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Google Professional Machine Learning Engineer Sample Questions (Q34-Q39):

NEW QUESTION # 34

You were asked to investigate failures of a production line component based on sensor readings. After receiving the dataset, you discover that less than 1% of the readings are positive examples representing failure incidents. You have tried to train several classification models, but none of them converge. How should you resolve the class imbalance problem?

- A. Downsample the data with upweighting to create a sample with 10% positive examples
- B. Remove negative examples until the numbers of positive and negative examples are equal
- C. Use the class distribution to generate 10% positive examples
- D. Use a convolutional neural network with max pooling and softmax activation

Answer: A

Explanation:

The class imbalance problem is a common challenge in machine learning, especially in classification tasks. It occurs when the distribution of the target classes is highly skewed, such that one class (the majority class) has much more examples than the other class (the minority class). The minority class is often the more interesting or important class, such as failure incidents, fraud cases, or rare diseases. However, most machine learning algorithms are designed to optimize the overall accuracy, which can be biased towards the majority class and ignore the minority class. This can result in poor predictive performance, especially for the minority class.

There are different techniques to deal with the class imbalance problem, such as data-level methods, algorithm-level methods, and evaluation-level methods¹. Data-level methods involve resampling the original dataset to create a more balanced class distribution. There are two main types of data-level methods:

oversampling and undersampling. Oversampling methods increase the number of examples in the minority class, either by duplicating existing examples or by generating synthetic examples. Undersampling methods reduce the number of examples in the majority class, either by randomly removing examples or by using clustering or other criteria to select representative examples. Both oversampling and undersampling methods can be combined with upweighting or downweighting, which assign different weights to the examples according to their class frequency, to further balance the dataset.

For the use case of investigating failures of a production line component based on sensor readings, the best option is to downsample the data with upweighting to create a sample with 10% positive examples. This option involves randomly removing some of the negative examples (the majority class) until the ratio of positive to negative examples is 1:9, and then assigning higher weights to the positive examples to compensate for their low frequency. This option can create a more balanced dataset that can improve the performance of the classification models, while preserving the diversity and representativeness of the original data. This option can also reduce the computation time and memory usage, as the size of the dataset is reduced.

Therefore, downsampling the data with upweighting to create a sample with 10% positive examples is the best option for this use case.

References:

* A Systematic Study of the Class Imbalance Problem in Convolutional Neural Networks

NEW QUESTION # 35

You need to build classification workflows over several structured datasets currently stored in BigQuery.

Because you will be performing the classification several times, you want to complete the following steps without writing code: exploratory data analysis, feature selection, model building, training, and hyperparameter tuning and serving. What should you do?

- A. Run a BigQuery ML task to perform logistic regression for the classification
- B. Use AI Platform to run the classification model job configured for hyperparameter tuning
- C. Configure AutoML Tables to perform the classification task
- D. Use AI Platform Notebooks to run the classification model with pandas library

Answer: C

Explanation:

AutoML Tables is a service that allows you to automatically build and deploy state-of-the-art machine learning models on structured data without writing code. You can use AutoML Tables to perform the following steps for the classification task:

* Exploratory data analysis: AutoML Tables provides a graphical user interface (GUI) and a command-line interface (CLI) to explore your data, visualize statistics, and identify potential issues.

* Feature selection: AutoML Tables automatically selects the most relevant features for your model based on the data schema and the target column. You can also manually exclude or include features, or create new features from existing ones using feature

engineering.

* **Model building:** AutoML Tables automatically builds and evaluates multiple machine learning models using different algorithms and architectures. You can also specify the optimization objective, the budget, and the evaluation metric for your model.

* **Training and hyperparameter tuning:** AutoML Tables automatically trains and tunes your model using the best practices and techniques from Google's research and engineering teams. You can monitor the training progress and the performance of your model on the GUI or the CLI.

* **Serving:** AutoML Tables automatically deploys your model to a fully managed, scalable, and secure environment. You can use the GUI or the CLI to request predictions from your model, either online

* (synchronously) or offline (asynchronously).

References:

* [AutoML Tables documentation]

* [AutoML Tables overview]

* [AutoML Tables how-to guides]

NEW QUESTION # 36

You are an ML engineer at a global car manufacturer. You need to build an ML model to predict car sales in different cities around the world. Which features or feature crosses should you use to train city-specific relationships between car type and number of sales?

- A. Two feature crosses as a element-wise product the first between binned latitude and one-hot encoded car type, and the second between binned longitude and one-hot encoded car type
- B. Three individual features binned latitude, binned longitude, and one-hot encoded car type
- **C. One feature obtained as an element-wise product between binned latitude, binned longitude, and one-hot encoded car type**
- D. One feature obtained as an element-wise product between latitude, longitude, and car type

Answer: C

Explanation:

A feature cross is a synthetic feature that is obtained by combining two or more existing features, usually by taking their product or concatenation. A feature cross can help to capture the nonlinear and interaction effects between the original features, and improve the predictive performance of the model. A feature cross can be applied to different types of features, such as numeric, categorical, or geospatial features 1 .

For the use case of building an ML model to predict car sales in different cities around the world, the best option is to use one feature obtained as an element-wise product between binned latitude, binned longitude, and one-hot encoded car type. This option involves creating a feature cross that combines three individual features: binned latitude, binned longitude, and one-hot encoded car type. Binning is a technique that transforms a continuous numeric feature into a discrete categorical feature by dividing its range into equal intervals, or bins. One-hot encoding is a technique that transforms a categorical feature into a binary vector, where each element corresponds to a possible category, and has a value of 1 if the feature belongs to that category, and 0 otherwise. By applying binning and one-hot encoding to the latitude, longitude, and car type features, the feature cross can capture the city-specific relationships between car type and number of sales, as each combination of bins and car types can represent a different city and its preference for a certain car type.

For example, the feature cross can learn that a city with a latitude bin of [40, 50], a longitude bin of [-80, -70], and a car type of SUV has a higher number of sales than a city with a latitude bin of [-10, 0], a longitude bin of [10, 20], and a car type of sedan. Therefore, using one feature obtained as an element-wise product between binned latitude, binned longitude, and one-hot encoded car type is the best option for this use case.

References:

Feature Crosses | Machine Learning Crash Course

NEW QUESTION # 37

A Machine Learning Specialist uploads a dataset to an Amazon S3 bucket protected with server-side encryption using AWS KMS. How should the ML Specialist define the Amazon SageMaker notebook instance so it can read the same dataset from Amazon S3?

- A. Define security group(s) to allow all HTTP inbound/outbound traffic and assign those security group(s) to the Amazon SageMaker notebook instance.
- **B. Assign the same KMS key used to encrypt data in Amazon S3 to the Amazon SageMaker notebook instance.**
- C. Configure the Amazon SageMaker notebook instance to have access to the VPC. Grant permission in the KMS key policy to the notebook's KMS role.

- D. Assign an IAM role to the Amazon SageMaker notebook with S3 read access to the dataset. Grant permission in the KMS key policy to that role.

Answer: B

Explanation:

Explanation/Reference: <https://docs.aws.amazon.com/sagemaker/latest/dg/encryption-at-rest.html>

NEW QUESTION # 38

You have trained a DNN regressor with TensorFlow to predict housing prices using a set of predictive features. Your default precision is `tf.float64`, and you use a standard TensorFlow estimator; `estimator = tf.estimator.DNNRegressor(feature_columns=[YOUR_LIST_OF_FEATURES], hidden_units=[1024, 512, 256], dropout=None)` Your model performs well, but Just before deploying it to production, you discover that your current serving latency is 10ms @ 90 percentile and you currently serve on CPUs. Your production requirements expect a model latency of 8ms @ 90 percentile. You are willing to accept a small decrease in performance in order to reach the latency requirement Therefore your plan is to improve latency while evaluating how much the model's prediction decreases. What should you first try to quickly lower the serving latency?

- A. Switch from CPU to GPU serving
- **B. Apply quantization to your SavedModel by reducing the floating point precision to `tf.float16`.**
- C. Increase the dropout rate to 0.8 and retrain your model.
- D. Increase the dropout rate to 0.8 in `_PREDICT` mode by adjusting the TensorFlow Serving parameters

Answer: B

Explanation:

* Quantization is a technique that reduces the numerical precision of the weights and activations of a neural network, which can improve the inference speed and reduce the memory footprint of the model.

* Reducing the floating point precision from `tf.float64` to `tf.float16` can potentially halve the latency and

* memory usage of the model, while having minimal impact on the accuracy.

* Increasing the dropout rate to 0.8 in either mode would not affect the latency, but would likely degrade the performance of the model significantly, as dropout is a regularization technique that randomly drops out units during training to prevent overfitting.

* Switching from CPU to GPU serving may or may not improve the latency, depending on the hardware specifications and the model complexity, but it would also incur additional costs and complexity for deployment.

NEW QUESTION # 39

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