MS-DP100T01: DESIGNING AND IMPLEMENTING A DATA SCIENCE SOLUTION ON AZURE

DURATION	LEVEL	TECHNOLOGY	DELIVERY METHOD	TRAINING CREDITS
4 Days	Intermediate	Azure	Instructor-led	NA

INTRODUCTION

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 with Azure Machine Learning and MLflow.

AUDIENCE PROFILE

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:

- Successful Azure Data Scientists start this role with a fundamental knowledge of cloud computing concepts, and experience in general data science and machine learning tools and techniques.
- Specifically:
- Creating cloud resources in Microsoft Azure.
- Using Python to explore and visualize data.
- Training and validating machine learning models using common frameworks like Scikit-Learn, PyTorch, and TensorFlow.
- Working with containersTo gain these prerequisite skills, take the following free online training before attending the course:
- Explore Microsoft cloud concepts.
- Create machine learning models.
- Administer containers in AzureIf you are completely new to data science and machine learning, please complete Microsoft Azure AI Fundamentals first.

COURSE OBJECTIVES

After completing this course, students will be able to:

- Understand the data science in Azure
- Use Machine Learning to automate the end-to-end process
- Manage and monitor the Machine Learning service

COURSE CONTENT

Module 1: Design a data ingestion strategy for machine learning projects
Learn how to design a data ingestion solution for training data used in machine learning projects.
Lessons
- Introduction
- Identify your data source and format
- Choose how to serve data to machine learning workflows
- Design a data ingestion solution
- Exercise: Design a data ingestion strategy
- Knowledge check
- Summary

By the end of this module, you'll be able to:
- Identify your data source and format.
- Choose how to serve data to machine learning workflows.
- Design a data ingestion solution.

Module 2: Design a machine learning model training solution
Learn how to design a model training solution for machine learning projects.
Lessons
- Introduction
- Identify machine learning tasks
- Choose a service to train a machine learning model
- Decide between compute options
- Exercise: Design a model training strategy

- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Identify machine learning tasks
- Choose a service to train a model
- Choose between compute options

Module 3: Design a model deployment solution
Learn how to design a model deployment solution and how the requirements of the deployed model can affect the way you train a model.
Lessons
- Introduction
- Understand how model will be consumed
- Decide on real-time or batch deployment
- Exercise - Design a deployment solution
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Understand how a model will be consumed.
- Decide whether to deploy your model to a real-time or batch endpoint.

Module 4: Design a machine learning operations solution
Learn about machine learning operations or MLOps to bring a model from development to production. Identify options for monitoring and retraining when preparing a model for production.
Lessons
- Introduction
- Explore an MLOps architecture
- Design for monitoring
- Design for retraining
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Explore an MLOps architecture.
- Design for monitoring.
- Design for retraining.

Module 5: Explore Azure Machine Learning workspace resources and assets
As a data scientist, you can use Azure Machine Learning to train and manage your machine learning models. Learn what Azure Machine Learning is and get familiar with all its resources and assets.
Lessons
- Introduction
- Create an Azure Machine Learning workspace
- Identify Azure Machine Learning resources
- Identify Azure Machine Learning assets
- Train models in the workspace
- Exercise - Explore the workspace
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Create an Azure Machine Learning workspace.
- Identify resources and assets.
- Train models in the workspace.

Module 6: Explore developer tools for workspace interaction
Learn how you can interact with the Azure Machine Learning workspace. You can use the Azure Machine Learning studio, the Python SDK (v2), or the Azure CLI (v2).
Lessons
- Introduction
- Explore the studio
- Explore the Python SDK
- Explore the CLI
- Exercise - Explore the developer tools
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- The Azure Machine Learning studio.
- The Python Software Development Kit (SDK).
- The Azure Command Line Interface (CLI).

Module 7: Make data available in Azure Machine Learning
Learn about how to connect to data from the Azure Machine Learning workspace. You're introduced to datastores and data assets.
Lessons
- Introduction
- Understand URIs
- Create a datastore
- Create a data asset
- Exercise - Make data available in Azure Machine Learning
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Access data by using Uniform Resource Identifiers (URIs).
- Connect to cloud data sources with datastores.
- Use data asset to access specific files or folders.

Module 8: Work with compute targets in Azure Machine Learning
Learn how to work with compute targets in Azure Machine Learning. Compute targets allow you to run your machine learning workloads. Explore how and when you can use a compute instance or compute cluster.
Lessons
- Introduction
- Choose the appropriate compute target
- Create and use a compute instance
- Create and use a compute cluster
- Exercise - Work with compute resources
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Choose the appropriate compute target.
- Work with compute instances and clusters.
- Manage installed packages with environments.

Module 9: Work with environments in Azure Machine Learning
Learn how to use environments in Azure Machine Learning to run scripts on any compute target.
Lessons
- Introduction
- Understand environments
- Explore and use curated environments
- Create and use custom environments
- Exercise - Work with environments

- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Understand environments in Azure Machine Learning.
- Explore and use curated environments.
- Create and use custom environments.

Module 10: Find the best classification model with Automated Machine Learning
Learn how to convert your code to a script and run it as a command job in Azure Machine Learning.
Lessons
- Introduction
- Preprocess data and configure featurization
- Run an Automated Machine Learning experiment
- Evaluate and compare models
- Exercise - Find the best classification model with Automated Machine Learning
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Prepare your data to use AutoML for classification.
- Configure and run an AutoML experiment.
- Evaluate and compare models.

Module 11: Track model training in Jupyter notebooks with MLflow
Learn how to use MLflow for model tracking when experimenting in notebooks.
Lessons
- Introduction
- Configure MLflow for model tracking in notebooks
- Train and track models in notebooks
- Exercise - Track model training
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Configure to use MLflow in notebooks
- Use MLflow for model tracking in notebooks

Module 12: Run a training script as a command job in Azure Machine Learning
Learn how to convert your code to a script and run it as a command job in Azure Machine Learning.
Lessons
- Introduction
- Convert a notebook to a script
- Run a script as a command job
- Use parameters in a command job
- Exercise - Run a training script as a command job
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Convert a notebook to a script.
- Test scripts in a terminal.
- Run a script as a command job.
- Use parameters in a command job.

Module 13: Track model training with MLflow in jobs
Learn how to track model training with MLflow in jobs when running scripts.
Lessons
- Introduction
- Track metrics with MLflow
- View metrics and evaluate models
- Exercise - Use MLflow to track training jobs
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Use MLflow when you run a script as a job.
- Review metrics, parameters, artifacts, and models from a run.

Module 14: Perform hyperparameter tuning with Azure Machine Learning
Learn how to perform hyperparameter tuning with a sweep job in Azure Machine Learning.
Lessons
- Introduction
- Define a search space
- Configure a sampling method
- Configure early termination
- Use a sweep job for hyperparameter tuning
- Exercise - Run a sweep job
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Define a hyperparameter search space.
- Configure hyperparameter sampling.
- Select an early-termination policy.
- Run a sweep job.

Module 15: Run pipelines in Azure Machine Learning
Learn how to create and use components to build pipeline in Azure Machine Learning. Run and schedule Azure Machine Learning pipelines to automate machine learning workflows.
Lessons
- Introduction
- Create components
- Create a pipeline
- Run a pipeline job
- Exercise - Run a pipeline job
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Create components.
- Build an Azure Machine Learning pipeline.
- Run an Azure Machine Learning pipeline.

Module 16: Register an MLflow model in Azure Machine Learning
Learn how to log and register an MLflow model in Azure Machine Learning.
Lessons
- Introduction
- Log models with MLflow
- Understand the MLflow model format
- Register an MLflow model
- Exercise - Log and register models with MLflow
- Knowledge check
- Summary

By the end of this module, you'll be able to:

- Log models with MLflow.
- Understand the MLmodel format.
- Register an MLflow model in Azure Machine Learning.
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Module 17: Create and explore the Responsible AI

dashboard for a model in Azure Machine Learning
Explore model explanations, error analysis, counterfactuals, and causal analysis by creating a Responsible AI dashboard. You'll create and run the pipeline in Azure Machine Learning using the Python SDK v2 to generate the dashboard.
Lessons
- Introduction
- Understand Responsible AI
- Create the Responsible AI dashboard
- Evaluate the Responsible AI dashboard
- Exercise - Explore the Responsible AI dashboard
- Knowledge check
- Summary

By the end of this module, you'll be able to:
- Understand Azure Machine Learning's built-in components for responsible AI.
- Create a Responsible AI dashboard.
- Explore a Responsible AI dashboard.

Module 18: Deploy a model to a managed online endpoint
Learn how to deploy models to a managed online endpoint for real-time inferencing.
Lessons
- Introduction
- Explore managed online endpoints
- Deploy your MLflow model to a managed online endpoint
- Deploy a model to a managed online endpoint
- Test managed online endpoints
- Exercise - Deploy an MLflow model to an online endpoint
- Knowledge check
- Summary

By the end of this module, you'll be able to:
- Use managed online endpoints.
- Deploy your MLflow model to a managed online endpoint.
- Deploy a custom model to a managed online endpoint.
- Test online endpoints.

Module 19: Deploy a model to a batch endpoint
Learn how to deploy models to a batch endpoint. When you invoke a batch endpoint, you'll trigger a batch scoring job.
Learning objectives
In this module, you'll learn how to:
- Introduction
- Understand and create batch endpoints
- Deploy your MLflow model to a batch endpoint
- Deploy a custom model to a batch endpoint
- Invoke and troubleshoot batch endpoints
- Exercise - Deploy an MLflow model to a batch endpoint
- Knowledge check
- Summary

By the end of this module, you'll be able to:
- Create a batch endpoint.
- Deploy your MLflow model to a batch endpoint.
- Deploy a custom model to a batch endpoint.
- Invoke batch endpoints

ASSOCIATED CERTIFICATIONS & EXAM

This course will prepare delegates to write the Microsoft DP-100: Designing and Implementing a Data Science Solution on Azure exam.