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To be eligible for the MLS-C01 exam, candidates must have a minimum of one year of experience in developing and deploying machine learning solutions on AWS. Additionally, candidates should have a strong understanding of programming languages such as Python, R, and Java, as well as experience with distributed computing and big data technologies such as Apache Hadoop and Apache Spark.

Understanding functional and technical aspects of AWS Certified Machine Learning Specialty Exam Data Engineering

The following will be dicussed here:

- Identify and implement a data-ingestion solution
- Identify and implement a data-transformation solution
- Create data repositories for machine learning

The Amazon AWS-Certified-Machine-Learning-Specialty Exam covers a wide range of topics such as data preparation, feature engineering, modeling, evaluation, and deployment. The candidate is expected to have a deep understanding of the AWS infrastructure and services related to machine learning, such as Amazon SageMaker, Amazon Rekognition, Amazon Comprehend, and Amazon Lex, among others.

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Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q34-Q39):

NEW QUESTION # 34
An ecommerce company sends a weekly email newsletter to all of its customers. Management has hired a team of writers to create additional targeted content. A data scientist needs to identify five customer segments based on age, income, and location. The customers' current segmentation is unknown. The data scientist previously built an XGBoost model to predict the likelihood of a customer responding to an email based on age, income, and location.
Why does the XGBoost model NOT meet the current requirements, and how can this be fixed?

- A. The XGBoost model provides a true/false binary output. Apply principal component analysis (PCA) with five feature dimensions to predict a segment.
- B. The XGBoost model provides a true/false binary output. Increase the number of classes the XGBoost model predicts to five classes to predict a segment.
- C. The XGBoost model is a supervised machine learning algorithm. Train a k-means model with K = 5 on the same dataset to predict a segment.
- D. The XGBoost model is a supervised machine learning algorithm. Train a k-Nearest-Neighbors (kNN) model with K = 5 on the same dataset to predict a segment.

Answer: C

Explanation:
The XGBoost model is a supervised machine learning algorithm, which means it requires labeled data to learn from. The customers' current segmentation is unknown, so there is no label to train the XGBoost model on. Moreover, the XGBoost model is designed for classification or regression tasks, not for clustering.
Clustering is a type of unsupervised machine learning, which means it does not require labeled data.
Clustering algorithms try to find natural groups or clusters in the data based on their similarity or distance. A common clustering algorithm is k-means, which partitions the data into K clusters, where each data point belongs to the cluster with the nearest mean.
To meet the current requirements, the data scientist should train a k-means model with K = 5 on the same dataset to predict a segment for each customer. This way, the data scientist can identify five customer segments based on age, income, and location, without needing any labels. References:
* What is XGBoost? - Amazon SageMaker
* What is Clustering? - Amazon SageMaker
* K-Means Algorithm - Amazon SageMaker

NEW QUESTION # 35
A Data Scientist uses logistic regression to build a fraud detection model. While the model accuracy is 99%, 90% of the fraud cases are not detected by the model.
What action will definitively help the model detect more than 10% of fraud cases?

- A. Using regularization to reduce overfitting
- B. Using oversampling to balance the dataset
- C. Decreasing the class probability threshold
- D. Using undersampling to balance the dataset

Answer: C

Explanation:
Decreasing the class probability threshold makes the model more sensitive and, therefore, marks more cases as the positive class, which is fraud in this case. This will increase the likelihood of fraud detection. However, it comes at the price of lowering precision.

NEW QUESTION # 36
A data scientist is training a text classification model by using the Amazon SageMaker built-in BlazingText algorithm. There are 5 classes in the dataset, with 300 samples for category A, 292 samples for category B, 240 samples for category C, 258 samples for category D, and 310 samples for category E.
The data scientist shuffles the data and splits off 10% for testing. After training the model, the data scientist generates confusion matrices for the training and test sets.

Training data confusion matrix

		Predicted class					
		A	B	C	D	E	Total
True class	A	270	0	0	0	0	270
	B	1	260	0	0	2	263
	C	0	0	111	100	5	216
	D	4	3	132	92	1	232
	E	0	0	2	3	274	279
	Total	275	263	245	195	282	1260

Test data confusion matrix

		Predicted class					
		A	B	C	D	E	Total
True class	A	9	1	0	0	0	10
	B	2	25	0	2	0	29
	C	10	2	11	10	1	34
	D	1	0	12	14	0	27
	E	9	1	4	1	25	40
	Total	31	29	27	27	26	140

What could the data scientist conclude form these results?

- A. Classes C and D are too similar.
- B. The dataset is too small for holdout cross-validation.
- C. The model is overfitting for classes B and E.
- D. The data distribution is skewed.

Answer: C

Explanation:
A confusion matrix is a matrix that summarizes the performance of a machine learning model on a set of test data. It displays the number of true positives (TP), true negatives (TN), false positives (FP), and false negatives (FN) produced by the model on the test data1. For multi-class classification, the matrix shape will be equal to the number of classes i.e for n classes it will be nXn1. The diagonal values represent the number of correct predictions for each class, and the off-diagonal values represent the number of incorrect predictions for each class1.

The BlazingText algorithm is a proprietary machine learning algorithm for forecasting time series using causal convolutional neural networks (CNNs). BlazingText works best with large datasets containing hundreds of time series. It accepts item metadata, and is the only Forecast algorithm that accepts related time series data without future values2.
From the confusion matrices for the training and test sets, we can observe the following:
The model has a high accuracy on the training set, as most of the diagonal values are high and the off-diagonal values are low. This means that the model is able to learn the patterns and features of the training data well.
However, the model has a lower accuracy on the test set, as some of the diagonal values are lower and some of the off-diagonal values are higher. This means that the model is not able to generalize well to the unseen data and makes more errors.
The model has a particularly high error rate for classes B and E on the test set, as the values of M_22 and M_55 are much lower than the values of M_12, M_21, M_15, M_25, M_51, and M_52. This means that the model is confusing classes B and E with other classes more often than it should.
The model has a relatively low error rate for classes A, C, and D on the test set, as the values of M_11, M_33, and M_44 are high and the values of M_13, M_14, M_23, M_24, M_31, M_32, M_34, M_41, M_42, and M_43 are low. This means that the model is able to distinguish classes A, C, and D from other classes well.
These results indicate that the model is overfitting for classes B and E, meaning that it is memorizing the specific features of these classes in the training data, but failing to capture the general features that are applicable to the test data. Overfitting is a common problem in machine learning, where the model performs well on the training data, but poorly on the test data3. Some possible causes of overfitting are:
The model is too complex or has too many parameters for the given data. This makes the model flexible enough to fit the noise and outliers in the training data, but reduces its ability to generalize to new data.
The data is too small or not representative of the population. This makes the model learn from a limited or biased sample of data, but fails to capture the variability and diversity of the population.
The data is imbalanced or skewed. This makes the model learn from a disproportionate or uneven distribution of data, but fails to account for the minority or rare classes.
Some possible solutions to prevent or reduce overfitting are:
Simplify the model or use regularization techniques. This reduces the complexity or the number of parameters of the model, and prevents it from fitting the noise and outliers in the data. Regularization techniques, such as L1 or L2 regularization, add a penalty term to the loss function of the model, which shrinks the weights of the model and reduces overfitting3.
Increase the size or diversity of the data. This provides more information and examples for the model to learn from, and increases its ability to generalize to new data. Data augmentation techniques, such as rotation, flipping, cropping, or noise addition, can generate new data from the existing data by applying some transformations3.
Balance or resample the data. This adjusts the distribution or the frequency of the data, and ensures that the model learns from all classes equally. Resampling techniques, such as oversampling or undersampling, can create a balanced dataset by increasing or decreasing the number of samples for each class3.
References:
Confusion Matrix in Machine Learning - GeeksforGeeks
BlazingText algorithm - Amazon SageMaker
Overfitting and Underfitting in Machine Learning - GeeksforGeeks

NEW QUESTION # 37
A machine learning (ML) specialist is using Amazon SageMaker hyperparameter optimization (HPO) to improve a model's accuracy. The learning rate parameter is specified in the following HPO configuration:
During the results analysis, the ML specialist determines that most of the training jobs had a learning rate between 0.01 and 0.1. The best result had a learning rate of less than 0.01. Training jobs need to run regularly over a changing dataset. The ML specialist needs to find a tuning mechanism that uses different learning rates more evenly from the provided range between MinValue and MaxValue.
Which solution provides the MOST accurate result?

- A. Run three different HPO jobs that use different learning rates form the following intervals for MinValue and MaxValue. Divide the number of training jobs for each HPO job by three:
  [0.01, 0.1]
  [0.001, 0.01]
  [0.0001, 0.001]
  Select the most accurate hyperparameter configuration form these three HPO jobs.
- B. Modify the HPO configuration as follows:
  Select the most accurate hyperparameter configuration form this HPO job.
- C. Run three different HPO jobs that use different learning rates form the following intervals for MinValue and MaxValue while using the same number of training jobs for each HPO job:
  [0.01, 0.1]
  [0.001, 0.01]

[0.0001, 0.001]
Select the most accurate hyperparameter configuration form these three HPO jobs.

- D. Modify the HPO configuration as follows:
  Select the most accurate hyperparameter configuration form this training job.

Answer: D

Explanation:
The solution C modifies the HPO configuration to use a logarithmic scale for the learning rate parameter. This means that the values of the learning rate are sampled from a log-uniform distribution, which gives more weight to smaller values. This can help to explore the lower end of the range more evenly and find the optimal learning rate more efficiently. The other solutions either use a linear scale, which may not sample enough values from the lower end, or divide the range into sub-intervals, which may miss some combinations of hyperparameters. References:
* How Hyperparameter Tuning Works - Amazon SageMaker
* Tuning Hyperparameters - Amazon SageMaker

NEW QUESTION # 38
A company is running a machine learning prediction service that generates 100 TB of predictions every day A Machine Learning Specialist must generate a visualization of the daily precision-recall curve from the predictions, and forward a read-only version to the Business team.
Which solution requires the LEAST coding effort?

- A. Run a daily Amazon EMR workflow to generate precision-recall data, and save the results in Amazon S3 Visualize the arrays in Amazon QuickSight, and publish them in a dashboard shared with the Business team
- B. Run a daily Amazon EMR workflow to generate precision-recall data, and save the results in Amazon S3 Give the Business team read-only access to S3
- C. Generate daily precision-recall data in Amazon ES, and publish the results in a dashboard shared with the Business team.
- D. Generate daily precision-recall data in Amazon QuickSight, and publish the results in a dashboard shared with the Business team

Answer: A

Explanation:
A precision-recall curve is a plot that shows the trade-off between the precision and recall of a binary classifier as the decision threshold is varied. It is a useful tool for evaluating and comparing the performance of different models. To generate a precision-recall curve, the following steps are needed:
* Calculate the precision and recall values for different threshold values using the predictions and the true labels of the data.
* Plot the precision values on the y-axis and the recall values on the x-axis for each threshold value.
* Optionally, calculate the area under the curve (AUC) as a summary metric of the model performance.
Among the four options, option C requires the least coding effort to generate and share a visualization of the daily precision-recall curve from the predictions. This option involves the following steps:
* Run a daily Amazon EMR workflow to generate precision-recall data: Amazon EMR is a service that allows running big data frameworks, such as Apache Spark, on a managed cluster of EC2 instances.
Amazon EMR can handle large-scale data processing and analysis, such as calculating the precision and recall values for different threshold values from 100 TB of predictions. Amazon EMR supports various languages, such as Python, Scala, and R, for writing the code to perform the calculations. Amazon EMR also supports scheduling workflows using Apache Airflow or AWS Step Functions, which can automate the daily execution of the code.
* Save the results in Amazon S3: Amazon S3 is a service that provides scalable, durable, and secure object storage. Amazon S3 can store the precision-recall data generated by Amazon EMR in a cost- effective and accessible way. Amazon S3 supports various data formats, such as CSV, JSON, or Parquet, for storing the data. Amazon S3 also integrates with other AWS services, such as Amazon QuickSight, for further processing and visualization of the data.
* Visualize the arrays in Amazon QuickSight: Amazon QuickSight is a service that provides fast, easy-to- use, and interactive business intelligence and data visualization. Amazon QuickSight can connect to Amazon S3 as a data source and import the precision-recall data into a dataset. Amazon QuickSight can then create a line chart to plot the precision-recall curve from the dataset. Amazon QuickSight also supports calculating the AUC and adding it as an annotation to the chart.
* Publish them in a dashboard shared with the Business team: Amazon QuickSight allows creating and publishing dashboards that contain one or more visualizations from the datasets. Amazon QuickSight also allows sharing the dashboards with other users or groups within the same AWS account or across different AWS accounts. The Business team can access the dashboard with read-only permissions and view the daily precision-recall curve from the predictions.
The other options require more coding effort than option C for the following reasons:

* Option A: This option requires writing code to plot the precision-recall curve from the data stored in Amazon S3, as well as creating a mechanism to share the plot with the Business team. This can involve using additional libraries or tools, such as matplotlib, seaborn, or plotly, for creating the plot, and using email, web, or cloud services, such as AWS Lambda or Amazon SNS, for sharing the plot.
* Option B: This option requires transforming the predictions into a format that Amazon QuickSight can recognize and import as a data source, such as CSV, JSON, or Parquet. This can involve writing code to process and convert the predictions, as well as uploading them to a storage service, such as Amazon S3 or Amazon Redshift, that Amazon QuickSight can connect to.
* Option D: This option requires writing code to generate precision-recall data in Amazon ES, as well as creating a dashboard to visualize the data. Amazon ES is a service that provides a fully managed Elasticsearch cluster, which is mainly used for search and analytics purposes. Amazon ES is not designed for generating precision-recall data, and it requires using a specific data format, such as JSON, for storing the data. Amazon ES also requires using a tool, such as Kibana, for creating and sharing the dashboard, which can involve additional configuration and customization steps.
Precision-Recall
What Is Amazon EMR?
What Is Amazon S3?
[What Is Amazon QuickSight?]
[What Is Amazon Elasticsearch Service?]

NEW QUESTION # 39
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