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Google Professional Machine Learning Engineer Sample Questions (Q91-Q96):

NEW QUESTION # 91

You have been asked to develop an input pipeline for an ML training model that processes images from disparate sources at a low latency. You discover that your input data does not fit in memory. How should you create a dataset following Google-recommended

best practices?

- A. Convert the images to tf.Tensor Objects, and then run Dataset.from_tensor_slices().
- B. Create a tf.data.Dataset.prefetch transformation
- C. Convert the images to tf.Tensor Objects, and then run tf.data.Dataset.from_tensors().
- **D. Convert the images Into TFRecords, store the images in Cloud Storage, and then use the tf.data API to read the images for training**

Answer: D

Explanation:

An input pipeline is a way to prepare and feed data to a machine learning model for training or inference. An input pipeline typically consists of several steps, such as reading, parsing, transforming, batching, and prefetching the data. An input pipeline can improve the performance and efficiency of the model, as it can handle large and complex datasets, optimize the data processing, and reduce the latency and memory usage¹.

For the use case of developing an input pipeline for an ML training model that processes images from disparate sources at a low latency, the best option is to convert the images into TFRecords, store the images in Cloud Storage, and then use the tf.data API to read the images for training. This option involves using the following components and techniques:

TFRecords: TFRecords is a binary file format that can store a sequence of data records, such as images, text, or audio. TFRecords can help to compress, serialize, and store the data efficiently, and reduce the data loading and parsing time. TFRecords can also support data sharding and interleaving, which can improve the data throughput and parallelism².

Cloud Storage: Cloud Storage is a service that allows you to store and access data on Google Cloud. Cloud Storage can help to store and manage large and distributed datasets, such as images from different sources, and provide high availability, durability, and scalability. Cloud Storage can also integrate with other Google Cloud services, such as Compute Engine, AI Platform, and Dataflow³.

tf.data API: tf.data API is a set of tools and methods that allow you to create and manipulate data pipelines in TensorFlow. tf.data API can help to read, transform, batch, and prefetch the data efficiently, and optimize the data processing for performance and memory. tf.data API can also support various data sources and formats, such as TFRecords, CSV, JSON, and images.

By using these components and techniques, the input pipeline can process large datasets of images from disparate sources that do not fit in memory, and provide low latency and high performance for the ML training model. Therefore, converting the images into TFRecords, storing the images in Cloud Storage, and using the tf.data API to read the images for training is the best option for this use case.

Reference:

[Build TensorFlow input pipelines | TensorFlow Core](#)

[TFRecord and tf.Example | TensorFlow Core](#)

[Cloud Storage documentation | Google Cloud](#)

[\[tf.data: Build TensorFlow input pipelines | TensorFlow Core\]](#)

NEW QUESTION # 92

You work on an operations team at an international company that manages a large fleet of on-premises servers located in few data centers around the world. Your team collects monitoring data from the servers, including CPU/memory consumption. When an incident occurs on a server, your team is responsible for fixing it.

Incident data has not been properly labeled yet. Your management team wants you to build a predictive maintenance solution that uses monitoring data from the VMs to detect potential failures and then alerts the service desk team. What should you do first?

- **A. Implement a simple heuristic (e.g., based on z-score) to label the machines' historical performance data. Train a model to predict anomalies based on this labeled dataset.**
- B. Train a time-series model to predict the machines' performance values. Configure an alert if a machine's actual performance values significantly differ from the predicted performance values.
- C. Hire a team of qualified analysts to review and label the machines' historical performance data. Train a model based on this manually labeled dataset.
- D. Develop a simple heuristic (e.g., based on z-score) to label the machines' historical performance data. Test this heuristic in a production environment.

Answer: A

Explanation:

* Option A is incorrect because training a time-series model to predict the machines' performance values, and configuring an alert if a machine's actual performance values significantly differ from the predicted performance values, is not the best way to build a predictive maintenance solution that uses monitoring data from the VMs to detect potential failures and then alerts the service desk

team. This option assumes that the performance values follow a predictable pattern, which may not be the case for complex systems. Moreover, this option does not use any historical incident data, which may contain useful information for identifying failures. Furthermore, this option does not involve any model evaluation or validation, which are essential steps for ensuring the quality and reliability of the model.

* Option B is correct because implementing a simple heuristic (e.g., based on z-score) to label the machines' historical performance data, and training a model to predict anomalies based on this labeled dataset, is a reasonable way to build a predictive maintenance solution that uses monitoring data from the VMs to detect potential failures and then alerts the service desk team. This option uses a simple and fast method to label the historical performance data, which is necessary for supervised learning. A z-score is a measure of how many standard deviations a value is away from the mean of a distribution¹.

By using a z-score, we can label the performance values that are unusually high or low as anomalies, which may indicate failures. Then, we can train a model to learn the patterns of normal and anomalous performance values, and use it to predict anomalies on new data. We can also evaluate and validate the model using metrics such as precision, recall, or F1-score, and compare it with other models or methods.

* Option C is incorrect because developing a simple heuristic (e.g., based on z-score) to label the machines' historical performance data, and testing this heuristic in a production environment, is not a safe way to build a predictive maintenance solution that uses monitoring data from the VMs to detect potential failures and then alerts the service desk team. This option does not involve any model training or evaluation, which are essential steps for ensuring the quality and reliability of the solution. Moreover, this option does not test the heuristic on a separate dataset, such as a validation or test set, before deploying it to production, which may lead to errors or failures in the production environment.

* Option D is incorrect because hiring a team of qualified analysts to review and label the machines' historical performance data, and training a model based on this manually labeled dataset, is not a feasible way to build a predictive maintenance solution that uses monitoring data from the VMs to detect potential failures and then alerts the service desk team. This option may produce high-quality labels, but it is also costly, time-consuming, and prone to human errors or biases. Moreover, this option may not scale well with large or complex datasets, which may require more analysts or more time to label.

References:

- * Z-score
- * [Predictive maintenance]
- * [Anomaly detection]
- * [Time-series analysis]
- * [Model evaluation]

NEW QUESTION # 93

You are training an ML model using data stored in BigQuery that contains several values that are considered Personally Identifiable Information (PII). You need to reduce the sensitivity of the dataset before training your model. Every column is critical to your model. How should you proceed?

- **A. Use the Cloud Data Loss Prevention (DLP) API to scan for sensitive data, and use Dataflow with the DLP API to encrypt sensitive values with Format Preserving Encryption**
- B. Before training, use BigQuery to select only the columns that do not contain sensitive data. Create an authorized view of the data so that sensitive values cannot be accessed by unauthorized individuals.
- C. Using Dataflow, ingest the columns with sensitive data from BigQuery, and then randomize the values in each sensitive column.
- D. Use the Cloud Data Loss Prevention (DLP) API to scan for sensitive data, and use Dataflow to replace all sensitive data by using the encryption algorithm AES-256 with a salt.

Answer: A

Explanation:

The best option for reducing the sensitivity of the dataset before training the model is to use the Cloud Data Loss Prevention (DLP) API to scan for sensitive data, and use Dataflow with the DLP API to encrypt sensitive values with Format Preserving Encryption. This option allows you to keep every column in the dataset, while protecting the sensitive data from unauthorized access or exposure. The Cloud DLP API can detect and classify various types of sensitive data, such as names, email addresses, phone numbers, credit card numbers, and more¹. Dataflow can create scalable and reliable pipelines to process large volumes of data from BigQuery and other sources². Format Preserving Encryption (FPE) is a technique that encrypts sensitive data while preserving its original format and length, which can help maintain the utility and validity of the data³.

By using Dataflow with the DLP API, you can apply FPE to the sensitive values in the dataset, and store the encrypted data in BigQuery or another destination. You can also use the same pipeline to decrypt the data when needed, by using the same encryption key and method⁴.

The other options are not as suitable as option B, for the following reasons:

* Option A: Using Dataflow to ingest the columns with sensitive data from BigQuery, and then randomize the values in each sensitive

column, would reduce the sensitivity of the data, but also the utility and accuracy of the data. Randomization is a technique that replaces sensitive data with random values, which can prevent re-identification of the data, but also distort the distribution and relationships of the data³. This can affect the performance and quality of the ML model, especially if every column is critical to the model.

* Option C: Using the Cloud DLP API to scan for sensitive data, and use Dataflow to replace all sensitive data by using the encryption algorithm AES-256 with a salt, would reduce the sensitivity of the data, but also the utility and validity of the data. AES-256 is a symmetric encryption algorithm that uses a 256-bit key to encrypt and decrypt data. A salt is a random value that is added to the data before encryption, to increase the randomness and security of the encrypted data. However, AES-256 does not preserve the format or length of the original data, which can cause problems when storing or processing the data. For example, if the original data is a 10-digit phone number, AES-256 would produce a much longer and different string, which can break the schema or logic of the dataset³.

* Option D: Before training, using BigQuery to select only the columns that do not contain sensitive data, and creating an authorized view of the data so that sensitive values cannot be accessed by unauthorized individuals, would reduce the exposure of the sensitive data, but also the completeness and relevance of

the data. An authorized view is a BigQuery view that allows you to share query results with particular users or groups, without giving them access to the underlying tables. However, this option assumes that you can identify the columns that do not contain sensitive data, which may not be easy or accurate.

Moreover, this option would remove some columns from the dataset, which can affect the performance and quality of the ML model, especially if every column is critical to the model.

References:

* Preparing for Google Cloud Certification: Machine Learning Engineer, Course 5: Responsible AI, Week 2: Privacy

* Google Cloud Professional Machine Learning Engineer Exam Guide, Section 5: Developing responsible AI solutions, 5.2 Implementing privacy techniques

* Official Google Cloud Certified Professional Machine Learning Engineer Study Guide, Chapter 9: Responsible AI, Section 9.4: Privacy

* De-identification techniques

* Cloud Data Loss Prevention (DLP) API

* Dataflow

* Using Dataflow and Sensitive Data Protection to securely tokenize and import data from a relational database to BigQuery

* [AES encryption]

* [Salt (cryptography)]

* [Authorized views]

NEW QUESTION # 94

You developed a Vertex AI pipeline that trains a classification model on data stored in a large BigQuery table. The pipeline has four steps, where each step is created by a Python function that uses the KubeFlow v2 API. The components have the following names:

```
dt=datetime.now().strftime("%Y%m%d%H%M%S")
f"export-{dt}.yaml", f"preprocess-{dt}.yaml", f"train-{dt}.yaml",
f"calibrate-{dt}.yaml"
```

You launch your Vertex AI pipeline as the following:

```
job = aip.PipelineJob(
    display_name="my-awesome-pipeline",
    template_path="pipeline.json",
    job_id=f"my-awesome-pipeline-{dt}",
    parameter_values=params,
    enable_caching=True,
    location="europe-west1"
)
```

You perform many model iterations by adjusting the code and parameters of the training step. You observe high costs associated with the development, particularly the data export and preprocessing steps. You need to reduce model development costs. What should you do?

- A. Change the name of the pipeline to `f"my-awesome-pipeline-{dt}"`.
- B.

Add the `{"kubeflow.v1.caching": True}` parameter to the set of params provided to your PipelineJob.

- C.

Change the components' YAML filenames to `export.yaml`, `preprocess.yaml`, `f"train-{dt}.yaml"`, `f"calibrate-{dt}.yaml"`.

- D.

Move the first step of your pipeline to a separate step, and provide a cached path to Cloud Storage as an input to the main pipeline.

Answer: C

Explanation:

According to the official exam guide¹, one of the skills assessed in the exam is to "automate and orchestrate ML pipelines using Cloud Composer". Vertex AI Pipelines² is a service that allows you to orchestrate your ML workflows using Kubeflow Pipelines SDK v2 or TensorFlow Extended. Vertex AI Pipelines supports execution caching, which means that if you run a pipeline and it reaches a component that has already been run with the same inputs and parameters, the component does not run again. Instead, the component uses the output from the previous run. This can save you time and resources when you are iterating on your pipeline. Therefore, option A is the best way to reduce model development costs, as it enables execution caching for the data export and preprocessing steps, which are likely to be the same for each model iteration. The other options are not relevant or optimal for this scenario. Reference:

Professional ML Engineer Exam Guide

Vertex AI Pipelines

Google Professional Machine Learning Certification Exam 2023

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NEW QUESTION # 95

You trained a model, packaged it with a custom Docker container for serving, and deployed it to Vertex AI Model Registry. When you submit a batch prediction job, it fails with this error "Error model server never became ready Please validate that your model file or container configuration are valid. There are no additional errors in the logs What should you do?

- A. Pull the Docker image locally and use the `docker run` command to launch it locally. Use the `docker logs` command to explore the error logs.
- B. Change the HTTP port in your model's configuration to the default value of 8080
- C. Change the health Route value in your models configuration to `/healthcheck`.
- D. Add a logging configuration to your application to emit logs to Cloud Logging.

Answer: B

Explanation:

When you deploy a custom container to Vertex AI Model Registry, you need to follow some requirements for the container configuration. One of these requirements is to use the HTTP port 8080 for serving predictions. If you use a different port, the model server might not be able to communicate with Vertex AI and cause the error "Error model server never became ready". To fix this error, you need to change the HTTP port in your model's configuration to the default value of 8080 and redeploy the container.

References:

* Custom container requirements documentation

* Preparing for Google Cloud Certification: Machine Learning Engineer Professional Certificate

NEW QUESTION # 96

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