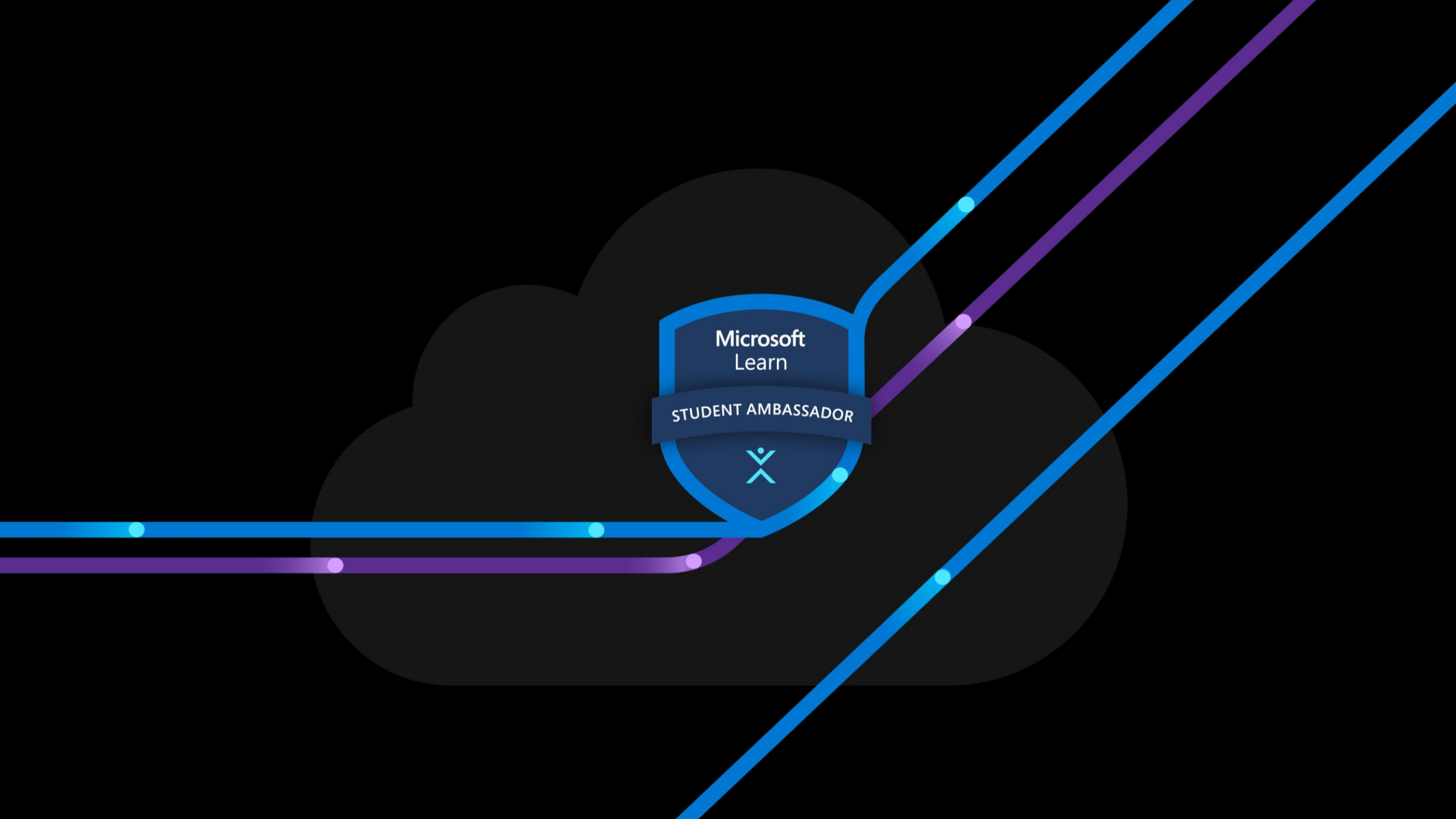
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Azure ML Jumpstart: Unveiling Machine Learning Magic

BY
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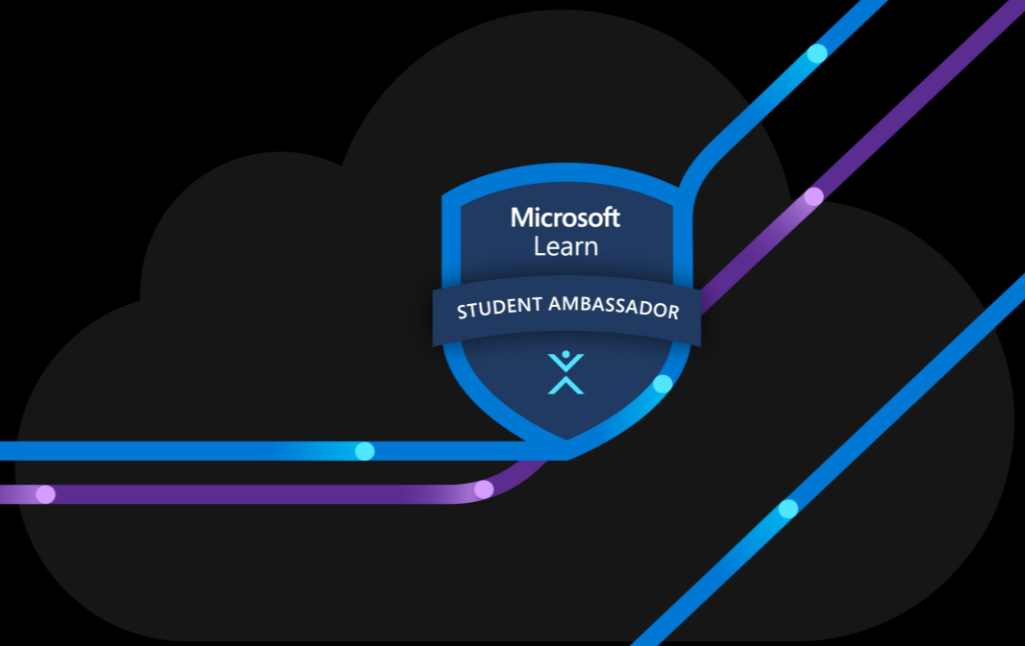
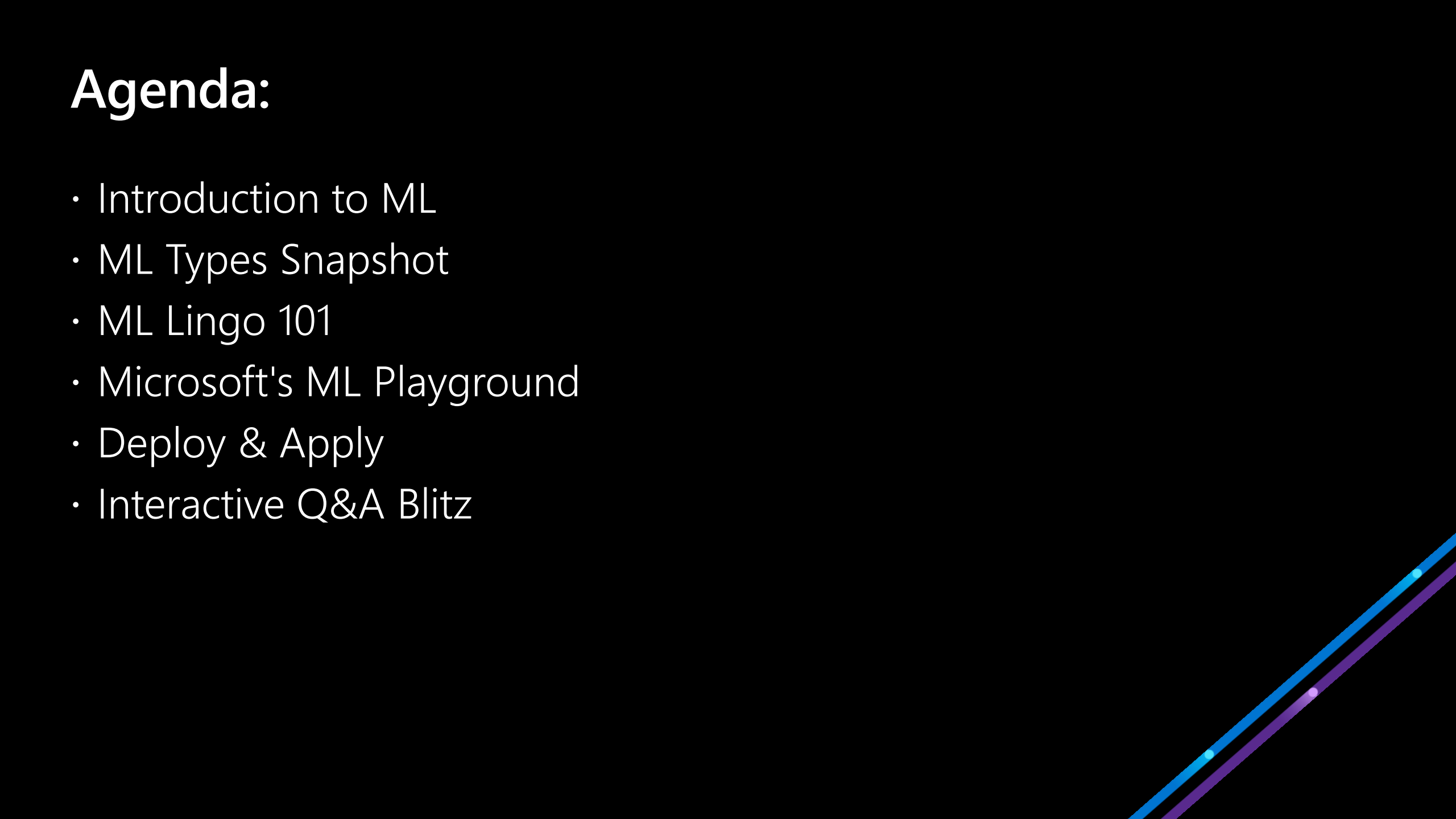
MACHINE LEARNING HEAD @TCPC
PRESIDENT @ AICP UET CHAPTER.



Agenda:

- Introduction to ML
- ML Types Snapshot
- ML Lingo 101
- Microsoft's ML Playground
- Deploy & Apply
- Interactive Q&A Blitz

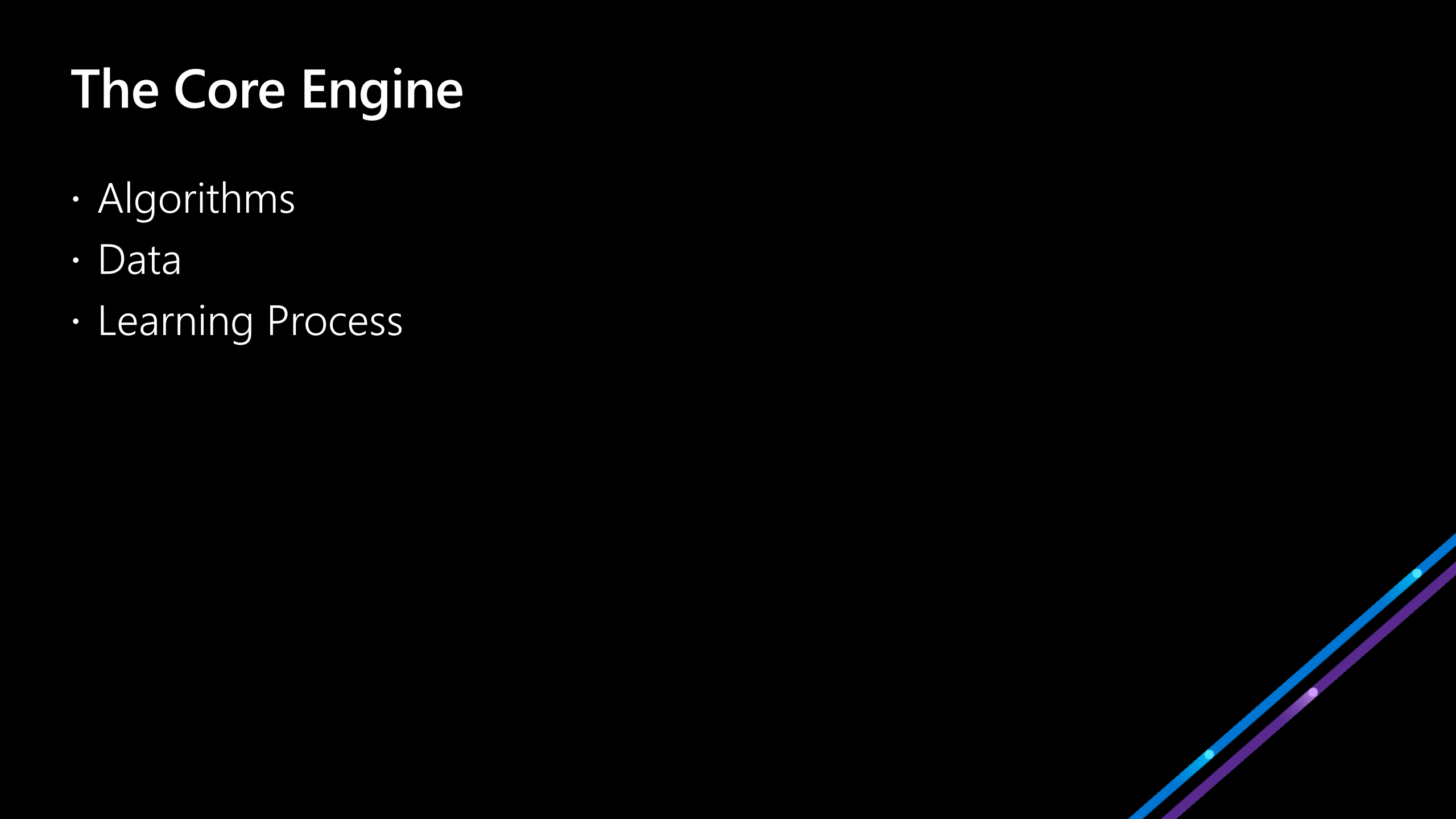


Introduction to ML

- Machine Learning (ML) is a subset of artificial intelligence, teaching computers to learn patterns from data and make decisions without explicit programming.
- Core Concept: The ability of machines to learn from vast amounts of data using ALGORITHMS

The Core Engine

- Algorithms
- Data
- Learning Process

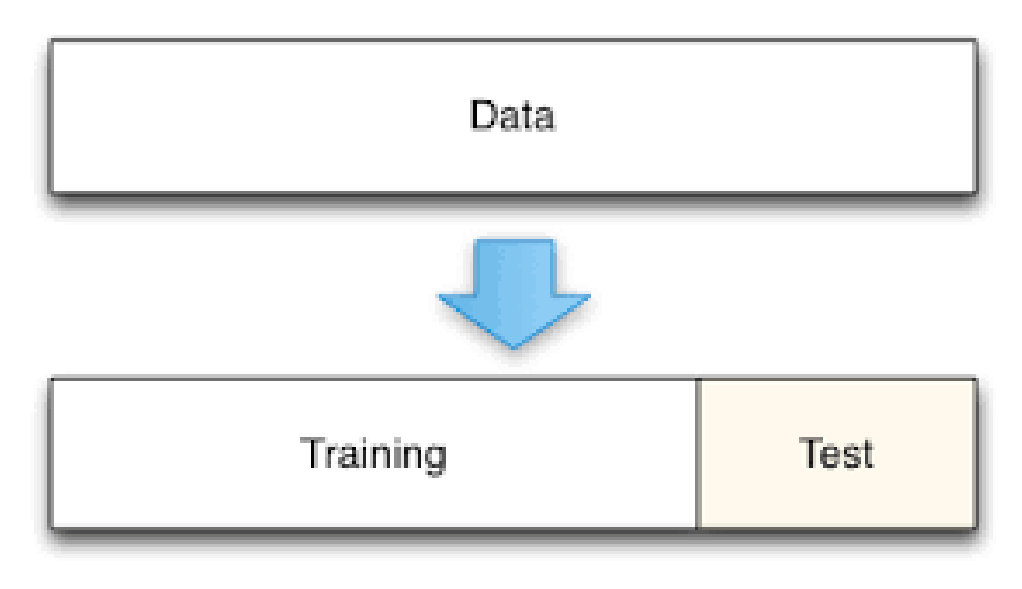


Algorithms

- Algorithms are step-by-step procedures or sets of rules designed to perform specific tasks or solve particular problems
- They learn from data, uncovering patterns and relationships invisible to humans.

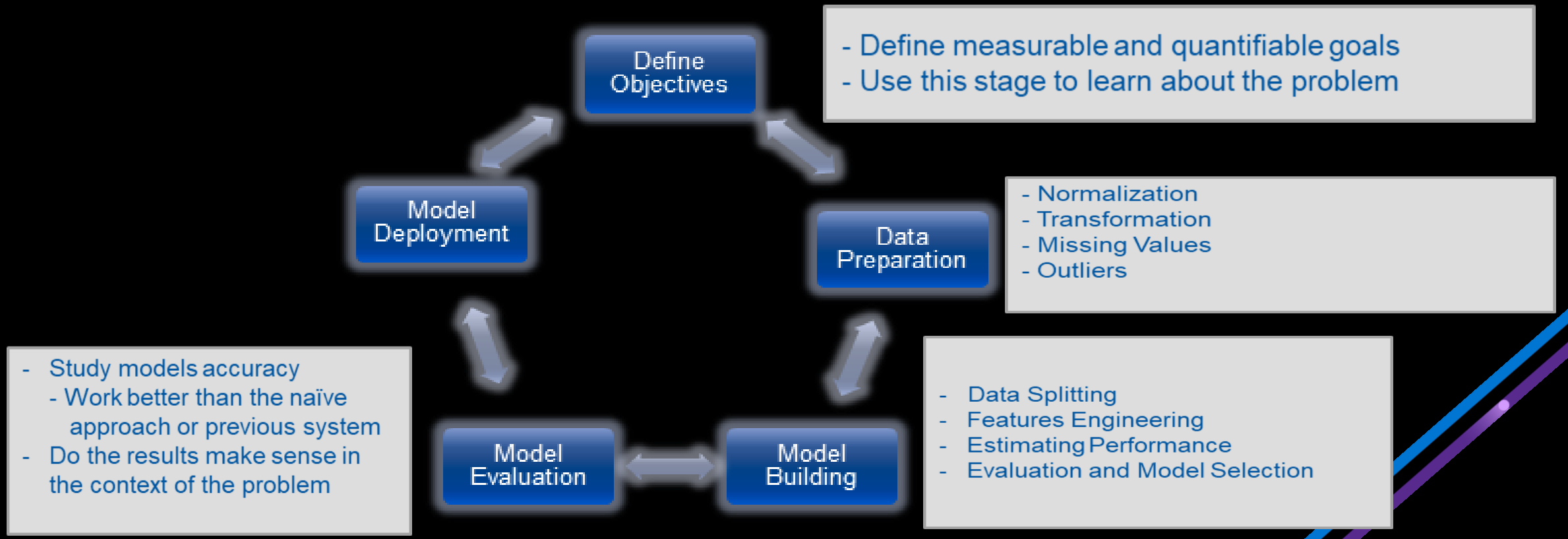
DATA

- The fuel that powers ML.
- The more diverse and relevant the data, the better the model learns and performs.
- The data is divided into TWO parts (Training , Test)



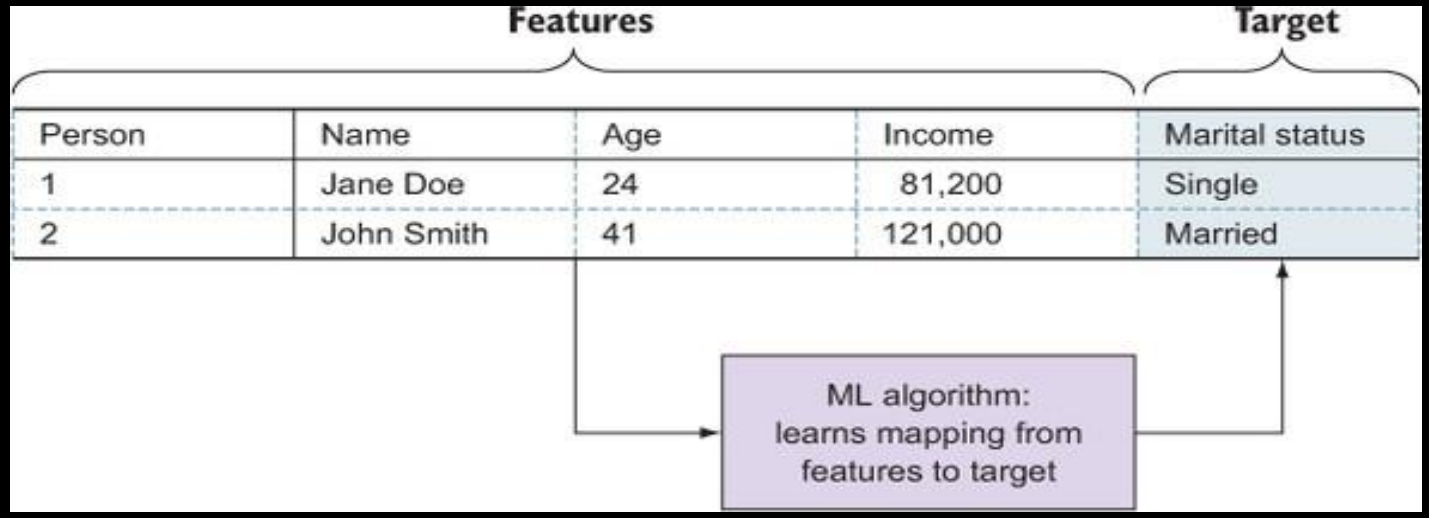
Learning Process

- This is where the magic unfolds.
- Different algorithms utilize various techniques to learn from data and improve their predictions or insights.

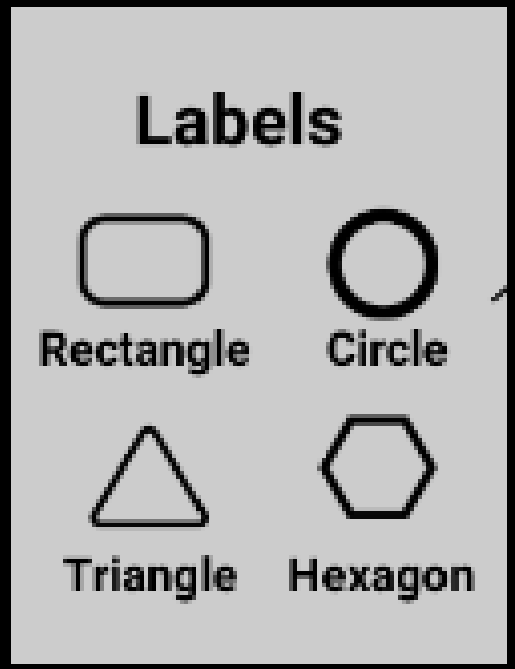


Essential Terms in a Nutshell

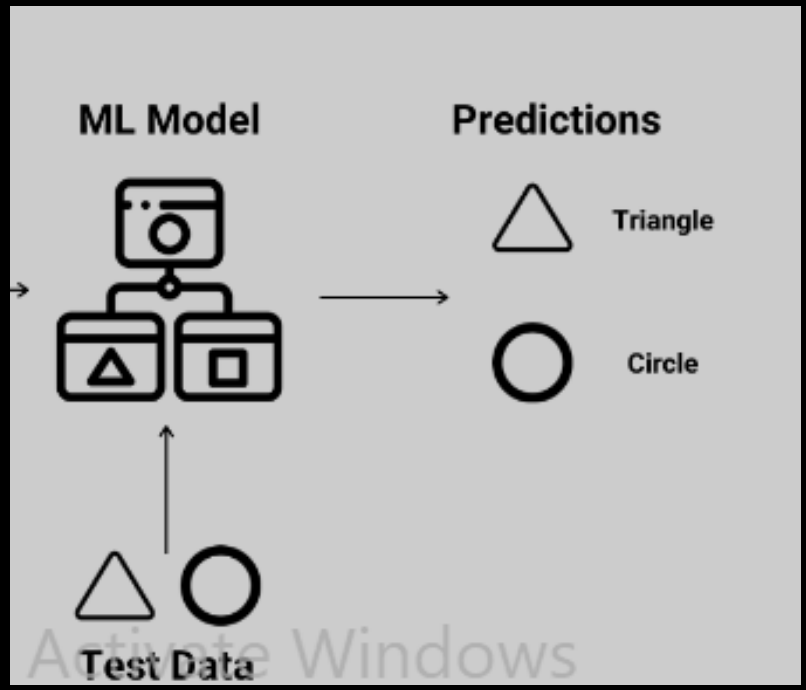
- Feature: An input variable used by a machine learning model to make predictions. Features can be numerical or categorical.



Label: The output or the target variable that the machine learning model aims to predict.



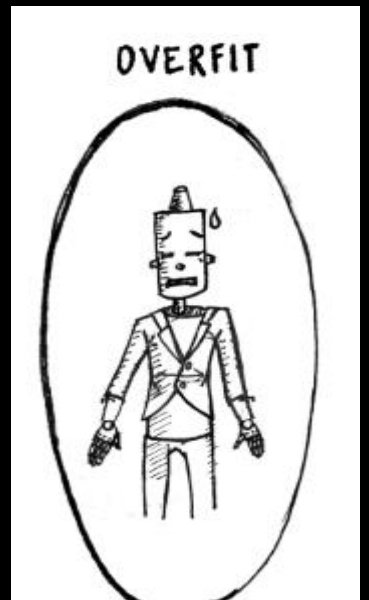
Model: The trained version of the algorithm, ready to make predictions

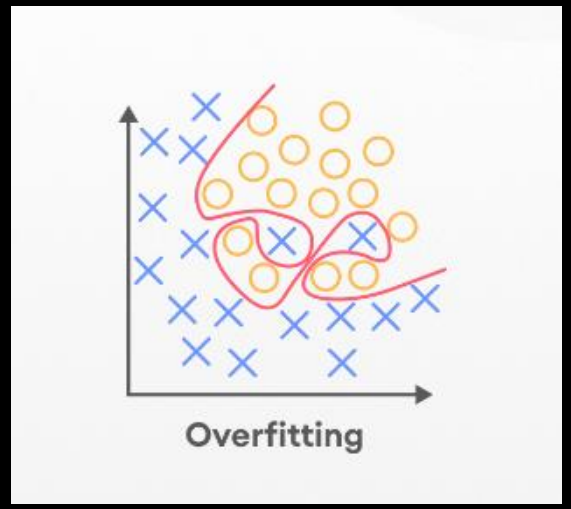


OVERFITTING VS UNDERFITTING

Overfitting: When your model memorizes the training data capturing noise and irrelevant patterns but fails on new data.

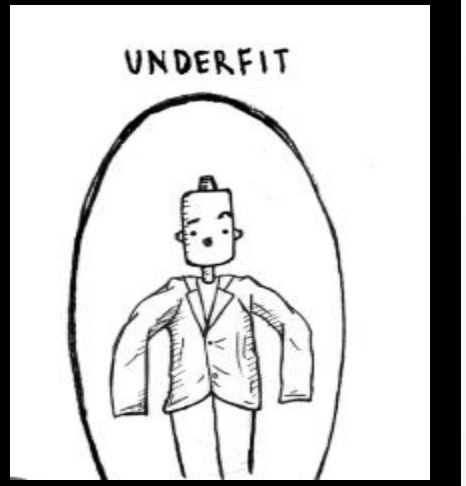
Complex models used for simple data.

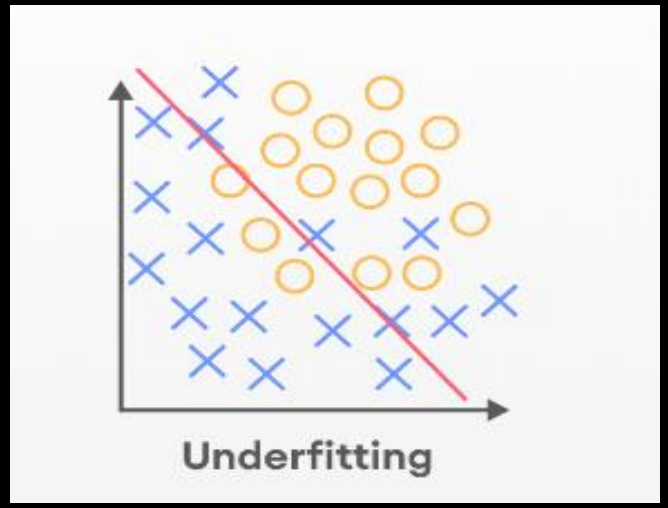




Underfitting: when model is too simple and fails to capture the underlying patterns in the training data.

Simple models used for complex data.





Bias: Think of it as your model having a "favorite answer" due to unfairness in the data or its design.

Accuracy: How often your model makes
the correct prediction, regardless of which type of error it makes. predicts both positive and negative instances

Recall: How good your model is at catching all the true positives (finding true cats and not missing any).

Precision: How accurate your model is when it says something is positive (only saying "cat" for actual cats)

Unveiling the Tricks

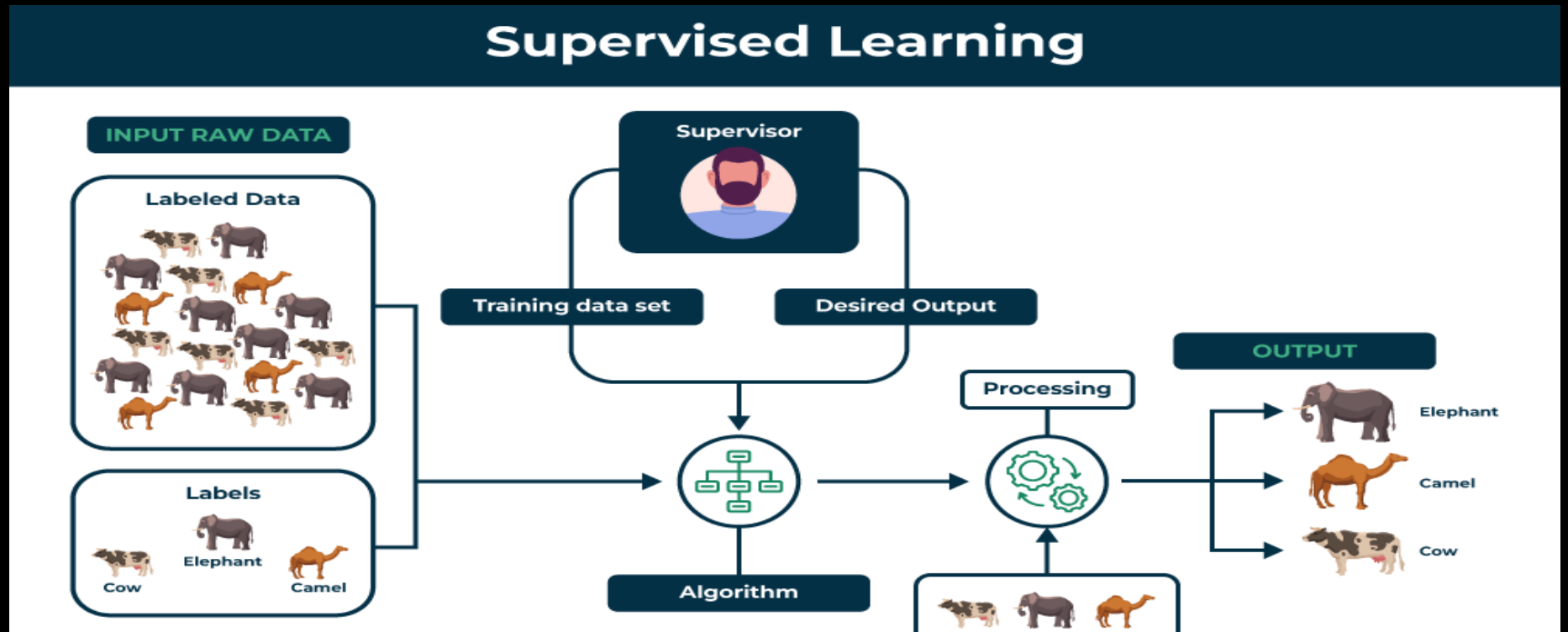
- Pattern Recognition:
  ML excels at finding complex patterns in data, similar to how we recognize faces or predict weather patterns. Imagine analyzing millions of images to identify cats - an impossible feat for humans but a breeze for ML! . ML has ability to go beyond simple tasks.

ML Types Snapshot

1. SUPERVISED LEARNING
2. UNSUPERVISED LEARNING
3. RE-INFORCEMENT LEARNING

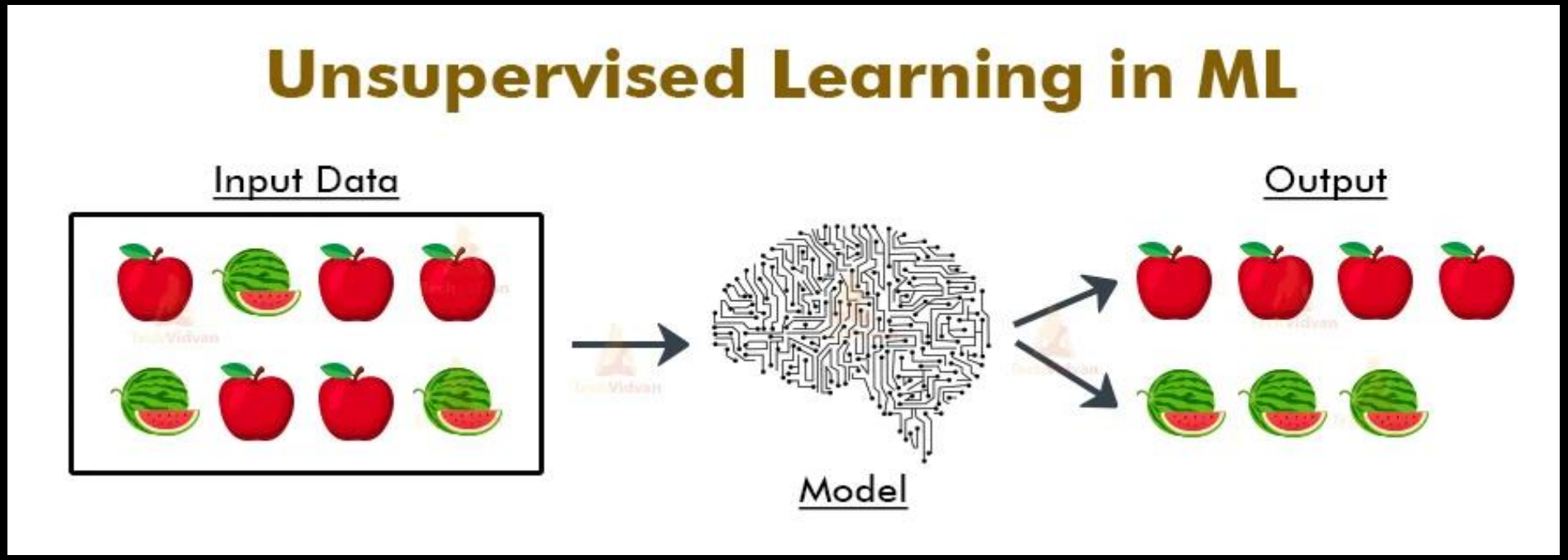
Supervised Learning:

- Imagine: Having a teacher guide you.
- Process: Learns from labeled data (inputs with corresponding outputs).
- Goal: Predicts new, unseen outputs based on learned patterns.



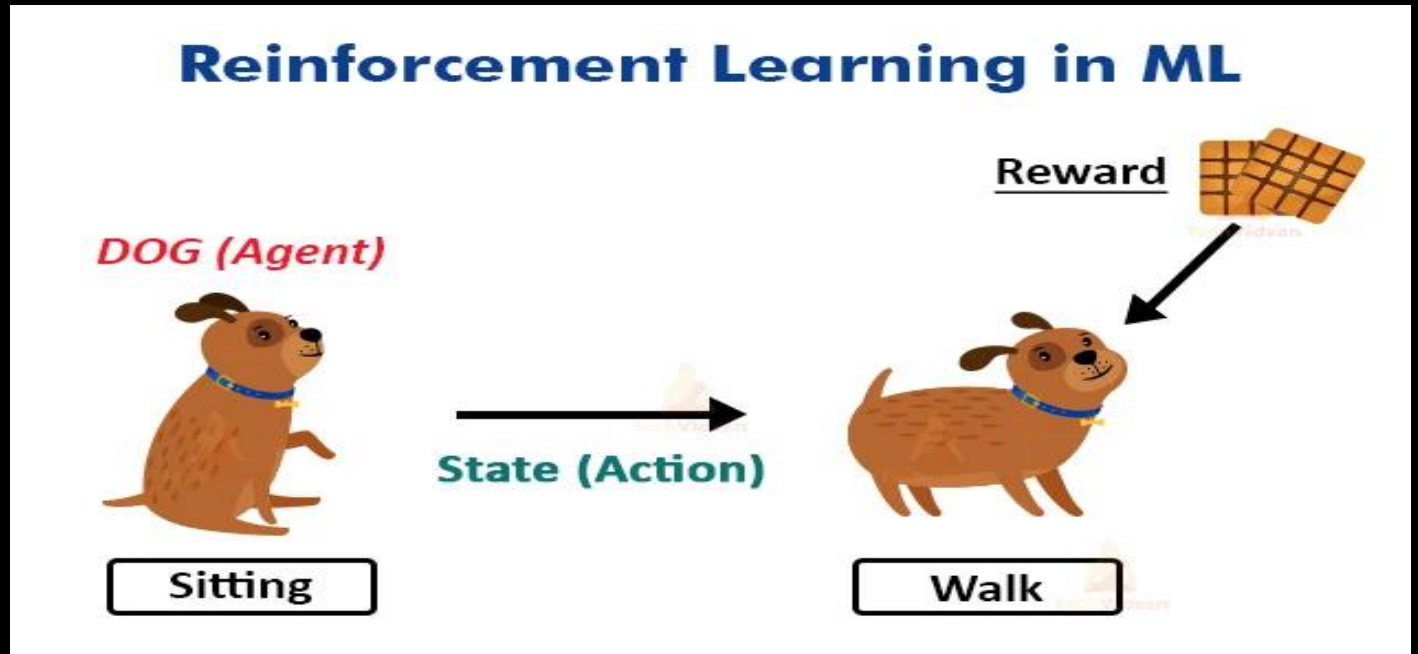
Unsupervised Learning:

- Imagine: Exploring a new city on your own.
- Process: Discovers hidden patterns and structures in unlabeled data.
- Goal: Uncovers insights and trends without predetermined outputs.



Reinforcement Learning:

- Imagine: Learning through trial and error in a game.
- Process: Learns through interactions with an environment, receiving rewards for desired actions.
- Goal: Maximizes long-term rewards by adapting its behavior.



Algorithms

Supervised

- Linear Regression
- Decision Trees
- Random Forest etc

Unsupervised

- K-Means Clustering
- Hierarchical Clustering
- Apriori (Association Rule Learning) etc

Reinforcement

- Q-Learning
- Deep Q Networks (DQN)
- Policy Gradient Methods etc

Steps of model developing

- Define the Problem
- Collect and Prepare Data
- Select a Model
- Split the Data
- Train the Model
- Validate and Tune
- Test the Model
- Deploy the Model

Python code for model development

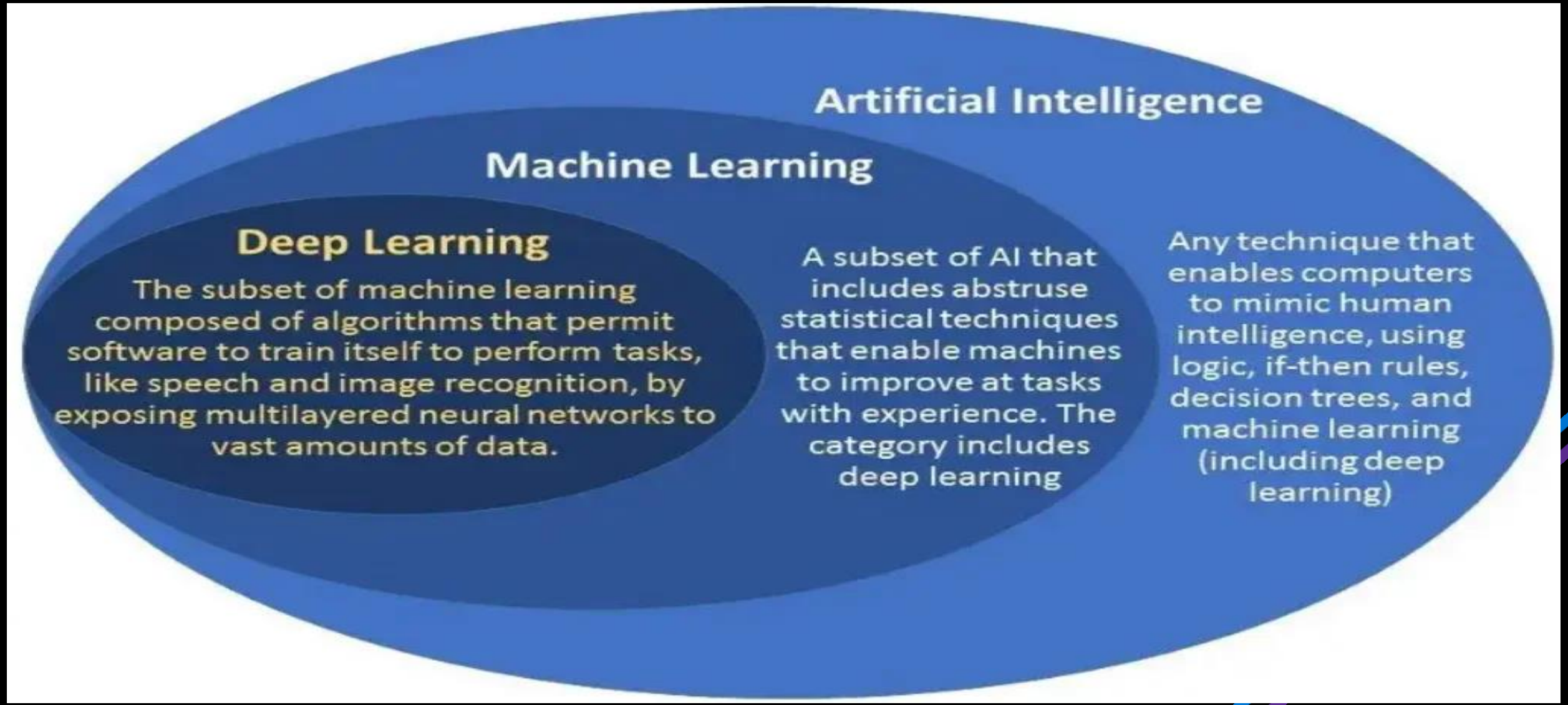
```
# Import necessary libraries
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score

# Load the Iris dataset
from sklearn.datasets import load_iris
iris = load_iris()
X, y = iris.data, iris.target

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2
```

```
# Choose a machine learning algorithm (Decision Tree in this case)
model = DecisionTreeClassifier()

# Train the model on the training data
model.fit(X_train, y_train)

# Make predictions on the testing set
predictions = model.predict(X_test)

# Evaluate the model's accuracy
accuracy = accuracy_score(y_test, predictions)
print(f'Model Accuracy: {accuracy}')
```

AI vs. ML

- Misconception: Artificial Intelligence and Machine Learning are the same.
- Clarification: AI is the broader concept, while ML is a subset of AI that focuses specifically on learning from data.
- We can get AI without using machine learning, but this would require building millions of lines of codes with complex rules and decision-trees.

AI VS ML VS DL


Artificial Intelligence
Any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision trees, and machine learning (including deep learning)
Machine Learning
A subset of AI that includes abstruse statistical techniques that enable machines to improve at tasks with experience. The category includes deep learning
Deep Learning
The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data.

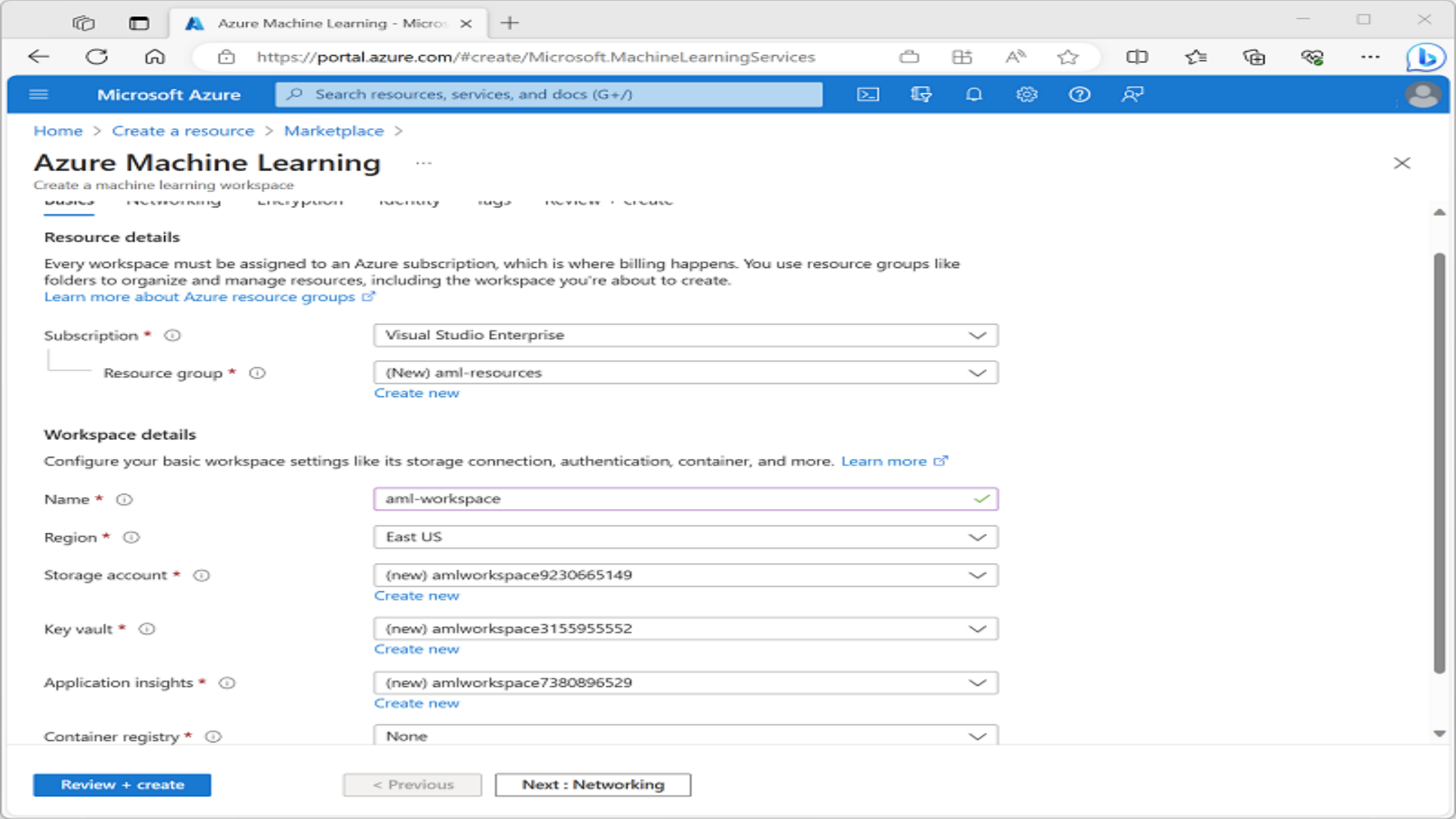
Azure Machine Learning:

- Cloud-based platform for building, training, deploying, and managing machine learning models at scale.

  Exploring data and preparing it for modeling.
- Training and evaluating machine learning models.
- Registering and managing trained models.
- Deploying trained models for use by applications and services.
- Reviewing and applying responsible AI principles and practices.

Azure Machine Learning workspace

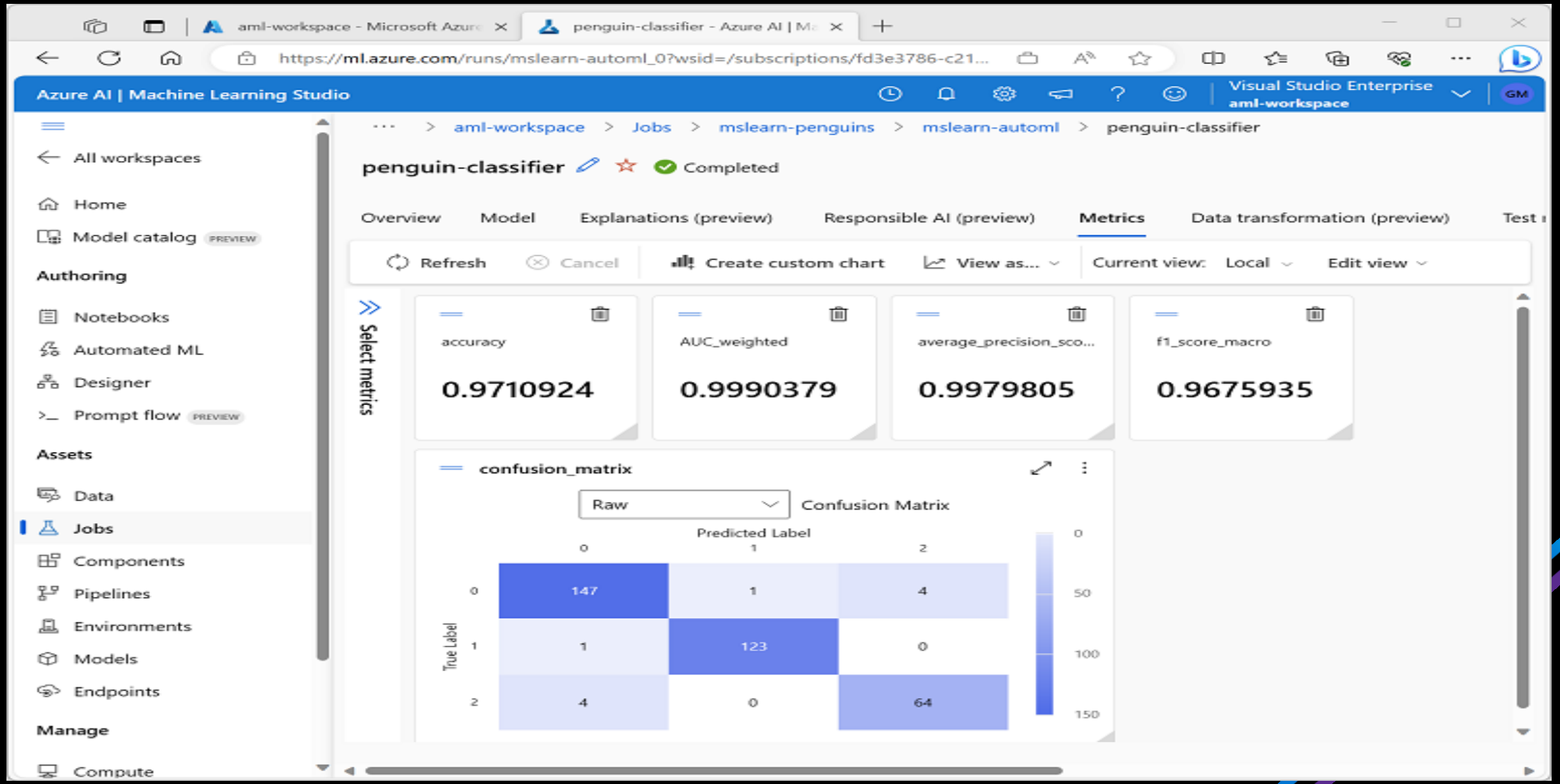
- The primary resource required for Azure Machine Learning is an *Azure Machine Learning workspace*
- To create an Azure Machine Learning workspace, you can use the Azure portal


Azure Machine Learning - Micros
https://portal.azure.com/#create/Microsoft.MachineLearningServices
Microsoft Azure
Search resources, services, and docs (G+/)
Home > Create a resource > Marketplace >
Azure Machine Learning
Create a machine learning workspace
Resource details
Every workspace must be assigned to an Azure subscription, which is where billing happens. You use resource groups like folders to organize and manage resources, including the workspace you're about to create.
Learn more about Azure resource groups
Subscription *
Visual Studio Enterprise
Resource group *
(New) aml-resources
Create new
Workspace details
Configure your basic workspace settings like its storage connection, authentication, container, and more. Learn more
Name *
aml-workspace
Region *
East US
Storage account *
(new) amlworkspace9230665149
Create new
Key vault *
(new) amlworkspace3155955552
Create new
Application insights *
(new) amlworkspace7380896529
Create new
Container registry *
None
Review + create
< Previous
Next : Networking

Azure Machine Learning studio

- *Azure Machine Learning studio* is a browser-based service that provides no-code and code-first solutions to visually create, train, and manage models through a web UI
- Azure Machine Learning studio allows the *Python* SDK to seamlessly integrate with the natively supported *Jupyter Notebooks* for collaborative notes and coding.
- Data within Azure Machine Learning studio is simple to manage with intuitive data visualization and AI-assisted image or text labeling features.

The screenshot below shows the **Metrics** page for a trained model in Azure Machine Learning studio, in which you can see the evaluation metrics for a trained multiclass classification model.



Create an Azure Machine Learning workspace

- To set up Azure Machine Learning service, access Azure, sign in, create a resource group, and establish a workspace. The workspace triggers the creation of essential resources like storage, key vault, application insights, and container registry for effective management and monitoring.
- You can create an Azure Machine Learning workspace in

➢user interface in the **Azure portal**

➢Azure Resource Manager (ARM) template

➢Azure Command Line Interface (CLI)

➢Azure Machine Learning Python SDK.

following code uses the Python SDK to create a workspace named mlw-example

Python SDK

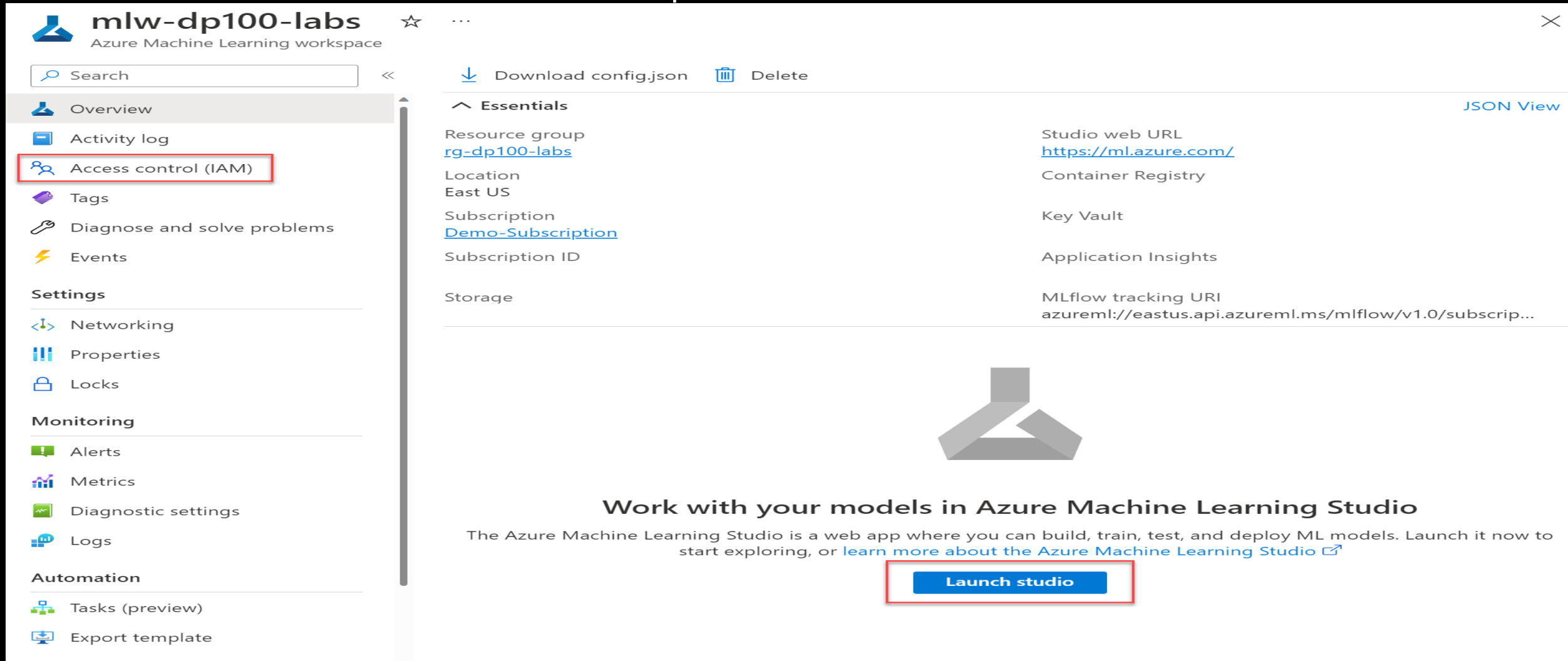
following code uses the Python SDK to create a workspace named mlw-example

Python

```python
from azure.ai.ml.entities import Workspace

workspace_name = "mlw-example"

ws_basic = Workspace(
    name=workspace_name,
    location="eastus",
    display_name="Basic workspace-example",
    description="This example shows how to create a basic workspace",
)
ml_client.workspaces.begin_create(ws_basic)
```

Explore the workspace in the Azure portal

- Creating an Azure Machine Learning workspace will typically take between 5-10 minutes to complete.



Overview of AZURE ML WORKSPACE

- From the Overview page of the Azure Machine Learning workspace in the Azure portal, you can launch the Azure Machine Learning studio. The Azure Machine Learning studio is a web portal and provides an easy-to-use interface to create, manage, and use resources and assets in the workspace.
- From the Azure portal, you can also give others access to the Azure Machine Learning workspace, using the **Access control**.

Give access to the Azure Machine Learning workspace

- Control access to Azure Machine Learning using role-based access in the Access control tab. Set permissions for specific tasks, like letting Azure administrators create resources or data scientists run and register models.
- Use roles like Owner, Contributor, and Reader, or specific roles like AzureML Data Scientist and AzureML Compute Operator.

Create and manage the workspace

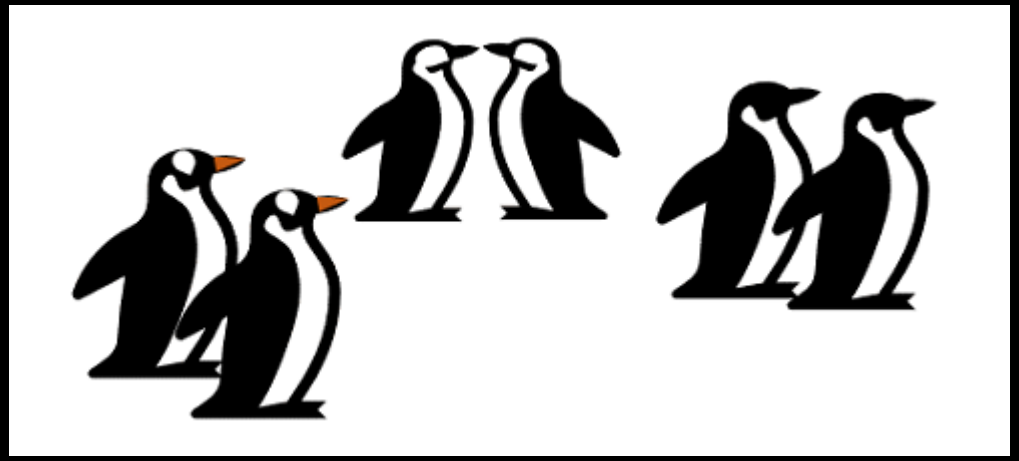
- The workspace is the resource for Azure Machine Learning. Data scientists need access to the workspace to train and track models, and to deploy the models to endpoints.
- be careful with who has *full* access to the workspace.
- you can find all logs, metrics, outputs, models, and snapshots of your code in the workspace.

clustering model azure machine learning

- You can use Microsoft Azure Machine Learning designer to create clustering models by using a drag and drop visual interface, without needing to write any code

Clustering

- *Clustering* is a form of machine learning that is used to group similar items into clusters based on their features
- Clustering is an example of *unsupervised* machine learning, in which you train a model to separate items into clusters based purely on their characteristics, or *features*. There is no previously known cluster value (or *label*) from which to train the model.



Steps

- To use Azure Machine Learning, you first create a *workspace* resource in your Azure subscription
- After you have created an Azure Machine Learning workspace, you can develop solutions with the Azure Machine Learning studio web portal
- To begin using the web portal, you need to assign the workspace you created in the Azure portal to Azure Machine Learning studio

All workspaces

Home

Model catalog PREVIEW

Authoring

Notebooks

Automated ML

Designer

Assets

Data

Jobs

Components

Pipelines

Environments

Models

Endpoints

Manage

Compute

Linked Services

Data Labeling

New

Shortcuts ···

Create notebook

Use notebooks for interactive cloud development.

Create new notebook

Add compute

A designated resource for running your training script, notebook, or hosting your service deployment.

Add compute

Connect data

Connect data from datastores, local files, public URLs, or Open Datasets assets.

Add data

Train a model

Submit a comman
your model using

Create job

Recently viewed ···

Resource type	Name	☆	Status	Quick actions

There are no recently viewed items to display

Compute instances ···

Add compute instance

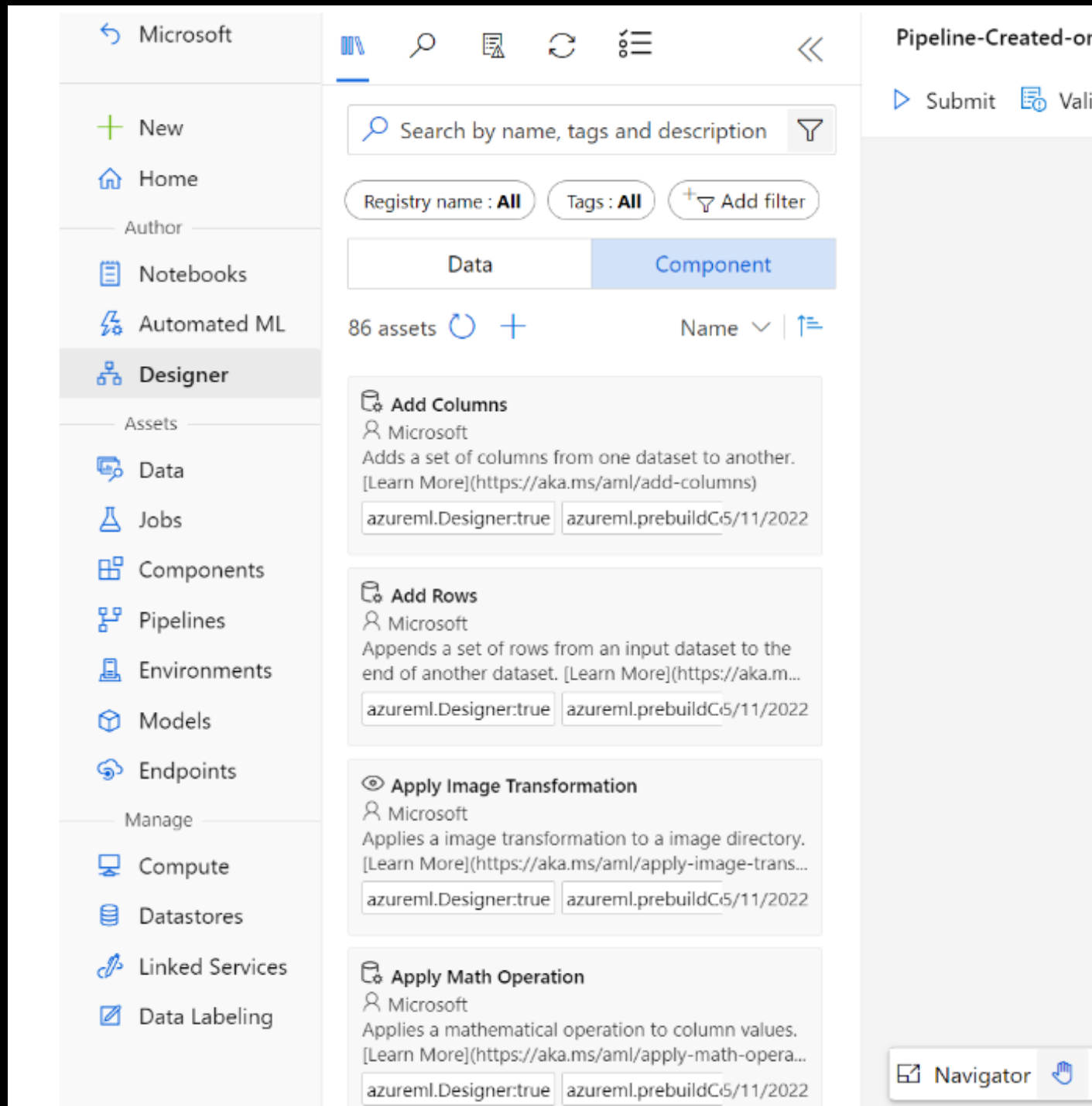
Azure Machine Learning compute

- Compute targets are cloud-based resources on which you can run model training and data exploration processes.
- There are four kinds of compute resource you can create:
- Compute Instances: Development workstations that data scientists can use to work with data and models.
- Compute Clusters: Scalable clusters of virtual machines for on-demand processing of experiment code.
- Kubernetes Clusters: Deployment targets for predictive services that use your trained models. You can access previous versions of "inference clusters" here.
- Attached Compute: Links to existing Azure compute resources, such as Virtual Machines or Azure Databricks clusters.

Azure Machine Learning designer

- In Azure Machine Learning studio, there are several ways to author clustering machine learning models.
- One way is to use a visual interface called *designer* that you can use to train, test, and deploy machine learning models
- The drag-and-drop interface makes use of clearly defined inputs and outputs that can be shared, reused,

Each *designer* project, known as a pipeline, has a left panel for navigation and a canvas on your right hand side. To use *designer*, identify the building blocks, or components, needed for your model, place and connect them on your canvas, and run a machine learning job.

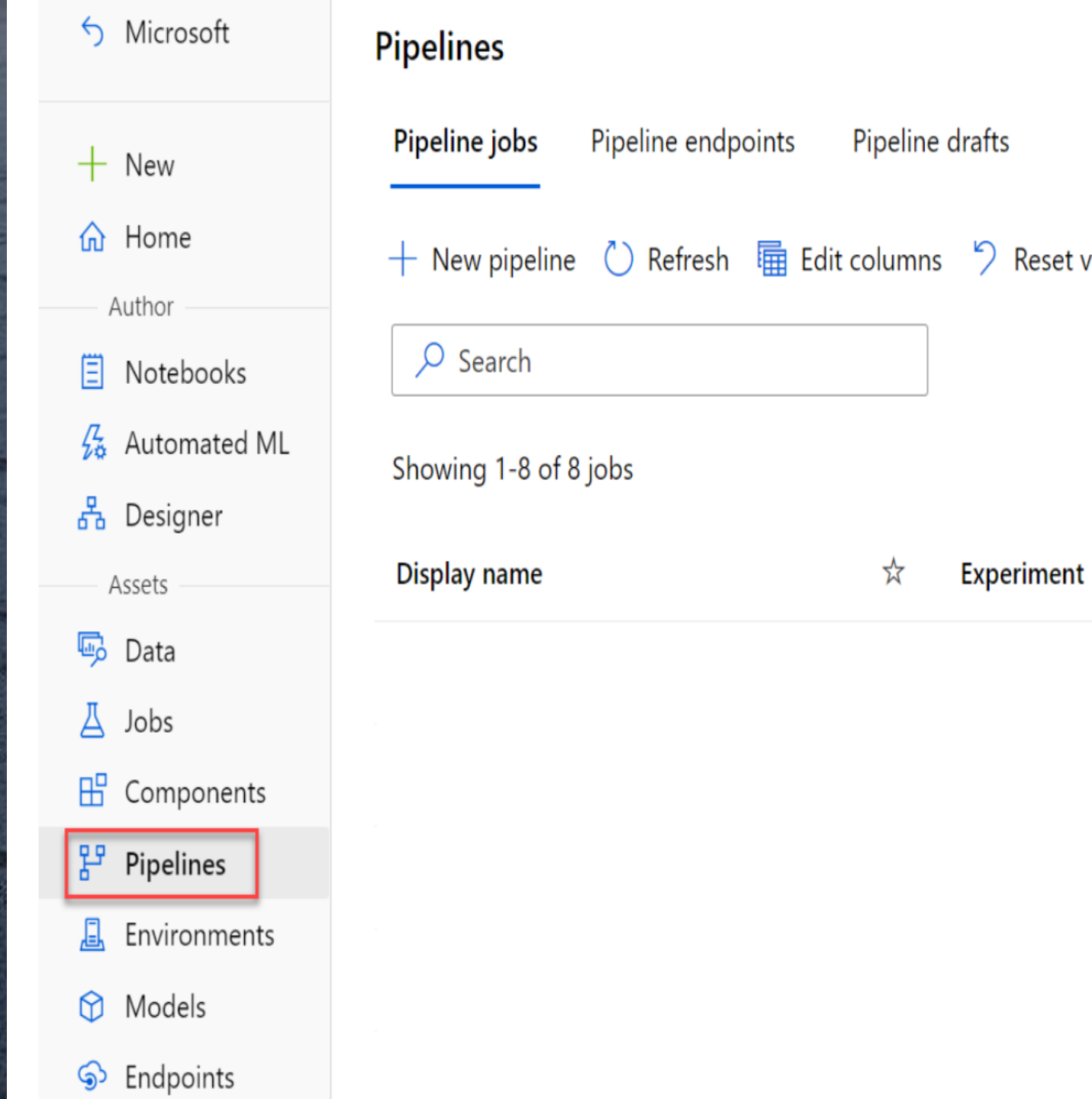


Pipelines

Pipelines let you organize, manage, and reuse complex machine learning workflows across projects and users.

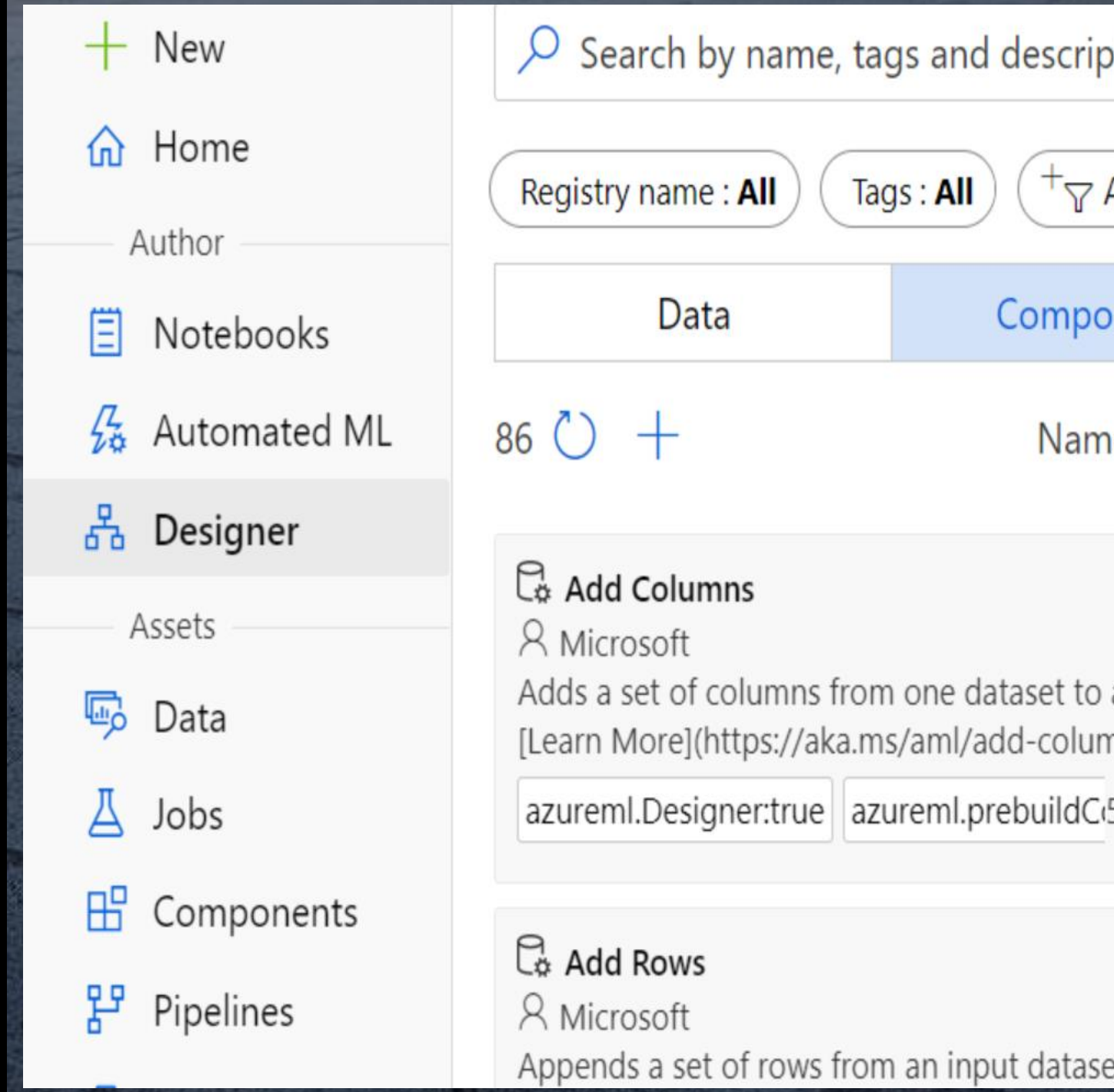
A pipeline starts with the dataset from which you want to train the model.

Each time you run a pipeline, the configuration of the pipeline and its results are stored in your workspace as a pipeline job



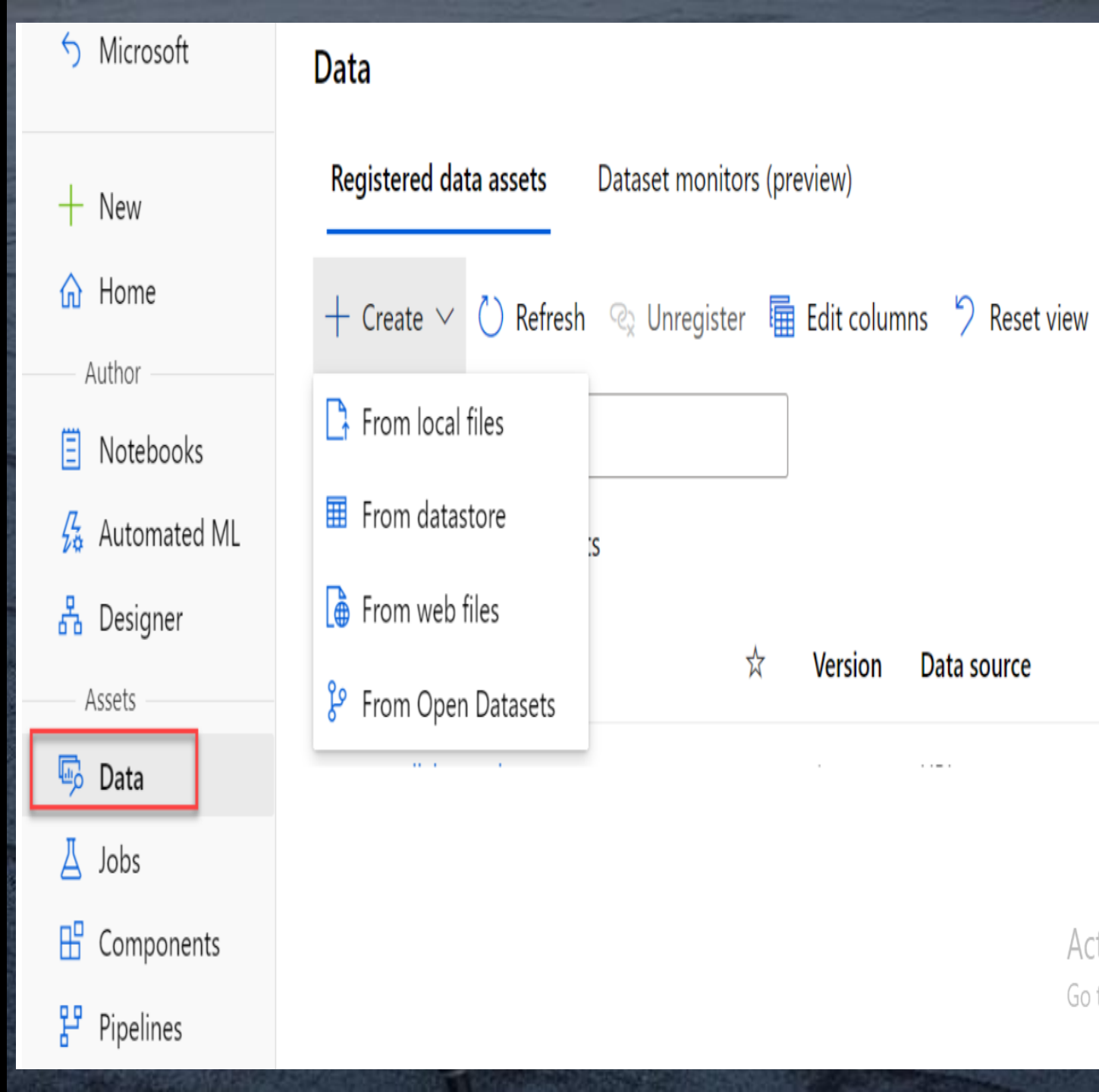
Components

Azure Machine Learning component acts as a building block for Azure Machine Learning pipelines. In a pipeline project, you can access data assets and components from the left panel's **Asset Library** tab.



Datasets

You can create data assets on the **Data** page from local files, a datastore, web files, and Open Datasets. These data assets will appear along with standard sample datasets
in *designer*'s **Asset Library**



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Understand steps for clustering

steps

Prepare data:

Train model:

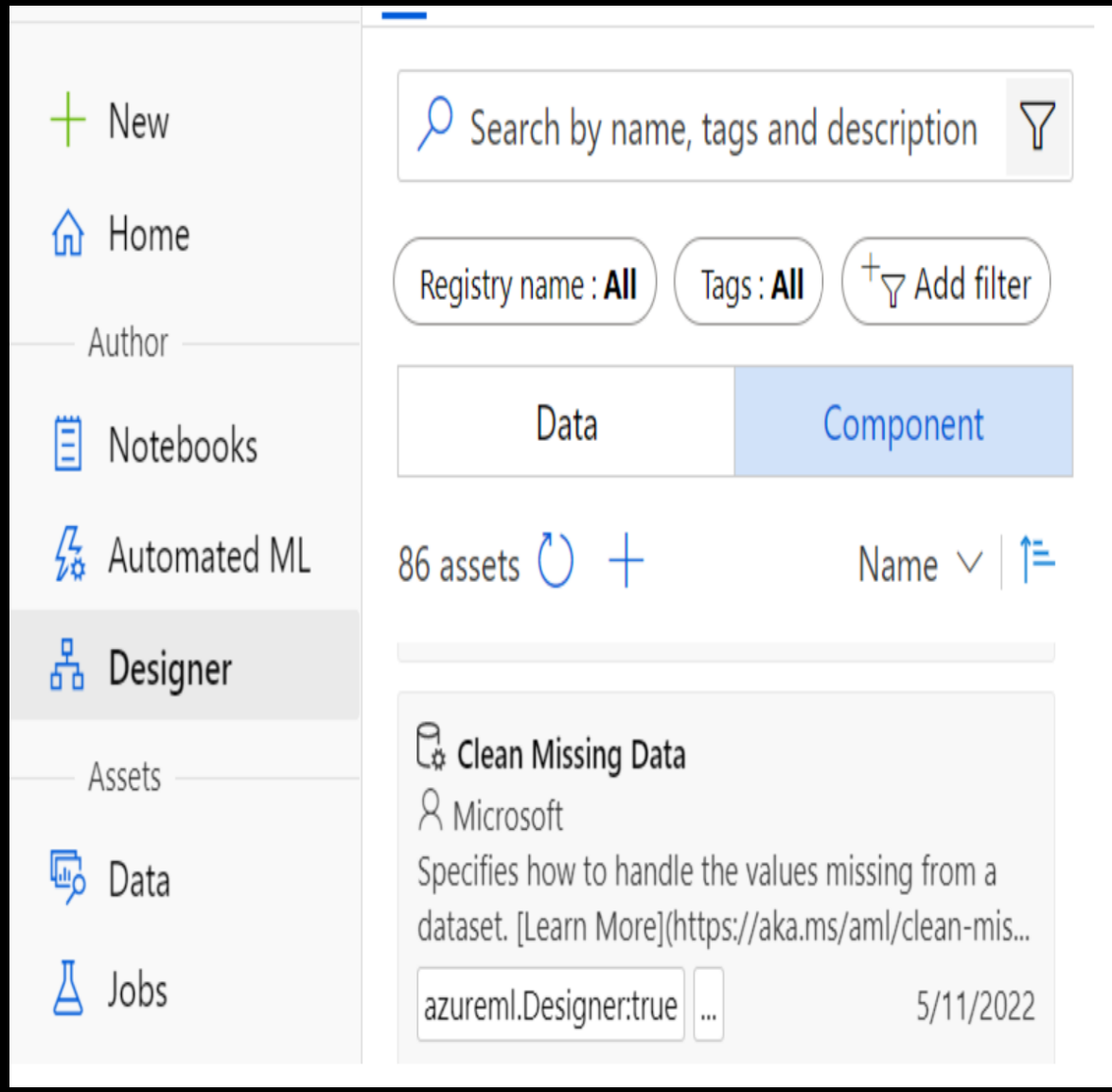
Evaluate performance:

Deploy a predictive service:

Prepare data

1) To train a clustering model, you need a dataset that includes multiple observations of the items you want to cluster

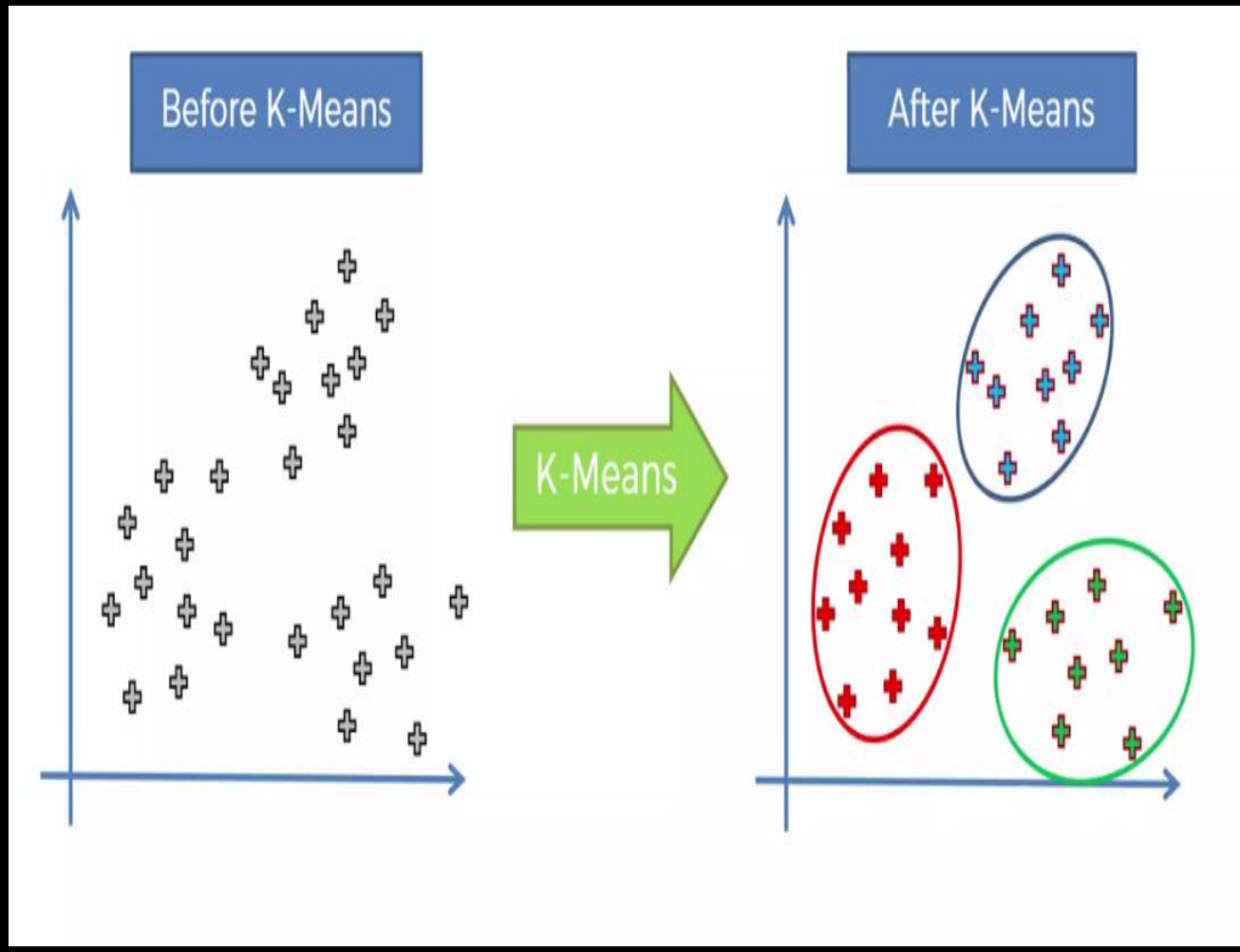
2) Azure Machine Learning designer has several pre-built components that can be used to prepare data for training. These components enable you to clean data, normalize features, join tables, and more



Train model

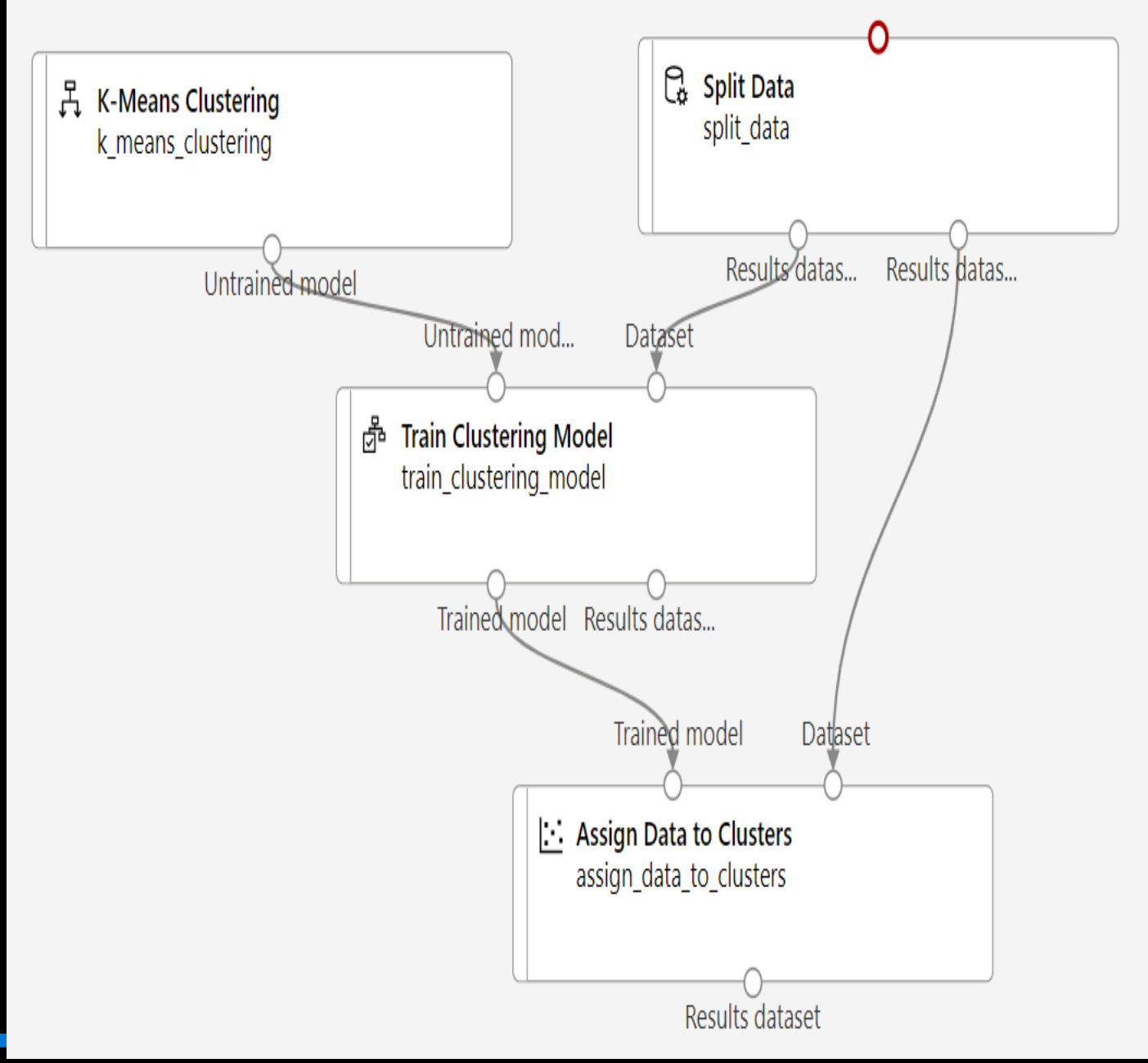
To train a clustering model, you need to apply a clustering algorithm to the data, using only the features that you have selected for clustering

The K-Means Clustering algorithm groups items into the number of clusters, or centroids, you specify - a value referred to as *K*.



Designer's Assign Data

You will use *designer's* **Assign Data** to **Clusters** component to group the data into clusters. Once you connect all the components, you will want to run an experiment, which will use the data asset on the canvas to train a model.



Evaluate performance

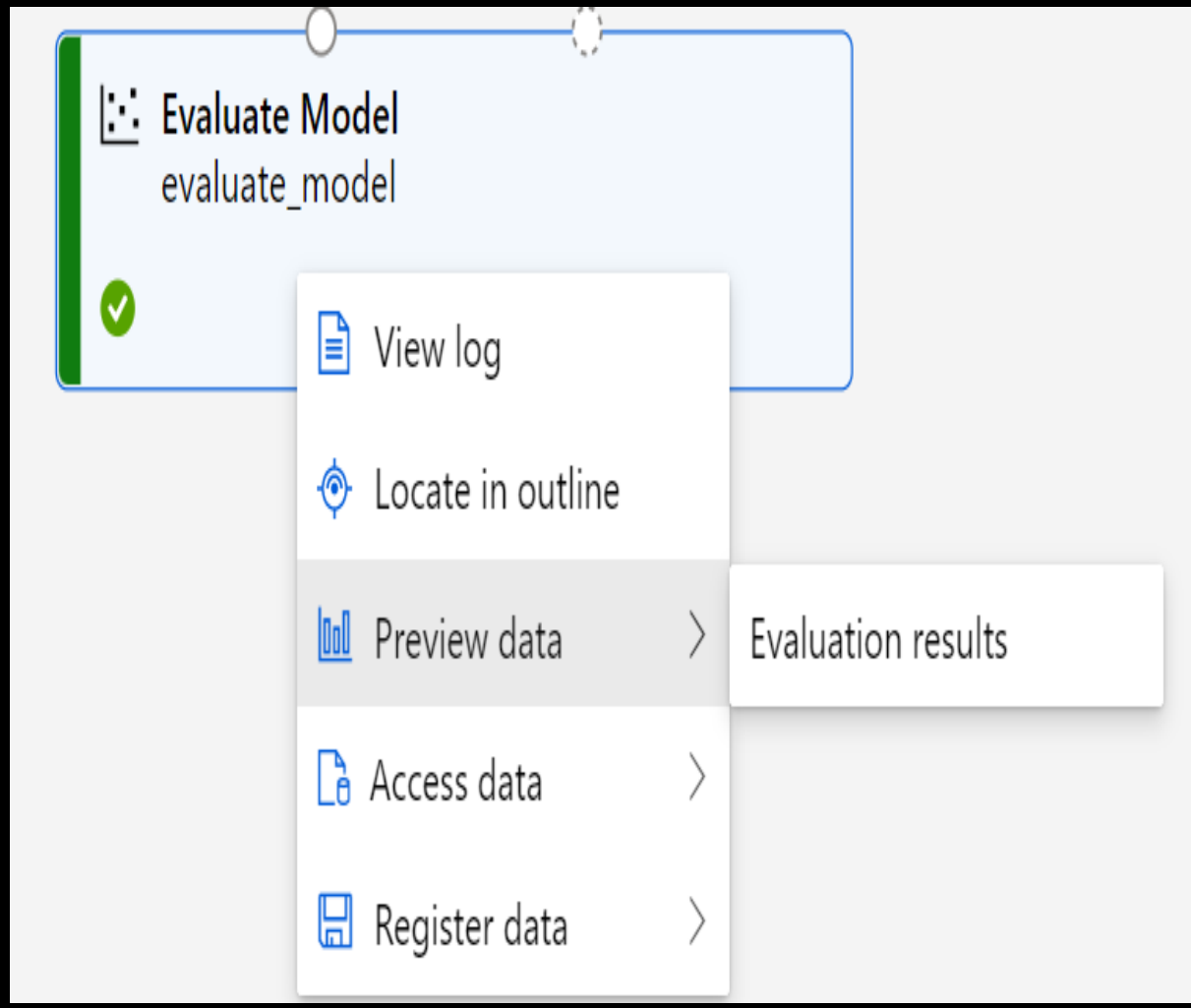
After training a model, it is important to evaluate its performance

There are many performance metrics and methodologies for evaluating how well a model makes predictions

AZURE EVALUATION

When the experiment run has finished, select Job details. Right click on the Evaluate Model module and select Preview data, then select Evaluation results.

These metrics can help data scientists assess how well the model separates the clusters.

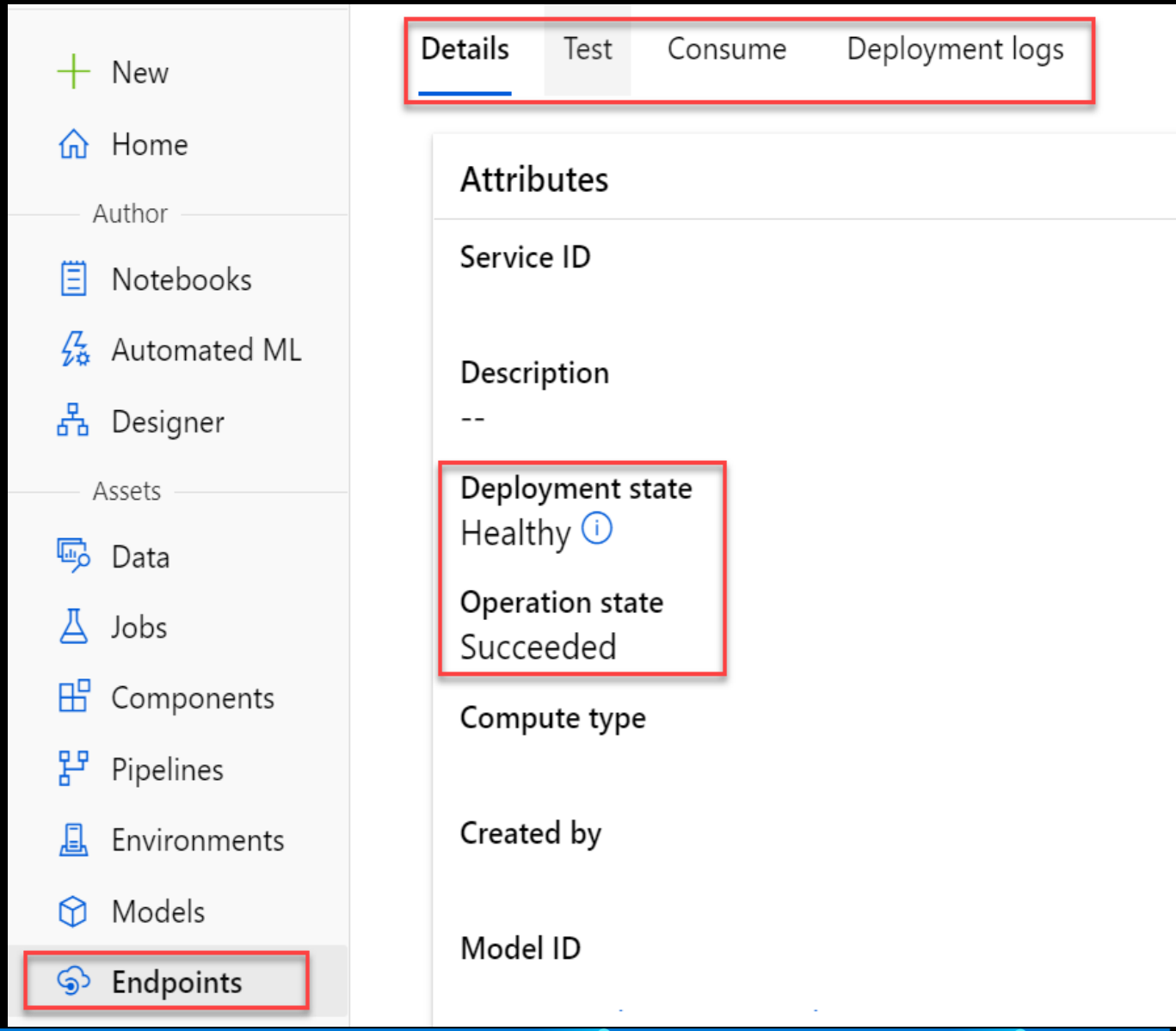


Deployment

In the endpoints page, you can view deployment details, test your pipeline service with sample data, and find credentials

It will take a while for your endpoint to be deployed.

The Deployment state on the **Details** tab will indicate *Healthy* when deployment is successful.



Application

Healthcare:

Example: Predictive analytics for disease diagnosis, personalized treatment plans.

Finance:

Example: Fraud detection, algorithmic trading, credit scoring.

Retail:

Example: Customer segmentation, demand forecasting, personalized recommendations. etc

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Q & A??

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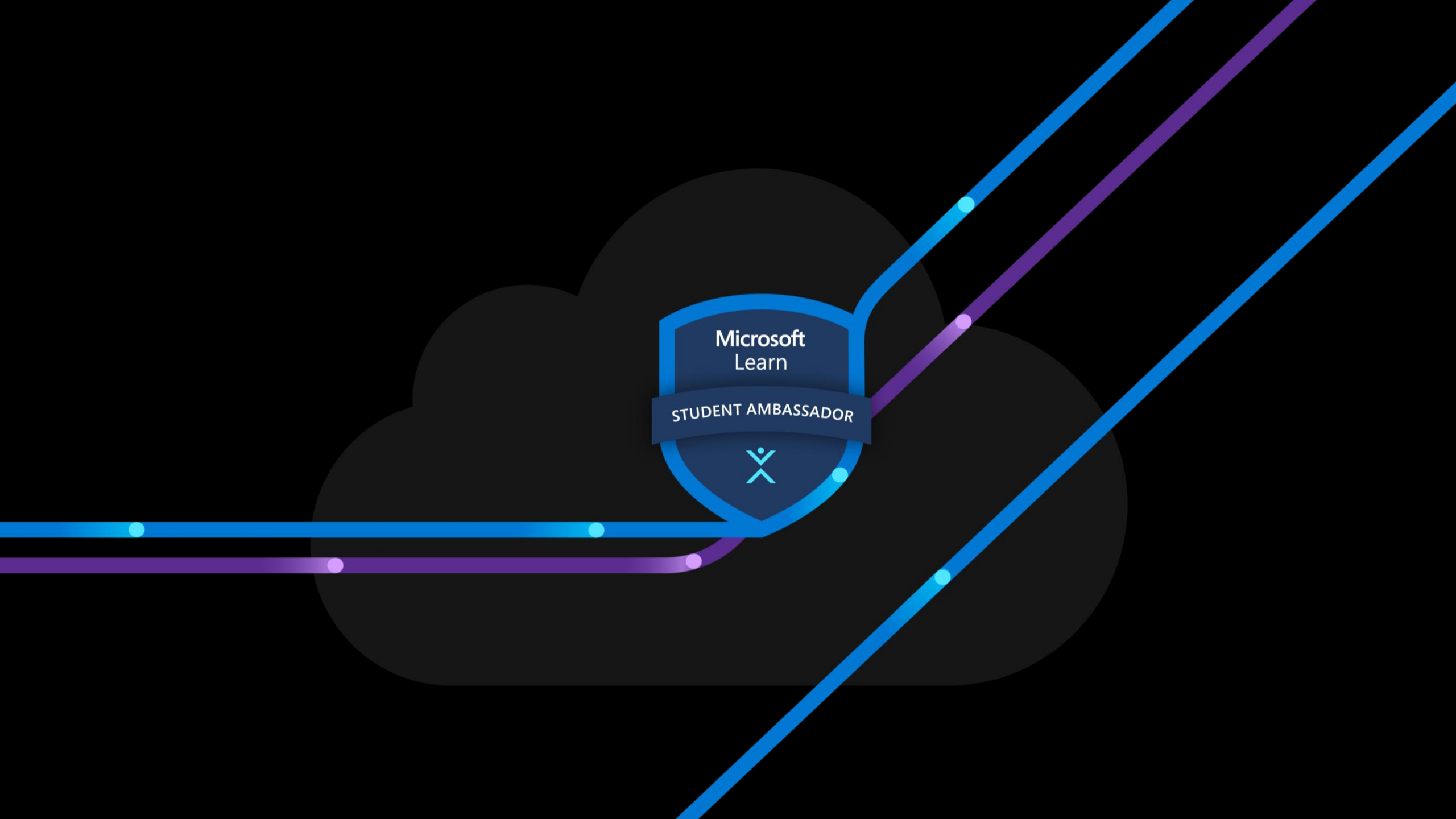
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