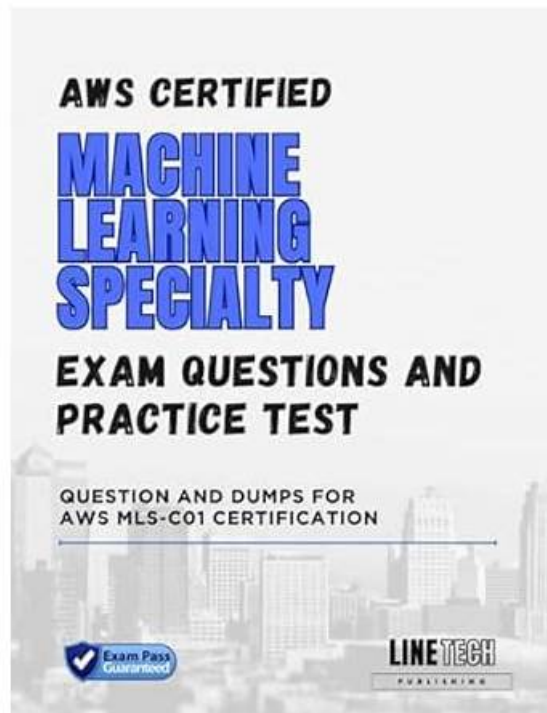


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Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q303-Q308):

NEW QUESTION # 303

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

Answer: B,D

Explanation:

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.¹² 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, etc.³⁴ 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 # 304

A company sells thousands of products on a public website and wants to automatically identify products with potential durability

problems. The company has 1.000 reviews with date, star rating, review text, review summary, and customer email fields, but many reviews are incomplete and have empty fields. Each review has already been labeled with the correct durability result. A machine learning specialist must train a model to identify reviews expressing concerns over product durability. The first model needs to be trained and ready to review in 2 days. What is the MOST direct approach to solve this problem within 2 days?

- A. Train a built-in BlazingText model using Word2Vec mode in Amazon SageMaker.
- **B. Train a custom classifier by using Amazon Comprehend.**
- C. Build a recurrent neural network (RNN) in Amazon SageMaker by using Gluon and Apache MXNet.
- D. Use a built-in seq2seq model in Amazon SageMaker.

Answer: B

Explanation:

The most direct approach to solve this problem within 2 days is to train a custom classifier by using Amazon Comprehend. Amazon Comprehend is a natural language processing (NLP) service that can analyze text and extract insights such as sentiment, entities, topics, and syntax. Amazon Comprehend also provides a custom classification feature that allows users to create and train a custom text classifier using their own labeled data. The custom classifier can then be used to categorize any text document into one or more custom classes. For this use case, the custom classifier can be trained to identify reviews that express concerns over product durability as a class, and use the star rating, review text, and review summary fields as input features. The custom classifier can be created and trained using the Amazon Comprehend console or API, and does not require any coding or machine learning expertise. The training process is fully managed and scalable, and can handle large and complex datasets. The custom classifier can be trained and ready to review in 2 days or less, depending on the size and quality of the dataset.

The other options are not the most direct approaches because:

Option B: Building a recurrent neural network (RNN) in Amazon SageMaker by using Gluon and Apache MXNet is a more complex and time-consuming approach that requires coding and machine learning skills. RNNs are a type of deep learning models that can process sequential data, such as text, and learn long-term dependencies between tokens. Gluon is a high-level API for MXNet that simplifies the development of deep learning models. Amazon SageMaker is a fully managed service that provides tools and frameworks for building, training, and deploying machine learning models. However, to use this approach, the machine learning specialist would have to write custom code to preprocess the data, define the RNN architecture, train the model, and evaluate the results. This would likely take more than 2 days and involve more administrative overhead.

Option C: Training a built-in BlazingText model using Word2Vec mode in Amazon SageMaker is not a suitable approach for text classification. BlazingText is a built-in algorithm in Amazon SageMaker that provides highly optimized implementations of the Word2Vec and text classification algorithms. The Word2Vec algorithm is useful for generating word embeddings, which are dense vector representations of words that capture their semantic and syntactic similarities. However, word embeddings alone are not sufficient for text classification, as they do not account for the context and structure of the text documents. To use this approach, the machine learning specialist would have to combine the word embeddings with another classifier model, such as a logistic regression or a neural network, which would add more complexity and time to the solution.

Option D: Using a built-in seq2seq model in Amazon SageMaker is not a relevant approach for text classification. Seq2seq is a built-in algorithm in Amazon SageMaker that provides a sequence-to-sequence framework for neural machine translation based on MXNet. Seq2seq is a supervised learning algorithm that can generate an output sequence of tokens given an input sequence of tokens, such as translating a sentence from one language to another. However, seq2seq is not designed for text classification, which requires assigning a label or a category to a text document, not generating another text sequence. To use this approach, the machine learning specialist would have to modify the seq2seq algorithm to fit the text classification task, which would be challenging and inefficient.

References:

Custom Classification - Amazon Comprehend

Build a Text Classification Model with Amazon Comprehend - AWS Machine Learning Blog Recurrent Neural Networks - Gluon

API BlazingText Algorithm - Amazon SageMaker Sequence-to-Sequence Algorithm - Amazon SageMaker

NEW QUESTION # 305

A Machine Learning Specialist needs to move and transform data in preparation for training. Some of the data needs to be processed in near-real time and other data can be moved hourly. There are existing Amazon EMR MapReduce jobs to clean and feature engineering to perform on the data. Which of the following services can feed data to the MapReduce jobs? (Select TWO)

- A. AWS DMS
- **B. Amazon Kinesis**
- C. Amazon ES
- **D. AWS Data Pipeline**
- E. Amazon Athena

Answer: B,D

Explanation:

<https://aws.amazon.com/jp/emr/?whats-new-cards.sort-by=item.additionalFields.postDateTime&whats-new-cards.sort-order=desc>

NEW QUESTION # 306

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. 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.
- C. 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.
- 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: B

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.

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

NEW QUESTION # 307

A Machine Learning Specialist is applying a linear least squares regression model to a dataset with 1 000 records and 50 features. Prior to training, the ML Specialist notices that two features are perfectly linearly dependent. Why could this be an issue for the linear least squares regression model?

- A. It could cause the backpropagation algorithm to fail during training
- **B. It could create a singular matrix during optimization which fails to define a unique solution**
- C. It could introduce non-linear dependencies within the data which could invalidate the linear assumptions of the model
- D. It could modify the loss function during optimization causing it to fail during training

Answer: B

Explanation:

Explanation

Linear least squares regression is a method of fitting a linear model to a set of data by minimizing the sum of squared errors between the observed and predicted values. The solution of the linear least squares problem can be obtained by solving the normal equations, which are given by $ATAx=ATb$, where A is the matrix of explanatory variables, b is the vector of response variables, and x is the vector of unknown coefficients.

However, if the matrix A has two features that are perfectly linearly dependent, then the matrix ATA will be singular, meaning that it does not have a unique inverse. This implies that the normal equations do not have a unique solution, and the linear least squares problem is ill-posed. In other words, there are infinitely many values of x that can satisfy the normal equations, and the linear model is not identifiable.

This can be an issue for the linear least squares regression model, as it can lead to instability, inconsistency, and poor generalization of the model. It can also cause numerical difficulties when trying to solve the normal equations using computational methods, such as matrix inversion or decomposition.

Therefore, it is advisable to avoid or remove the linearly dependent features from the matrix A before applying the linear least squares regression model.

References:

Linear least squares (mathematics)

Linear Regression in Matrix Form

Singular Matrix Problem

NEW QUESTION # 308

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Appendix B: Web Resources, Ultimately, iCloud Photo Library will allow Apple users to create a single, online-based photo library, complete with individual Albums, and then be able to organize, manage, and access those Albums from any of their Macs, PCs, or iOS mobile devices.

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