



How to use Azure Machine Learning with Python

Kinfey Lo

關於我

Port-Cloud Information Technology Limited

Microsoft Tech Community Regional Director

Microsoft Most Valuable Professional

Xamarin Most Valuable Professional

Microsoft Teched/Ignite/TechEd Summit Speaker

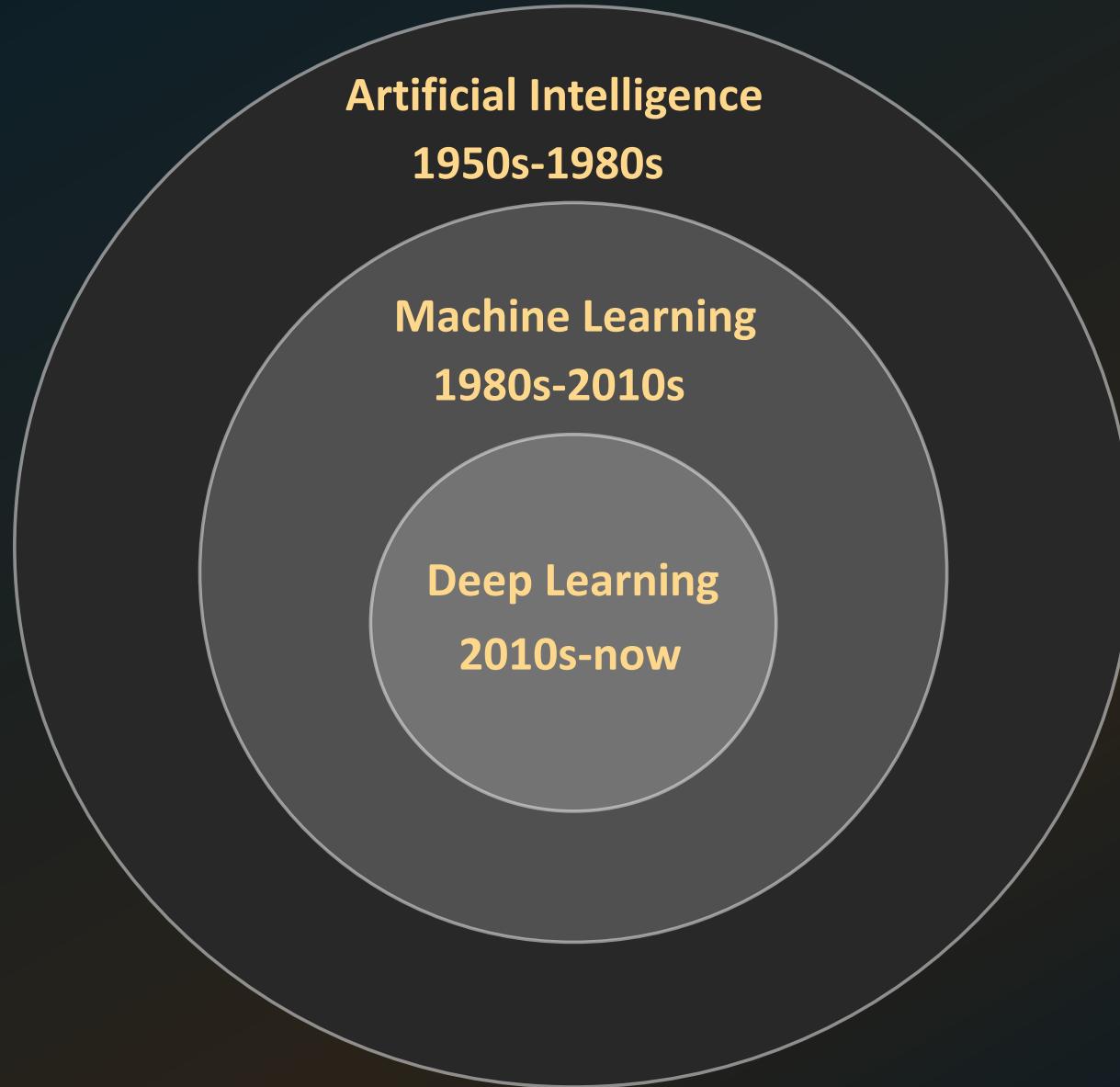
PyCon 2019 Breakout Session Speaker

Mail: lokinfey@outlook.com

Github : <https://github.com/lokinfey>



Artificial Intelligence 發展歷程



AI、Machine Learning 與 Deep Learning 關係

- Artificial Intelligence 是一種用電腦模仿人類的技術 (目標)
- Machine Learning 讓電腦能夠依賴經驗更好去處理任務的多項技術(過程)
 - Deep Learning 通過Neutral Network 作為基礎，讓電腦自我訓練(方法)

Traditional Programming

Data



Algorithm



Computation



Output

Machine Learning

(features)



(labels)



Computation



(model)

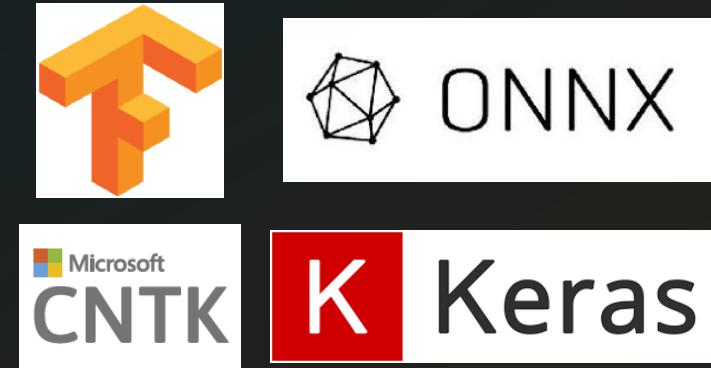
Artificial Intelligence的應用場景



Artificial Intelligence Stack



Language



Framework

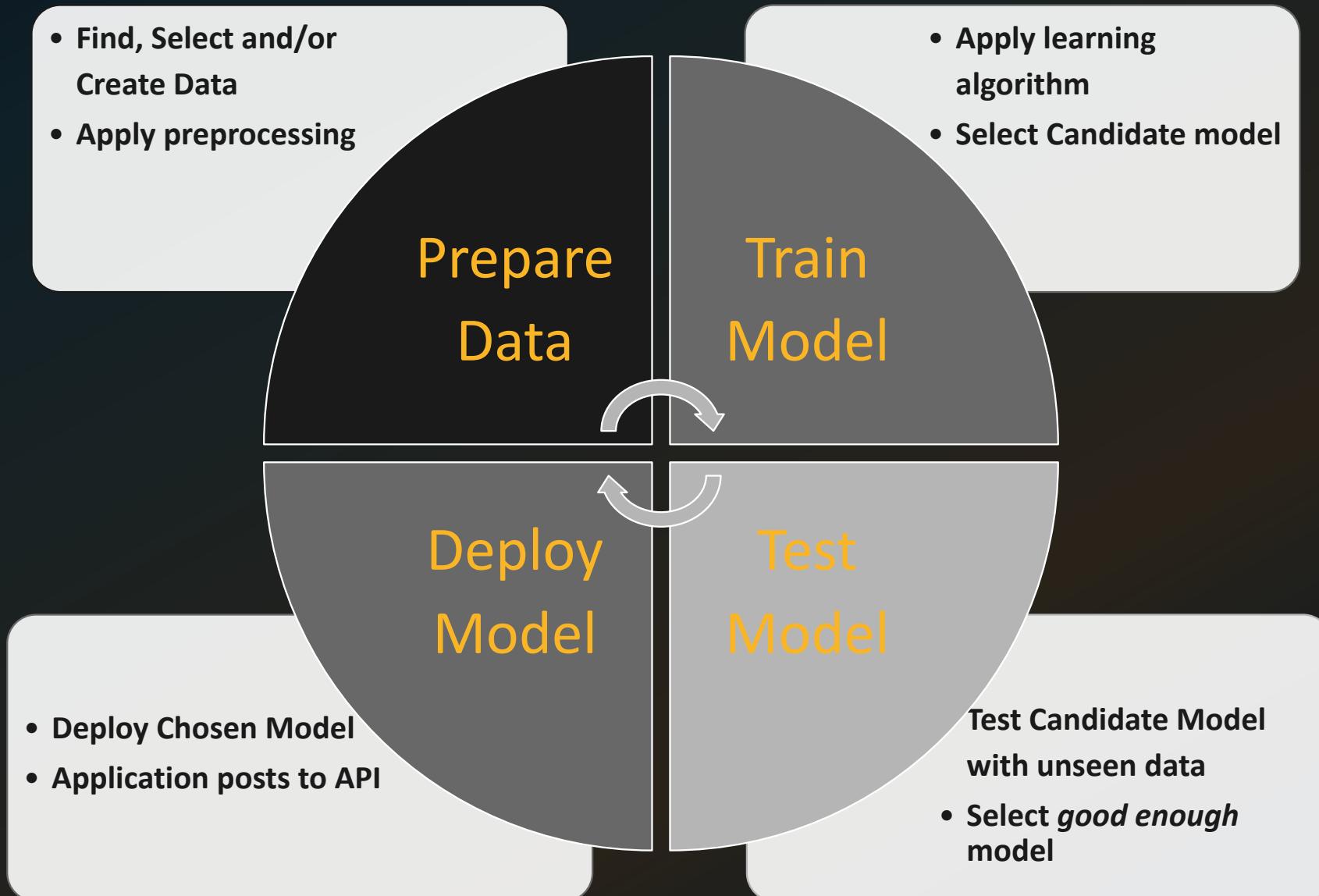


Hardware

Bye Bye AI ! ! !



完成一個Artificial Intelligence 過程



Azure AI

AI Application & Service



Azure Bot Service
Azure Cognitive Services

Machine Learning



Azure Databricks
Azure Machine Learning

Knowledge mining



Azure Cognitive Search

What is Azure Machine Learning Service?

Set of Azure Cloud
Services



Python
SDK

You can :

- ✓ Prepare data
- ✓ Build model
- ✓ Train model

- ✓ Manage Model
- ✓ Track Experiments
- ✓ Model Registration

Azure Machine Learning

Provide some predefined models

Can lower the development threshold



Vision



Speech



Language



Search

Compatible with different development tools

Quickly complete model development and simplify the development process



PyCharm



Jupyter



Visual Studio Code



Command line

Support for artificial intelligence development framework

Create deep learning solutions based on your needs



Pytorch



TensorFlow



Scikit-Learn



Onnx

Provide production services

Provide data and development environment for development team



Azure
Databricks



Azure Machine Learning



Machine
Learning VMs

Powerful hardware architecture support

Accelerate deep learning environment



CPU



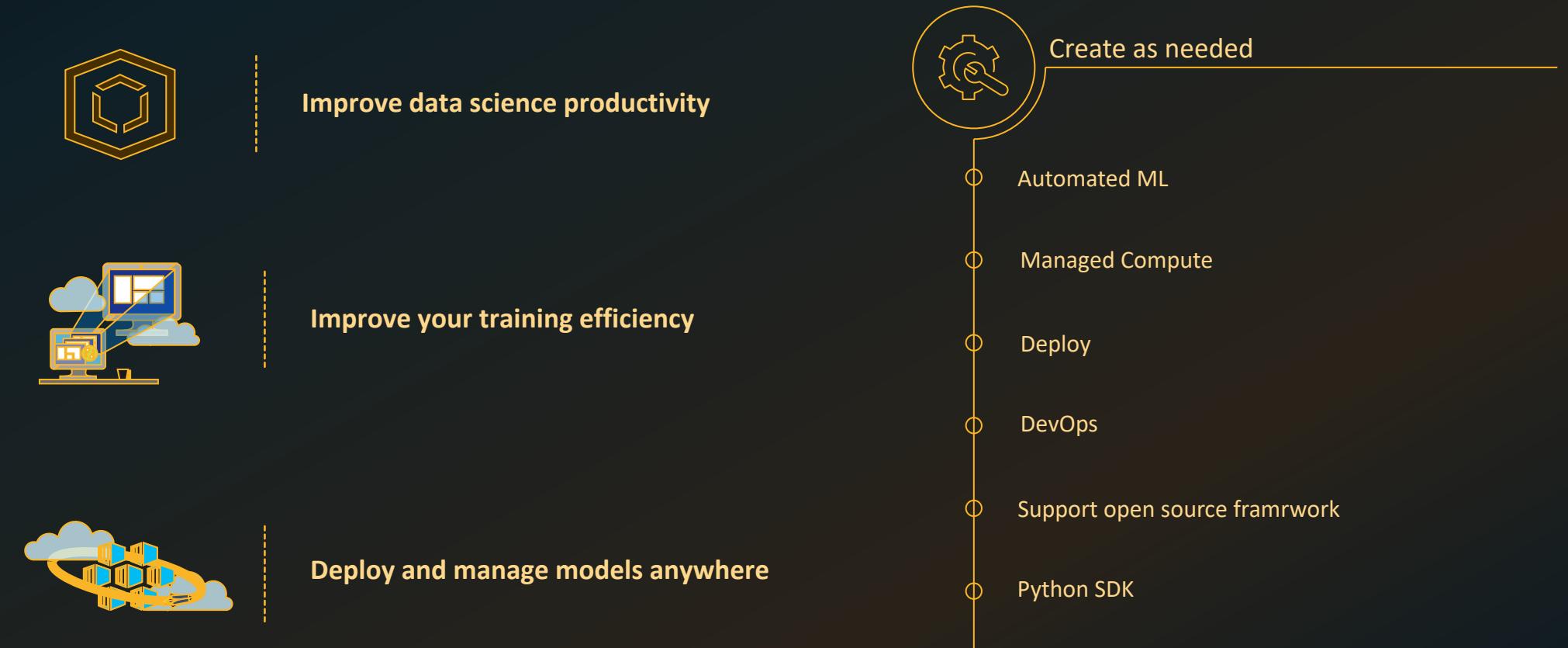
GPU



FPGA

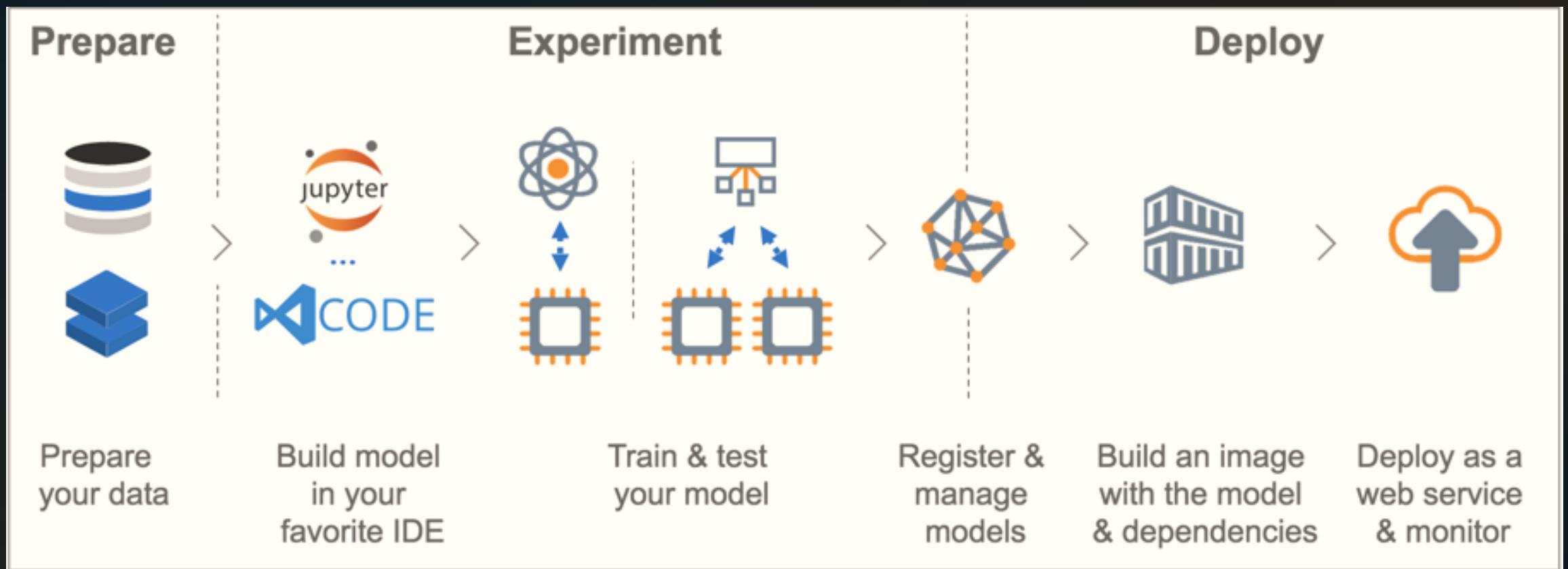
Azure Machine Learning service

- Is an AI development platform that enhances productivity

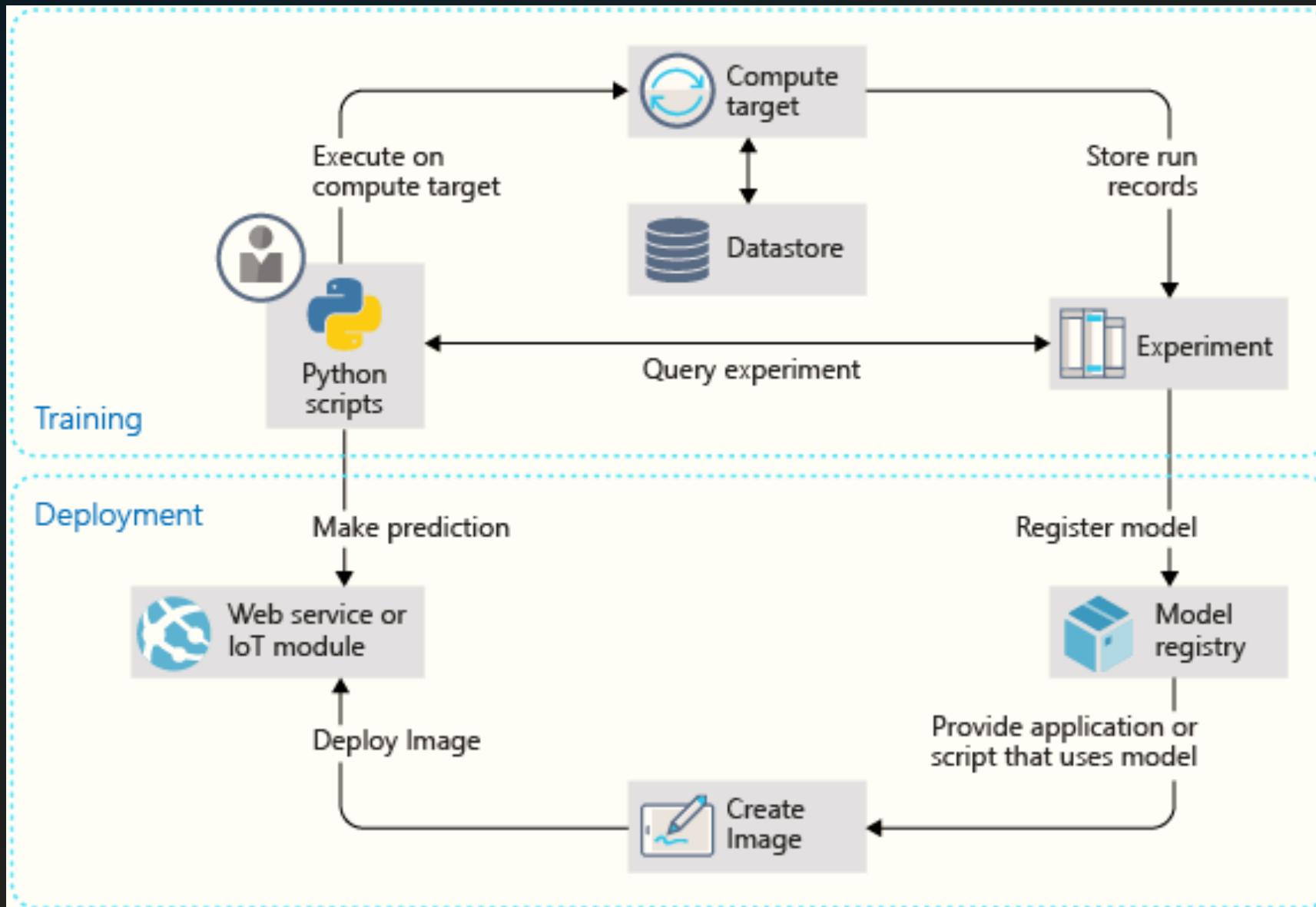


Azure Machine Learning Service

Azure Machine Learning Service provides a cloud-based environment that you can use to prepare data, train, test, deploy, manage, and track machine learning models.



Azure Machine Learning Service



Azure Machine Learning Service

Azure Marketplace [See all](#)

Featured [See all](#)

- Get started
- Recently created
- AI + Machine Learning**
- Analytics
- Blockchain
- Compute
- Containers
- Databases
- Developer Tools
- DevOps
- Identity
- Integration
- Internet of Things
- Media
- Mixed Reality
- IT & Management Tools
- Networking
- Software as a Service (SaaS)
- Security
- Storage
- Web

Machine Learning [Learn more](#)

Web App Bot [Quickstarts + tutorials](#)

Computer Vision [Quickstarts + tutorials](#)

Face [Quickstarts + tutorials](#)

Text Analytics [Quickstarts + tutorials](#)

Bing Search [Quickstarts + tutorials](#)

Ubuntu Server 18.04 LTS [Learn more](#)

StarWarAML
Machine Learning

Download config.json Delete

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Events

Assets

- Experiments
- Pipelines
- Compute
- Models
- Images
- Deployments
- Activities

Settings

- Properties
- Locks
- Export template

Monitoring

- Alerts
- Metrics
- Diagnostic settings
- Logs

Support + troubleshooting

- Usage + quotas
- New support request

Workspace edition : Enterprise

Resource group : AMLGpuGroup

Location : West US 2

Subscription : Microsoft Azure Sponsorship

Subscription ID : a5f85f4-07fd-4798-ba7b-025be3b07f52

Storage : starwaraml8174054724

Registry : starwaraml4c3fb7cd

Key Vault : starwaraml1653681273

Application Insights : starwaraml3280106667

Try the new Azure Machine Learning studio

Introducing a new immersive experience (preview) for managing the end-to-end machine learning lifecycle.

[Launch now](#) [Learn more](#)

Getting Started

View Documentation Learn how to use Azure Machine Learning.

View more samples at GitHub Get inspired by a large collection of machine learning examples.

View Forum Join the discussion of Azure Machine Learning.

Learn about Enterprise Edition Use the Enterprise edition to access UI-based tools for all skill levels, built-in MLOps and more

StarWarAML > Home

Welcome to the studio!

[Create new](#)

Notebooks
Code with Python SDK and run sample experiments.

Automated ML
Automatically train and tune a model using a target metric.

Designer
Drag-and-drop interface from prepping data to deploying models.

My recent resources

Run	Run ID	Experiment	Status	Submitted time
Run 3	gpuml_experiment_1586097535_909859...	gpuml_experiment	Completed	Apr 5, 2020 10:39 PM
Run 2	gpuml_experiment_1586095519_d7b07e...	gpuml_experiment	Failed	Apr 5, 2020 10:05 PM
Run 1	gpuml_experiment_1586093883_62ba7c...	gpuml_experiment	Failed	Apr 5, 2020 9:38 PM
Run 69	3db8774c-2473-4a31-a428-339dc127ed...	step1	Completed	Apr 2, 2020 8:50 PM
Run 63	9f7e1637-d9a9-48d7-9935-82e07bed16...	step1	Completed	Apr 2, 2020 8:43 PM
Run 60	afff788e-e427-4c20-896f-be541bc752eb	step1	Completed	Apr 2, 2020 8:37 PM
Run 57	133aa9ce-7ee9-498e-ad02-f7508eba6f41	step1	Failed	Apr 2, 2020 8:24 PM
Run 55	689e95ca-7748-4e94-9e81-588768b815...	step1	Failed	Apr 2, 2020 7:54 PM
Run 53	ee4ede60-d618-44ca-87af-eff09dbea885	step1	Failed	Apr 2, 2020 7:50 PM
Run 51	25be51c0-4f15-46e4-adcc-80aa34175c56	step1	Failed	Apr 2, 2020 7:47 PM

[View all experiments →](#)

Compute			
Name	Type	Provisioning state	Created on
starwarcompute	Machine Learning Com...	✓ Succeeded (4 nodes)	Apr 2, 2020 4:12 PM

[View all compute →](#)

Azure Machine Learning Service

- Key Artifacts



Workspace



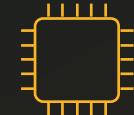
Models



Experiments



Pipelines



Compute Target



Images

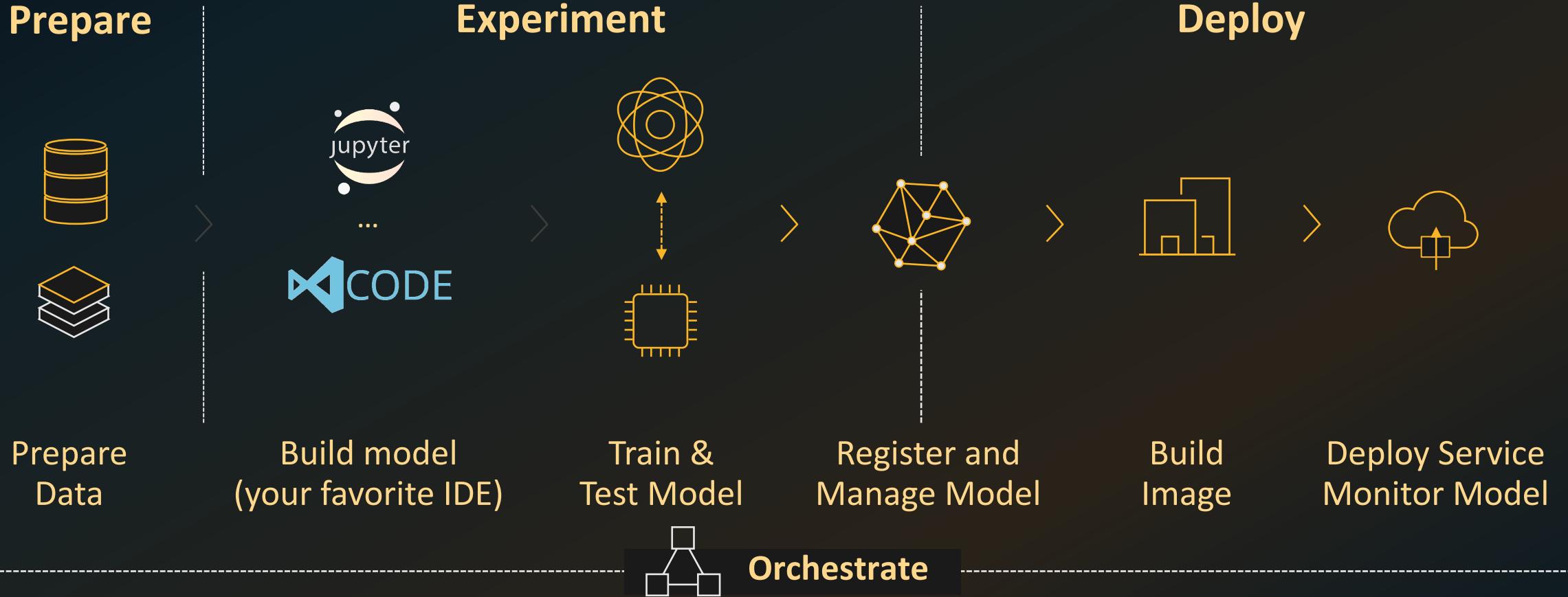


Deployment



Data Stores

Azure Machine Learning



Azure Machine Learning Pipelines

101010
010101
101010

Dataset



Azure Machine Learning studio < New - Microsoft Azure https://ml.azure.com/?wsid=/subscriptions/a55f85f4-07fd-4798-ba7b-025be3b07f52/resourcegroups/AMLGpuGroup/workspaces/StarWarAML&tid=ed483693-3413-4359-9fdf-53a3156196d5 Bookmarks Phiflow AI Xicheng MySelf Phiflow Imported From Goo... Imported From Mic... Imported From Mic... ImmiAccount 相关信息 mail.qq.com Phiflow Other Favorites Preview Microsoft Azure Machine Learning

StarWarAML > Home

Welcome to the studio!

Create new  **Notebooks**  **Automated ML**  **Designer** 

Code with Python SDK and run sample experiments.

Automatically train and tune a model using a target metric.

Drag-and-drop interface from prepping data to deploying models.

Start now **Start now** **Start now**

My recent resources

Run	Run ID	Experiment	Status	Submitted time
Run 3	gpuml_experiment_1586097535_90985...	gpuml_experiment	Completed	Apr 5, 2020 10:39 PM
Run 2	gpuml_experiment_1586095519_d7b07e...	gpuml_experiment	Failed	Apr 5, 2020 10:05 PM
Run 1	gpuml_experiment_1586093883_62ba7c...	gpuml_experiment	Failed	Apr 5, 2020 9:38 PM
Run 69	3db8774c-2473-4a31-a428-339dc127ed...	step1	Completed	Apr 2, 2020 8:50 PM
Run 63	9f7e1637-d9a9-48d7-9935-82e07bed16...	step1	Completed	Apr 2, 2020 8:43 PM
Run 60	aiff788e-e427-4c20-896f-be541bc752eb	step1	Completed	Apr 2, 2020 8:37 PM
Run 57	133aa9ce-7ee9-498e-ad02-f7508eba6f41	step1	Failed	Apr 2, 2020 8:24 PM
Run 55	689e95ca-7748-4e94-9e81-588768b815...	step1	Failed	Apr 2, 2020 7:54 PM
Run 53	ee4ede60-d618-44ca-87af-eff09dbea885	step1	Failed	Apr 2, 2020 7:50 PM
Run 51	25be51c0-4f15-46e4-adcc-80aa34175c56	step1	Failed	Apr 2, 2020 7:47 PM

[View all experiments →](#)

Name	Type	Provisioning state	Created on
starwarcompute	Machine Learning Com...	 Succeeded (4 nodes)	Apr 2, 2020 4:12 PM

[View all compute →](#)

Tutorials

 What is Azure Machine Learning?	 Train your first ML model with Notebook	 Create, explore and deploy Automated ML experiments.
 What is Azure Machine Learning designer?	 What are compute targets in Azure Machine Learning?	 Deploy models with Azure Machine Learning

dataset.ipynb* — mldemo

Jupyter Server: loc Python 3.7.5 64-bit: I...

EXPLORER

OPEN EDITORS

- datasets_init.ipynb
- dataset.ipynb*

MLDEMO

- > datasets
- > resized_dataset
- aml.ipynb
- { config.json
- dataset.ipynb
- datasets_init.ipynb
- train.py

[1] M4

```
from azureml.core import Workspace, Dataset
import azureml.contrib.dataset

subscription_id = ''
resource_group = 'AMLGPUGroup'
workspace_name = 'StarWarAML'

workspace = Workspace(subscription_id, resource_group, workspace_name)

dataset = Dataset.get_by_name(workspace, name='StarWarLabel-2020-04-02 11:53:10')
dataset.to_pandas_dataframe()
```

WARNING – Warning: Falling back to use azure cli login credentials.
If you run your code in unattended mode, i.e., where you can't give a user input, then we recommend to use ServicePrincipalAuthentication or MsiAuthentication.
Please refer to aka.ms/aml-notebook-auth for different authentication mechanisms in azureml-sdk.

	image_url	label	label_confidence
0	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	r2d2	1.0
1	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	c3po	1.0
2	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	r2d2	1.0
3	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	c3po	1.0
4	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	c3po	1.0
5	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	r2d2	1.0
6	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	c3po	1.0
7	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	c3po	1.0
8	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	r2d2	1.0
9	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	r2d2	1.0
10	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	c3po	1.0
11	StreamInfo(AmlDatastore://UI/04-02-2020_073223...	c3po	1.0

[2] M4

```
print('Workspace name: ' + workspace.name,
      'Azure region: ' + workspace.location,
      'Subscription id: ' + workspace.subscription_id,
      'Resource group: ' + workspace.resource_group, sep='\n')
```

Workspace name: StarWarAML
Azure region: westus2
Subscription id: a55f85f4-07fd-4798-ba7b-025be3b0712
Resource group: AMLGPUGroup

[4] M4

```
starwar_labels = Dataset.get_by_name(workspace, name='StarWarLabel-2020-04-02 11:53:10')
starwar_labels
```

```
{
  "source": [
    "('workspaceblobstore', '/export/dataset/7cba7279-5ced-6ccf-1233-e53167d797c6/4984c20b-a101-4767-9909-082fd3766d62/c2c1a5bc-bc3f-4558-b926-5fff9b17b706/LabeledDatasetJsonLines.json')"
  ],
  "definition": [
    "GetDatastoreFiles",
    "ParseJsonLines",
    "ExpressionAddColumn",
    "DropColumns",
    "DropColumns",
    "RenameColumns"
  ],
  "registration": {
    "id": "b5212952-a08a-4b26-8ada-77138ef9fc99",
    "name": "StarWarLabel-2020-04-02 11:53:10",
    "version": 1,
    "description": "LabeledDs_StarWarLabel Of Type ImageClassificationMultiClass, Sourced From 4984c20b-a101-4767-9909-082fd3766d62"
  }
}
```

OUTLINE

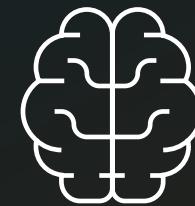
TIMELINE

Python 3.7.5 64-bit ⊗ 0 △ 0

Azure Machine Learning Pipelines

101010
010101
101010

Dataset



Training



Python 3.7.5 64-bit ⑧ 3 ▲ 1

train.py — midemo

EXPLORER

OPEN EDITORS

- datasets_init.ipynb
- train.py**

MLDEMO

- > datasets
- > resized_dataset
- aml.ipynb
- { config.json
- dataset.ipynb
- datasets_init.ipynb

train.py

train.py > ...

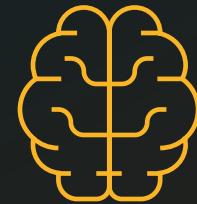
```
67
68     model = tf.keras.Sequential()
69     model.add(tf.keras.layers.Conv2D(32, (6, 6), input_shape=(x_train.shape[1], x_train.shape[2], x_train.shape[3]), act
70     model.add(tf.keras.layers.MaxPooling2D(pool_size=(2,2)))
71     model.add(tf.keras.layers.Conv2D(32, (6, 6), activation='relu'))
72     model.add(tf.keras.layers.MaxPooling2D(pool_size=(2, 2)))
73     model.add(tf.keras.layers.Dropout(0.5))
74     model.add(tf.keras.layers.Conv2D(32, (6, 6), activation='relu'))
75     model.add(tf.keras.layers.MaxPooling2D(pool_size=(2, 2)))
76     model.add(tf.keras.layers.Dropout(0.5))
77     model.add(tf.keras.layers.Flatten())
78     model.add(tf.keras.layers.Dense(len(classnames), activation='softmax'))
79
80     model.compile(loss='categorical_crossentropy',
81                   optimizer='adam',
82                   metrics=['accuracy'])
83     num_epochs = 20
84     history = model.fit(x_train, y_train, epochs=num_epochs, batch_size=64, validation_data=(x_test, y_test))
85
86     import tensorflow.keras.models
87
88     model_json = model.to_json()
89     with open("./outputs/starwar.json", "w") as json_file:
90         json_file.write(model_json)
91     # serialize weights to HDF5
92     model.save_weights("./outputs/startwar.h5")
93     print("Saved model to disk")
94
95
96
97
98
```

LN 60, COL 64 SPACES: 4 UTF-8 LF Python ⚙️ ⚙️

Azure Machine Learning Pipelines

101010
010101
101010

Dataset



Training



Model Registration



AMLTrain.ipynb — AzureCOVID

Jupyter Server: local Python 3: Idle

EXPLORER

OPEN EDITORS

AMLTrain.ipynb

AZURECOVID

.ipynb_checkpoints

dataset

model

AMLTrain.ipynb

config.json

test001.png

test002.png

test003.png

train.py

OUTLINE

TIMELINE

AMLTrain.ipynb x

[1] ML

```
import azureml.core  
print(azureml.core.VERSION)
```

1.0.85

[3] ML

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

ws = Workspace.from_config()

[4] ML

```
ds = ws.get_default_datastore()
```

[5] ML

```
datastores = ws.datastores  
for name, ds in datastores.items():  
    print(name, ds.datastore_type)
```

workspaceblobstore AzureBlob
workspacefilestore AzureFile

[7] ML

```
import azureml.data  
from azureml.data.azure_storage_datastore import AzureFileDatastore, AzureBlobDatastore
```

ds.upload(src_dir='./dataset',
 target_path='dataset',
 overwrite=True,
 show_progress=True)

Output was trimmed for performance reasons.
To see the full output set the setting "python.dataScience.textOutputLimit" to 0.

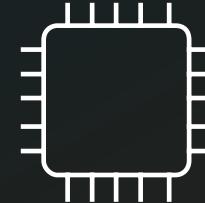
...

person291_virus_596.jpeg, 5845 files out of an estimated total of 5978
Uploading ./dataset/train/person731_bacteria_2633.jpeg
Uploaded ./dataset/train/person58_bacteria_272.jpeg, 5846 files out of an estimated total of 5978
Uploading ./dataset/train/person860_virus_1505.jpeg
Uploading ./dataset/train/person1438_bacteria_3718.jpeg
Uploaded ./dataset/train/person731_bacteria_2633.jpeg, 5847 files out of an estimated total of 5978
Uploaded ./dataset/train/person24_bacteria_111.jpeg, 5848 files out of an estimated total of 5978
Uploaded ./dataset/train/person860_virus_1505.jpeg, 5849 files out of an estimated total of 5978
Uploaded ./dataset/train/person1438_bacteria_3718.jpeg, 5850 files out of an estimated total of 5978
Uploading ./dataset/train/person397_virus_790.jpeg
Uploading ./dataset/train/person1235_virus_2095.jpeg
Uploading ./dataset/train/NORMAL2-IM-0553-0001.jpeg

Azure Machine Learning Pipelines



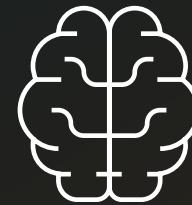
Dataset



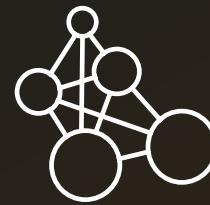
Compute

101010
010101
101010

Data Preparation



Training



Model Registration

Azure Machine Learning Automated ML

Preview Microsoft Azure Machine Learning

StarWarAML > Automated ML > Select Open Dataset

Create a new Automated ML

Select dataset

Select Open Dataset

Dataset details

Configure run

Task type and settings

Select an Open Dataset to register with your workspace.

Type to filter...

San Francisco Safety Data

Fire department calls for service and 311 cases in San Francisco.

Learn more

Sample: Diabetes

The Diabetes dataset has 442 samples with 10 features, making it ideal for getting started with machine learn...

Learn more

US National Employment Hours and Earnings

The Current Employment Statistics (CES) program produces detailed industry estimates of nonfar...

Learn more

NOAA Global Forecast System (GFS)

15-day US hourly weather forecast data (example: temperature, precipitation, wind) produced by the Glob...

Learn more

US Labor Force Statistics

Labor Force Statistics labor force, labor force participation rates, and the civilian noninstitutional population ...

Learn more

US Consumer Price Index

The Consumer Price Index (CPI) is a measure of the average change over time in the prices paid by urban consumers for...

Learn more

US Population by ZIP Code

US population by gender and race for each US ZIP code sourced from 2010 Decennial Census.

Learn more

NYC Taxi & Limousine Commission - green taxi trip records

The green taxi trip records include fields capturing pick-up and drop-off dates/times, pick-up and drop-off locations, tr...

Learn more

The MNIST database of handwritten digits

The MNIST database of handwritten digits has a training set of 60,000 examples and a test set of 10,0...

Learn more

US State Employment Hours and Earnings

The Current Employment Statistics (CES) program produces detailed industry estimates of nonfar...

Learn more

US Producer Price Index - Commodities

The Producer Price Index (PPI) is a measure of average change over time in the selling prices received by domestic produce...

Learn more

New York City Safety Data

All New York City 311 service requests from 2010 to the present.

Learn more

US Producer Price Index - Industry

The Producer Price Index (PPI) is a measure of average change over time in the selling prices received by domestic produce...

Learn more

NYC Taxi & Limousine Commission - yellow taxi trip records

The yellow taxi trip records include fields capturing pick-up and drop-off dates/times, pick-up and drop-off locations, tr...

Learn more

Public Holidays

Worldwide public holiday data sourced from PyPI holidays package and Wikipedia, covering 38 countries or regio...

Learn more

US Local Area Unemployment Statistics

The Local Area Unemployment Statistics (LAUS) program produces monthly and annual employment, unemploymen...

Learn more

Boston Safety Data

311 calls reported to the city of Boston.

Learn more

Seattle Safety Data

Seattle Fire Department 911 dispatches.

Learn more

Chicago Safety Data

311 service requests from the city of Chicago, including historical sanitation code complaints, pot holes report...

Learn more

US Population by County

US population by gender and race for each US county sourced from 2000 and 2010 Decennial Census.

Learn more

NOAA Integrated Surface Data (ISD)

Worldwide hourly weather history data (example: temperature, precipitation, wind) sourced from t...

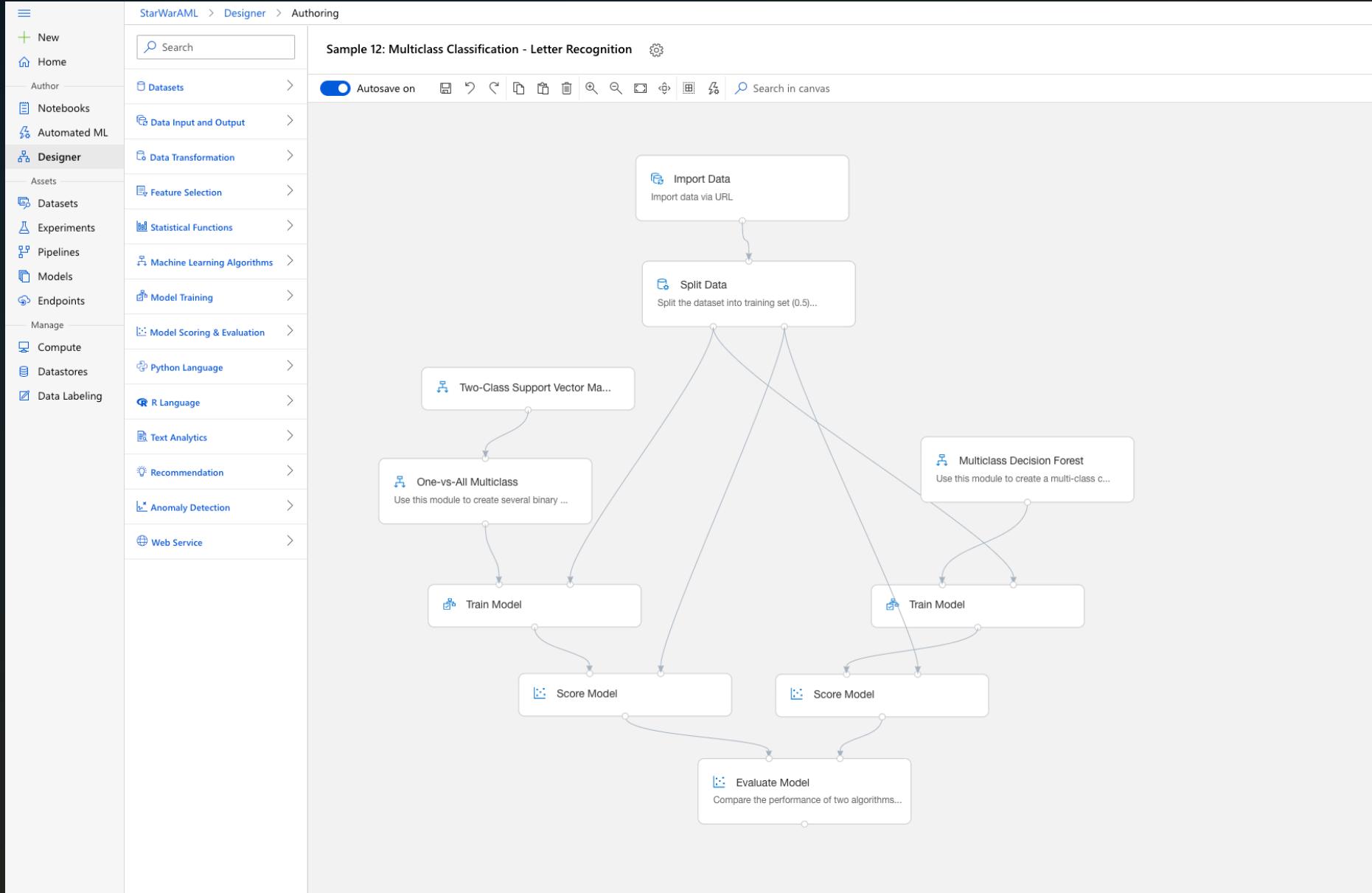
Learn more

NYC Taxi & Limousine Commission - For-Hire Vehicle (FHV) trip records

The For-Hire Vehicle ("FHV") trip records include fields capturing the dispatching base license number and the pick-up dat...

Learn more

Azure Machine Learning Designer



DevOps 过程

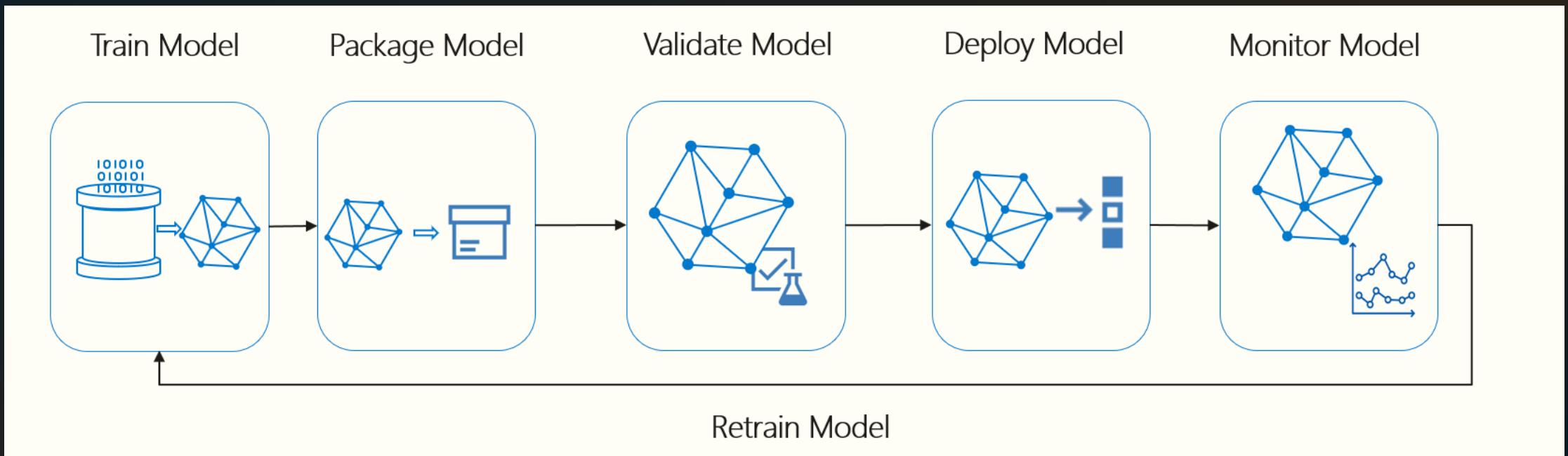


DevOps Good Practices

- Source Control
- Continuous Integration
- Continuous Delivery

MLOps

- MLOps are communications between data scientists and operations or production teams. It is essentially deep collaboration, designed to eliminate waste through machine learning, automate as much as possible, and produce richer and more consistent insights.



Source Control

- Code and comments only (not Jupyter output)
- Plus every part of the pipeline
- And Infrastructure and dependencies
- And maybe a subset of data



Continuous Integration



- Triggered on code change
- Refresh and execute AML Pipeline
- Code quality, linting, and unit testing
- Pull request process
- aka.ms/mitt/azuredevops

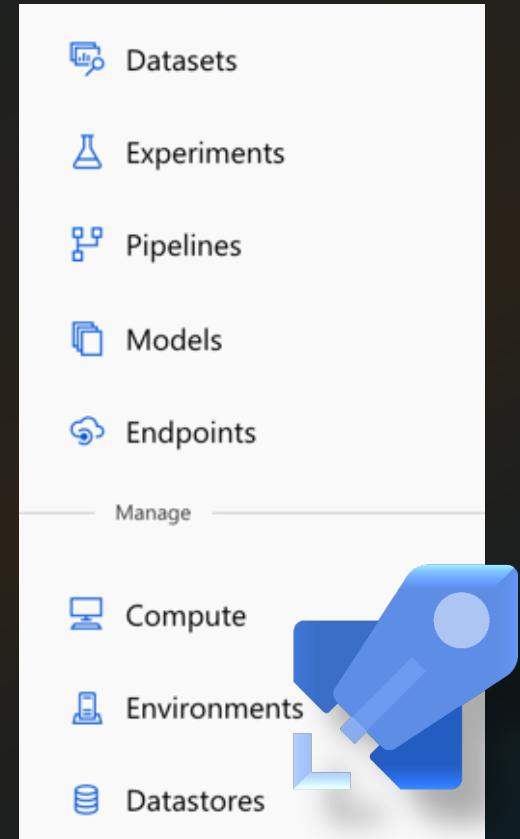
Continuous Delivery



- Trigger on model registration
- Deploy to test and staging environments
- Run integration and load tests
- Control: rollout, feature flags, A/B testing

Summary

- All code and infra in source control
- Known, shared data sources
- AML Pipelines and Azure Pipelines
- Have retraining strategies
- DevOps good practices for delivery



Waiting for dev.azure.com...

Tailwind Traders | Azure ML Workspace (Preview) | seer_pipeline - Jupyter Notebook | Builds - Pipelines | Release Seer - Pipelines | Paused

dev.azure.com/damo-enterprise/AML-Testing/_build?definitionid=4

Search all pipelines

+ New

Damovisa.seer

History Analytics

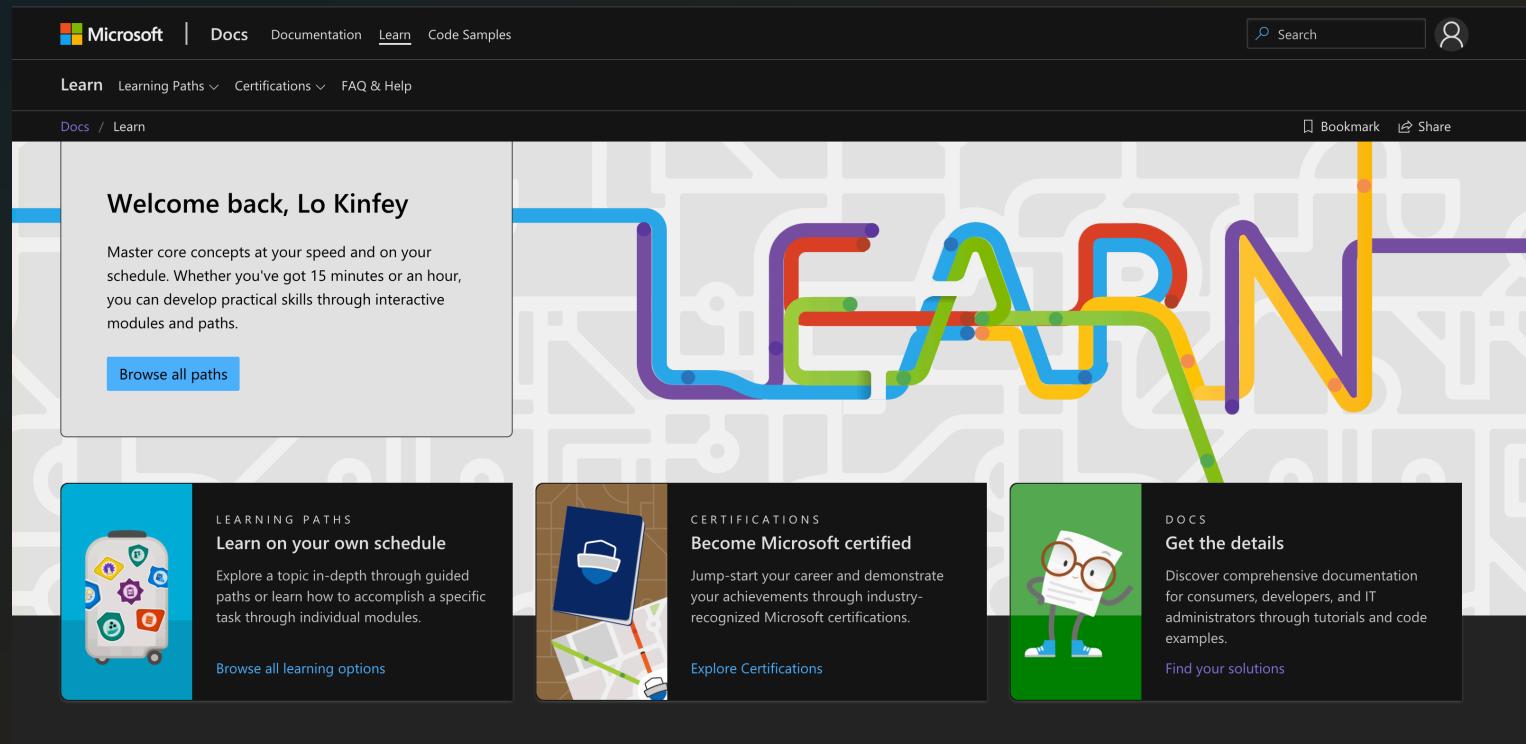
Commit	Build #	Branch	Queued	Duration	Started	Completed
Small updates to pipeline CI build for Damovisa	1.59.1	master	2019-09-17 · 12:04	2:55.397	2019-09-17 · 12:05	2019-09-17 · 12:08
Better training parameters? CI build for Damovisa	1.58.1	master	2019-09-13 · 09:13	2:57.720	2019-09-13 · 09:13	2019-09-13 · 09:16
reset training CI build for Damovisa	1.57.1	master	2019-09-13 · 07:36	2:59.262	2019-09-13 · 07:36	2019-09-13 · 07:39
No need to specify GPU CI build for Damovisa	1.56.1	master	2019-09-13 · 06:17	2:58.790	2019-09-13 · 06:17	2019-09-13 · 06:20
pip requirements for registration CI build for Damovisa	1.55.1	master	2019-09-13 · 05:26	2:52.644	2019-09-13 · 05:26	2019-09-13 · 05:29
pip requirements for tasks CI build for Damovisa	1.54.1	master	2019-09-13 · 04:54	2:58.449	2019-09-13 · 04:54	2019-09-13 · 04:57
Fixed environment creation CI build for Damovisa	1.53.1	master	2019-09-13 · 02:29	3:07.754	2019-09-13 · 02:30	2019-09-13 · 02:33
included tensorflow explicitly CI build for Damovisa	1.52.1	master	2019-09-12 · 08:25	2:51.539	2019-09-12 · 08:25	2019-09-12 · 08:28
run the published pipeline not the local one CI build for Damovisa	1.51.1	master	2019-09-12 · 08:17	2:49.706	2019-09-12 · 08:17	2019-09-12 · 08:20
Updated pipeline to better fit SDK CI build for Damovisa	1.50.1	master	2019-09-12 · 08:06	3:12.356	2019-09-12 · 08:06	2019-09-12 · 08:09
updated pipeline CI build for Damovisa	1.49.1	master	2019-09-06 · 09:37	2:57.616	2019-09-06 · 09:37	2019-09-06 · 09:40
reset batch and epochs CI build for Damovisa	1.48.1	master	2019-09-06 · 08:36	2:57.674	2019-09-06 · 08:36	2019-09-06 · 08:39
Increase running time and batch size	1.47.1	master	2019-09-06 · 08:25	2:57.102	2019-09-06 · 08:25	2019-09-06 · 08:28

Edit Queue

Some Tips for Learning Artificial Intelligence

/MS Learn

- Complete interactive learning exercises, watch videos, and practice and apply new skills learned.



Learning Path

Build AI solutions with Azure Machine Learning

<https://aka.ms/pyhk/AIML>

Introduction to machine learning with Python and Azure Notebooks

<https://aka.ms/pyhk/MLpython>

感謝

