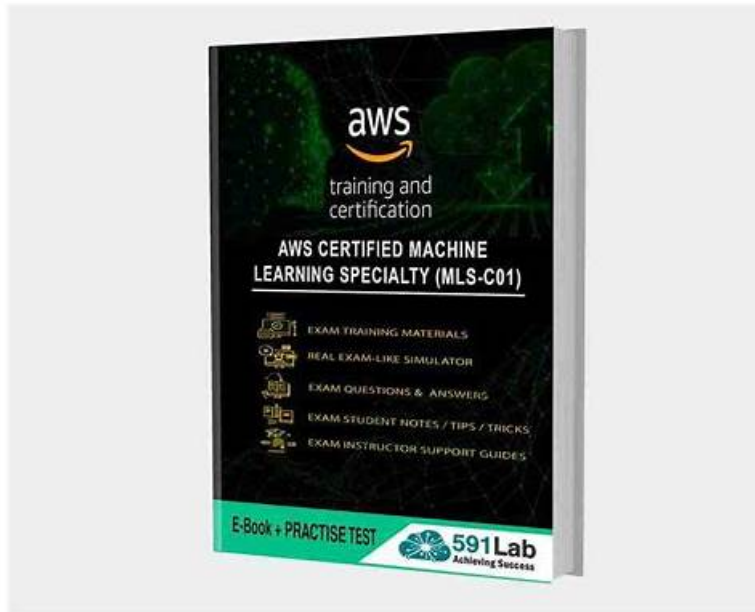


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Amazon AWS Certified Machine Learning - Specialty Sample Questions (Q306-Q311):

NEW QUESTION # 306

A retail company intends to use machine learning to categorize new products. A labeled dataset of current products was provided to the Data Science team. The dataset includes 1,200 products. The labeled dataset has 15 features for each product such as title, dimensions, weight, and price. Each product is labeled as belonging to one of six categories such as books, games, electronics, and movies.

Which model should be used for categorizing new products using the provided dataset for training?

- A. A DeepAR forecasting model based on a recurrent neural network (RNN)
- **B. An XGBoost model where the objective parameter is set to multi: softmax**
- C. A regression forest where the number of trees is set equal to the number of product categories

- D. A deep convolutional neural network (CNN) with a softmax activation function for the last layer

Answer: B

NEW QUESTION # 307

An automotive company uses computer vision in its autonomous cars. The company trained its object detection models successfully by using transfer learning from a convolutional neural network (CNN). The company trained the models by using PyTorch through the Amazon SageMaker SDK.

The vehicles have limited hardware and compute power. The company wants to optimize the model to reduce memory, battery, and hardware consumption without a significant sacrifice in accuracy.

Which solution will improve the computational efficiency of the models?

- A. Use Amazon SageMaker Ground Truth to build and run data labeling workflows. Collect a larger labeled dataset with the labelling workflows. Run a new training job that uses the new labeled data with previous training data.
- B. Use Amazon SageMaker Model Monitor to gain visibility into the ModelLatency metric and OverheadLatency metric of the model after the company deploys the model. Increase the model learning rate. Run a new training job.
- C. Use Amazon SageMaker Debugger to gain visibility into the training weights, gradients, biases, and activation outputs. Compute the filter ranks based on the training information. Apply pruning to remove the low-ranking filters. Set the new weights based on the pruned set of filters. Run a new training job with the pruned model.
- D. Use Amazon CloudWatch metrics to gain visibility into the SageMaker training weights, gradients, biases, and activation outputs. Compute the filter ranks based on the training information. Apply pruning to remove the low-ranking filters. Set new weights based on the pruned set of filters. Run a new training job with the pruned model.

Answer: C

Explanation:

The solution C will improve the computational efficiency of the models because it uses Amazon SageMaker Debugger and pruning, which are techniques that can reduce the size and complexity of the convolutional neural network (CNN) models. The solution C involves the following steps:

Use Amazon SageMaker Debugger to gain visibility into the training weights, gradients, biases, and activation outputs. Amazon SageMaker Debugger is a service that can capture and analyze the tensors that are emitted during the training process of machine learning models. Amazon SageMaker Debugger can provide insights into the model performance, quality, and convergence. Amazon SageMaker Debugger can also help to identify and diagnose issues such as overfitting, underfitting, vanishing gradients, and exploding gradients¹.

Compute the filter ranks based on the training information. Filter ranking is a technique that can measure the importance of each filter in a convolutional layer based on some criterion, such as the average percentage of zero activations or the L1-norm of the filter weights. Filter ranking can help to identify the filters that have little or no contribution to the model output, and thus can be removed without affecting the model accuracy².

Apply pruning to remove the low-ranking filters. Pruning is a technique that can reduce the size and complexity of a neural network by removing the redundant or irrelevant parts of the network, such as neurons, connections, or filters. Pruning can help to improve the computational efficiency, memory usage, and inference speed of the model, as well as to prevent overfitting and improve generalization³.

Set the new weights based on the pruned set of filters. After pruning, the model will have a smaller and simpler architecture, with fewer filters in each convolutional layer. The new weights of the model can be set based on the pruned set of filters, either by initializing them randomly or by fine-tuning them from the original weights⁴.

Run a new training job with the pruned model. The pruned model can be trained again with the same or a different dataset, using the same or a different framework or algorithm. The new training job can use the same or a different configuration of Amazon SageMaker, such as the instance type, the hyperparameters, or the data ingestion mode. The new training job can also use Amazon SageMaker Debugger to monitor and analyze the training process and the model quality⁵.

The other options are not suitable because:

Option A: Using Amazon CloudWatch metrics to gain visibility into the SageMaker training weights, gradients, biases, and activation outputs will not be as effective as using Amazon SageMaker Debugger.

Amazon CloudWatch is a service that can monitor and observe the operational health and performance of AWS resources and applications. Amazon CloudWatch can provide metrics, alarms, dashboards, and logs for various AWS services, including Amazon SageMaker. However, Amazon CloudWatch does not provide the same level of granularity and detail as Amazon SageMaker Debugger for the tensors that are emitted during the training process of machine learning models. Amazon CloudWatch metrics are mainly focused on the resource utilization and the training progress, not on the model performance, quality, and convergence⁶.

Option B: Using Amazon SageMaker Ground Truth to build and run data labeling workflows and collecting a larger labeled dataset with the labeling workflows will not improve the computational efficiency of the models. Amazon SageMaker Ground Truth is a service that can create high-quality training datasets for machine learning by using human labelers. A larger labeled dataset can help

to improve the model accuracy and generalization, but it will not reduce the memory, battery, and hardware consumption of the model. Moreover, a larger labeled dataset may increase the training time and cost of the model⁷.

Option D: Using Amazon SageMaker Model Monitor to gain visibility into the ModelLatency metric and OverheadLatency metric of the model after the company deploys the model and increasing the model learning rate will not improve the computational efficiency of the models. Amazon SageMaker Model Monitor is a service that can monitor and analyze the quality and performance of machine learning models that are deployed on Amazon SageMaker endpoints. The ModelLatency metric and the OverheadLatency metric can measure the inference latency of the model and the endpoint, respectively. However, these metrics do not provide any information about the training weights, gradients, biases, and activation outputs of the model, which are needed for pruning. Moreover, increasing the model learning rate will not reduce the size and complexity of the model, but it may affect the model convergence and accuracy.

- 1: Amazon SageMaker Debugger
 - 2: Pruning Convolutional Neural Networks for Resource Efficient Inference
 - 3: Pruning Neural Networks: A Survey
 - 4: Learning both Weights and Connections for Efficient Neural Networks
 - 5: Amazon SageMaker Training Jobs
 - 6: Amazon CloudWatch Metrics for Amazon SageMaker
 - 7: Amazon SageMaker Ground Truth
- Amazon SageMaker Model Monitor

NEW QUESTION # 308

A company is converting a large number of unstructured paper receipts into images. The company wants to create a model based on natural language processing (NLP) to find relevant entities such as date, location, and notes, as well as some custom entities such as receipt numbers.

The company is using optical character recognition (OCR) to extract text for data labeling. However, documents are in different structures and formats, and the company is facing challenges with setting up the manual workflows for each document type.

Additionally, the company trained a named entity recognition (NER) model for custom entity detection using a small sample size.

This model has a very low confidence score and will require retraining with a large dataset.

Which solution for text extraction and entity detection will require the LEAST amount of effort?

- **A. Extract text from receipt images by using Amazon Textract. Use Amazon Comprehend for entity detection, and use Amazon Comprehend custom entity recognition for custom entity detection.**
- B. Extract text from receipt images by using Amazon Textract. Use the Amazon SageMaker BlazingText algorithm to train on the text for entities and custom entities.
- C. Extract text from receipt images by using a deep learning OCR model from the AWS Marketplace. Use the NER deep learning model to extract entities.
- D. Extract text from receipt images by using a deep learning OCR model from the AWS Marketplace. Use Amazon Comprehend for entity detection, and use Amazon Comprehend custom entity recognition for custom entity detection.

Answer: A

Explanation:

Explanation

The best solution for text extraction and entity detection with the least amount of effort is to use Amazon Textract and Amazon Comprehend. These services are:

Amazon Textract for text extraction from receipt images. Amazon Textract is a machine learning service that can automatically extract text and data from scanned documents. It can handle different structures and formats of documents, such as PDF, TIFF, PNG, and JPEG, without any preprocessing steps. It can also extract key-value pairs and tables from documents¹ Amazon Comprehend for entity detection and custom entity detection. Amazon Comprehend is a natural language processing service that can identify entities, such as dates, locations, and notes, from unstructured text. It can also detect custom entities, such as receipt numbers, by using a custom entity recognizer that can be trained with a small amount of labeled data² The other options are not suitable because they either require more effort for text extraction, entity detection, or custom entity detection. For example: Option A uses the Amazon SageMaker BlazingText algorithm to train on the text for entities and custom entities. BlazingText is a supervised learning algorithm that can perform text classification and word2vec. It requires users to provide a large amount of labeled data, preprocess the data into a specific format, and tune the hyperparameters of the model³ Option B uses a deep learning OCR model from the AWS Marketplace and a NER deep learning model for text extraction and entity detection. These models are pre-trained and may not be suitable for the specific use case of receipt processing. They also require users to deploy and manage the models on Amazon SageMaker or Amazon EC2 instances⁴ Option D uses a deep learning OCR model from the AWS Marketplace for text extraction. This model has the same drawbacks as option B. It also requires users to integrate the model output with Amazon Comprehend for entity detection and custom entity detection.

References:

- 1: Amazon Textract - Extract text and data from documents
- 2: Amazon Comprehend - Natural Language Processing (NLP) and Machine Learning (ML)
- 3: BlazingText - Amazon SageMaker
- 4: AWS Marketplace: OCR

NEW QUESTION # 309

A company needs to deploy a chatbot to answer common questions from customers. The chatbot must base its answers on company documentation.

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

- **A. Index company documents by using Amazon Kendra. Integrate the chatbot with Amazon Kendra by using the Amazon Kendra Query API operation to answer customer questions.**
- B. Train a Bidirectional Attention Flow (BiDAF) network based on past customer questions and company documents. Deploy the model as a real-time Amazon SageMaker endpoint. Integrate the model with the chatbot by using the SageMaker Runtime InvokeEndpoint API operation to answer customer questions.
- C. Index company documents by using Amazon OpenSearch Service. Integrate the chatbot with OpenSearch Service by using the OpenSearch Service k-nearest neighbors (k-NN) Query API operation to answer customer questions.
- D. Train an Amazon SageMaker BlazingText model based on past customer questions and company documents. Deploy the model as a real-time SageMaker endpoint. Integrate the model with the chatbot by using the SageMaker Runtime InvokeEndpoint API operation to answer customer questions.

Answer: A

Explanation:

Explanation

The solution A will meet the requirements with the least development effort because it uses Amazon Kendra, which is a highly accurate and easy to use intelligent search service powered by machine learning. Amazon Kendra can index company documents from various sources and formats, such as PDF, HTML, Word, and more. Amazon Kendra can also integrate with chatbots by using the Amazon Kendra Query API operation, which can understand natural language questions and provide relevant answers from the indexed documents. Amazon Kendra can also provide additional information, such as document excerpts, links, and FAQs, to enhance the chatbot experience¹.

The other options are not suitable because:

Option B: Training a Bidirectional Attention Flow (BiDAF) network based on past customer questions and company documents, deploying the model as a real-time Amazon SageMaker endpoint, and integrating the model with the chatbot by using the SageMaker Runtime InvokeEndpoint API operation will incur more development effort than using Amazon Kendra. The company will have to write the code for the BiDAF network, which is a complex deep learning model for question answering. The company will also have to manage the SageMaker endpoint, the model artifact, and the inference logic².

Option C: Training an Amazon SageMaker BlazingText model based on past customer questions and company documents, deploying the model as a real-time SageMaker endpoint, and integrating the model with the chatbot by using the SageMaker Runtime InvokeEndpoint API operation will incur more development effort than using Amazon Kendra. The company will have to write the code for the BlazingText model, which is a fast and scalable text classification and word embedding algorithm. The company will also have to manage the SageMaker endpoint, the model artifact, and the inference logic³.

Option D: Indexing company documents by using Amazon OpenSearch Service and integrating the chatbot with OpenSearch Service by using the OpenSearch Service k-nearest neighbors (k-NN) Query API operation will not meet the requirements effectively. Amazon OpenSearch Service is a fully managed service that provides fast and scalable search and analytics capabilities. However, it is not designed for natural language question answering, and it may not provide accurate or relevant answers for the chatbot. Moreover, the k-NN Query API operation is used to find the most similar documents or vectors based on a distance function, not to find the best answers based on a natural language query⁴.

References:

- 1: Amazon Kendra
- 2: Bidirectional Attention Flow for Machine Comprehension
- 3: Amazon SageMaker BlazingText
- 4: Amazon OpenSearch Service

NEW QUESTION # 310

This graph shows the training and validation loss against the epochs for a neural network. The network being trained is as follows:

- * Two dense layers, one output neuron
- * 100 neurons in each layer

* 100 epochs

* Random initialization of weights



Which technique can be used to improve model performance in terms of accuracy in the validation set?

- A. Adding another layer with the 100 neurons
- B. Early stopping
- C. Increasing the number of epochs
- D. Random initialization of weights with appropriate seed

Answer: A

NEW QUESTION # 311

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