DP-100

Number: DP-100
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File Version: 1

DP-100

https://www.gratisexam.com/

Define and prepare the development environment

Question Set 1

QUESTION 1
You are developing a hands-on workshop to introduce Docker for Windows to attendees.

You need to ensure that workshop attendees can install Docker on their devices.

Which two prerequisite components should attendees install on the devices? Each correct answer presents part of the solution.

NOTE: Each correct selection is worth one point.

A. Microsoft Hardware-Assisted Virtualization Detection Tool
B. Kitematic
C. BIOS-enabled virtualization
D. VirtualBox
E. Windows 10 64-bit Professional

Correct Answer: CE
Section: (none)
Explanation

Explanation/Reference:
Explanation:
C: Make sure your Windows system supports Hardware Virtualization Technology and that virtualization is enabled.
Ensure that hardware virtualization support is turned on in the BIOS settings. For example:

E: To run Docker, your machine must have a 64-bit operating system running Windows 7 or higher.

References:
https://docs.docker.com/toolbox/toolbox_install_windows/

https://blogs.technet.microsoft.com/canitpro/2015/09/08/step-by-step-enabling-hyper-v-for-use-on-windows-10/

QUESTION 2
Your team is building a data engineering and data science development environment.

The environment must support the following requirements:

- support Python and Scala
- compose data storage, movement, and processing services into automated data pipelines
- the same tool should be used for the orchestration of both data engineering and data science
- support workload isolation and interactive workloads
- enable scaling across a cluster of machines

You need to create the environment.

What should you do?

A. Build the environment in Apache Hive for HDInsight and use Azure Data Factory for orchestration.
B. Build the environment in Azure Databricks and use Azure Data Factory for orchestration.
C. Build the environment in Apache Spark for HDInsight and use Azure Container Instances for orchestration.
D. Build the environment in Azure Databricks and use Azure Container Instances for orchestration.

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
In Azure Databricks, we can create two different types of clusters.
- Standard, these are the default clusters and can be used with Python, R, Scala and SQL
- High-concurrency

Azure Databricks is fully integrated with Azure Data Factory.

Incorrect Answers:
D: Azure Container Instances is good for development or testing. Not suitable for production workloads.

References:
https://docs.microsoft.com/en-us/azure/architecture/data-guide/technology-choices/data-science-and-machine-learning

QUESTION 3
You plan to build a team data science environment. Data for training models in machine learning pipelines will be over 20 GB in size.

You have the following requirements:

- Models must be built using Caffe2 or Chainer frameworks.
- Data scientists must be able to use a data science environment to build the machine learning pipelines and train models on their personal devices in both connected and disconnected network environments.

Personal devices must support updating machine learning pipelines when connected to a network.

You need to select a data science environment.

Which environment should you use?

A. Azure Machine Learning Service

B. Azure Machine Learning Studio
C. Azure Databricks
D. Azure Kubernetes Service (AKS)

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
The Data Science Virtual Machine (DSVM) is a customized VM image on Microsoft's Azure cloud built specifically for doing data science. Caffe2 and Chainer are supported by DSVM.
DSVM integrates with Azure Machine Learning.

Incorrect Answers:
B: Use Machine Learning Studio when you want to experiment with machine learning models quickly and easily, and the built-in machine learning algorithms are sufficient for your solutions.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/data-science-virtual-machine/overview

QUESTION 4
You are implementing a machine learning model to predict stock prices.

The model uses a PostgreSQL database and requires GPU processing.

You need to create a virtual machine that is pre-configured with the required tools.

What should you do?

A. Create a Data Science Virtual Machine (DSVM) Windows edition.
B. Create a Geo AI Data Science Virtual Machine (Geo-DSVM) Windows edition.
C. Create a Deep Learning Virtual Machine (DLVM) Linux edition.
D. Create a Deep Learning Virtual Machine (DLVM) Windows edition.

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:

Explanation:
In the DSVM, your training models can use deep learning algorithms on hardware that's based on graphics processing units (GPUs).

PostgreSQL is available for the following operating systems: Linux (all recent distributions), 64-bit installers available for macOS (OS X) version 10.6 and newer – Windows (with installers available for 64-bit version; tested on latest versions and back to Windows 2012 R2.

Incorrect Answers:

B: The Azure Geo AI Data Science VM (Geo-DSVM) delivers geospatial analytics capabilities from Microsoft's Data Science VM. Specifically, this VM extends the AI and data science toolkits in the Data Science VM by adding ESRI's market-leading ArcGIS Pro Geographic Information System.

C, D: DLVM is a template on top of DSVM image. In terms of the packages, GPU drivers etc are all there in the DSVM image. Mostly it is for convenience during creation where we only allow DLVM to be created on GPU VM instances on Azure.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/data-science-virtual-machine/overview

QUESTION 5
You are developing deep learning models to analyze semi-structured, unstructured, and structured data types.

You have the following data available for model building:

- Video recordings of sporting events
- Transcripts of radio commentary about events
- Logs from related social media feeds captured during sporting events

You need to select an environment for creating the model.

Which environment should you use?

A. Azure Cognitive Services
B. Azure Data Lake Analytics
C. Azure HDInsight with Spark MLib
D. Azure Machine Learning Studio

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:

Explanation:
Azure Cognitive Services expand on Microsoft's evolving portfolio of machine learning APIs and enable developers to easily add cognitive features – such as emotion and video detection; facial, speech, and vision recognition; and speech and language understanding – into their applications. The goal of Azure Cognitive Services is to help developers create applications that can see, hear, speak, understand, and even begin to reason. The catalog of services within Azure Cognitive Services can be categorized into five main pillars - Vision, Speech, Language, Search, and Knowledge.

References:
https://docs.microsoft.com/en-us/azure/cognitive-services/welcome

QUESTION 6
You must store data in Azure Blob Storage to support Azure Machine Learning.

You need to transfer the data into Azure Blob Storage.

What are three possible ways to achieve the goal? Each correct answer presents a complete solution.

NOTE: Each correct selection is worth one point.

A. Bulk Insert SQL Query
B. AzCopy
C. Python script
D. Azure Storage Explorer
E. Bulk Copy Program (BCP)

Correct Answer: BCD
Section: (none)
Explanation

Explanation/Reference:
Explanation:
You can move data to and from Azure Blob storage using different technologies:

- Azure Storage-Explorer
- AzCopy
- Python
- SSIS

References:
https://docs.microsoft.com/en-us/azure/machine-learning/team-data-science-process/move-azure-blob

QUESTION 7

You are moving a large dataset from Azure Machine Learning Studio to a Weka environment.

You need to format the data for the Weka environment.

Which module should you use?

A. Convert to CSV
B. Convert to Dataset
C. Convert to ARFF
D. Convert to SVMLight

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Use the Convert to ARFF module in Azure Machine Learning Studio, to convert datasets and results in Azure Machine Learning to the attribute-relation file format used by the Weka toolset. This format is known as ARFF.

The ARFF data specification for Weka supports multiple machine learning tasks, including data preprocessing, classification, and feature selection. In this format, data is organized by entites and their attributes, and is contained in a single text file.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/convert-to-arff

QUESTION 8
You plan to create a speech recognition deep learning model.

The model must support the latest version of Python.

You need to recommend a deep learning framework for speech recognition to include in the Data Science Virtual Machine (DSVM).

What should you recommend?

A. Rattle
B. TensorFlow
C. Weka
D. Scikit-learn

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
TensorFlow is an open source library for numerical computation and large-scale machine learning. It uses Python to provide a convenient front-end API for building applications with the framework
TensorFlow can train and run deep neural networks for handwritten digit classification, image recognition, word embeddings, recurrent neural networks, sequence-to-sequence models for machine translation, natural language processing, and PDE (partial differential equation) based simulations.

Incorrect Answers:
A: Rattle is the R analytical tool that gets you started with data analytics and machine learning.
C: Weka is used for visual data mining and machine learning software in Java.
D: Scikit-learn is one of the most useful library for machine learning in Python. It is on NumPy, SciPy and matplotlib, this library contains a lot of effiecient tools for machine learning and statistical modeling including classification, regression, clustering and dimensionality reduction.

Reference:
https://www.infoworld.com/article/3278008/what-is-tensorflow-the-machine-learning-library-explained.html

QUESTION 9
You plan to use a Deep Learning Virtual Machine (DLVM) to train deep learning models using Compute Unified Device Architecture (CUDA) computations.

You need to configure the DLVM to support CUDA.

What should you implement?

A. Solid State Drives (SSD)
B. Computer Processing Unit (CPU) speed increase by using overclocking
C. Graphic Processing Unit (GPU)
D. High Random Access Memory (RAM) configuration
E. Intel Software Guard Extensions (Intel SGX) technology

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
A Deep Learning Virtual Machine is a pre-configured environment for deep learning using GPU instances.

References:
https://azuremarketplace.microsoft.com/en-au/marketplace/apps/microsoft-ads.dsvm-deep-learning

QUESTION 10
You plan to use a Data Science Virtual Machine (DSVM) with the open source deep learning frameworks Caffe2 and PyTorch.

You need to select a pre-configured DSVM to support the frameworks.

What should you create?

A. Data Science Virtual Machine for Windows 2012
B. Data Science Virtual Machine for Linux (CentOS)
C. Geo AI Data Science Virtual Machine with ArcGIS
D. Data Science Virtual Machine for Windows 2016
E. Data Science Virtual Machine for Linux (Ubuntu)

Correct Answer: E
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Caffe2 and PyTorch is supported by Data Science Virtual Machine for Linux.
Microsoft offers Linux editions of the DSVM on Ubuntu 16.04 LTS and CentOS 7.4.
Only the DSVM on Ubuntu is preconfigured for Caffe2 and PyTorch.

Incorrect Answers:
D: Caffe2 and PytOCH are only supported in the Data Science Virtual Machine for Linux.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/data-science-virtual-machine/overview

QUESTION 11
You are developing a data science workspace that uses an Azure Machine Learning service.

You need to select a compute target to deploy the workspace.

What should you use?

A. Azure Data Lake Analytics

B. Azure Databricks
C. Azure Container Service
D. Apache Spark for HDInsight

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Azure Container Instances can be used as compute target for testing or development. Use for low-scale CPU-based workloads that require less than 48 GB of RAM.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/service/how-to-deploy-and-where

QUESTION 12
You are solving a classification task.

The dataset is imbalanced.

You need to select an Azure Machine Learning Studio module to improve the classification accuracy.

Which module should you use?

A. Permutation Feature Importance
B. Filter Based Feature Selection
C. Fisher Linear Discriminant Analysis
D. Synthetic Minority Oversampling Technique (SMOTE)

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Use the SMOTE module in Azure Machine Learning Studio (classic) to increase the number of underepresented cases in a dataset used for machine learning. SMOTE is a better way of increasing the number of rare cases than simply duplicating existing cases.

You connect the SMOTE module to a dataset that is imbalanced. There are many reasons why a dataset might be imbalanced: the category you are targeting might

be very rare in the population, or the data might simply be difficult to collect. Typically, you use SMOTE when the class you want to analyze is under-represented.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/smote

QUESTION 13
You are analyzing a dataset containing historical data from a local taxi company. You are developing a regression model.

You must predict the fare of a taxi trip.

You need to select performance metrics to correctly evaluate the regression model.

Which two metrics can you use? Each correct answer presents a complete solution?

NOTE: Each correct selection is worth one point.

A. a Root Mean Square Error value that is low
B. an R-Squared value close to 0
C. an F1 score that is low
D. an R-Squared value close to 1
E. an F1 score that is high
F. a Root Mean Square Error value that is high

Correct Answer: AD
Section: (none)
Explanation

Explanation/Reference:
Explanation:
RMSE and R2 are both metrics for regression models.

A: Root mean squared error (RMSE) creates a single value that summarizes the error in the model. By squaring the difference, the metric disregards the difference between over-prediction and under-prediction.

D: Coefficient of determination, often referred to as R2, represents the predictive power of the model as a value between 0 and 1. Zero means the model is random (explains nothing); 1 means there is a perfect fit. However, caution should be used in interpreting R2 values, as low values can be entirely normal and high values can be suspect.

Incorrect Answers:
C, E: F-score is used for classification models, not for regression models.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/evaluate-model

QUESTION 14
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are using Azure Machine Learning to run an experiment that trains a classification model.

You want to use Hyperdrive to find parameters that optimize the AUC metric for the model. You configure a HyperDriveConfig for the experiment by running the following code:

```
hyperdrive = HyperDriveConfig(estimator=your_estimator,
 hyperparameter_sampling=your_params,
 policy=policy,
 primary_metric_name='AUC',
 primary_metric_goal=PrimaryMetricGoal.MAXIMIZE,
 max_total_runs=6,
 max_concurrent_runs=4)
```

You plan to use this configuration to run a script that trains a random forest model and then tests it with validation data. The label values for the validation data are stored in a variable named y_test variable, and the predicted probabilities from the model are stored in a variable named y_predicted.

You need to add logging to the script to allow Hyperdrive to optimize hyperparameters for the AUC metric.

Solution: Run the following code:

```
from sklearn.metrics import roc_auc_score
import logging
# code to train model omitted
auc = roc_auc_score(y_test, y_predicted)
logging.info("AUC: " + str(auc))
```

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Python printing/logging example:
logging.info(message)

Destination: Driver logs, Azure Machine Learning designer

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-debug-pipelines

QUESTION 15
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 max_total_runs=6,
 max_concurrent_runs=4)
```

You plan to use this configuration to run a script that trains a random forest model and then tests it with validation data. The label values for the validation data are stored in a variable named y_test variable, and the predicted probabilities from the model are stored in a variable named y_predicted.

You need to add logging to the script to allow Hyperdrive to optimize hyperparameters for the AUC metric.

Solution: Run the following code:

```
import json, os
from sklearn.metrics import roc_auc_score
# code to train model omitted
auc = roc_auc_score(y_test, y_predicted)
os.makedirs("outputs", exist_ok = True)
with open("outputs/AUC.txt", "w") as file_cur:
    file_cur.write(auc)
```

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation
Use a solution with logging.info(message) instead.

Note: Python printing/logging example:
logging.info(message)

Destination: Driver logs, Azure Machine Learning designer

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-debug-pipelines

QUESTION 16
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might

meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

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 hyperparameter_sampling=your_params,
 policy=policy,
 primary_metric_name='AUC',
 primary_metric_goal=PrimaryMetricGoal.MAXIMIZE,
 max_total_runs=6,
 max_concurrent_runs=4)
```

You plan to use this configuration to run a script that trains a random forest model and then tests it with validation data. The label values for the validation data are stored in a variable named y_test variable, and the predicted probabilities from the model are stored in a variable named y_predicted.

You need to add logging to the script to allow Hyperdrive to optimize hyperparameters for the AUC metric.

Solution: Run the following code:

```
import numpy as np
from sklearn.metrics import roc_auc_score
# code to train model omitted
auc = roc_auc_score(y_test, y_predicted)
print(np.float(auc))
```

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B

Section: (none)
Explanation

Explanation/Reference:
Explanation
Use a solution with logging.info(message) instead.

Note: Python printing/logging example:
logging.info(message)

Destination: Driver logs, Azure Machine Learning designer

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-debug-pipelines

QUESTION 17
You plan to provision an Azure Machine Learning Basic edition workspace for a data science project.

You need to identify the tasks you will be able to perform in the workspace.

Which three tasks will you be able to perform? Each correct answer presents a complete solution.

NOTE: Each correct selection is worth one point.

A. Create a Compute Instance and use it to run code in Jupyter notebooks.
B. Create an Azure Kubernetes Service (AKS) inference cluster.
C. Use the designer to train a model by dragging and dropping pre-defined modules.
D. Create a tabular dataset that supports versioning.
E. Use the Automated Machine Learning user interface to train a model.

Correct Answer: ABD
Section: (none)
Explanation

Explanation/Reference:
Incorrect Answers:
C, E: The UI is included the Enterprise edition only.

Reference:
https://azure.microsoft.com/en-us/pricing/details/machine-learning/

QUESTION 18
A set of CSV files contains sales records. All the CSV files have the same data schema.

Each CSV file contains the sales record for a particular month and has the filename sales.csv. Each file in stored in a folder that indicates the month and year when the data was recorded. The folders are in an Azure blob container for which a datastore has been defined in an Azure Machine Learning workspace. The folders are organized in a parent folder named sales to create the following hierarchical structure:

```
/sales
  /01-2019
    /sales.csv
  /02-2019
    /sales.csv
  /03-2019
    /sales.csv
  ...
```

At the end of each month, a new folder with that month's sales file is added to the **sales** folder.

You plan to use the sales data to train a machine learning model based on the following requirements:

- You must define a dataset that loads all of the sales data to date into a structure that can be easily converted to a dataframe.
- You must be able to create experiments that use only data that was created before a specific previous month, ignoring any data that was added after that month.
- You must register the minimum number of datasets possible.

You need to register the sales data as a dataset in Azure Machine Learning service workspace.

What should you do?

A. Create a tabular dataset that references the datastore and explicitly specifies each 'sales/*mm-yyyy*/sales.csv' file every month. Register the dataset with the name **sales_dataset** each month, replacing the existing dataset and specifying a tag named **month** indicating the month and year it was registered. Use this dataset for all experiments.
B. Create a tabular dataset that references the datastore and specifies the path 'sales/*/sales.csv', register the dataset with the name **sales_dataset** and a tag named **month** indicating the month and year it was registered, and use this dataset for all experiments.
C. Create a new tabular dataset that references the datastore and explicitly specifies each 'sales/*mm-yyyy*/sales.csv' file every month. Register the dataset with the name **sales_dataset_MM-YYYY** each month with appropriate MM and YYYY values for the month and year. Use the appropriate month-specific dataset for experiments.

D. Create a tabular dataset that references the datastore and explicitly specifies each 'sales/*mm-yyyy*/sales.csv' file. Register the dataset with the name **sales_dataset** each month as a new version and with a tag named **month** indicating the month and year it was registered. Use this dataset for all experiments, identifying the version to be used based on the **month** tag as necessary.

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Specify the path.

Example:
The following code gets the workspace existing workspace and the desired datastore by name. And then passes the datastore and file locations to the path parameter to create a new TabularDataset, weather_ds.

```
from azureml.core import Workspace, Datastore, Dataset

datastore_name = 'your datastore name'

# get existing workspace
workspace = Workspace.from_config()

# retrieve an existing datastore in the workspace by name
datastore = Datastore.get(workspace, datastore_name)

# create a TabularDataset from 3 file paths in datastore
datastore_paths = [(datastore, 'weather/2018/11.csv'),
                   (datastore, 'weather/2018/12.csv'),
                   (datastore, 'weather/2019/*.csv')]

weather_ds = Dataset.Tabular.from_delimited_files(path=datastore_paths)
```

QUESTION 19
You use the following code to run a script as an experiment in Azure Machine Learning:

```
from azureml.core import Workspace, Experiment, Run
from azureml.core import RunConfig, ScriptRunConfig
ws = Workspace.from_config()
run_config = RunConfiguration()
run_config.target='local'
script_config = ScriptRunConfig(source_directory='./script', script='experiment.py', run_config=run_config)
experiment = Experiment(workspace=ws, name='script experiment')
run = experiment.submit(config=script_config)
run.wait_for_completion()
```

You must identify the output files that are generated by the experiment run.

You need to add code to retrieve the output file names.

Which code segment should you add to the script?

A. `files = run.get_properties()`
B. `files= run.get_file_names()`
C. `files = run.get_details_with_logs()`
D. `files = run.get_metrics()`
E. `files = run.get_details()`

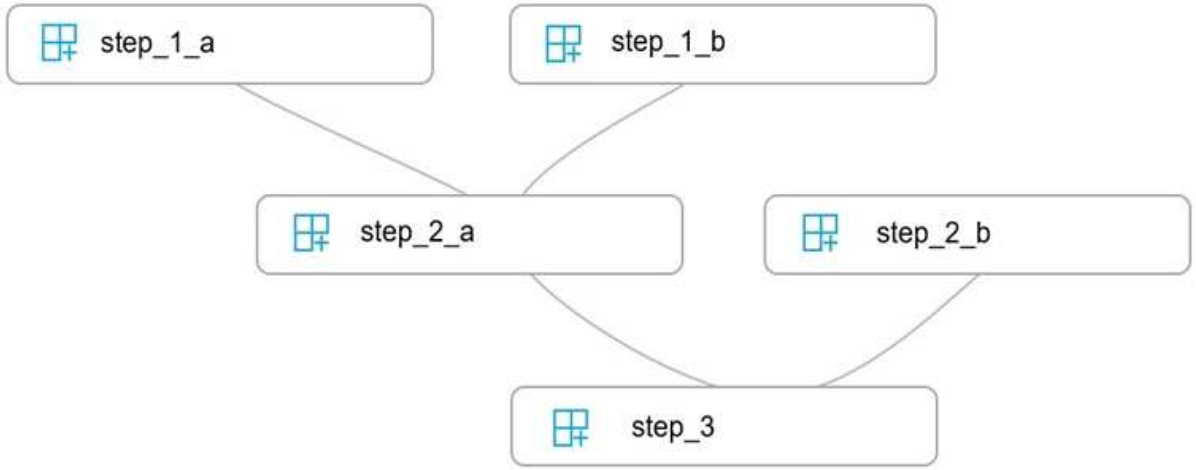
Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
You can list all of the files that are associated with this run record by called run.get_file_names()

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-track-experiments

QUESTION 20
You write five Python scripts that must be processed in the order specified in Exhibit A – which allows the same modules to run in parallel, but will wait for modules with dependencies.

You must create an Azure Machine Learning pipeline using the Python SDK, because you want to script to create the pipeline to be tracked in your version control system. You have created five PythonScriptSteps and have named the variables to match the module names.



You need to create the pipeline shown. Assume all relevant imports have been done.

Which Python code segment should you use?

A.
```
p = Pipeline(ws, steps=[[[[step_1_a, step_1_b], step_2_a],  step_2_b], step_3])
```

B.
```
pipeline_steps = {
    "Pipeline": {
        "run": step_3,
        "run_after": {[
            {"run": step_2_a,
                "run_after":
                    [{"run": step_1_a},
                     {"run": step_1_b}]
                },
            {"run": step_2_b}]
        }
    }
}
p = Pipeline(ws, steps=pipeline_steps)
```

C.
```
step_2_a.run_after(step_1_b)
step_2_a.run_after(step_1_a)
step_3.run_after(step_2_b)
step_3.run_after(step_2_a)
p = Pipeline(ws, steps=[step_3])
```

D.
```
p = Pipeline(ws, steps=[step_1_a, step_1_b, step_2_a, step_2_b, step_3])
```

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
The steps parameter is an array of steps. To build pipelines that have multiple steps, place the steps in order in this array.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-use-parallel-run-step

QUESTION 21
You create a datastore named **training_data** that references a blob container in an Azure Storage account. The blob container contains a folder named **csv_files** in which multiple comma-separated values (CSV) files are stored.

You have a script named train.py in a local folder named ./script that you plan to run as an experiment using an estimator. The script includes the following code to read data from the csv_files folder:

```
import os
import argparse
import pandas as pd

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from azureml.core import Run

run = Run.get_context()
parser = argparse.ArgumentParser()
parser.add_argument('--data-folder', type=str, dest='data_folder', help='data reference')
args = parser.parse_args()

data_folder = args.data_folder
csv_files = os.listdir(data_folder)
training_data = pd.concat((pd.read_csv(os.path.join(data_folder,csv_file)) for csv_file in csv_files))

# Code goes on to split the training data and train a logistic regression model
```

You have the following script.

```
from azureml.core import Workspace, Datastore, Experiment
from azureml.train.sklearn import SKLearn

ws = Workspace.from_config()
exp = Experiment(workspace=ws, name='csv_training')
ds = Datastore.get(ws, datastore_name='training_data')
data_ref = ds.path('csv_files')

# Code to define estimator goes here

run = exp.submit(config=estimator)
run.wait_for_completion(show_output=True)
```

You need to configure the estimator for the experiment so that the script can read the data from a data reference named data_ref that references the csv_files folder in the training_data datastore.

Which code should you use to configure the estimator?

A.
```
estimator = SKLearn(source_directory='./script',
 inputs=[data_ref.as_named_input('data-folder').to_pandas_dataframe()],
 compute_target='local',
 entry_script='train.py')
```

B.
```
script_params = {
    '--data-folder': data_ref.as_mount()
}
estimator = SKLearn(source_directory='./script',
 script_params=script_params,
 compute_target='local',
 entry_script='train.py'
```

C.
```
estimator = SKLearn(source_directory='./script',
 inputs=[data_ref.as_named_input('data-folder').as_mount()],
 compute_target='local',
 entry_script='train.py')
```

D.
```
script_params = {
    '--data-folder': data_ref.as_download(path_on_compute='csv_files')
}
estimator = SKLearn(source_directory='./script',
 script_params=script_params,
 compute_target='local',
 entry_script='train.py'
```

E.
```
estimator = SKLearn(source_directory='./script',
 inputs=[data_ref.as_named_input('data-folder').as_download(path_on_compute='csv_files')],
 compute_target='local',
 entry_script='train.py')
```

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Besides passing the dataset through the inputs parameter in the estimator, you can also pass the dataset through script_params and get the data path (mounting point) in your training script via arguments. This way, you can keep your training script independent of azureml-sdk. In other words, you will be able use the same training script for local debugging and remote training on any cloud platform.

Example:
from azureml.train.sklearn import SKLearn

```
script_params = {
    # mount the dataset on the remote compute and pass the mounted path as an argument to the training script
    '--data-folder': mnist_ds.as_named_input('mnist').as_mount(),
    '--regularization': 0.5
}

est = SKLearn(source_directory=script_folder,
              script_params=script_params,
              compute_target=compute_target,
```

```
        environment_definition=env,
        entry_script='train_mnist.py')

# Run the experiment
run = experiment.submit(est)
run.wait_for_completion(show_output=True)
```

Incorrect Answers:
A: Pandas DataFrame not used.

Reference:
https://docs.microsoft.com/es-es/azure/machine-learning/how-to-train-with-datasets

QUESTION 22
You create a deep learning model for image recognition on Azure Machine Learning service using GPU-based training.

You must deploy the model to a context that allows for real-time GPU-based inferencing.

You need to configure compute resources for model inferencing.

Which compute type should you use?

A. Azure Container Instance
B. Azure Kubernetes Service
C. Field Programmable Gate Array
D. Machine Learning Compute

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
You can use Azure Machine Learning to deploy a GPU-enabled model as a web service. Deploying a model on Azure Kubernetes Service (AKS) is one option. The AKS cluster provides a GPU resource that is used by the model for inference.

Inference, or model scoring, is the phase where the deployed model is used to make predictions. Using GPUs instead of CPUs offers performance advantages on highly parallelizable computation.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-deploy-inferencing-gpus

QUESTION 23
You create a batch inference pipeline by using the Azure ML SDK. You run the pipeline by using the following code:

```
from azureml.pipeline.core import Pipeline
from azureml.core.experiment import Experiment

pipeline = Pipeline(workspace=ws, steps=[parallelrun_step])
pipeline_run = Experiment(ws, 'batch_pipeline').submit(pipeline)
```

You need to monitor the progress of the pipeline execution.

What are two possible ways to achieve this goal? Each correct answer presents a complete solution.

NOTE: Each correct selection is worth one point.

A. Run the following code in a notebook:
```
from azureml.contrib.interpret.explanation.explanation_client import ExplanationClient
client = ExplanationClient.from_run(pipeline_run)
explanation = client.download_model_explanation()
explanation = client.download_model_explanation(top_k=4)
global_importance_values = explanation.get_ranked_global_values()
global_importance_names = explanation.get_ranked_global_names()
print('global importance values: {}'.format(global_importance_values))
print('global importance names: {}'.format(global_importance_names))
```
B. Use the Inference Clusters tab in Machine Learning Studio.
C. Use the Activity log in the Azure portal for the Machine Learning workspace.
D. Run the following code in a notebook:
```
from azureml.widgets import RunDetails
RunDetails(pipeline_run).show()
```
E. Run the following code and monitor the console output from the PipelineRun object:
```
pipeline_run.wait_for_completion(show_output=True)
```

Correct Answer: DE
Section: (none)
Explanation

Explanation/Reference:

Explanation:
A batch inference job can take a long time to finish. This example monitors progress by using a Jupyter widget. You can also manage the job's progress by using:

- Azure Machine Learning Studio.
- Console output from the PipelineRun object.

```
from azureml.widgets import RunDetails
RunDetails(pipeline_run).show()

pipeline_run.wait_for_completion(show_output=True)
```

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-use-parallel-run-step#monitor-the-parallel-run-job

QUESTION 24
You train and register a model in your Azure Machine Learning workspace.

You must publish a pipeline that enables client applications to use the model for batch inferencing. You must use a pipeline with a single ParallelRunStep step that runs a Python inferencing script to get predictions from the input data.

You need to create the inferencing script for the ParallelRunStep pipeline step.

Which two functions should you include? Each correct answer presents part of the solution.

NOTE: Each correct selection is worth one point.

A. `run(mini_batch)`
B. `main()`
C. `batch()`
D. `init()`
E. `score(mini_batch)`

Correct Answer: AD
Section: (none)
Explanation

Explanation/Reference:
Reference:
https://github.com/Azure/MachineLearningNotebooks/tree/master/how-to-use-azureml/machine-learning-pipelines/parallel-run

QUESTION 25
You deploy a model as an Azure Machine Learning real-time web service using the following code.

```
# ws, model, interference_config, and deployment_config defined previously
service = Model.deploy(ws, 'classification-service', [model], inference_config, deployment_config)
service.wait_for_deployment(True)
```

The deployment fails.

You need to troubleshoot the deployment failure by determining the actions that were performed during deployment and identifying the specific action that failed.

Which code segment should you run?

A. `service.get_logs()`
B. `service.state`
C. `service.serialize()`
D. `service.update_deployment_state()`

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
You can print out detailed Docker engine log messages from the service object. You can view the log for ACI, AKS, and Local deployments. The following example demonstrates how to print the logs.

# if you already have the service object handy
print(service.get_logs())

# if you only know the name of the service (note there might be multiple services with the same name but different version number)
print(ws.webservices['mysvc'].get_logs())

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-troubleshoot-deployment

QUESTION 26
You create a multi-class image classification deep learning model.

You train the model by using PyTorch version 1.2.

You need to ensure that the correct version of PyTorch can be identified for the inferencing environment when the model is deployed.

What should you do?

A. Save the model locally as a **.pt** file, and deploy the model as a local web service.
B. Deploy the model on computer that is configured to use the default Azure Machine Learning conda environment.
C. Register the model with a **.pt** file extension and the default **version** property.
D. Register the model, specifying the **model_framework** and **model_framework_version** properties.

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
framework_version: The PyTorch version to be used for executing training code.

Reference:
https://docs.microsoft.com/en-us/python/api/azureml-train-core/azureml.train.dnn.pytorch?view=azure-ml-py

Prepare data for modeling

Testlet 1

Case study

Overview

You are a data scientist in a company that provides data science for professional sporting events. Models will use global and local market data to meet the following business goals:

- Understand sentiment of mobile device users at sporting events based on audio from crowd reactions.
- Assess a user's tendency to respond to an advertisement.
- Customize styles of ads served on mobile devices.
- Use video to detect penalty events

Current environment

- Media used for penalty event detection will be provided by consumer devices. Media may include images and videos captured during the sporting event and shared using social media. The images and videos will have varying sizes and formats.
- The data available for model building comprises of seven years of sporting event media. The sporting event media includes; recorded video transcripts or radio commentary, and logs from related social media feeds captured during the sporting events.
- Crowd sentiment will include audio recordings submitted by event attendees in both mono and stereo formats.

Penalty detection and sentiment

- Data scientists must build an intelligent solution by using multiple machine learning models for penalty event detection.
- Data scientists must build notebooks in a local environment using automatic feature engineering and model building in machine learning pipelines.
- Notebooks must be deployed to retrain by using Spark instances with dynamic worker allocation.
- Notebooks must execute with the same code on new Spark instances to recode only the source of the data.
- Global penalty detection models must be trained by using dynamic runtime graph computation during training.
- Local penalty detection models must be written by using BrainScript.
- Experiments for local crowd sentiment models must combine local penalty detection data.
- Crowd sentiment models must identify known sounds such as cheers and known catch phrases. Individual crowd sentiment models will detect similar sounds.
- All shared features for local models are continuous variables.
- Shared features must use double precision. Subsequent layers must have aggregate running mean and standard deviation metrics available.

Advertisements

During the initial weeks in production, the following was observed:

- Ad response rated declined.

- Drops were not consistent across ad styles.
- The distribution of features across training and production data are not consistent

Analysis shows that, of the 100 numeric features on user location and behavior, the 47 features that come from location sources are being used as raw features. A suggested experiment to remedy the bias and variance issue is to engineer 10 linearly uncorrelated features.

- Initial data discovery shows a wide range of densities of target states in training data used for crowd sentiment models.
- All penalty detection models show inference phases using a Stochastic Gradient Descent (SGD) are running too slow.
- Audio samples show that the length of a catch phrase varies between 25%-47% depending on region
- The performance of the global penalty detection models shows lower variance but higher bias when comparing training and validation sets. Before implementing any feature changes, you must confirm the bias and variance using all training and validation cases.

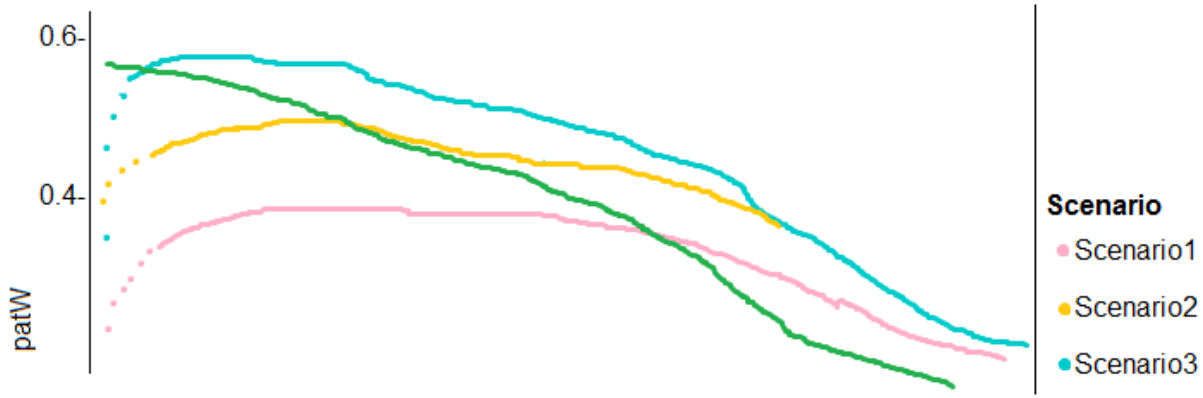
- Ad response models must be trained at the beginning of each event and applied during the sporting event.
- Market segmentation models must optimize for similar ad response history.
- Sampling must guarantee mutual and collective exclusively between local and global segmentation models that share the same features.
- Local market segmentation models will be applied before determining a user's propensity to respond to an advertisement.
- Ad response models must support non-linear boundaries of features.
- The ad propensity model uses a cut threshold is 0.45 and retrains occur if weighted Kappa deviated from 0.1 +/- 5%.
- The ad propensity model uses cost factors shown in the following diagram:

		Actual	
		1	**0**
Predicted	**0**	1	2
	1	2	1

- The ad propensity model uses proposed cost factors shown in the following diagram:

		Actual	
		1	0
Predicted	0	1	5
	1	5	1

- Performance curves of current and proposed cost factor scenarios are shown in the following diagram:



QUESTION 1
You need to implement a scaling strategy for the local penalty detection data.

Which normalization type should you use?

A. Streaming
B. Weight

C. Batch
D. Cosine

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Post batch normalization statistics (PBN) is the Microsoft Cognitive Toolkit (CNTK) version of how to evaluate the population mean and variance of Batch Normalization which could be used in inference Original Paper.
In CNTK, custom networks are defined using the BrainScriptNetworkBuilder and described in the CNTK network description language "BrainScript."

Scenario:
Local penalty detection models must be written by using BrainScript.

References:
https://docs.microsoft.com/en-us/cognitive-toolkit/post-batch-normalization-statistics

Prepare data for modeling

Testlet 2

Case study

This is a case study. Case studies are not timed separately. You can use as much exam time as you would like to complete each case. However, there may be additional case studies and sections on this exam. You must manage your time to ensure that you are able to complete all questions included on this exam in the time provided.

To answer the questions included in a case study, you will need to reference information that is provided in the case study. Case studies might contain exhibits and other resources that provide more information about the scenario that is described in the case study. Each question is independent of the other questions in this case study.

At the end of this case study, a review screen will appear. This screen allows you to review your answers and to make changes before you move to the next section of the exam. After you begin a new section, you cannot return to this section.

To start the case study
To display the first question in this case study, click the Next button. Use the buttons in the left pane to explore the content of the case study before you answer the questions. Clicking these buttons displays information such as business requirements, existing environment, and problem statements. If the case study has an All Information tab, note that the information displayed is identical to the information displayed on the subsequent tabs. When you are ready to answer a question, click the Question button to return to the question.

Overview

You are a data scientist for Fabrikam Residences, a company specializing in quality private and commercial property in the United States. Fabrikam Residences is considering expanding into Europe and has asked you to investigate prices for private residences in major European cities.
You use Azure Machine Learning Studio to measure the median value of properties. You produce a regression model to predict property prices by using the Linear Regression and Bayesian Linear Regression modules.

Datasets

There are two datasets in CSV format that contain property details for two cities, London and Paris. You add both files to Azure Machine Learning Studio as separate datasets to the starting point for an experiment. Both datasets contain the following columns:

Column heading	Description
CapitaCrimeRate	per capita crime rate by town
Zoned	proportion of residential land zoned for lots over 25.000 square feet
NonRetailAcres	proportion of retail business acres per town
NextToRiver	proximity of a property to the river
NitrogenOxideConcentration	nitric oxides concentration (parts per 10 million)
AvgRoomsPerHouse	average number of rooms per dwelling
Age	proportion of owner-occupied units built prior to 1940
DistanceToEmploymentCenter	weighted distances to employment centers
AccessibilityToHighway	index of accessibility to radial highways to a value of two decimal places
Tax	full value property tax rate per $10,000
PupilTeacherRatio	pupil to teacher ratio by town
ProfessionalClass	professional class percentage
LowerStatus	percentage lower status of the population
MedianValue	median value of owner-occupied homes in $1000s

An initial investigation shows that the datasets are identical in structure apart from the MedianValue column. The smaller Paris dataset contains the MedianValue in text format, whereas the larger London dataset contains the MedianValue in numerical format.

Data issues

Missing values

The AccessibilityToHighway column in both datasets contains missing values. The missing data must be replaced with new data so that it is modeled conditionally using the other variables in the data before filling in the missing values.

Columns in each dataset contain missing and null values. The datasets also contain many outliers. The Age column has a high proportion of outliers. You need to remove the rows that have outliers in the Age column. The MedianValue and AvgRoomsInHouse columns both hold data in numeric format. You need to select a feature selection algorithm to analyze the relationship between the two columns in more detail.

Model fit

The model shows signs of overfitting. You need to produce a more refined regression model that reduces the overfitting.

Experiment requirements

You must set up the experiment to cross-validate the Linear Regression and Bayesian Linear Regression modules to evaluate performance. In each case, the predictor of the dataset is the column named MedianValue. You must ensure that the datatype of the MedianValue column of the Paris dataset matches the structure of the London dataset.

You must prioritize the columns of data for predicting the outcome. You must use non-parametric statistics to measure relationships.

You must use a feature selection algorithm to analyze the relationship between the MedianValue and AvgRoomsInHouse columns.

Model training

Permutation Feature Importance

Given a trained model and a test dataset, you must compute the Permutation Feature Importance scores of feature variables. You must be determined the absolute fit for the model.

Hyperparameters

You must configure hyperparameters in the model learning process to speed the learning phase**.** In addition, this configuration should cancel the lowest performing runs at each evaluation interval, thereby directing effort and resources towards models that are more likely to be successful.

You are concerned that the model might not efficiently use compute resources in hyperparameter tuning. You also are concerned that the model might prevent an increase in the overall tuning time. Therefore, must implement an early stopping criterion on models that provides savings without terminating promising jobs.

Testing

You must produce multiple partitions of a dataset based on sampling using the Partition and Sample module in Azure Machine Learning Studio.

Cross-validation

You must create three equal partitions for cross-validation. You must also configure the cross-validation process so that the rows in the test and training datasets are divided evenly by properties that are near each city's main river. You must complete this task before the data goes through the sampling process.

Linear regression module

When you train a Linear Regression module, you must determine the best features to use in a model. You can choose standard metrics provided to measure performance before and after the feature importance process completes. The distribution of features across multiple training models must be consistent.

Data visualization

You need to provide the test results to the Fabrikam Residences team. You create data visualizations to aid in presenting the results.

You must produce a Receiver Operating Characteristic (ROC) curve to conduct a diagnostic test evaluation of the model. You need to select appropriate methods for producing the ROC curve in Azure Machine Learning Studio to compare the Two-Class Decision Forest and the Two-Class Decision Jungle modules with one another.

QUESTION 1
You need to visually identify whether outliers exist in the Age column and quantify the outliers before the outliers are removed.

Which three Azure Machine Learning Studio modules should you use? Each correct answer presents part of the solution.

NOTE: Each correct selection is worth one point.

A. Create Scatterplot
B. Summarize Data
C. Clip Values
D. Replace Discrete Values
E. Build Counting Transform

Correct Answer: ABC
Section: (none)
Explanation

Explanation/Reference:
Explanation:
B: To have a global view, the summarize data module can be used. Add the module and connect it to the data set that needs to be visualized.
A: One way to quickly identify Outliers visually is to create scatter plots.

C: The easiest way to treat the outliers in Azure ML is to use the Clip Values module. It can identify and optionally replace data values that are above or below a specified threshold.

You can use the Clip Values module in Azure Machine Learning Studio, to identify and optionally replace data values that are above or below a specified threshold. This is useful when you want to remove outliers or replace them with a mean, a constant, or other substitute value.

References:
https://blogs.msdn.microsoft.com/azuredev/2017/05/27/data-cleansing-tools-in-azure-machine-learning/

https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/clip-values

Prepare data for modeling

Question Set 3

QUESTION 1
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are analyzing a numerical dataset which contains missing values in several columns.

You must clean the missing values using an appropriate operation without affecting the dimensionality of the feature set.

You need to analyze a full dataset to include all values.

Solution: Calculate the column median value and use the median value as the replacement for any missing value in the column.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Use the Multiple Imputation by Chained Equations (MICE) method.

References:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3074241/

https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/clean-missing-data

QUESTION 2
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are a data scientist using Azure Machine Learning Studio.

You need to normalize values to produce an output column into bins to predict a target column.

Solution: Apply an Equal Width with Custom Start and Stop binning mode.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Use the Entropy MDL binning mode which has a target column.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/group-data-into-bins

QUESTION 3
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are a data scientist using Azure Machine Learning Studio.

You need to normalize values to produce an output column into bins to predict a target column.

Solution: Apply a Quantiles binning mode with a PQuantile normalization.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B

Section: (none)
Explanation

Explanation/Reference:
Explanation:
Use the Entropy MDL binning mode which has a target column.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/group-data-into-bins

QUESTION 4
You are solving a classification task.

You must evaluate your model on a limited data sample by using k-fold cross-validation. You start by configuring a k parameter as the number of splits.

You need to configure the k parameter for the cross-validation.

Which value should you use?

A. k=0.5
B. k=0.01
C. k=5
D. k=1

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Leave One Out (LOO) cross-validation
Setting K = n (the number of observations) yields n-fold and is called leave-one out cross-validation (LOO), a special case of the K-fold approach.

LOO CV is sometimes useful but typically doesn't shake up the data enough. The estimates from each fold are highly correlated and hence their average can have high variance.
This is why the usual choice is K=5 or 10. It provides a good compromise for the bias-variance tradeoff.

QUESTION 5
You use Azure Machine Learning Studio to build a machine learning experiment.

You need to divide data into two distinct datasets.

Which module should you use?

A. Assign Data to Clusters
B. Load Trained Model
C. Partition and Sample
D. Tune Model-Hyperparameters

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Partition and Sample with the Stratified split option outputs multiple datasets, partitioned using the rules you specified.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/partition-and-sample

QUESTION 6
You are creating a machine learning model. You have a dataset that contains null rows.

You need to use the Clean Missing Data module in Azure Machine Learning Studio to identify and resolve the null and missing data in the dataset.

Which parameter should you use?

A. Replace with mean
B. Remove entire column
C. Remove entire row
D. Hot Deck
E. Custom substitution value
F. Replace with mode

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:

Remove entire row: Completely removes any row in the dataset that has one or more missing values. This is useful if the missing value can be considered randomly missing.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/clean-missing-data

QUESTION 7
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are using Azure Machine Learning Studio to perform feature engineering on a dataset.

You need to normalize values to produce a feature column grouped into bins.

Solution: Apply an Entropy Minimum Description Length (MDL) binning mode.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Entropy MDL binning mode: This method requires that you select the column you want to predict and the column or columns that you want to group into bins. It then makes a pass over the data and attempts to determine the number of bins that minimizes the entropy. In other words, it chooses a number of bins that allows the data column to best predict the target column. It then returns the bin number associated with each row of your data in a column named <colname>quantized.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/group-data-into-bins

QUESTION 8
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are a data scientist using Azure Machine Learning Studio.

You need to normalize values to produce an output column into bins to predict a target column.

Solution: Apply a Quantiles normalization with a QuantileIndex normalization.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Use the Entropy MDL binning mode which has a target column.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/group-data-into-bins

QUESTION 9
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are creating a new experiment in Azure Machine Learning Studio.

One class has a much smaller number of observations than the other classes in the training set.

You need to select an appropriate data sampling strategy to compensate for the class imbalance.

Solution: You use the Scale and Reduce sampling mode.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Instead use the Synthetic Minority Oversampling Technique (SMOTE) sampling mode.

Note: SMOTE is used to increase the number of underepresented cases in a dataset used for machine learning. SMOTE is a better way of increasing the number of rare cases than simply duplicating existing cases.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/smote

QUESTION 10
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are creating a new experiment in Azure Machine Learning Studio.

One class has a much smaller number of observations than the other classes in the training set.

You need to select an appropriate data sampling strategy to compensate for the class imbalance.

Solution: You use the Synthetic Minority Oversampling Technique (SMOTE) sampling mode.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
SMOTE is used to increase the number of underepresented cases in a dataset used for machine learning. SMOTE is a better way of increasing the number of rare

cases than simply duplicating existing cases.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/smote

QUESTION 11
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are creating a new experiment in Azure Machine Learning Studio.

One class has a much smaller number of observations than the other classes in the training set.

You need to select an appropriate data sampling strategy to compensate for the class imbalance.

Solution: You use the Stratified split for the sampling mode.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Instead use the Synthetic Minority Oversampling Technique (SMOTE) sampling mode.

Note: SMOTE is used to increase the number of underepresented cases in a dataset used for machine learning. SMOTE is a better way of increasing the number of rare cases than simply duplicating existing cases.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/smote

QUESTION 12
You are creating a machine learning model.

You need to identify outliers in the data.

Which two visualizations can you use? Each correct answer presents a complete solution.

NOTE: Each correct selection is worth one point.

A. Venn diagram
B. Box plot
C. ROC curve
D. Random forest diagram
E. Scatter plot

Correct Answer: BE
Section: (none)
Explanation

Explanation/Reference:
Explanation:
The box-plot algorithm can be used to display outliers.

One other way to quickly identify Outliers visually is to create scatter plots.

References:
https://blogs.msdn.microsoft.com/azuredev/2017/05/27/data-cleansing-tools-in-azure-machine-learning/

QUESTION 13
You are analyzing a dataset by using Azure Machine Learning Studio.

You need to generate a statistical summary that contains the p-value and the unique count for each feature column.

Which two modules can you use? Each correct answer presents a complete solution.

NOTE: Each correct selection is worth one point.

A. Computer Linear Correlation
B. Export Count Table
C. Execute Python Script
D. Convert to Indicator Values
E. Summarize Data

Correct Answer: BE
Section: (none)
Explanation

Explanation/Reference:
Explanation:
The Export Count Table module is provided for backward compatibility with experiments that use the Build Count Table (deprecated) and Count Featurizer (deprecated) modules.

E: Summarize Data statistics are useful when you want to understand the characteristics of the complete dataset. For example, you might need to know:

How many missing values are there in each column?
How many unique values are there in a feature column?
What is the mean and standard deviation for each column?
The module calculates the important scores for each column, and returns a row of summary statistics for each variable (data column) provided as input.

Incorrect Answers:
A: The Compute Linear Correlation module in Azure Machine Learning Studio is used to compute a set of Pearson correlation coefficients for each possible pair of variables in the input dataset.

C: With Python, you can perform tasks that aren't currently supported by existing Studio modules such as:
Visualizing data using matplotlib
Using Python libraries to enumerate datasets and models in your workspace
Reading, loading, and manipulating data from sources not supported by the Import Data module

D: The purpose of the Convert to Indicator Values module is to convert columns that contain categorical values into a series of binary indicator columns that can more easily be used as features in a machine learning model.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/export-count-table

https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/summarize-data

QUESTION 14
You are evaluating a completed binary classification machine learning model.

You need to use the precision as the evaluation metric.

Which visualization should you use?

A. Violin plot

B. Gradient descent
C. Box plot
D. Binary classification confusion matrix

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Incorrect Answers:
A: A violin plot is a visual that traditionally combines a box plot and a kernel density plot.

B: Gradient descent is a first-order iterative optimization algorithm for finding the minimum of a function. To find a local minimum of a function using gradient descent, one takes steps proportional to the negative of the gradient (or approximate gradient) of the function at the current point.

C: A box plot lets you see basic distribution information about your data, such as median, mean, range and quartiles but doesn't show you how your data looks throughout its range.

References:
https://machinelearningknowledge.ai/confusion-matrix-and-performance-metrics-machine-learning/

QUESTION 15
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are analyzing a numerical dataset which contains missing values in several columns.

You must clean the missing values using an appropriate operation without affecting the dimensionality of the feature set.

You need to analyze a full dataset to include all values.

Solution: Use the Last Observation Carried Forward (LOCF) method to impute the missing data points.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Instead use the Multiple Imputation by Chained Equations (MICE) method.

Replace using MICE: For each missing value, this option assigns a new value, which is calculated by using a method described in the statistical literature as "Multivariate Imputation using Chained Equations" or "Multiple Imputation by Chained Equations". With a multiple imputation method, each variable with missing data is modeled conditionally using the other variables in the data before filling in the missing values.

Note: Last observation carried forward (LOCF) is a method of imputing missing data in longitudinal studies. If a person drops out of a study before it ends, then his or her last observed score on the dependent variable is used for all subsequent (i.e., missing) observation points. LOCF is used to maintain the sample size and to reduce the bias caused by the attrition of participants in a study.

References:
https://methods.sagepub.com/reference/encyc-of-research-design/n211.xml

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3074241/

QUESTION 16
You are performing a filter-based feature selection for a dataset to build a multi-class classifier by using Azure Machine Learning Studio.

The dataset contains categorical features that are highly correlated to the output label column.

You need to select the appropriate feature scoring statistical method to identify the key predictors.

Which method should you use?

A. Kendall correlation
B. Spearman correlation
C. Chi-squared
D. Pearson correlation

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:

Pearson's correlation statistic, or Pearson's correlation coefficient, is also known in statistical models as the r value. For any two variables, it returns a value that indicates the strength of the correlation

Pearson's correlation coefficient is the test statistics that measures the statistical relationship, or association, between two continuous variables. It is known as the best method of measuring the association between variables of interest because it is based on the method of covariance. It gives information about the magnitude of the association, or correlation, as well as the direction of the relationship.

Incorrect Answers:
C: The two-way chi-squared test is a statistical method that measures how close expected values are to actual results.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/filter-based-feature-selection

https://www.statisticssolutions.com/pearsons-correlation-coefficient/

QUESTION 17
You plan to deliver a hands-on workshop to several students. The workshop will focus on creating data visualizations using Python. Each student will use a device that has internet access.

Student devices are not configured for Python development. Students do not have administrator access to install software on their devices. Azure subscriptions are not available for students.

You need to ensure that students can run Python-based data visualization code.

Which Azure tool should you use?

A. Anaconda Data Science Platform
B. Azure BatchAl
C. Azure Notebooks
D. Azure Machine Learning Service

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
References:
https://notebooks.azure.com/

QUESTION 18
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might

meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are analyzing a numerical dataset which contains missing values in several columns.

You must clean the missing values using an appropriate operation without affecting the dimensionality of the feature set.

You need to analyze a full dataset to include all values.

Solution: Replace each missing value using the Multiple Imputation by Chained Equations (MICE) method.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Replace using MICE: For each missing value, this option assigns a new value, which is calculated by using a method described in the statistical literature as "Multivariate Imputation using Chained Equations" or "Multiple Imputation by Chained Equations". With a multiple imputation method, each variable with missing data is modeled conditionally using the other variables in the data before filling in the missing values.

Note: Multivariate imputation by chained equations (MICE), sometimes called “fully conditional specification” or “sequential regression multiple imputation” has emerged in the statistical literature as one principled method of addressing missing data. Creating multiple imputations, as opposed to single imputations, accounts for the statistical uncertainty in the imputations. In addition, the chained equations approach is very flexible and can handle variables of varying types (e.g., continuous or binary) as well as complexities such as bounds or survey skip patterns.

References:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3074241/

https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/clean-missing-data

QUESTION 19
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are analyzing a numerical dataset which contains missing values in several columns.

You must clean the missing values using an appropriate operation without affecting the dimensionality of the feature set.

You need to analyze a full dataset to include all values.

Solution: Remove the entire column that contains the missing data point.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Use the Multiple Imputation by Chained Equations (MICE) method.

References:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3074241/

https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/clean-missing-data

QUESTION 20
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You are creating a new experiment in Azure Machine Learning Studio.

One class has a much smaller number of observations than the other classes in the training set.

You need to select an appropriate data sampling strategy to compensate for the class imbalance.

Solution: You use the Principal Components Analysis (PCA) sampling mode.

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Instead use the Synthetic Minority Oversampling Technique (SMOTE) sampling mode.

Note: SMOTE is used to increase the number of underepresented cases in a dataset used for machine learning. SMOTE is a better way of increasing the number of rare cases than simply duplicating existing cases.

Incorrect Answers:
The Principal Component Analysis module in Azure Machine Learning Studio (classic) is used to reduce the dimensionality of your training data. The module analyzes your data and creates a reduced feature set that captures all the information contained in the dataset, but in a smaller number of features.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/smote

https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/principal-component-analysis

QUESTION 21
You are creating a new experiment in Azure Machine Learning Studio. You have a small dataset that has missing values in many columns. The data does not require the application of predictors for each column. You plan to use the Clean Missing Data.

You need to select a data cleaning method.

Which method should you use?

A. Replace using Probabilistic PCA
B. Normalization
C. Synthetic Minority Oversampling Technique (SMOTE)
D. Replace using MICE

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Replace using Probabilistic PCA: Compared to other options, such as Multiple Imputation using Chained Equations (MICE), this option has the advantage of not requiring the application of predictors for each column. Instead, it approximates the covariance for the full dataset. Therefore, it might offer better performance for datasets that have missing values in many columns.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/clean-missing-data

QUESTION 22
You are evaluating a completed binary classification machine learning model.

You need to use the precision as the evaluation metric.

Which visualization should you use?

A. violin plot
B. Gradient descent
C. Scatter plot
D. Receiver Operating Characteristic (ROC) curve

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Receiver operating characteristic (or ROC) is a plot of the correctly classified labels vs. the incorrectly classified labels for a particular model.

Incorrect Answers:
A: A violin plot is a visual that traditionally combines a box plot and a kernel density plot.

B: Gradient descent is a first-order iterative optimization algorithm for finding the minimum of a function. To find a local minimum of a function using gradient descent, one takes steps proportional to the negative of the gradient (or approximate gradient) of the function at the current point.

C: A scatter plot graphs the actual values in your data against the values predicted by the model. The scatter plot displays the actual values along the X-axis, and displays the predicted values along the Y-axis. It also displays a line that illustrates the perfect prediction, where the predicted value exactly matches the actual

value.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-understand-automated-ml#confusion-matrix

QUESTION 23
You are solving a classification task.

You must evaluate your model on a limited data sample by using k-fold cross-validation. You start by configuring a k parameter as the number of splits.

You need to configure the k parameter for the cross-validation.

Which value should you use?

A. k=1
B. k=10
C. k=0.5
D. k=0.9

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Leave One Out (LOO) cross-validation
Setting K = n (the number of observations) yields n-fold and is called leave-one out cross-validation (LOO), a special case of the K-fold approach.

LOO CV is sometimes useful but typically doesn't shake up the data enough. The estimates from each fold are highly correlated and hence their average can have high variance.
This is why the usual choice is K=5 or 10. It provides a good compromise for the bias-variance tradeoff.

QUESTION 24
You use Azure Machine Learning Studio to build a machine learning experiment.

You need to divide data into two distinct datasets.

Which module should you use?

A. Split Data

B. Load Trained Model
C. Assign Data to Clusters
D. Group Data into Bins

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
The Group Data into Bins module supports multiple options for binning data. You can customize how the bin edges are set and how values are apportioned into the bins.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/group-data-into-bins

QUESTION 25
You are a lead data scientist for a project that tracks the health and migration of birds. You create a multi-class image classification deep learning model that uses a set of labeled bird photographs collected by experts.

You have 100,000 photographs of birds. All photographs use the JPG format and are stored in an Azure blob container in an Azure subscription.

You need to access the bird photograph files in the Azure blob container from the Azure Machine Learning service workspace that will be used for deep learning model training. You must minimize data movement.

What should you do?

A. Create an Azure Data Lake store and move the bird photographs to the store.
B. Create an Azure Cosmos DB database and attach the Azure Blob containing bird photographs storage to the database.
C. Create and register a dataset by using TabularDataset class that references the Azure blob storage containing bird photographs.
D. Register the Azure blob storage containing the bird photographs as a datastore in Azure Machine Learning service.
E. Copy the bird photographs to the blob datastore that was created with your Azure Machine Learning service workspace.

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
We recommend creating a datastore for an Azure Blob container. When you create a workspace, an Azure blob container and an Azure file share are automatically

registered to the workspace.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-access-data

QUESTION 26
You use the Azure Machine Learning service to create a tabular dataset named **training_data**. You plan to use this dataset in a training script.

You create a variable that references the dataset using the following code:

```
training_ds = workspace.datasets.get("training_data")
```

You define an estimator to run the script.

You need to set the correct property of the estimator to ensure that your script can access the training_data dataset.

Which property should you set?

A. `environment_definition = {"training_data":training_ds}`
B. `inputs = [training_ds.as_named_input('training_ds')]`
C. `script_params = {"--training_ds":training_ds}`
D. `source_directory = training_ds`

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Example:
# Get the training dataset
diabetes_ds = ws.datasets.get("Diabetes Dataset")

# Create an estimator that uses the remote compute
hyper_estimator = SKLearn(source_directory=experiment_folder,
inputs=[diabetes_ds.as_named_input('diabetes')], # Pass the dataset as an input
compute_target = cpu_cluster,
conda_packages=['pandas','ipykernel','matplotlib'],
pip_packages=['azureml-sdk','argparse','pyarrow'],
entry_script='diabetes_training.py')

Reference:
https://notebooks.azure.com/GraemeMalcolm/projects/azureml-primers/html/04%20-%20Optimizing%20Model%20Training.ipynb

QUESTION 27
You register a file dataset named csv_folder that references a folder. The folder includes multiple comma-separated values (CSV) files in an Azure storage blob container.

You plan to use the following code to run a script that loads data from the file dataset. You create and instantiate the following variables:

Variable	Description
remote_cluster	References the Azure Machine Learning compute cluster
ws	References the Azure Machine Learning workspace

You have the following code:

```
from azureml.train.estimator import Estimator
file_dataset = ws.datasets.get('csv_folder')
estimator = Estimator(source_directory=script_folder,

compute_target = remote_cluster,
entry_script ='script.py')
run = experiment.submit(config=estimator)
run.wait_for_completion(show_output=True)
```

You need to pass the dataset to ensure that the script can read the files it references.

Which code segment should you insert to replace the code comment?

A. `inputs=[file_dataset.as_named_input('training_files')],`
B. `inputs=[file_dataset.as_named_input('training_files').as_mount()],`
C. `inputs=[file_dataset.as_named_input('training_files').to_pandas_dataframe()],`
D. `script_params={'--training_files': file_dataset},`

Correct Answer: B
Section: (none)

Explanation

Explanation/Reference:
Explanation:
Example:

```
from azureml.train.estimator import Estimator

script_params = {
    # to mount files referenced by mnist dataset
    '--data-folder': mnist_file_dataset.as_named_input('mnist_opendataset').as_mount(),
    '--regularization': 0.5
}

est = Estimator(source_directory=script_folder,
                script_params=script_params,
                compute_target=compute_target,
                environment_definition=env,
                entry_script='train.py')
```

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/tutorial-train-models-with-aml

QUESTION 28
You are creating a new Azure Machine Learning pipeline using the designer.

The pipeline must train a model using data in a comma-separated values (CSV) file that is published on a website. You have not created a dataset for this file.

You need to ingest the data from the CSV file into the designer pipeline using the minimal administrative effort.

Which module should you add to the pipeline in Designer?

A. Convert to CSV
B. Enter Data Manually
C. Import Data
D. Dataset

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:

Explanation:
The preferred way to provide data to a pipeline is a Dataset object. The Dataset object points to data that lives in or is accessible from a datastore or at a Web URL. The Dataset class is abstract, so you will create an instance of either a FileDataset (referring to one or more files) or a TabularDataset that's created by from one or more files with delimited columns of data.

Example:
from azureml.core import Dataset

iris_tabular_dataset = Dataset.Tabular.from_delimited_files([(def_blob_store, 'train-dataset/iris.csv')])

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-create-your-first-pipeline

QUESTION 29
You define a datastore named **ml-data** for an Azure Storage blob container. In the container, you have a folder named train that contains a file named data.csv. You plan to use the file to train a model by using the Azure Machine Learning SDK.

You plan to train the model by using the Azure Machine Learning SDK to run an experiment on local compute.

You define a DataReference object by running the following code:

```
from azureml.core import Workspace, Datastore, Environment
from azureml.train.estimator import Estimator
ws = Workspace.from_config()
ml_data = = Datastore.get(ws, datastore_name='ml-data')
data_ref = ml_data.path('train').as_download(path_on_compute='train_data')
estimator = Estimator(source_directory='experiment_folder',
  script_params={'--data-folder': data_ref},
  compute_target = 'local',
  entry_script='training.py')
run = experiment.submit(config=estimator)
run.wait_for_completion(show_output=True)
```

You need to load the training data.

Which code segment should you use?

A.
```
import os
import argparse
import pandas as pd

parser = argparse.ArgumentParser()
parser.add_argument('--data-folder', type=str, dest='data_folder')
data_folder = args.data_folder
data = pd.read_csv(os.path.join(data_folder,'ml-data','train_data','data.csv'))
```

B.
```
import os
import argparse
import pandas as pd

parser = argparse.ArgumentParser()
parser.add_argument('--data-folder', type=str, dest='data_folder')
data_folder = args.data_folder
data = pd.read_csv(os.path.join(data_folder,'train','data.csv'))
```

C.
```
import pandas as pd

data = pd.read_csv('./data.csv')
```

D.
```
import os
import argparse
import pandas as pd

parser = argparse.ArgumentParser()
parser.add_argument('--data-folder', type=str, dest='data_folder')
data_folder = args.data_folder
data = pd.read_csv(os.path.join('ml_data', data_folder,'data.csv'))
```

E.
```
import os
import argparse
import pandas as pd

parser = argparse.ArgumentParser()
parser.add_argument('--data-folder', type=str, dest='data_folder')
data_folder = args.data_folder
data = pd.read_csv(os.path.join(data_folder,'data.csv'))
```

Correct Answer: E

Section: (none)
Explanation

Explanation/Reference:
Explanation:

Example:
data_folder = args.data_folder
# Load Train and Test data
train_data = pd.read_csv(os.path.join(data_folder, 'data.csv'))

Reference:
https://www.element61.be/en/resource/azure-machine-learning-services-complete-toolbox-ai

Perform Feature Engineering

Testlet 1

Case study

Overview

You are a data scientist in a company that provides data science for professional sporting events. Models will use global and local market data to meet the following business goals:

- Understand sentiment of mobile device users at sporting events based on audio from crowd reactions.
- Assess a user's tendency to respond to an advertisement.
- Customize styles of ads served on mobile devices.
- Use video to detect penalty events

Current environment

- Media used for penalty event detection will be provided by consumer devices. Media may include images and videos captured during the sporting event and shared using social media. The images and videos will have varying sizes and formats.
- The data available for model building comprises of seven years of sporting event media. The sporting event media includes; recorded video transcripts or radio commentary, and logs from related social media feeds captured during the sporting events.
- Crowd sentiment will include audio recordings submitted by event attendees in both mono and stereo formats.

Penalty detection and sentiment

- Data scientists must build an intelligent solution by using multiple machine learning models for penalty event detection.
- Data scientists must build notebooks in a local environment using automatic feature engineering and model building in machine learning pipelines.
- Notebooks must be deployed to retrain by using Spark instances with dynamic worker allocation.
- Notebooks must execute with the same code on new Spark instances to recode only the source of the data.
- Global penalty detection models must be trained by using dynamic runtime graph computation during training.
- Local penalty detection models must be written by using BrainScript.
- Experiments for local crowd sentiment models must combine local penalty detection data.
- Crowd sentiment models must identify known sounds such as cheers and known catch phrases. Individual crowd sentiment models will detect similar sounds.
- All shared features for local models are continuous variables.
- Shared features must use double precision. Subsequent layers must have aggregate running mean and standard deviation metrics available.

Advertisements

During the initial weeks in production, the following was observed:

- Ad response rated declined.

- Drops were not consistent across ad styles.
- The distribution of features across training and production data are not consistent

Analysis shows that, of the 100 numeric features on user location and behavior, the 47 features that come from location sources are being used as raw features. A suggested experiment to remedy the bias and variance issue is to engineer 10 linearly uncorrelated features.

- Initial data discovery shows a wide range of densities of target states in training data used for crowd sentiment models.
- All penalty detection models show inference phases using a Stochastic Gradient Descent (SGD) are running too slow.
- Audio samples show that the length of a catch phrase varies between 25%-47% depending on region
- The performance of the global penalty detection models shows lower variance but higher bias when comparing training and validation sets. Before implementing any feature changes, you must confirm the bias and variance using all training and validation cases.

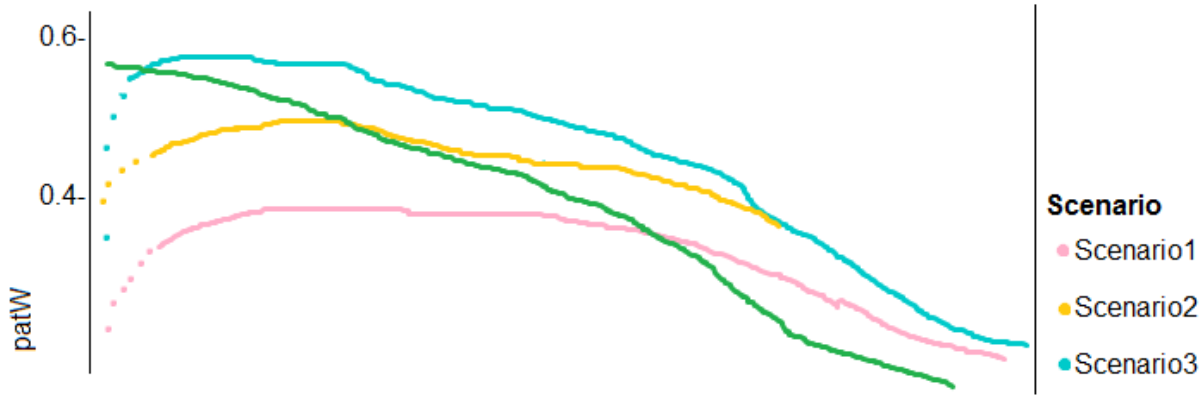
- Ad response models must be trained at the beginning of each event and applied during the sporting event.
- Market segmentation models must optimize for similar ad response history.
- Sampling must guarantee mutual and collective exclusively between local and global segmentation models that share the same features.
- Local market segmentation models will be applied before determining a user's propensity to respond to an advertisement.
- Ad response models must support non-linear boundaries of features.
- The ad propensity model uses a cut threshold is 0.45 and retrains occur if weighted Kappa deviated from 0.1 +/- 5%.
- The ad propensity model uses cost factors shown in the following diagram:

		Actual	
		1	**0**
Predicted	**0**	1	2
	1	2	1

- The ad propensity model uses proposed cost factors shown in the following diagram:

		Actual	
		1	0
Predicted	0	1	5
	1	5	1

- Performance curves of current and proposed cost factor scenarios are shown in the following diagram:



QUESTION 1
You need to implement a feature engineering strategy for the crowd sentiment local models.

What should you do?

A. Apply an analysis of variance (ANOVA).
B. Apply a Pearson correlation coefficient.

C. Apply a Spearman correlation coefficient.
D. Apply a linear discriminant analysis.

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
The linear discriminant analysis method works only on continuous variables, not categorical or ordinal variables.

Linear discriminant analysis is similar to analysis of variance (ANOVA) in that it works by comparing the means of the variables.

Scenario:
Data scientists must build notebooks in a local environment using automatic feature engineering and model building in machine learning pipelines.
Experiments for local crowd sentiment models must combine local penalty detection data.
All shared features for local models are continuous variables.

Incorrect Answers:
B: The Pearson correlation coefficient, sometimes called Pearson's R test, is a statistical value that measures the linear relationship between two variables. By examining the coefficient values, you can infer something about the strength of the relationship between the two variables, and whether they are positively correlated or negatively correlated.

C: Spearman's correlation coefficient is designed for use with non-parametric and non-normally distributed data. Spearman's coefficient is a nonparametric measure of statistical dependence between two variables, and is sometimes denoted by the Greek letter rho. The Spearman's coefficient expresses the degree to which two variables are monotonically related. It is also called Spearman rank correlation, because it can be used with ordinal variables.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/fisher-linear-discriminant-analysis

https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/compute-linear-correlation

Perform Feature Engineering

Testlet 2

Case study

This is a case study. Case studies are not timed separately. You can use as much exam time as you would like to complete each case. However, there may be additional case studies and sections on this exam. You must manage your time to ensure that you are able to complete all questions included on this exam in the time provided.

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Overview

You are a data scientist for Fabrikam Residences, a company specializing in quality private and commercial property in the United States. Fabrikam Residences is considering expanding into Europe and has asked you to investigate prices for private residences in major European cities.
You use Azure Machine Learning Studio to measure the median value of properties. You produce a regression model to predict property prices by using the Linear Regression and Bayesian Linear Regression modules.

Datasets

There are two datasets in CSV format that contain property details for two cities, London and Paris. You add both files to Azure Machine Learning Studio as separate datasets to the starting point for an experiment. Both datasets contain the following columns:

Column heading	Description
CapitaCrimeRate	per capita crime rate by town
Zoned	proportion of residential land zoned for lots over 25.000 square feet
NonRetailAcres	proportion of retail business acres per town
NextToRiver	proximity of a property to the river
NitrogenOxideConcentration	nitric oxides concentration (parts per 10 million)
AvgRoomsPerHouse	average number of rooms per dwelling
Age	proportion of owner-occupied units built prior to 1940
DistanceToEmploymentCenter	weighted distances to employment centers
AccessibilityToHighway	index of accessibility to radial highways to a value of two decimal places
Tax	full value property tax rate per $10,000
PupilTeacherRatio	pupil to teacher ratio by town
ProfessionalClass	professional class percentage
LowerStatus	percentage lower status of the population
MedianValue	median value of owner-occupied homes in $1000s

An initial investigation shows that the datasets are identical in structure apart from the MedianValue column. The smaller Paris dataset contains the MedianValue in text format, whereas the larger London dataset contains the MedianValue in numerical format.

Data issues

Missing values

The AccessibilityToHighway column in both datasets contains missing values. The missing data must be replaced with new data so that it is modeled conditionally using the other variables in the data before filling in the missing values.

Columns in each dataset contain missing and null values. The datasets also contain many outliers. The Age column has a high proportion of outliers. You need to remove the rows that have outliers in the Age column. The MedianValue and AvgRoomsInHouse columns both hold data in numeric format. You need to select a feature selection algorithm to analyze the relationship between the two columns in more detail.

Model fit

The model shows signs of overfitting. You need to produce a more refined regression model that reduces the overfitting.

Experiment requirements

You must set up the experiment to cross-validate the Linear Regression and Bayesian Linear Regression modules to evaluate performance. In each case, the predictor of the dataset is the column named MedianValue. You must ensure that the datatype of the MedianValue column of the Paris dataset matches the structure of the London dataset.

You must prioritize the columns of data for predicting the outcome. You must use non-parametric statistics to measure relationships.

You must use a feature selection algorithm to analyze the relationship between the MedianValue and AvgRoomsInHouse columns.

Model training

Permutation Feature Importance

Given a trained model and a test dataset, you must compute the Permutation Feature Importance scores of feature variables. You must be determined the absolute fit for the model.

Hyperparameters

You must configure hyperparameters in the model learning process to speed the learning phase**.** In addition, this configuration should cancel the lowest performing runs at each evaluation interval, thereby directing effort and resources towards models that are more likely to be successful.

You are concerned that the model might not efficiently use compute resources in hyperparameter tuning. You also are concerned that the model might prevent an increase in the overall tuning time. Therefore, must implement an early stopping criterion on models that provides savings without terminating promising jobs.

Testing

You must produce multiple partitions of a dataset based on sampling using the Partition and Sample module in Azure Machine Learning Studio.

Cross-validation

You must create three equal partitions for cross-validation. You must also configure the cross-validation process so that the rows in the test and training datasets are divided evenly by properties that are near each city's main river. You must complete this task before the data goes through the sampling process.

Linear regression module

When you train a Linear Regression module, you must determine the best features to use in a model. You can choose standard metrics provided to measure performance before and after the feature importance process completes. The distribution of features across multiple training models must be consistent.

Data visualization

You need to provide the test results to the Fabrikam Residences team. You create data visualizations to aid in presenting the results.

You must produce a Receiver Operating Characteristic (ROC) curve to conduct a diagnostic test evaluation of the model. You need to select appropriate methods for producing the ROC curve in Azure Machine Learning Studio to compare the Two-Class Decision Forest and the Two-Class Decision Jungle modules with one another.

QUESTION 1
You need to select a feature extraction method.

Which method should you use?

A. Mutual information
B. Mood's median test
C. Kendall correlation
D. Permutation Feature Importance

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
In statistics, the Kendall rank correlation coefficient, commonly referred to as Kendall's tau coefficient (after the Greek letter τ), is a statistic used to measure the ordinal association between two measured quantities.
It is a supported method of the Azure Machine Learning Feature selection.

Note: Both Spearman's and Kendall's can be formulated as special cases of a more general correlation coefficient, and they are both appropriate in this scenario.

Scenario: The MedianValue and AvgRoomsInHouse columns both hold data in numeric format. You need to select a feature selection algorithm to analyze the relationship between the two columns in more detail.

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/feature-selection-modules

QUESTION 2
You need to select a feature extraction method.

Which method should you use?

A. Mutual information
B. Pearson's correlation

C. Spearman correlation
D. Fisher Linear Discriminant Analysis

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Spearman's rank correlation coefficient assesses how well the relationship between two variables can be described using a monotonic function.

Note: Both Spearman's and Kendall's can be formulated as special cases of a more general correlation coefficient, and they are both appropriate in this scenario.

Scenario: The MedianValue and AvgRoomsInHouse columns both hold data in numeric format. You need to select a feature selection algorithm to analyze the relationship between the two columns in more detail.

Incorrect Answers:
B: The Spearman correlation between two variables is equal to the Pearson correlation between the rank values of those two variables; while Pearson's correlation assesses linear relationships, Spearman's correlation assesses monotonic relationships (whether linear or not).

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/feature-selection-modules

Perform Feature Engineering

Question Set 3

QUESTION 1
You are building a regression model for estimating the number of calls during an event.

You need to determine whether the feature values achieve the conditions to build a Poisson regression model.

Which two conditions must the feature set contain? Each correct answer presents part of the solution.

NOTE: Each correct selection is worth one point.

A. The label data must be a negative value.
B. The label data must be whole numbers.
C. The label data must be non-discrete.
D. The label data must be a positive value.
E. The label data can be positive or negative.

Correct Answer: BD
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Poisson regression is intended for use in regression models that are used to predict numeric values, typically counts. Therefore, you should use this module to create your regression model only if the values you are trying to predict fit the following conditions:

- The response variable has a Poisson distribution.
- Counts cannot be negative. The method will fail outright if you attempt to use it with negative labels.
- A Poisson distribution is a discrete distribution; therefore, it is not meaningful to use this method with non-whole numbers.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/poisson-regression

QUESTION 2
You are performing feature engineering on a dataset.

You must add a feature named CityName and populate the column value with the text **London**.

You need to add the new feature to the dataset.

Which Azure Machine Learning Studio module should you use?

A. Edit Metadata
B. Filter Based Feature Selection
C. Execute Python Script
D. Latent Dirichlet Allocation

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Typical metadata changes might include marking columns as features.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/edit-metadata

QUESTION 3
You are determining if two sets of data are significantly different from one another by using Azure Machine Learning Studio.

Estimated values in one set of data may be more than or less than reference values in the other set of data. You must produce a distribution that has a constant Type I error as a function of the correlation.

You need to produce the distribution.

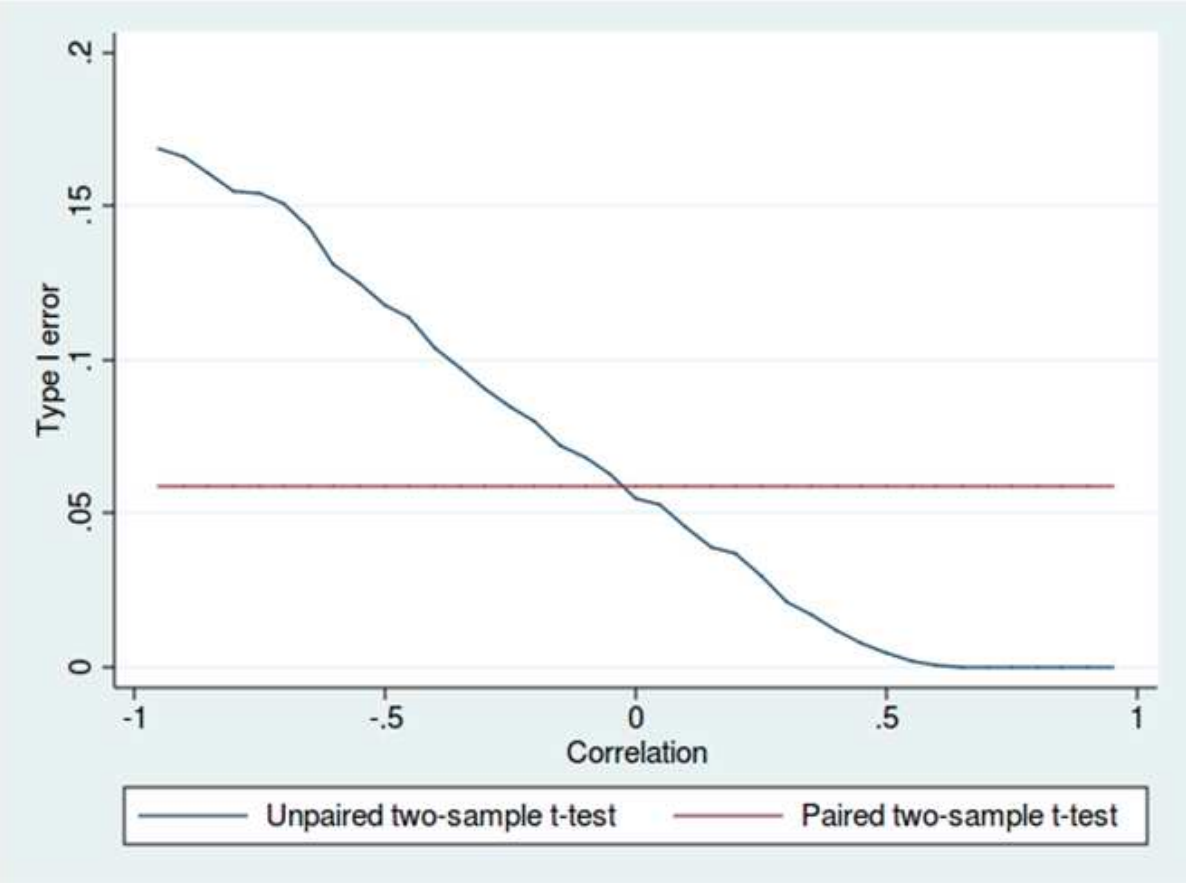
Which type of distribution should you produce?

A. Unpaired t-test with a two-tail option
B. Unpaired t-test with a one-tail option
C. Paired t-test with a one-tail option
D. Paired t-test with a two-tail option

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Choose a one-tail or two-tail test. The default is a two-tailed test. This is the most common type of test, in which the expected distribution is symmetric around zero.

Example: Type I error of unpaired and paired two-sample t-tests as a function of the correlation. The simulated random numbers originate from a bivariate normal distribution with a variance of 1.



Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/test-hypothesis-using-t-test

https://en.wikipedia.org/wiki/Student%27s_t-test

QUESTION 4
You are performing feature engineering on a dataset.

You must add a feature named CityName and populate the column value with the text **London**.

You need to add the new feature to the dataset.

Which Azure Machine Learning Studio module should you use?

A. Extract N-Gram Features from Text
B. Edit Metadata
C. Preprocess Text
D. Apply SQL Transformation

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Typical metadata changes might include marking columns as features.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/edit-metadata

QUESTION 5
You run an automated machine learning experiment in an Azure Machine Learning workspace. Information about the run is listed in the table below:

Experiment	Run ID	Status	Created on	Duration
auto_ml_clasification	AutoML_1234567890-123	Completed	11/11/2019 11:00:00 AM	00:27:11

You need to write a script that uses the Azure Machine Learning SDK to retrieve the best iteration of the experiment run.

Which Python code segment should you use?

A.
```
from azureml.core import Workspace
from azureml.train.automl.run import AutoMLRun
ws = Workspace.from_config()
automl_ex = ws.experiments.get('auto_ml_classification')
best_iter = automl_ex.archived_time.find('11/11/2019 11:00:00 AM')
```

B.
```
from azureml.core import Workspace
from azureml.train.automl.run import AutoMLRun
automl_ex = ws.experiments.get('auto_ml_classification')
automl_run = AutoMLRun(automl_ex, 'AutoML_1234567890-123')
best_iter = automl_run.current_run
```

C.
```
from azureml.core import Workspace
from azureml.train.automl.run import AutoMLRun
ws = Workspace.from_config()
automl_ex = ws.experiments.get('auto_ml_classification')
best_iter = list(automl_ex.get_runs())[0]
```

D.
```
from azureml.core import Workspace
from azureml.train.automl.run import AutoMLRun
ws = Workspace.from_config()
automl_ex = ws.experiments.get('auto_ml_classification')
automl_run = AutoMLRun(automl_ex, 'AutoML_1234567890-123')
best_iter = automl_run.get_output()[0]
```

E.
```
from azureml.core import Workspace
from azureml.train.automl.run import AutoMLRun
ws = Workspace.from_config()
automl_ex = ws.experiments.get('auto_ml_classification')
best_iter = automl_ex.get_runs('AutoML_1234567890-123')
```

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
The get_output method on automl_classifier returns the best run and the fitted model for the last invocation. Overloads on get_output allow you to retrieve the best run and fitted model for any logged metric or for a particular iteration.

In [ ]:
best_run, fitted_model = local_run.get_output()

Reference:
https://notebooks.azure.com/azureml/projects/azureml-getting-started/html/how-to-use-azureml/automated-machine-learning/classification-with-deployment/auto-ml-classification-with-deployment.ipynb

QUESTION 6
You have a comma-separated values (CSV) file containing data from which you want to train a classification model.

You are using the Automated Machine Learning interface in Azure Machine Learning studio to train the classification model. You set the task type to Classification.

You need to ensure that the Automated Machine Learning process evaluates only linear models.

What should you do?

A. Add all algorithms other than linear ones to the blocked algorithms list.
B. Set the Exit criterion option to a metric score threshold.
C. Clear the option to perform automatic featurization.
D. Clear the option to enable deep learning.
E. Set the task type to **Regression**.

Correct Answer: C
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Automatic featurization can fit non-linear models.

Reference:
https://econml.azurewebsites.net/spec/estimation/dml.html

https://docs.microsoft.com/en-us/azure/machine-learning/how-to-use-automated-ml-for-ml-models

QUESTION 7
You are a data scientist working for a bank and have used Azure ML to train and register a machine learning model that predicts whether a customer is likely to repay a loan.

You want to understand how your model is making selections and must be sure that the model does not violate government regulations such as denying loans based on where an applicant lives.

You need to determine the extent to which each feature in the customer data is influencing predictions.

What should you do?

A. Enable data drift monitoring for the model and its training dataset.
B. Score the model against some test data with known label values and use the results to calculate a confusion matrix.
C. Use the Hyperdrive library to test the model with multiple hyperparameter values.
D. Use the interpretability package to generate an explainer for the model.
E. Add tags to the model registration indicating the names of the features in the training dataset.

Correct Answer: D
Section: (none)
Explanation

Explanation/Reference:
Explanation:
When you compute model explanations and visualize them, you're not limited to an existing model explanation for an automated ML model. You can also get an explanation for your model with different test data. The steps in this section show you how to compute and visualize engineered feature importance based on your test data.

Incorrect Answers:
A: In the context of machine learning, data drift is the change in model input data that leads to model performance degradation. It is one of the top reasons where model accuracy degrades over time, thus monitoring data drift helps detect model performance issues.

B: A confusion matrix is used to describe the performance of a classification model. Each row displays the instances of the true, or actual class in your dataset, and each column represents the instances of the class that was predicted by the model.

C: Hyperparameters are adjustable parameters you choose for model training that guide the training process. The HyperDrive package helps you automate choosing these parameters.

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-machine-learning-interpretability-automl

QUESTION 8

You create a multi-class image classification deep learning model that uses the PyTorch deep learning framework.

You must configure Azure Machine Learning Hyperdrive to optimize the hyperparameters for the classification model.

You need to define a primary metric to determine the hyperparameter values that result in the model with the best accuracy score.

Which three actions must you perform? Each correct answer presents part of the solution.

NOTE: Each correct selection is worth one point.

A. Set the primary_metric_goal of the estimator used to run the bird_classifier_train.py script to **maximize**.
B. Add code to the bird_classifier_train.py script to calculate the validation loss of the model and log it as a float value with the key **loss**.
C. Set the primary_metric_goal of the estimator used to run the bird_classifier_train.py script to **minimize**.
D. Set the primary_metric_name of the estimator used to run the bird_classifier_train.py script to **accuracy**.
E. Set the primary_metric_name of the estimator used to run the bird_classifier_train.py script to **loss**.
F. Add code to the bird_classifier_train.py script to calculate the validation accuracy of the model and log it as a float value with the key **accuracy**.

Correct Answer: ADF
Section: (none)
Explanation

Explanation/Reference:
Explanation:

AD:
primary_metric_name="accuracy",
primary_metric_goal=PrimaryMetricGoal.MAXIMIZE

Optimize the runs to maximize "accuracy". Make sure to log this value in your training script.
Note:
primary_metric_name: The name of the primary metric to optimize. The name of the primary metric needs to exactly match the name of the metric logged by the training script.

primary_metric_goal: It can be either PrimaryMetricGoal.MAXIMIZE or PrimaryMetricGoal.MINIMIZE and determines whether the primary metric will be maximized or minimized when evaluating the runs.

F: The training script calculates the val_accuracy and logs it as "accuracy", which is used as the primary metric.

QUESTION 9
You plan to use automated machine learning to train a regression model. You have data that has features which have missing values, and categorical features with

few distinct values.

You need to configure automated machine learning to automatically impute missing values and encode categorical features as part of the training task.

Which parameter and value pair should you use in the AutoMLConfig class?

A. `featurization = 'auto'`
B. `enable_voting_ensemble = True`
C. `task = 'classification'`
D. `exclude_nan_labels = True`
E. `enable_tf = True`

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Featurization str or FeaturizationConfig
Values: 'auto' / 'off' / FeaturizationConfig
Indicator for whether featurization step should be done automatically or not, or whether customized featurization should be used.

Column type is automatically detected. Based on the detected column type preprocessing/featurization is done as follows:

Categorical: Target encoding, one hot encoding, drop high cardinality categories, impute missing values.
Numeric: Impute missing values, cluster distance, weight of evidence.
DateTime: Several features such as day, seconds, minutes, hours etc.

Text: Bag of words, pre-trained Word embedding, text target encoding.

Reference:
https://docs.microsoft.com/en-us/python/api/azureml-train-automl-client/azureml.train.automl.automlconfig.automlconfig

Develop models

Testlet 1

Case study

Overview

You are a data scientist in a company that provides data science for professional sporting events. Models will use global and local market data to meet the following business goals:

- Understand sentiment of mobile device users at sporting events based on audio from crowd reactions.
- Assess a user's tendency to respond to an advertisement.
- Customize styles of ads served on mobile devices.
- Use video to detect penalty events

Current environment

- Media used for penalty event detection will be provided by consumer devices. Media may include images and videos captured during the sporting event and shared using social media. The images and videos will have varying sizes and formats.
- The data available for model building comprises of seven years of sporting event media. The sporting event media includes; recorded video transcripts or radio commentary, and logs from related social media feeds captured during the sporting events.
- Crowd sentiment will include audio recordings submitted by event attendees in both mono and stereo formats.

Penalty detection and sentiment

- Data scientists must build an intelligent solution by using multiple machine learning models for penalty event detection.
- Data scientists must build notebooks in a local environment using automatic feature engineering and model building in machine learning pipelines.
- Notebooks must be deployed to retrain by using Spark instances with dynamic worker allocation.
- Notebooks must execute with the same code on new Spark instances to recode only the source of the data.
- Global penalty detection models must be trained by using dynamic runtime graph computation during training.
- Local penalty detection models must be written by using BrainScript.
- Experiments for local crowd sentiment models must combine local penalty detection data.
- Crowd sentiment models must identify known sounds such as cheers and known catch phrases. Individual crowd sentiment models will detect similar sounds.
- All shared features for local models are continuous variables.
- Shared features must use double precision. Subsequent layers must have aggregate running mean and standard deviation metrics available.

Advertisements

During the initial weeks in production, the following was observed:

- Ad response rated declined.

- Drops were not consistent across ad styles.
- The distribution of features across training and production data are not consistent

Analysis shows that, of the 100 numeric features on user location and behavior, the 47 features that come from location sources are being used as raw features. A suggested experiment to remedy the bias and variance issue is to engineer 10 linearly uncorrelated features.

- Initial data discovery shows a wide range of densities of target states in training data used for crowd sentiment models.
- All penalty detection models show inference phases using a Stochastic Gradient Descent (SGD) are running too slow.
- Audio samples show that the length of a catch phrase varies between 25%-47% depending on region
- The performance of the global penalty detection models shows lower variance but higher bias when comparing training and validation sets. Before implementing any feature changes, you must confirm the bias and variance using all training and validation cases.

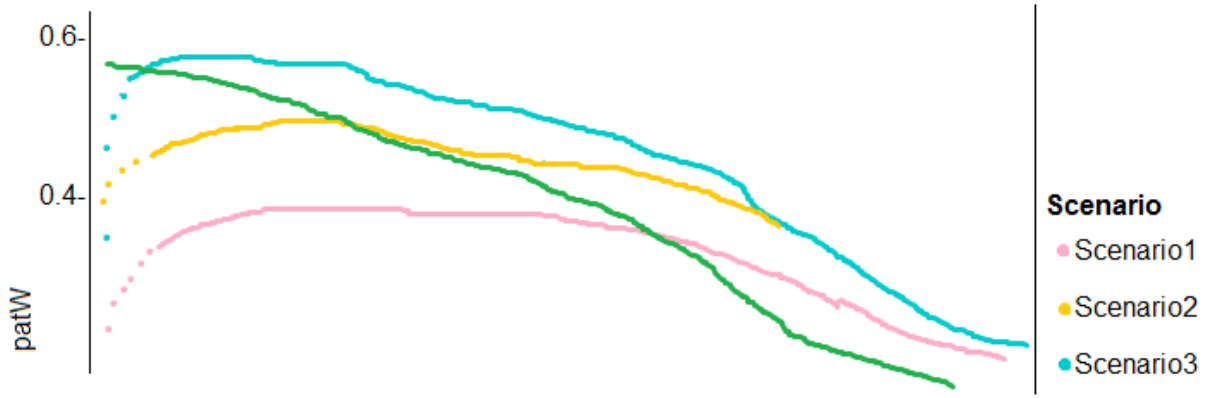
- Ad response models must be trained at the beginning of each event and applied during the sporting event.
- Market segmentation models must optimize for similar ad response history.
- Sampling must guarantee mutual and collective exclusively between local and global segmentation models that share the same features.
- Local market segmentation models will be applied before determining a user's propensity to respond to an advertisement.
- Ad response models must support non-linear boundaries of features.
- The ad propensity model uses a cut threshold is 0.45 and retrains occur if weighted Kappa deviated from 0.1 +/- 5%.
- The ad propensity model uses cost factors shown in the following diagram:

		Actual	
		1	**0**
Predicted	**0**	1	2
	1	2	1

- The ad propensity model uses proposed cost factors shown in the following diagram:

		Actual	
		1	0
Predicted	0	1	5
	1	5	1

- Performance curves of current and proposed cost factor scenarios are shown in the following diagram:



QUESTION 1
You need to implement a model development strategy to determine a user's tendency to respond to an ad.

Which technique should you use?

A. Use a Relative Expression Split module to partition the data based on centroid distance.
B. Use a Relative Expression Split module to partition the data based on distance travelled to the event.

C. Use a Split Rows module to partition the data based on distance travelled to the event.
D. Use a Split Rows module to partition the data based on centroid distance.

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Split Data partitions the rows of a dataset into two distinct sets.
The Relative Expression Split option in the Split Data module of Azure Machine Learning Studio is helpful when you need to divide a dataset into training and testing datasets using a numerical expression.

Relative Expression Split: Use this option whenever you want to apply a condition to a number column. The number could be a date/time field, a column containing age or dollar amounts, or even a percentage. For example, you might want to divide your data set depending on the cost of the items, group people by age ranges, or separate data by a calendar date.

Scenario:
Local market segmentation models will be applied before determining a user's propensity to respond to an advertisement.
The distribution of features across training and production data are not consistent

References:
https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/split-data

QUESTION 2
You need to implement a new cost factor scenario for the ad response models as illustrated in the performance curve exhibit.

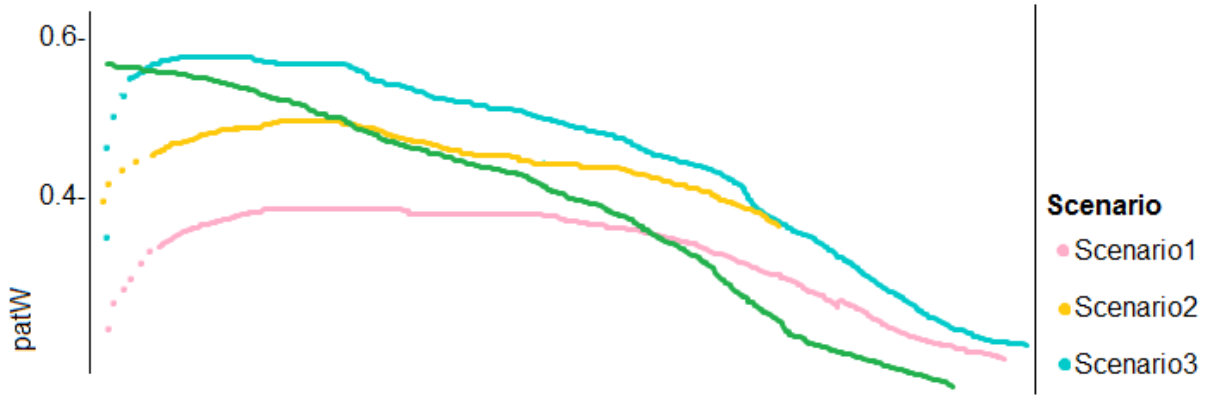
Which technique should you use?

A. Set the threshold to **0.5** and retrain if weighted Kappa deviates +/- 5% from 0.45.
B. Set the threshold to **0.05** and retrain if weighted Kappa deviates +/- 5% from 0.5.
C. Set the threshold to **0.2** and retrain if weighted Kappa deviates +/- 5% from 0.6.
D. Set the threshold to **0.75** and retrain if weighted Kappa deviates +/- 5% from 0.15.

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:

Scenario:
Performance curves of current and proposed cost factor scenarios are shown in the following diagram:



The ad propensity model uses a cut threshold is 0.45 and retrains occur if weighted Kappa deviated from 0.1 +/- 5%.

Develop models

Testlet 2

Case study

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AvgRoomsPerHouse	average number of rooms per dwelling
Age	proportion of owner-occupied units built prior to 1940
DistanceToEmploymentCenter	weighted distances to employment centers
AccessibilityToHighway	index of accessibility to radial highways to a value of two decimal places
Tax	full value property tax rate per $10,000
PupilTeacherRatio	pupil to teacher ratio by town
ProfessionalClass	professional class percentage
LowerStatus	percentage lower status of the population
MedianValue	median value of owner-occupied homes in $1000s

An initial investigation shows that the datasets are identical in structure apart from the MedianValue column. The smaller Paris dataset contains the MedianValue in text format, whereas the larger London dataset contains the MedianValue in numerical format.

Data issues

Missing values

The AccessibilityToHighway column in both datasets contains missing values. The missing data must be replaced with new data so that it is modeled conditionally using the other variables in the data before filling in the missing values.

Columns in each dataset contain missing and null values. The datasets also contain many outliers. The Age column has a high proportion of outliers. You need to remove the rows that have outliers in the Age column. The MedianValue and AvgRoomsInHouse columns both hold data in numeric format. You need to select a feature selection algorithm to analyze the relationship between the two columns in more detail.

Model fit

The model shows signs of overfitting. You need to produce a more refined regression model that reduces the overfitting.

Experiment requirements

You must set up the experiment to cross-validate the Linear Regression and Bayesian Linear Regression modules to evaluate performance. In each case, the predictor of the dataset is the column named MedianValue. You must ensure that the datatype of the MedianValue column of the Paris dataset matches the structure of the London dataset.

You must prioritize the columns of data for predicting the outcome. You must use non-parametric statistics to measure relationships.

You must use a feature selection algorithm to analyze the relationship between the MedianValue and AvgRoomsInHouse columns.

Model training

Permutation Feature Importance

Given a trained model and a test dataset, you must compute the Permutation Feature Importance scores of feature variables. You must be determined the absolute fit for the model.

Hyperparameters

You must configure hyperparameters in the model learning process to speed the learning phase**.** In addition, this configuration should cancel the lowest performing runs at each evaluation interval, thereby directing effort and resources towards models that are more likely to be successful.

You are concerned that the model might not efficiently use compute resources in hyperparameter tuning. You also are concerned that the model might prevent an increase in the overall tuning time. Therefore, must implement an early stopping criterion on models that provides savings without terminating promising jobs.

Testing

You must produce multiple partitions of a dataset based on sampling using the Partition and Sample module in Azure Machine Learning Studio.

Cross-validation

You must create three equal partitions for cross-validation. You must also configure the cross-validation process so that the rows in the test and training datasets are divided evenly by properties that are near each city's main river. You must complete this task before the data goes through the sampling process.

Linear regression module

When you train a Linear Regression module, you must determine the best features to use in a model. You can choose standard metrics provided to measure performance before and after the feature importance process completes. The distribution of features across multiple training models must be consistent.

Data visualization

You need to provide the test results to the Fabrikam Residences team. You create data visualizations to aid in presenting the results.

You must produce a Receiver Operating Characteristic (ROC) curve to conduct a diagnostic test evaluation of the model. You need to select appropriate methods for producing the ROC curve in Azure Machine Learning Studio to compare the Two-Class Decision Forest and the Two-Class Decision Jungle modules with one another.

Develop models

Question Set 3

QUESTION 1
You are building a recurrent neural network to perform a binary classification.

You review the training loss, validation loss, training accuracy, and validation accuracy for each training epoch.

You need to analyze model performance.

You need to identify whether the classification model is overfitted.

Which of the following is correct?

A. The training loss stays constant and the validation loss stays on a constant value and close to the training loss value when training the model.
B. The training loss decreases while the validation loss increases when training the model.
C. The training loss stays constant and the validation loss decreases when training the model.
D. The training loss increases while the validation loss decreases when training the model.

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
An overfit model is one where performance on the train set is good and continues to improve, whereas performance on the validation set improves to a point and then begins to degrade.

References:
https://machinelearningmastery.com/diagnose-overfitting-underfitting-lstm-models/

QUESTION 2
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You create a model to forecast weather conditions based on historical data.

You need to create a pipeline that runs a processing script to load data from a datastore and pass the processed data to a machine learning model training script.

Solution: Run the following code:

```
datastore = ws.get_default_datastore()
data_input = PipelineData("raw_data", datastore=rawdatastore)
data_output = PipelineData("processed_data", datastore=datastore)
process_step = PythonScriptStep(script_name="process.py",
 arguments=["--data_for_train", data_input],
 outputs=[data_output], compute_target=aml_compute,
 source_directory=process_directory)
train_step = PythonScriptStep(script_name="train.py",
 arguments=["--data_for_train", data_input], inputs=[data_output],
 compute_target=aml_compute, source_directory=train_directory)
pipeline = Pipeline(workspace=ws, steps=[process_step, train_step])
```

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: B
Section: (none)
Explanation

Explanation/Reference:
Explanation:
Note: Data used in pipeline can be produced by one step and consumed in another step by providing a PipelineData object as an output of one step and an input of one or more subsequent steps.

Compare with this example, the pipeline train step depends on the process_step_output output of the pipeline process step:

```
from azureml.pipeline.core import Pipeline, PipelineData
  from azureml.pipeline.steps import PythonScriptStep

  datastore = ws.get_default_datastore()
```

```
process_step_output = PipelineData("processed_data", datastore=datastore)
process_step = PythonScriptStep(script_name="process.py",
                                arguments=["--data_for_train", process_step_output],
                                outputs=[process_step_output],
                                compute_target=aml_compute,
                                source_directory=process_directory)
train_step = PythonScriptStep(script_name="train.py",
                              arguments=["--data_for_train", process_step_output],
                              inputs=[process_step_output],
                              compute_target=aml_compute,
                              source_directory=train_directory)

pipeline = Pipeline(workspace=ws, steps=[process_step, train_step])
```

Reference:
https://docs.microsoft.com/en-us/python/api/azureml-pipeline-core/azureml.pipeline.core.pipelinedata?view=azure-ml-py

QUESTION 3
Note: This question is part of a series of questions that present the same scenario. Each question in the series contains a unique solution that might meet the stated goals. Some question sets might have more than one correct solution, while others might not have a correct solution.

After you answer a question in this section, you will NOT be able to return to it. As a result, these questions will not appear in the review screen.

You have a Python script named train.py in a local folder named scripts. The script trains a regression model by using scikit-learn. The script includes code to load a training data file which is also located in the scripts folder.

You must run the script as an Azure ML experiment on a compute cluster named aml-compute.

You need to configure the run to ensure that the environment includes the required packages for model training. You have instantiated a variable named aml-compute that references the target compute cluster.

Solution: Run the following code:

```
from azureml.train.sklearn import SKLearn
sk_est = SKLearn(source_directory='./scripts',
 compute_target=aml-compute,
 entry_script='train.py')
```

Does the solution meet the goal?

A. Yes
B. No

Correct Answer: A
Section: (none)
Explanation

Explanation/Reference:
Explanation:
The scikit-learn estimator provides a simple way of launching a scikit-learn training job on a compute target. It is implemented through the SKLearn class, which can be used to support single-node CPU training.

Example:
from azureml.train.sklearn import SKLearn

}

```
estimator = SKLearn(source_directory=project_folder,
                    compute_target=compute_target,
                    entry_script='train_iris.py'
                   )
```

Reference:
https://docs.microsoft.com/en-us/azure/machine-learning/how-to-train-scikit-learn