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

The following will be disussed here:

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

The AWS-Certified-Machine-Learning-Specialty Exam is a challenging certification program that requires a comprehensive understanding of machine learning concepts such as data preparation, model training, and model evaluation. AWS-Certified-Machine-Learning-Specialty Exam covers a wide range of topics, including machine learning algorithms, AWS services such as Amazon SageMaker, and data analysis techniques. Candidates must also demonstrate their ability to design, deploy, and maintain machine learning solutions using AWS services.

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Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q227-Q232):

NEW QUESTION #227

A machine learning specialist is developing a proof of concept for government users whose primary concern is security. The specialist is using Amazon SageMaker to train a convolutional neural network (CNN) model for a photo classifier application. The specialist wants to protect the data so that it cannot be accessed and transferred to a remote host by malicious code accidentally installed on the training container.

Which action will provide the MOST secure protection?

- A. Remove Amazon S3 access permissions from the SageMaker execution role.
- B. Encrypt the training and validation dataset.
- C. Encrypt the weights of the CNN model.
- D. Enable network isolation for training jobs.

Answer: D

Explanation:

The most secure action to protect the data from being accessed and transferred to a remote host by malicious code accidentally installed on the training container is to enable network isolation for training jobs. Network isolation is a feature that allows you to run training and inference containers in internet-free mode, which blocks any outbound network calls from the containers, even to other AWS services such as Amazon S3. Additionally, no AWS credentials are made available to the container runtime environment. This way, you can prevent unauthorized access to your data and resources by malicious code or users. You can enable network isolation by setting the EnableNetworkIsolation parameter to True when you call CreateTrainingJob, CreateHyperParameterTuningJob, or CreateModel.

References:

Run Training and Inference Containers in Internet-Free Mode - Amazon SageMaker

NEW QUESTION # 228

A media company is building a computer vision model to analyze images that are on social media. The model consists of CNNs that the company trained by using images that the company stores in Amazon S3. The company used an Amazon SageMaker training job in File mode with a single Amazon EC2 On-Demand Instance.

Every day, the company updates the model by using about 10,000 images that the company has collected in the last 24 hours. The company configures training with only one epoch. The company wants to speed up training and lower costs without the need to make any code changes.

Which solution will meet these requirements?

- A. Instead Of On-Demand Instances, configure the SageMaker training job to use Spot Instances.Implement model checkpoints.
- B. Instead Of File mode, configure the SageMaker training job to use FastFile mode with no Other changes.
- C. Instead Of On-Demand Instances, configure the SageMaker training job to use Spot Instances. Make no Other changes.
- D. Instead of File mode, configure the SageMaker training job to use Pipe mode. Ingest the data from a pipe.

Answer: C

Explanation:

Explanation

The solution C will meet the requirements because it uses Amazon SageMaker Spot Instances, which are unused EC2 instances that are available at up to 90% discount compared to On-Demand prices. Amazon SageMaker Spot Instances can speed up training and lower costs by taking advantage of the spare EC2 capacity. The company does not need to make any code changes to use Spot Instances, as it can simply enable the managed spot training option in the SageMaker training job configuration. The company also does not need to implement model checkpoints, as it is using only one epoch for training, which means the model will not resume from a previous state 1.

The other options are not suitable because:

Option A: Configuring the SageMaker training job to use Pipe mode instead of File mode will not speed up training or lower costs significantly. Pipe mode is a data ingestion mode that streams data directly from S3 to the training algorithm, without copying the data to the local storage of the training instance.

Pipe mode can reduce the startup time of the training job and the disk space usage, but it does not affect the computation time or the instance price. Moreover, Pipe mode may require some code changes to handle the streaming data, depending on the training algorithm2.

Option B: Configuring the SageMaker training job to use FastFile mode instead of File mode will not speed up training or lower costs significantly. FastFile mode is a data ingestion mode that copies data from S3 to the local storage of the training instance in parallel with the training process. FastFile mode can reduce the startup time of the training job and the disk space usage, but it does not affect the computation time or the instance price. Moreover, FastFile mode is only available for distributed training jobs that use multiple instances, which is not the case for the company3.

Option D: Configuring the SageMaker training job to use Spot Instances and implementing model checkpoints will not meet the requirements without the need to make any code changes. Model checkpoints are a feature that allows the training job to save the model state periodically to S3, and resume from the latest checkpoint if the training job is interrupted. Model checkpoints can help to avoid losing the training progress and ensure the model convergence, but they require some code changes to implement the checkpointing logic and the resuming logic4.

References:

- 1: Managed Spot Training Amazon SageMaker
- 2: Pipe Mode Amazon SageMaker
- 3: FastFile Mode Amazon SageMaker
- 4: Checkpoints Amazon SageMaker

NEW QUESTION # 229

A data scientist is developing a pipeline to ingest streaming web traffic dat a. The data scientist needs to implement a process to identify unusual web traffic patterns as part of the pipeline. The patterns will be used downstream for alerting and incident response. The data scientist has access to unlabeled historic data to use, if needed.

The solution needs to do the following:

Calculate an anomaly score for each web traffic entry.

Adapt unusual event identification to changing web patterns over time.

Which approach should the data scientist implement to meet these requirements?

- A. Use historic web traffic data to train an anomaly detection model using the Amazon SageMaker Random Cut Forest
 (RCF) built-in model. Use an Amazon Kinesis Data Stream to process the incoming web traffic data. Attach a preprocessing
 AWS Lambda function to perform data enrichment by calling the RCF model to calculate the anomaly score for each record.
- B. Collect the streaming data using Amazon Kinesis Data Firehose. Map the delivery stream as an input source for Amazon Kinesis Data Analytics. Write a SQL query to run in real time against the streaming data with the k-Nearest Neighbors (kNN) SQL extension to calculate anomaly scores for each record using a tumbling window.
- C. Collect the streaming data using Amazon Kinesis Data Firehose. Map the delivery stream as an input source for Amazon Kinesis Data Analytics. Write a SQL query to run in real time against the streaming data with the Amazon Random Cut Forest (RCF) SQL extension to calculate anomaly scores for each record using a sliding window.
- D. Use historic web traffic data to train an anomaly detection model using the Amazon SageMaker built-in XGBoost model.
 Use an Amazon Kinesis Data Stream to process the incoming web traffic data. Attach a preprocessing AWS Lambda function to perform data enrichment by calling the XGBoost model to calculate the anomaly score for each record.

Answer: C

Explanation:

Amazon Kinesis Data Analytics is a service that allows users to analyze streaming data in real time using SQL queries. Amazon Random Cut Forest (RCF) is a SQL extension that enables anomaly detection on streaming data. RCF is an unsupervised machine

learning algorithm that assigns an anomaly score to each data point based on how different it is from the rest of the data. A sliding window is a type of window that moves along with the data stream, so that the anomaly detection model can adapt to changing patterns over time. A tumbling window is a type of window that has a fixed size and does not overlap with other windows, so that the anomaly detection model is based on a fixed period of time. Therefore, option D is the best approach to meet the requirements of the question, as it uses RCF to calculate anomaly scores for each web traffic entry and uses a sliding window to adapt to changing web patterns over time.

Option A is incorrect because Amazon SageMaker Random Cut Forest (RCF) is a built-in model that can be used to train and deploy anomaly detection models on batch or streaming data, but it requires more steps and resources than using the RCF SQL extension in Amazon Kinesis Data Analytics. Option B is incorrect because Amazon SageMaker XGBoost is a built-in model that can be used for supervised learning tasks such as classification and regression, but not for unsupervised learning tasks such as anomaly detection. Option C is incorrect because k-Nearest Neighbors (kNN) is a SQL extension that can be used for classification and regression tasks on streaming data, but not for anomaly detection. Moreover, using a tumbling window would not allow the anomaly detection model to adapt to changing web patterns over time.

References:

Using CloudWatch anomaly detection
Anomaly Detection With CloudWatch
Performing Real-time Anomaly Detection using AWS
What Is AWS Anomaly Detection? (And Is There A Better Option?)

NEW QUESTION #230

A data scientist has developed a machine learning translation model for English to Japanese by using Amazon SageMaker's built-in seq2seq algorithm with 500,000 aligned sentence pairs. While testing with sample sentences, the data scientist finds that the translation quality is reasonable for an example as short as five words. However, the quality becomes unacceptable if the sentence is 100 words long.

Which action will resolve the problem?

- A. Choose a different weight initialization type.
- B. Change preprocessing to use n-grams.
- C. Add more nodes to the recurrent neural network (RNN) than the largest sentence's word count.
- D. Adjust hyperparameters related to the attention mechanism.

Answer: D

Explanation:

https://docs.aws.amazon.com/sagemaker/latest/dg/seq-2-seq-howitworks.html

NEW QUESTION #231

A data scientist is using the Amazon SageMaker Neural Topic Model (NTM) algorithm to build a model that recommends tags from blog posts. The raw blog post data is stored in an Amazon S3 bucket in JSON format.

During model evaluation, the data scientist discovered that the model recommends certain stopwords such as

"a," "an," and "the" as tags to certain blog posts, along with a few rare words that are present only in certain blog entries. After a few iterations of tag review with the content team, the data scientist notices that the rare words are unusual but feasible. The data scientist also must ensure that the tag recommendations of the generated model do not include the stopwords.

What should the data scientist do to meet these requirements?

- A. Remove the stop words from the blog post data by using the Count Vectorizer function in the scikit- learn library. Replace the blog post data in the S3 bucket with the results of the vectorizer.
- B. Use the Amazon Comprehend entity recognition API operations. Remove the detected words from the blog post data. Replace the blog post data source in the S3 bucket.
- C. Run the SageMaker built-in principal component analysis (PCA) algorithm with the blog post data from the S3 bucket as the data source. Replace the blog post data in the S3 bucket with the results of the training job.
- D. Use the SageMaker built-in Object Detection algorithm instead of the NTM algorithm for the training job to process the blog post data.

Answer: A

Explanation:

The data scientist should remove the stop words from the blog post data by using the Count Vectorizer function in the scikit-learn library, and replace the blog post data in the S3 bucket with the results of the vectorizer. This is because:

The Count Vectorizer function is a tool that can convert a collection of text documents to a matrix of token counts 1. It also enables the pre-processing of text data prior to generating the vector representation, such as removing accents, converting to lowercase, and filtering out stop words 1. By using this function, the data scientist can remove the stop words such as "a," "an," and "the" from the blog post data, and obtain a numerical representation of the text that can be used as input for the NTM algorithm

The NTM algorithm is a neural network-based topic modeling technique that can learn latent topics from a corpus of documents 2. It can be used to recommend tags from blog posts by finding the most probable topics for each document, and ranking the words associated with each topic 3. However, the NTM algorithm does not perform any text pre-processing by itself, so it relies on the quality of the input data. Therefore, the data scientist should replace the blog post data in the S3 bucket with the results of the vectorizer, to ensure that the NTM algorithm does not include the stop words in the tag recommendations.

The other options are not suitable for the following reasons:

Option A is not relevant because the Amazon Comprehend entity recognition API operations are used to detect and extract named entities from text, such as people, places, organizations, dates, etc4. This is not the same as removing stop words, which are common words that do not carry much meaning or information.

Moreover, removing the detected entities from the blog post data may reduce the quality and diversity of the tag recommendations, as some entities may be relevant and useful as tags.

Option B is not optimal because the SageMaker built-in principal component analysis (PCA) algorithm is used to reduce the dimensionality of a dataset by finding the most important features that capture the maximum amount of variance in the data 5. This is not the same as removing stop words, which are words that have low variance and high frequency in the data. Moreover, replacing the blog post data in the S3 bucket with the results of the PCA algorithm may not be compatible with the input format expected by the NTM algorithm, which requires a bag-of-words representation of the text 2.

Option C is not suitable because the SageMaker built-in Object Detection algorithm is used to detect and localize objects in images 6. This is not related to the task of recommending tags from blog posts, which are text documents. Moreover, using the Object Detection algorithm instead of the NTM algorithm would require a different type of input data (images instead of text), and a different type of output data (bounding boxes and labels instead of topics and words).

Neural Topic Model (NTM) Algorithm
Introduction to the Amazon SageMaker Neural Topic Model
Amazon Comprehend - Entity Recognition
sklearn.feature_extraction.text.CountVectorizer
Principal Component Analysis (PCA) Algorithm
Object Detection Algorithm

NEW QUESTION #232

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