

## DP-100T01-A: Designing and Implementing a Data Science Solution on Azure

### Course Summary

#### Description

Learn how to operate machine learning solutions at cloud scale using Azure Machine Learning. This course teaches you to leverage your existing knowledge of Python and machine learning to manage data ingestion and preparation, model training and deployment, and machine learning solution monitoring in Microsoft Azure.

#### Topics

- Introduction to Azure Machine Learning
- No-Code Machine Learning with Designer
- Running Experiments and Training Models
- Working with Data
- Compute Contexts
- Orchestrating Operations with Pipelines
- Deploying and Consuming Models
- Training Optimal Models
- Interpreting Models
- Monitoring Models

#### Audience

This course is designed for data scientists with existing knowledge of Python and machine learning frameworks like Scikit-Learn, PyTorch, and Tensorflow, who want to build and operate machine learning solutions in the cloud.

#### Prerequisites

Before attending this course, students must have:

- A fundamental knowledge of Microsoft Azure
- Experience of writing Python code to work with data, using libraries such as Numpy, Pandas, and Matplotlib.
- Understanding of data science; including how to prepare data, and train machine learning models using common machine learning libraries such as Scikit-Learn, PyTorch, or Tensorflow.

#### Duration

Three days

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### Course Outline

#### I. Introduction to Azure Machine Learning

In this module, you will learn how to provision an Azure Machine Learning workspace and use it to manage machine learning assets such as data, compute, model training code, logged metrics, and trained models. You will learn how to use the web-based Azure Machine Learning studio interface as well as the Azure Machine Learning SDK and developer tools like Visual Studio Code and Jupyter Notebooks to work with the assets in your workspace.

- A. Getting Started with Azure Machine Learning
- B. Azure Machine Learning Tools
- C. Lab : Creating an Azure Machine Learning Workspace
- D. Lab : Working with Azure Machine Learning Tools

#### II. No-Code Machine Learning with Designer

This module introduces the Designer tool, a drag and drop interface for creating machine learning models without writing any code. You will learn how to create a training pipeline that encapsulates data preparation and model training, and then convert that training pipeline to an inference pipeline that can be used to predict values from new data, before finally deploying the inference pipeline as a service for client applications to consume.

- A. Training Models with Designer
- B. Publishing Models with Designer
- C. Lab : Creating a Training Pipeline with the Azure ML Designer
- D. Lab : Deploying a Service with the Azure ML Designer

#### III. Running Experiments and Training Models

In this module, you will get started with experiments that encapsulate data processing and model training code, and use them to train machine learning models.

- A. Introduction to Experiments
- B. Training and Registering Models
- C. Lab : Running Experiments
- D. Lab : Training and Registering Models

#### IV. Working with Data

Data is a fundamental element in any machine learning workload, so in this module, you will learn how to create and manage datastores and datasets in an Azure Machine Learning workspace, and how to use them in model training experiments.

- A. Working with Datastores
- B. Working with Datasets
- C. Lab : Working with Datastores
- D. Lab : Working with Datasets

#### V. Compute Contexts

One of the key benefits of the cloud is the ability to leverage compute resources on demand, and use them to scale machine learning processes to an extent that would be infeasible on your own hardware. In this module, you'll learn how to manage experiment environments that ensure consistent runtime consistency for experiments, and how to create and use compute targets for experiment runs.

- A. Working with Environments
- B. Working with Compute Targets
- C. Lab : Working with Environments
- D. Lab : Working with Compute Targets

#### VI. Orchestrating Operations with Pipelines

Now that you understand the basics of running workloads as experiments that leverage data assets and compute resources, it's time to learn how to orchestrate these workloads as pipelines of connected steps. Pipelines are key to implementing an effective Machine Learning Operationalization (ML Ops) solution in Azure, so you'll explore how to define and run them in this module.

- A. Introduction to Pipelines
- B. Publishing and Running Pipelines
- C. Lab : Creating a Pipeline
- D. Lab : Publishing a Pipeline

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#### VII. *Deploying and Consuming Models*

Models are designed to help decision making through predictions, so they're only useful when deployed and available for an application to consume. In this module learn how to deploy models for real-time inferencing, and for batch inferencing.

- A. Real-time Inferencing
- B. Batch Inferencing
- C. Lab : Creating a Real-time Inferencing Service
- D. Lab : Creating a Batch Inferencing Service

#### VIII. *Training Optimal Models*

By this stage of the course, you've learned the end-to-end process for training, deploying, and consuming machine learning models; but how do you ensure your model produces the best predictive outputs for your data? In this module, you'll explore how you can use hyperparameter tuning and automated machine learning to take advantage of cloud-scale compute and find the best model for your data.

- A. Hyperparameter Tuning
- B. Automated Machine Learning
- C. Lab : Tuning Hyperparameters
- D. Lab : Using Automated Machine Learning

#### IX. *Interpreting Models*

Many of the decisions made by organizations and automated systems today are based on predictions made by machine learning models. It's increasingly important to be able to understand the factors that influence the predictions made by a model, and to be able to determine any unintended biases in the model's behavior. This module describes how you can interpret models to explain how feature importance determines their predictions.

- A. Introduction to Model Interpretation
- B. using Model Explainers
- C. Lab : Reviewing Automated Machine Learning Explanations
- D. Lab : Interpreting Models

#### X. *Monitoring Models*

After a model has been deployed, it's important to understand how the model is being used in production, and to detect any degradation in its effectiveness due to data drift. This module describes techniques for monitoring models and their data.

- A. Monitoring Models with Application Insights
- B. Monitoring Data Drift
- C. Lab : Monitoring a Model with Application Insights
- D. Lab : Monitoring Data Drift