uses a camera to observe drivers' behavior, so data augmentation can help the model deal with different lighting conditions, angles, distances, etc. Data augmentation can be done using various libraries and frameworks, such as TensorFlow, PyTorch, Keras, OpenCV, etc. Regularization is a technique that adds a penalty term to the model's objective function, which is typically based on the model's parameters. Regularization can reduce the complexity and flexibility of the model, which can prevent overfitting by avoiding learning the noise and details of the training data. Regularization can also improve the stability and robustness of the model, as it can reduce the sensitivity of the model to small fluctuations in the data. There are different types of regularization, such as L1, L2, dropout, etc., but they all have the same goal of reducing overfitting. L2 regularization, also known as weight decay or ridge regression, is one of the most common and effective regularization techniques. L2 regularization adds the squared norm of the model's parameters multiplied by a regularization parameter (λ) to the model's objective function. L2 regularization can shrink the model's parameters towards zero, which can reduce the variance of the model.

and improve the generalization ability of the model. L2 regularization can be implemented using various libraries and frameworks, such as TensorFlow, PyTorch, Keras, Scikit-learn, etc³⁴. The other options are not valid or relevant for resolving the issue of overfitting. Adding vanishing gradient to the model is not a technique, but a problem that occurs when the gradient of the model's objective function becomes very small and the model stops learning. Making the neural network architecture complex is not a solution, but a possible cause of overfitting, as a complex model can have more parameters and more flexibility to fit the training data too well. Using gradient checking in the model is not a technique, but a debugging method that verifies the correctness of the gradient computation in the model. Gradient checking is not related to overfitting, but to the implementation of the model.

NEW QUESTION # 38

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