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Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q91-Q96):

NEW QUESTION # 91

A Data Scientist is training a multilayer perception (MLP) on a dataset with multiple classes. The target class of interest is unique

compared to the other classes within the dataset, but it does not achieve an acceptable recall metric. The Data Scientist has already tried varying the number and size of the MLP's hidden layers, which has not significantly improved the results. A solution to improve recall must be implemented as quickly as possible.

Which techniques should be used to meet these requirements?

- A. Train an XGBoost model instead of an MLP
- B. Gather more data using Amazon Mechanical Turk and then retrain
- C. Train an anomaly detection model instead of an MLP
- **D. Add class weights to the MLP's loss function and then retrain**

Answer: D

Explanation:

The best technique to improve the recall of the MLP for the target class of interest is to add class weights to the MLP's loss function and then retrain. Class weights are a way of assigning different importance to each class in the dataset, such that the model will pay more attention to the classes with higher weights. This can help mitigate the class imbalance problem, where the model tends to favor the majority class and ignore the minority class. By increasing the weight of the target class of interest, the model will try to reduce the false negatives and increase the true positives, which will improve the recall metric. Adding class weights to the loss function is also a quick and easy solution, as it does not require gathering more data, changing the model architecture, or switching to a different algorithm.

References:

AWS Machine Learning Specialty Exam Guide

AWS Machine Learning Training - Deep Learning with Amazon SageMaker

AWS Machine Learning Training - Class Imbalance and Weighted Loss Functions

NEW QUESTION # 92

A Data Scientist is developing a machine learning model to classify whether a financial transaction is fraudulent. The labeled data available for training consists of 100,000 non-fraudulent observations and 1,000 fraudulent observations.

The Data Scientist applies the XGBoost algorithm to the data, resulting in the following confusion matrix when the trained model is applied to a previously unseen validation dataset. The accuracy of the model is 99.1%, but the Data Scientist needs to reduce the number of false negatives.

Predicted \ Actual	0	1
0	99,966	34
1	877	123

Which combination of steps should the Data Scientist take to reduce the number of false negative predictions by the model? (Choose two.)

- **A. Change the XGBoost eval_metric parameter to optimize based on Area Under the ROC Curve (AUC).**
- B. Increase the XGBoost max_depth parameter because the model is currently underfitting the data.
- C. Decrease the XGBoost max_depth parameter because the model is currently overfitting the data.
- **D. Increase the XGBoost scale_pos_weight parameter to adjust the balance of positive and negative weights.**
- E. Change the XGBoost eval_metric parameter to optimize based on Root Mean Square Error (RMSE).

Answer: A,D

Explanation:

The Data Scientist should increase the XGBoost scale_pos_weight parameter to adjust the balance of positive and negative weights and change the XGBoost eval_metric parameter to optimize based on Area Under the ROC Curve (AUC). This will help reduce the number of false negative predictions by the model.

The scale_pos_weight parameter controls the balance of positive and negative weights in the XGBoost algorithm. It is useful for imbalanced classification problems, such as fraud detection, where the number of positive examples (fraudulent transactions) is much smaller than the number of negative examples (non-fraudulent transactions). By increasing the scale_pos_weight parameter, the Data Scientist can assign more weight to the positive class and make the model more sensitive to detecting fraudulent transactions.

The eval_metric parameter specifies the metric that is used to measure the performance of the model during training and validation. The default metric for binary classification problems is the error rate, which is the fraction of incorrect predictions. However, the error rate is not a good metric for imbalanced classification problems, because it does not take into account the cost of different types of errors. For example, in fraud detection, a false negative (failing to detect a fraudulent transaction) is more costly than a false positive (flagging a non-fraudulent transaction as fraudulent). Therefore, the Data Scientist should use a metric that reflects the trade-off between the true positive rate (TPR) and the false positive rate (FPR), such as the Area Under the ROC Curve (AUC). The AUC is a measure of how well the model can distinguish between the positive and negative classes, regardless of the classification

threshold. A higher AUC means that the model can achieve a higher TPR with a lower FPR, which is desirable for fraud detection.
References:

- * XGBoost Parameters - Amazon Machine Learning
- * Using XGBoost with Amazon SageMaker - AWS Machine Learning Blog

NEW QUESTION # 93

A Machine Learning Specialist is configuring automatic model tuning in Amazon SageMaker. When using the hyperparameter optimization feature, which of the following guidelines should be followed to improve optimization?
Choose the maximum number of hyperparameters supported by

- A. Specify a very large hyperparameter range to allow Amazon SageMaker to cover every possible value.
- **B. Use log-scaled hyperparameters to allow the hyperparameter space to be searched as quickly as possible**
- C. Execute only one hyperparameter tuning job at a time and improve tuning through successive rounds of experiments
- D. Amazon SageMaker to search the largest number of combinations possible

Answer: B

Explanation:

Explanation

Using log-scaled hyperparameters is a guideline that can improve the automatic model tuning in Amazon SageMaker. Log-scaled hyperparameters are hyperparameters that have values that span several orders of magnitude, such as learning rate, regularization parameter, or number of hidden units. Log-scaled hyperparameters can be specified by using a log-uniform distribution, which assigns equal probability to each order of magnitude within a range. For example, a log-uniform distribution between 0.001 and 1000 can sample values such as 0.001, 0.01, 0.1, 1, 10, 100, or 1000 with equal probability. Using log-scaled hyperparameters can allow the hyperparameter optimization feature to search the hyperparameter space more efficiently and effectively, as it can explore different scales of values and avoid sampling values that are too small or too large. Using log-scaled hyperparameters can also help avoid numerical issues, such as underflow or overflow, that may occur when using linear-scaled hyperparameters. Using log-scaled hyperparameters can be done by setting the `ScalingType` parameter to `Logarithmic` when defining the hyperparameter ranges in Amazon SageMaker^{1,2}. The other options are not valid or relevant guidelines for improving the automatic model tuning in Amazon SageMaker. Choosing the maximum number of hyperparameters supported by Amazon SageMaker to search the largest number of combinations possible is not a good practice, as it can increase the time and cost of the tuning job and make it harder to find the optimal values. Amazon SageMaker supports up to 20 hyperparameters for tuning, but it is recommended to choose only the most important and influential hyperparameters for the model and algorithm, and use default or fixed values for the rest³. Specifying a very large hyperparameter range to allow Amazon SageMaker to cover every possible value is not a good practice, as it can result in sampling values that are irrelevant or impractical for the model and algorithm, and waste the tuning budget. It is recommended to specify a reasonable and realistic hyperparameter range based on the prior knowledge and experience of the model and algorithm, and use the results of the tuning job to refine the range if needed⁴. Executing only one hyperparameter tuning job at a time and improving tuning through successive rounds of experiments is not a good practice, as it can limit the exploration and exploitation of the hyperparameter space and make the tuning process slower and less efficient. It is recommended to use parallelism and concurrency to run multiple training jobs simultaneously and leverage the Bayesian optimization algorithm that Amazon SageMaker uses to guide the search for the best hyperparameter values⁵.

NEW QUESTION # 94

A company provisions Amazon SageMaker notebook instances for its data science team and creates Amazon VPC interface endpoints to ensure communication between the VPC and the notebook instances. All connections to the Amazon SageMaker API are contained entirely and securely using the AWS network. However, the data science team realizes that individuals outside the VPC can still connect to the notebook instances across the internet.

Which set of actions should the data science team take to fix the issue?

- A. Change the network ACL of the subnet the notebook is hosted in to restrict access to anyone outside the VPC.
- **B. Modify the notebook instances' security group to allow traffic only from the CIDR ranges of the VPC. Apply this security group to all of the notebook instances' VPC interfaces.**
- C. Create an IAM policy that allows the `sagemaker:CreatePresignedNotebookInstanceUrl` and `sagemaker:DescribeNotebookInstance` actions from only the VPC endpoints. Apply this policy to all IAM users, groups, and roles used to access the notebook instances.
- D. Add a NAT gateway to the VPC. Convert all of the subnets where the Amazon SageMaker notebook instances are hosted to private subnets. Stop and start all of the notebook instances to reassign only private IP addresses.

Answer: B

Explanation:

The issue is that the notebook instances' security group allows inbound traffic from any source IP address, which means that anyone with the authorized URL can access the notebook instances over the internet. To fix this issue, the data science team should modify the security group to allow traffic only from the CIDR ranges of the VPC, which are the IP addresses assigned to the resources within the VPC. This way, only the VPC interface endpoints and the resources within the VPC can communicate with the notebook instances. The data science team should apply this security group to all of the notebook instances' VPC interfaces, which are the network interfaces that connect the notebook instances to the VPC.

The other options are not correct because:

Option B: Creating an IAM policy that allows the `sagemaker:CreatePresignedNotebookInstanceUrl` and `sagemaker:DescribeNotebookInstance` actions from only the VPC endpoints does not prevent individuals outside the VPC from accessing the notebook instances. These actions are used to generate and retrieve the authorized URL for the notebook instances, but they do not control who can use the URL to access the notebook instances. The URL can still be shared or leaked to unauthorized users, who can then access the notebook instances over the internet.

Option C: Adding a NAT gateway to the VPC and converting the subnets where the notebook instances are hosted to private subnets does not solve the issue either. A NAT gateway is used to enable outbound internet access from a private subnet, but it does not affect inbound internet access. The notebook instances can still be accessed over the internet if their security group allows inbound traffic from any source IP address. Moreover, stopping and starting the notebook instances to reassign only private IP addresses is not necessary, because the notebook instances already have private IP addresses assigned by the VPC interface endpoints.

Option D: Changing the network ACL of the subnet the notebook is hosted in to restrict access to anyone outside the VPC is not a good practice, because network ACLs are stateless and apply to the entire subnet. This means that the data science team would have to specify both the inbound and outbound rules for each IP address range that they want to allow or deny. This can be cumbersome and error-prone, especially if the VPC has multiple subnets and resources. It is better to use security groups, which are stateful and apply to individual resources, to control the access to the notebook instances.

References:

Connect to SageMaker Within your VPC - Amazon SageMaker

Security Groups for Your VPC - Amazon Virtual Private Cloud

VPC Interface Endpoints - Amazon Virtual Private Cloud

NEW QUESTION # 95

A financial services company wants to automate its loan approval process by building a machine learning (ML) model. Each loan data point contains credit history from a third-party data source and demographic information about the customer. Each loan approval prediction must come with a report that contains an explanation for why the customer was approved for a loan or was denied for a loan. The company will use Amazon SageMaker to build the model.

Which solution will meet these requirements with the LEAST development effort?

- A. Use AWS Lambda to provide feature importance and partial dependence plots. Use the plots to generate and attach the explanation report.
- **B. Use SageMaker Clarify to generate the explanation report. Attach the report to the predicted results.**
- C. Use SageMaker Model Debugger to automatically debug the predictions, generate the explanation, and attach the explanation report.
- D. Use custom Amazon Cloud Watch metrics to generate the explanation report. Attach the report to the predicted results.

Answer: B

Explanation:

Explanation

The best solution for this scenario is to use SageMaker Clarify to generate the explanation report and attach it to the predicted results. SageMaker Clarify provides tools to help explain how machine learning (ML) models make predictions using a model-agnostic feature attribution approach based on SHAP values. It can also detect and measure potential bias in the data and the model. SageMaker Clarify can generate explanation reports during data preparation, model training, and model deployment. The reports include metrics, graphs, and examples that help understand the model behavior and predictions. The reports can be attached to the predicted results using the SageMaker SDK or the SageMaker API.

The other solutions are less optimal because they require more development effort and additional services.

Using SageMaker Model Debugger would require modifying the training script to save the model output tensors and writing custom rules to debug and explain the predictions. Using AWS Lambda would require writing code to invoke the ML model, compute the feature importance and partial dependence plots, and generate and attach the explanation report. Using custom Amazon CloudWatch metrics would require writing code to publish the metrics, create dashboards, and generate and attach the explanation report.

References:

Bias Detection and Model Explainability - Amazon SageMaker Clarify - AWS Amazon SageMaker Clarify Model Explainability
Amazon SageMaker Clarify: Machine Learning Bias Detection and Explainability GitHub - aws/amazon-sagemaker-clarify: Fairness
Aware Machine Learning

NEW QUESTION # 96

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