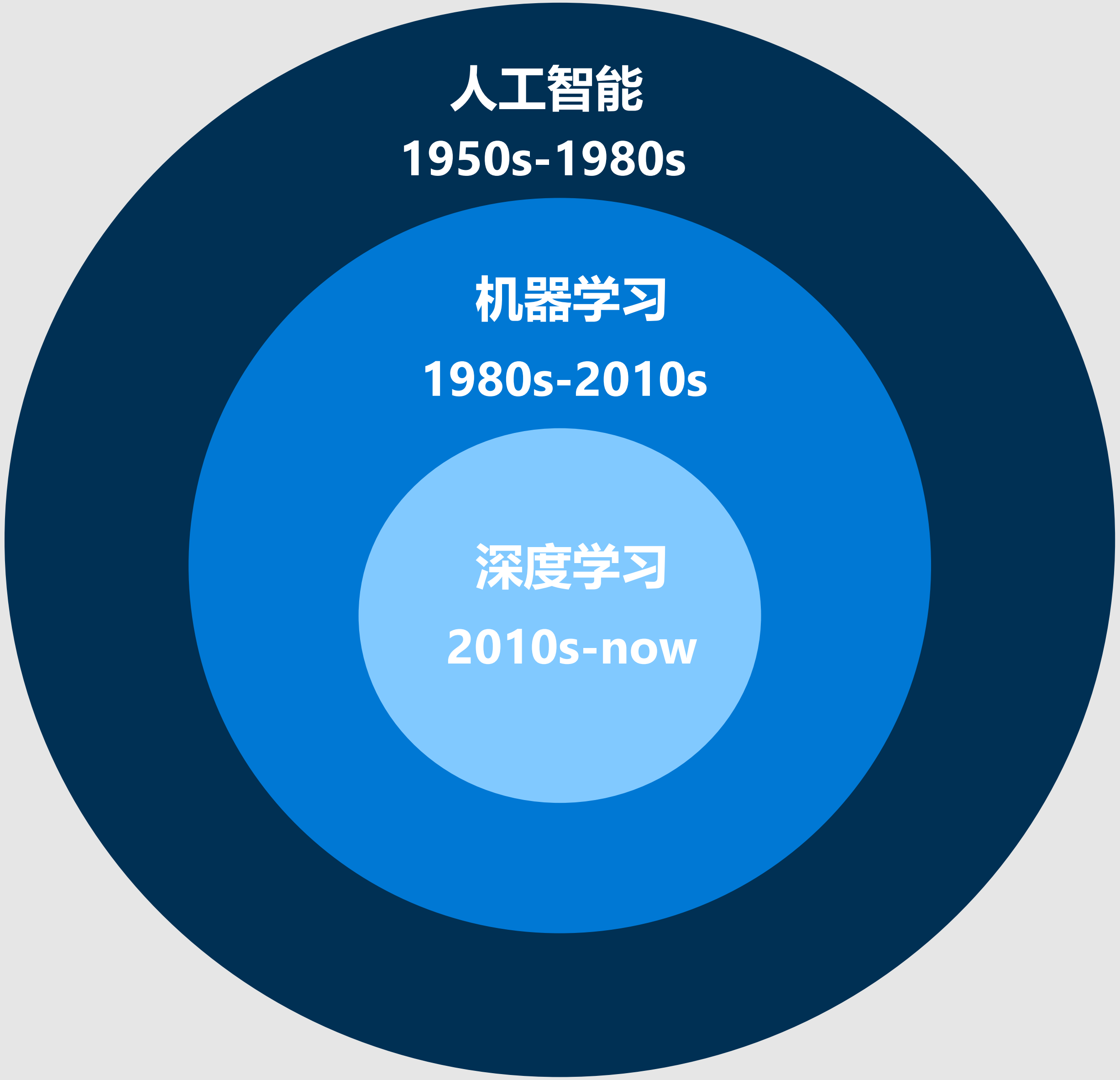
Azure Machine Learning Service

Kinfey.Lo
Microsoft MVP/Xamarin MVP
Github：https://github.com/lokinfey
Email: lokinfey@outlook.com

STUDY4
Study For Love

2019
Global Azure
BOOTCAMP

AI 技术不断变化



人工智能

1950s-1980s

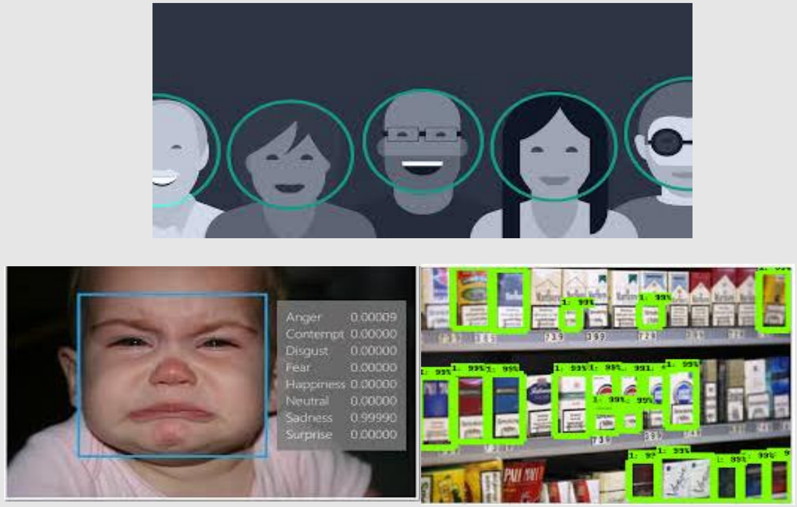
机器学习

1980s-2010s

深度学习

2010s-now

人工智能的热点方向



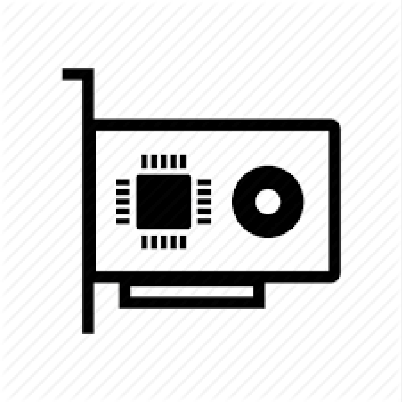
计算机视觉

翻译

搜索

如何做AI？

Local PC / Laptop



GPU

Cloud Computing

人工智能技术栈

++
R
JS
JavaScript
Java
C#

语言

ONNX
Microsoft
CNTK
K
Keras

框架

硬件

放弃AI！！！

Azure 提供的AI能力

AI 应用和服务

Azure Bot Service
Azure Cognitive Services

机器学习

Azure Databricks
Azure Machine Learning

知识挖掘

Azure Cognitive Search

Machine Learning on Azure

提供一些预定义的模型
能降低开发门槛

Vision　Speech　Language　Search

兼容不同的开发工具
快速完成模型开发，简化开发流程

PyCharm　Jupyter　Visual Studio Code　Command line

对人工智能开发框架的支持
根据你的需要创建深度学习的解决方案

Pytorch　TensorFlow　Scikit-Learn　Onnx

提供生产服务
为开发团队提供数据，和训练环境

Azure Databricks　Azure Machine Learning　Machine Learning VMs

强大的硬件架构支持
加速深度学习环境

CPU　GPU　FPGA

Azure Cognitive Services

1. Object Detection & Recognition for thousands of objects
2. Video Indexer (Preview)
3. Speech Recognition with customization
4. Speech Synthesis with customizable voice
5. Speech to Speech Translation
6. Text analytics with entity detection
7. Language Understanding (LUIS) with new integrated offer
8. QnA Maker is Generally Available
9. Bing Visual Search with smart identification

10.Bing Search SDK is Generally Available

Vision

Speech

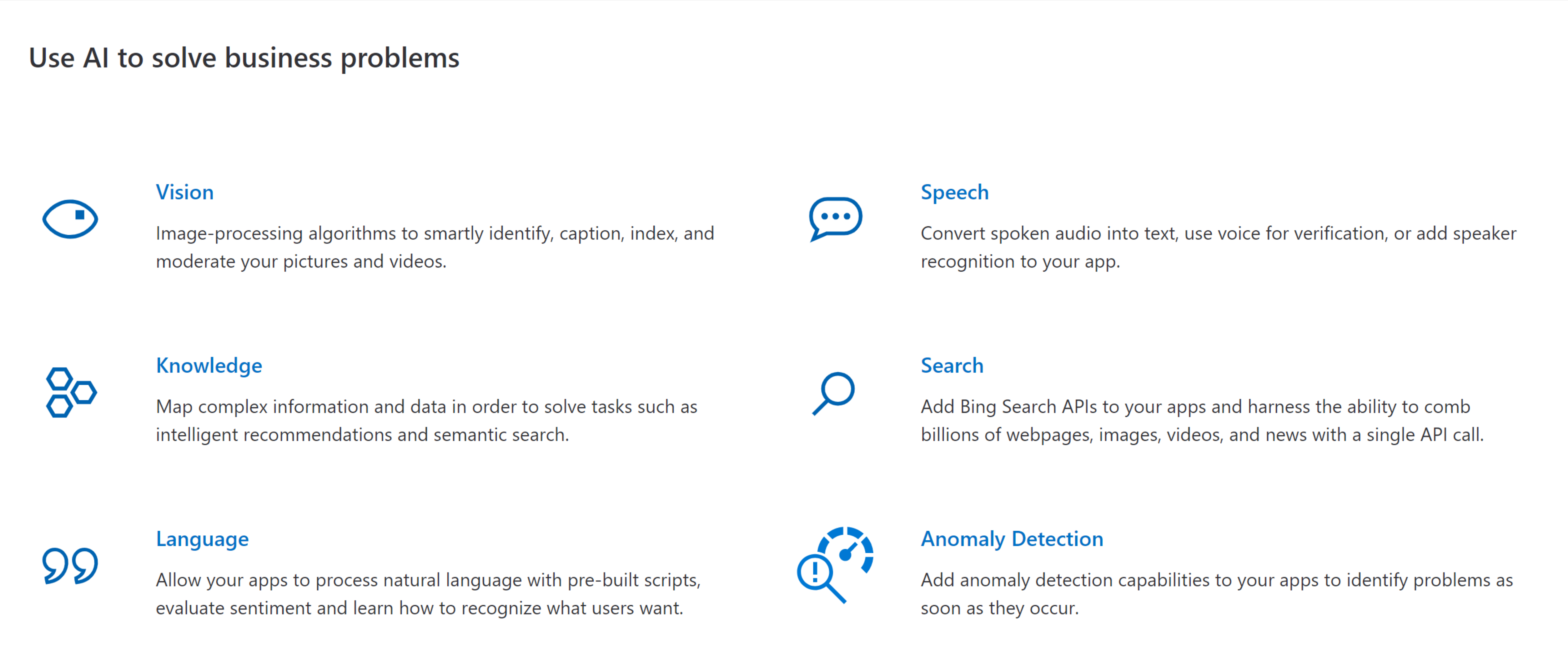
Language

Conversation

Bing Search

Knowledge

Azure Cognitive Services



Use AI to solve business problems

Vision

Image-processing algorithms to smartly identify, caption, index, and moderate your pictures and videos.

Knowledge

Map complex information and data in order to solve tasks such as intelligent recommendations and semantic search.

Language

Allow your apps to process natural language with pre-built scripts, evaluate sentiment and learn how to recognize what users want.

Speech

Convert spoken audio into text, use voice for verification, or add speaker recognition to your app.

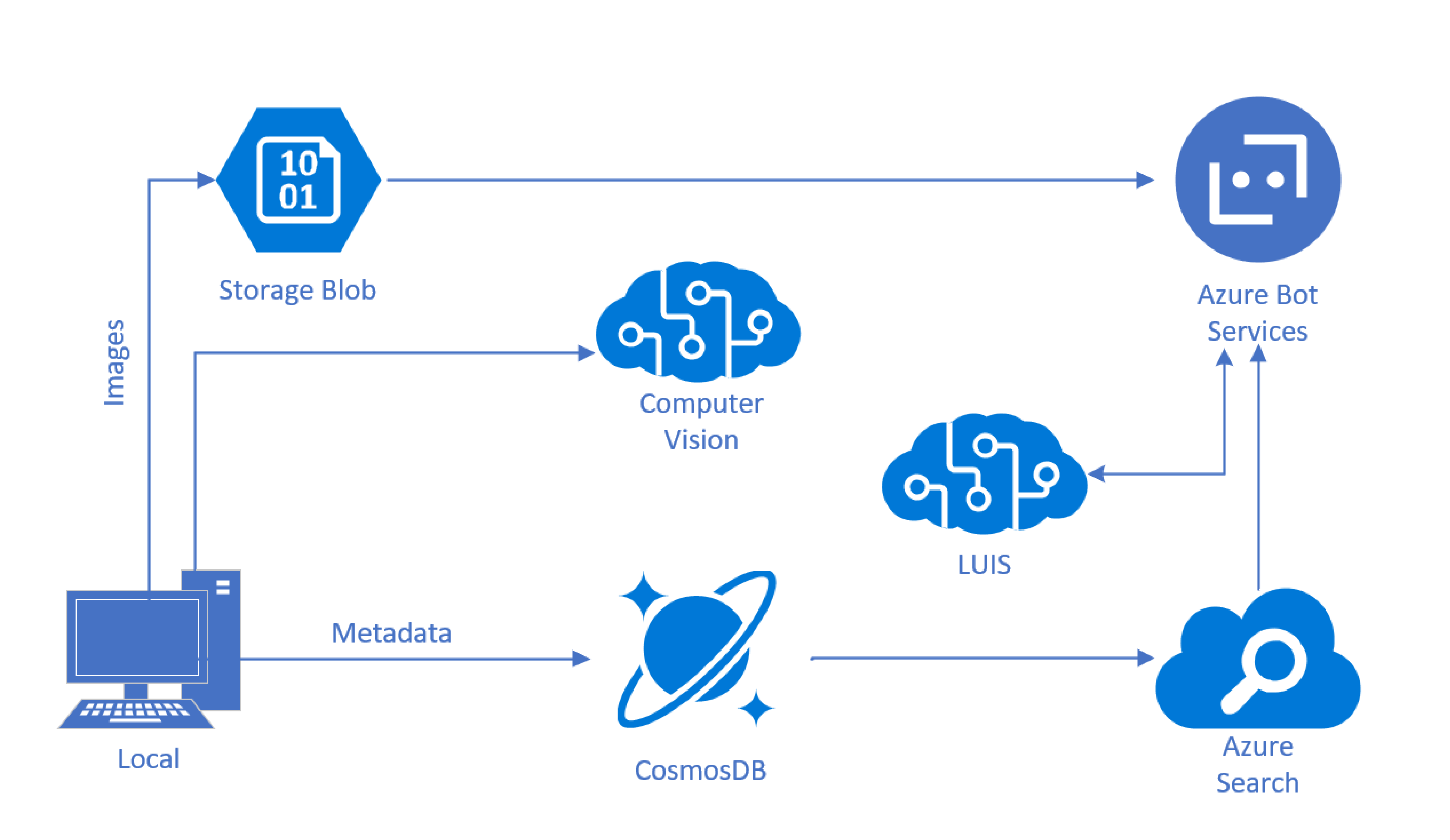
Search

Add Bing Search APIs to your apps and harness the ability to comb billions of webpages, images, videos, and news with a single API call.

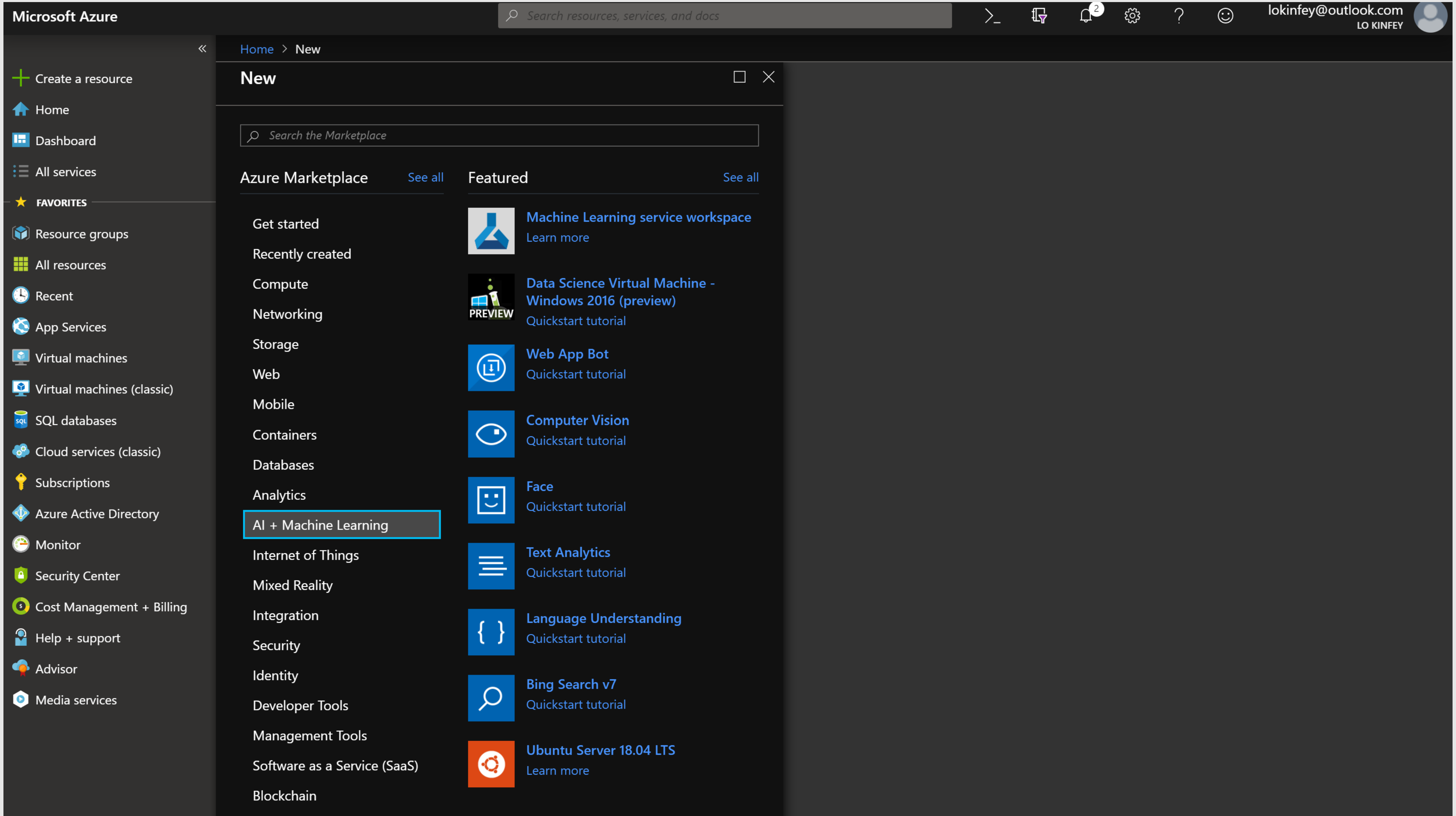
Anomaly Detection

Add anomaly detection capabilities to your apps to identify problems as soon as they occur.

Azure Cognitive Services



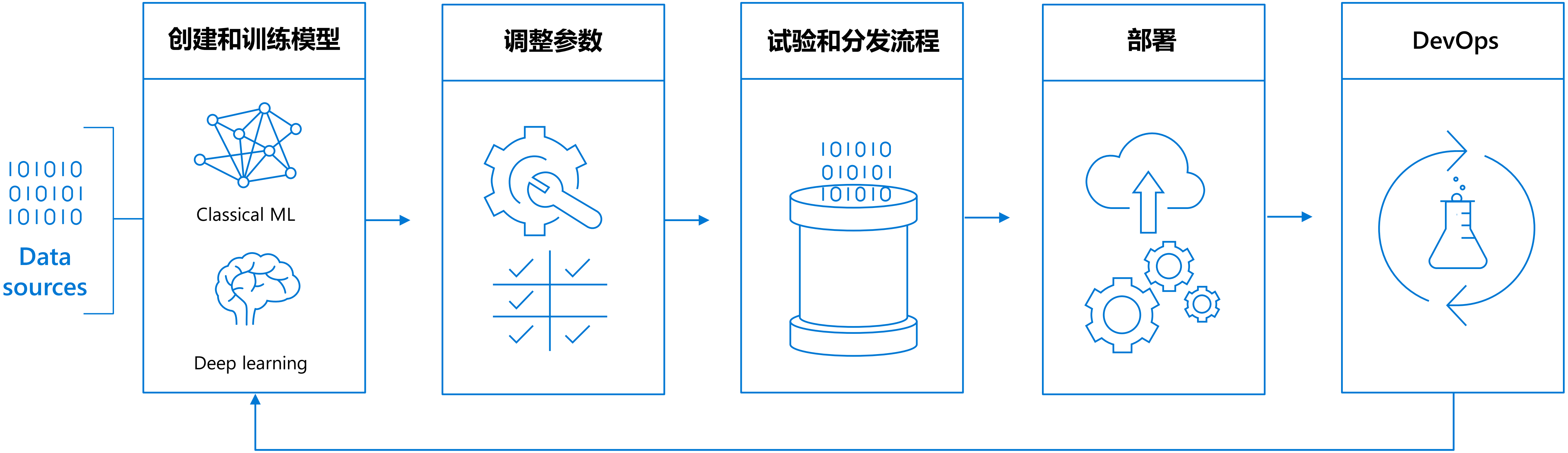
Azure Cognitive Services



可是老板

不会因为用Azure Cognitive Service 感到满足

构建AI项目的步骤

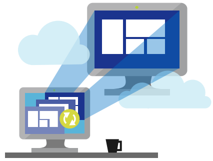


101010
010101
101010
Data sources
创建和训练模型
Classical ML
Deep learning
调整参数
试验和分发流程
101010
010101
101010
部署
DevOps

Azure Machine Learning service

是一个提升生产力的AI开发平台

Boost your data science productivity



Increase your rate of experimentation

Deploy and manage your models everywhere

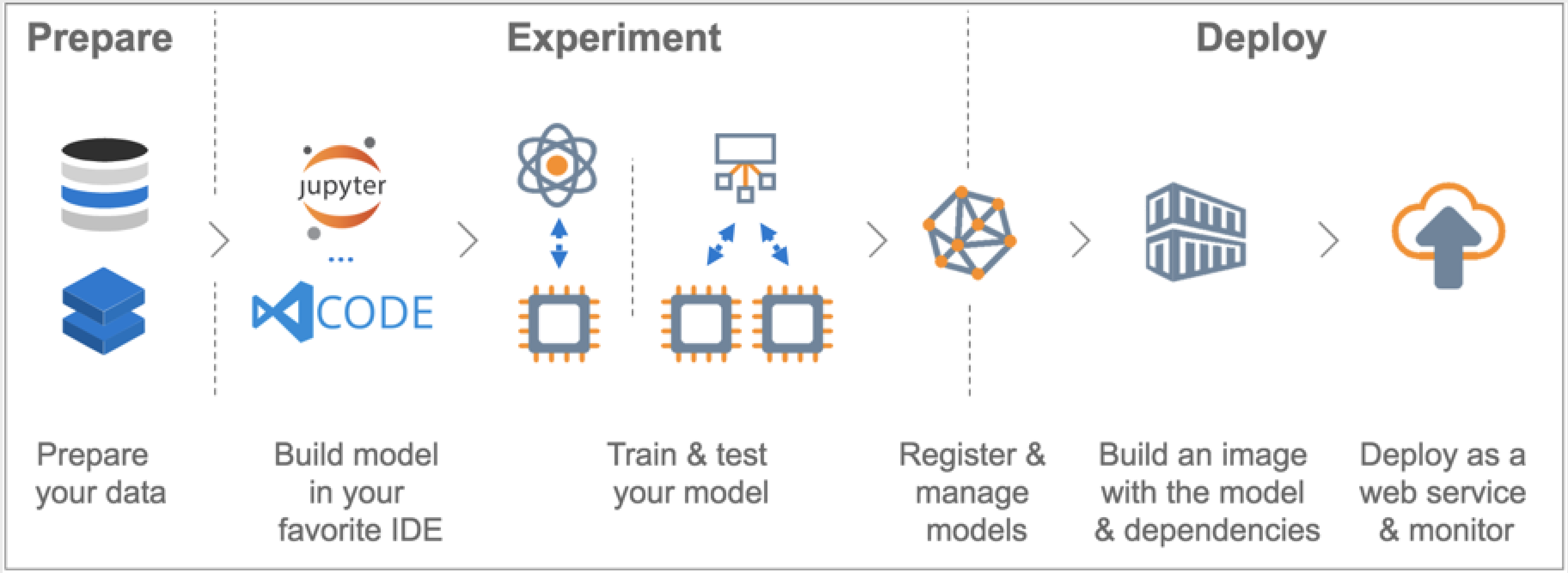
Built with your needs in mind

- Automated machine learning
- Managed compute
- Simple deployment
- DevOps for machine learning
- Support for open source frameworks
- Tool agnostic Python SDK

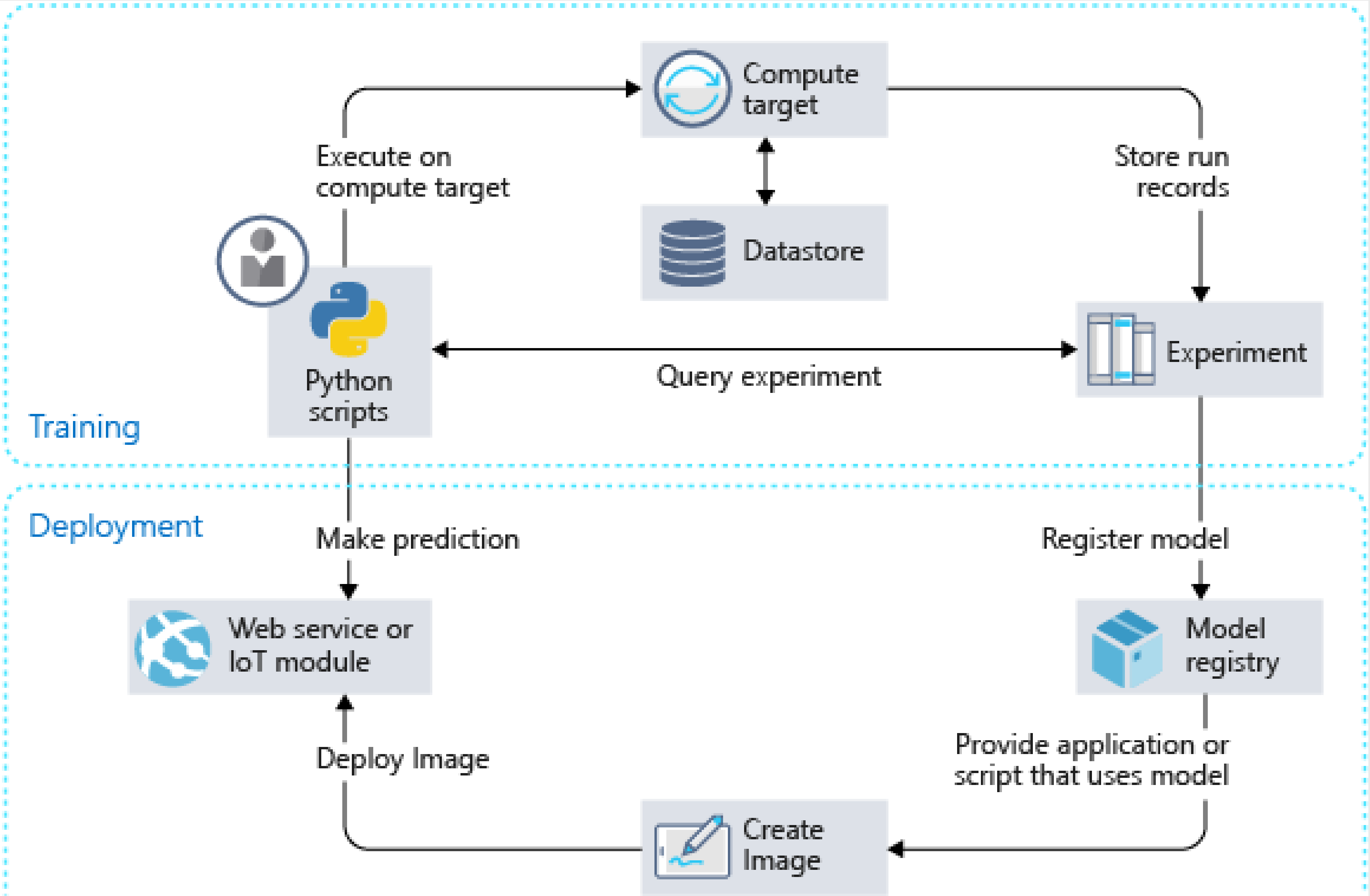
Seamlessly integrated with the Azure Portfolio

Azure Machine Learning Service

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


Prepare
Experiment
Deploy
jupyter
CODE
Prepare your data
Build model in your favorite IDE
Train & test your model
Register & manage models
Build an image with the model & dependencies
Deploy as a web service & monitor

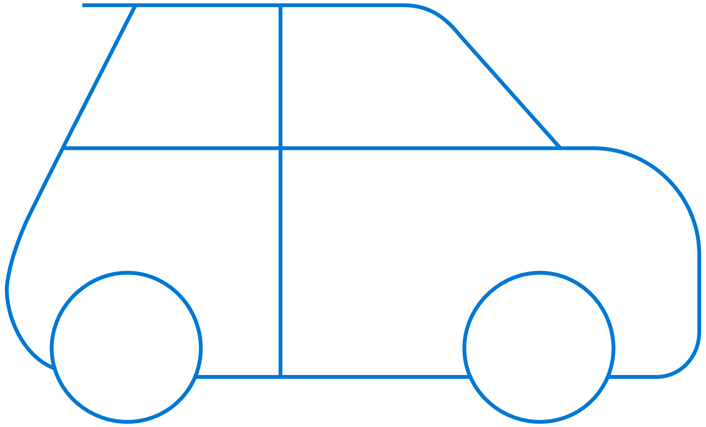
Azure Machine Learning Service



Automated machine learning

Azure Machine Learning

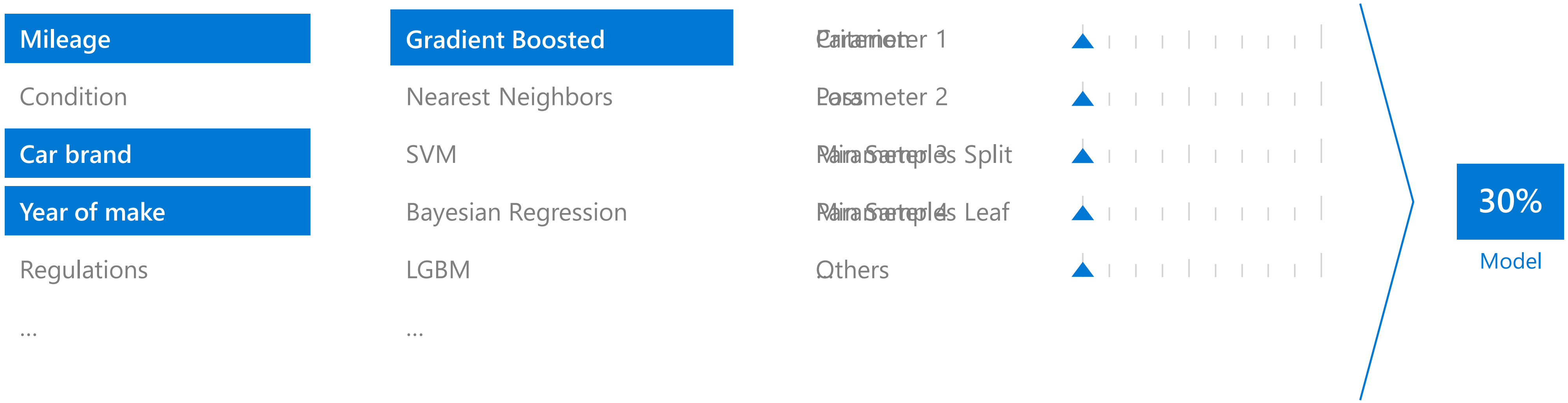
Automated machine learning



估算一台车的价格?

模型创建相当费时

Which features? Which algorithm? Which parameters?



Mileage

Condition

Car brand

Year of make

Regulations

…

Gradient Boosted

Nearest Neighbors

SVM

Bayesian Regression

LGBM

…

Parameter 1 / Criterion

Parameter 2 / Loss

Parameter 3 / Min Samples Split

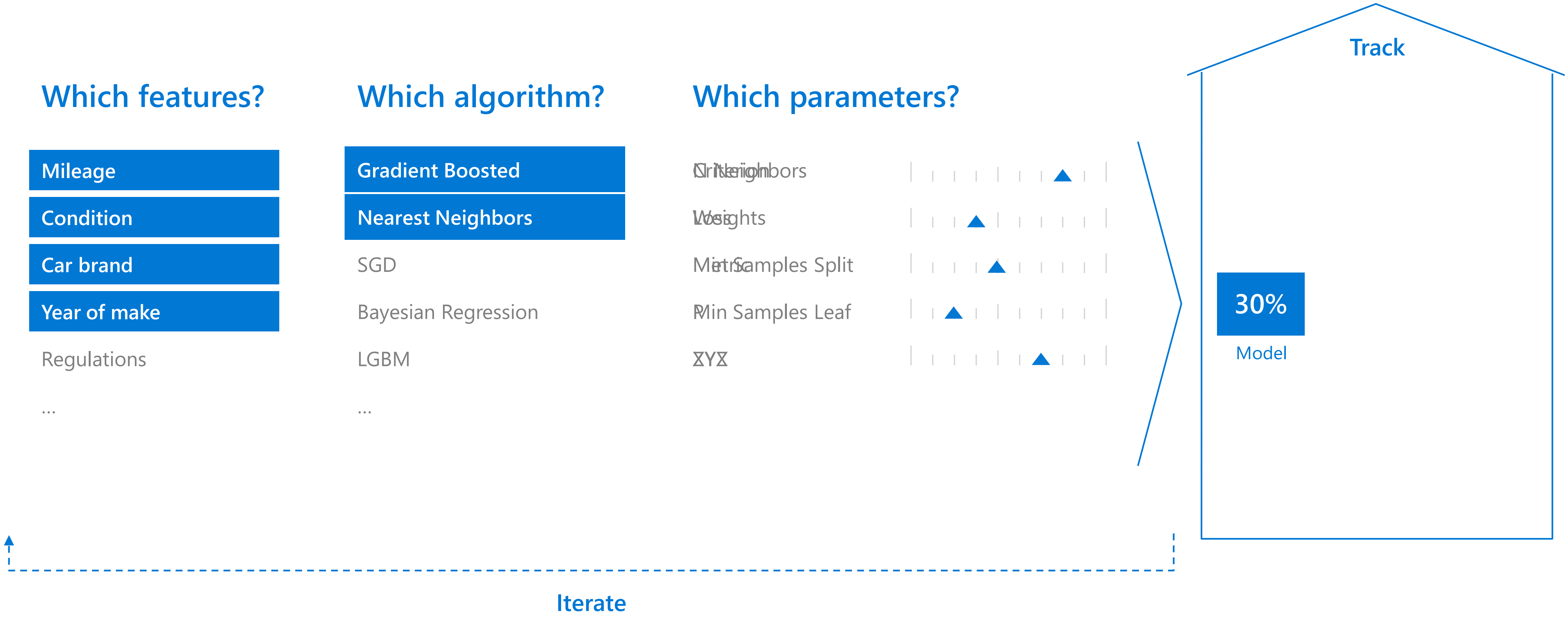
Parameter 4 / Min Samples Leaf

Others

30%

Model

模型创建相当费时



Which features?

- Mileage
- Condition
- Car brand
- Year of make
- Regulations
- …

Which algorithm?

- Gradient Boosted
- Nearest Neighbors
- SGD
- Bayesian Regression
- LGBM
- …

Which parameters?

- Criterion N Neighbors
- Loss Weights
- Metric Min Samples Split
- P Min Samples Leaf
- XYX

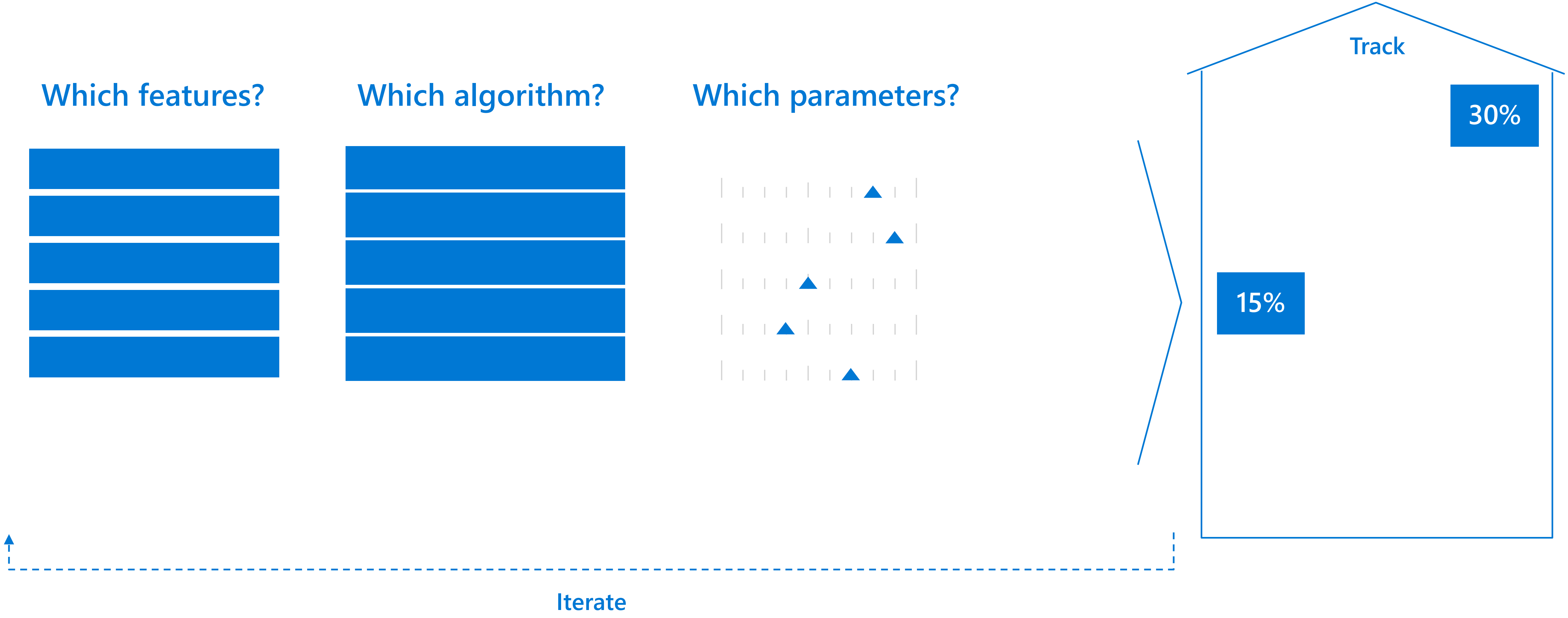
Track

30%

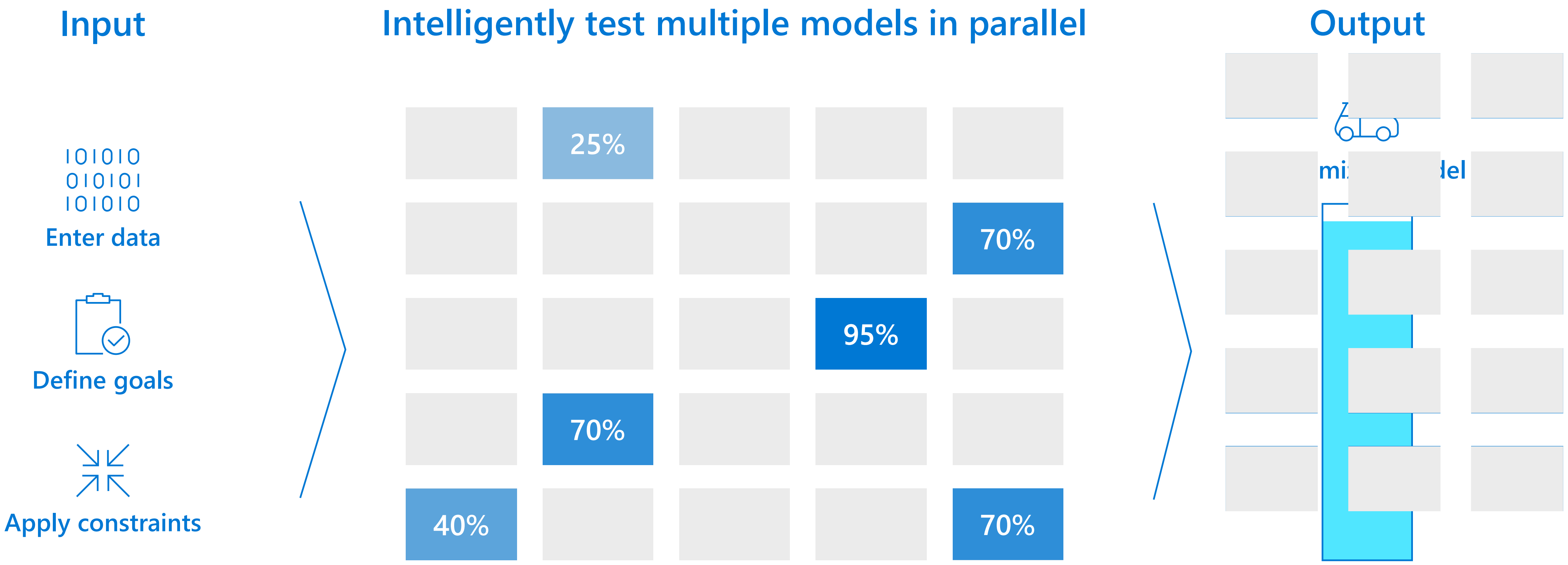
Model

Iterate

模型创建相当费时


Which features?
Which algorithm?
Which parameters?
Track
30%
15%
Iterate

Automated Machine Learning 加速模型训练

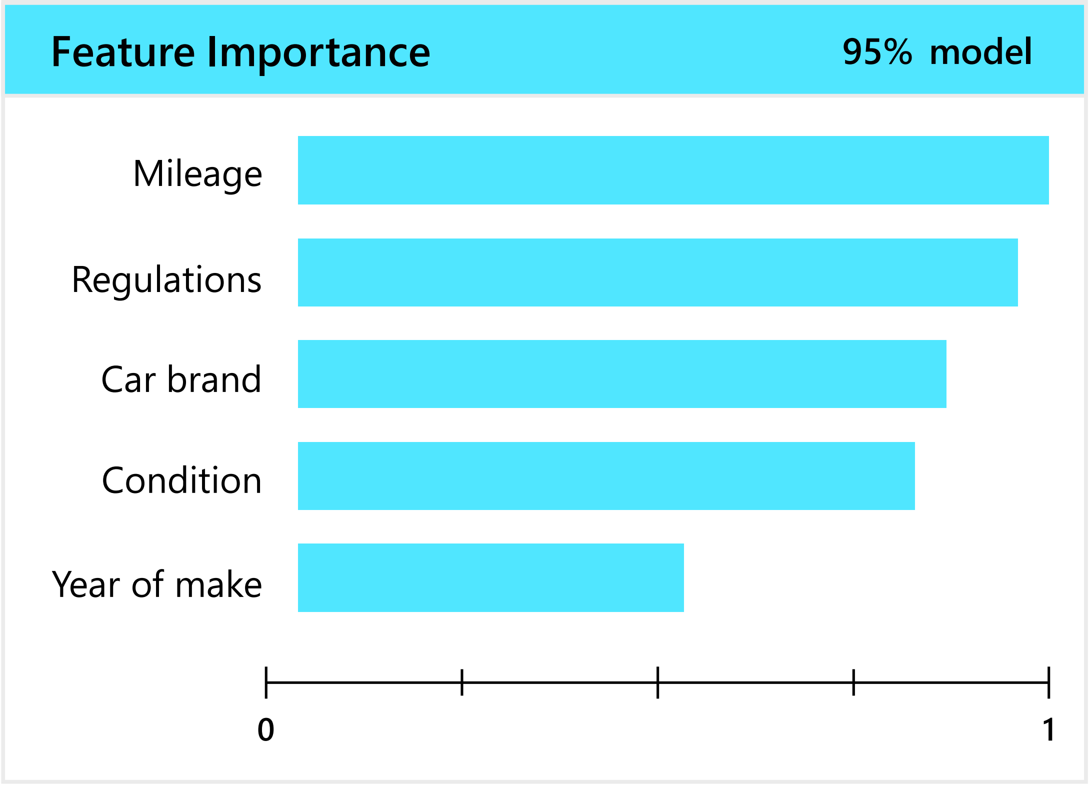


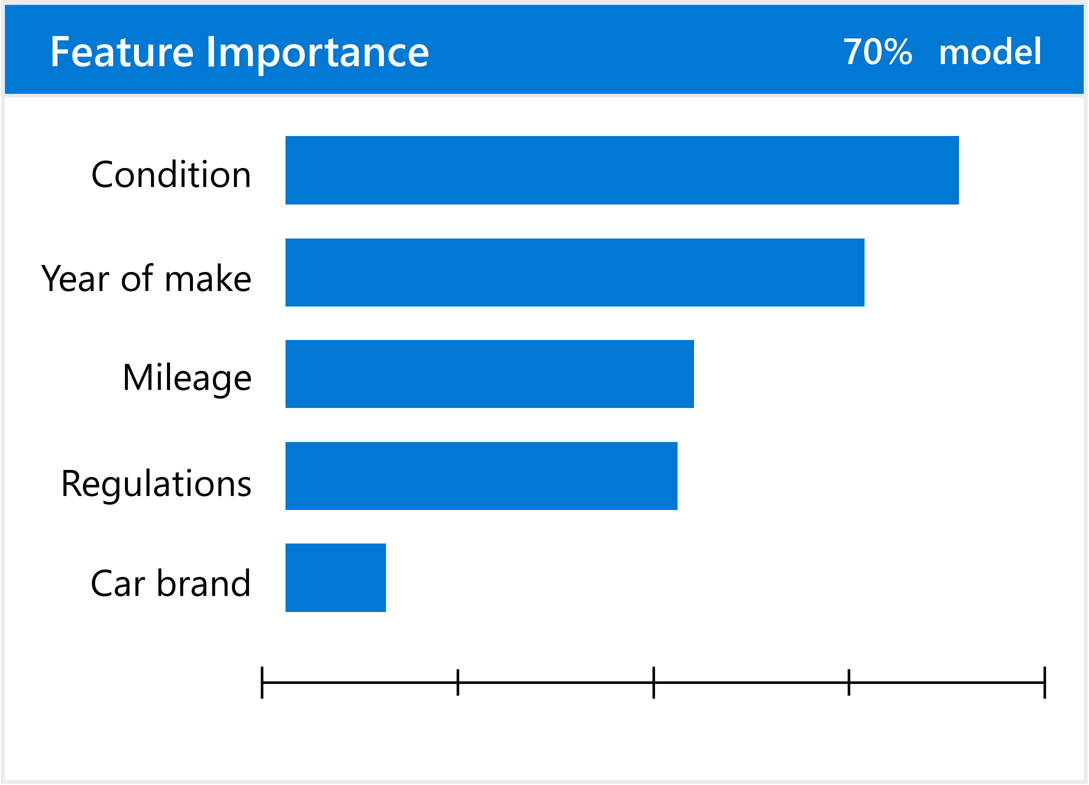
Input

Intelligently test multiple models in parallel

Output

Understand the inner workings of ML by analyzing feature importance





不是单一的迭代创建模型， 而且可以针对每次训练的模型进行分析，让你更快速找到最佳模型

Managed compute

训练时的基础设施

Dependencies and Containers

Leverage system-managed AML compute or bring your own compute

Distribute data

Manage and share resources across a workspace

Schedule jobs

Train at cloud scale using a framework of choice

Scale resources

Autoscale resources to only pay while running a job

Provision clusters

Use the latest NDv2 series VMs with the NVIDIA V100 GPUs

Powerful infrastructure

Accelerate deep learning

CPUs

General purpose machine learning

D, F, L, M, H Series

GPUs

Deep learning

N Series

FPGAs

Specialized hardware accelerated deep learning

Project Brainwave

Optimized for flexibility

Optimized for performance

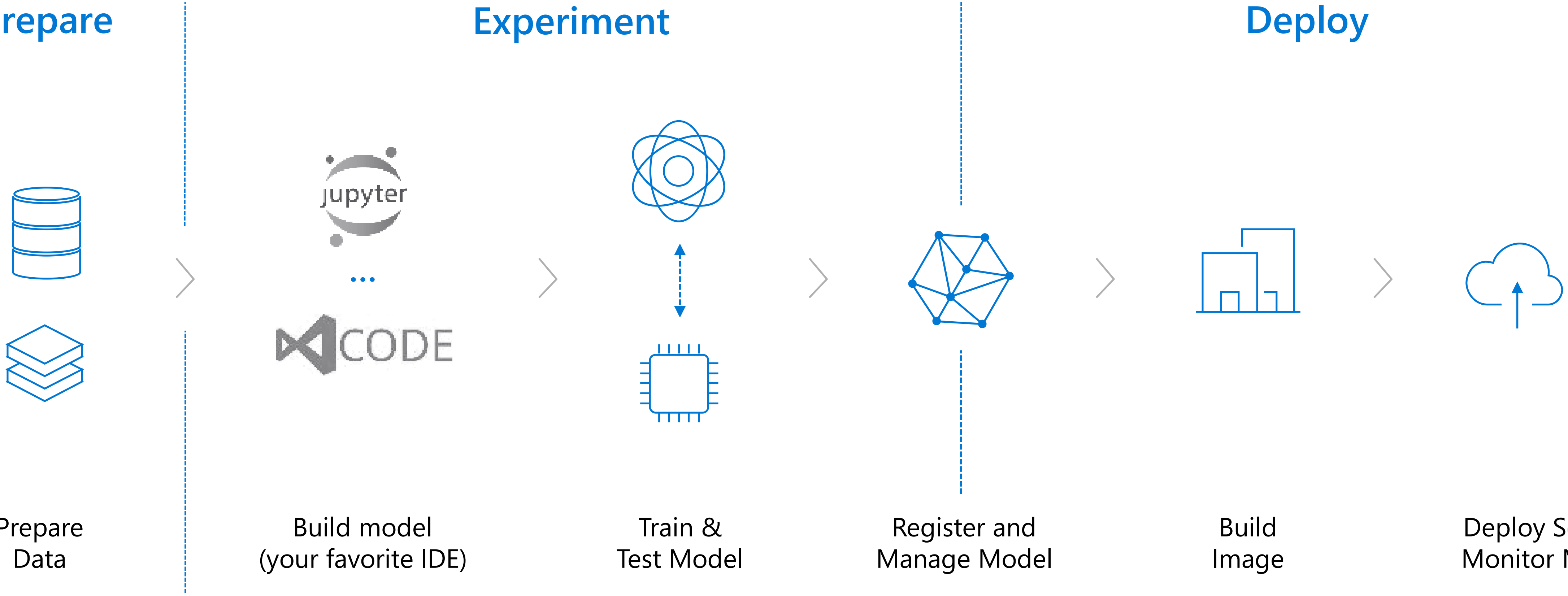
FPGA NEW UPDATES:

Support for image classification and recognition scenarios

ResNet 50, ResNet 152, VGG-16, SSD-VGG, DenseNet-121

Azure Machine Learning experiments

DevOps loop for data science



Prepare

Prepare
Data

Experiment

Build model
(your favorite IDE)

Train &
Test Model

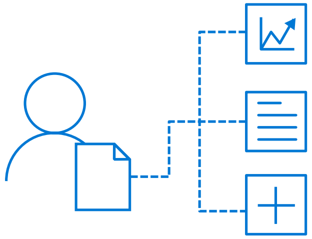
Register and
Manage Model

Deploy

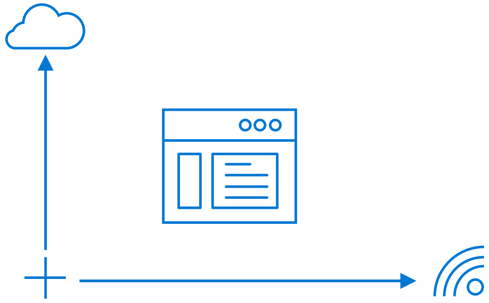
Build
Image

Deploy Service
Monitor Model

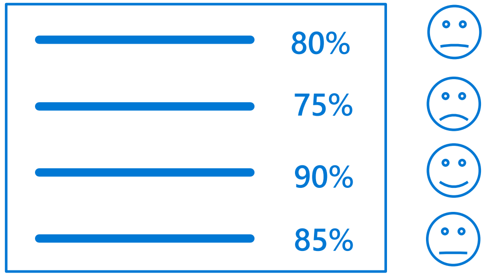
Experimentation



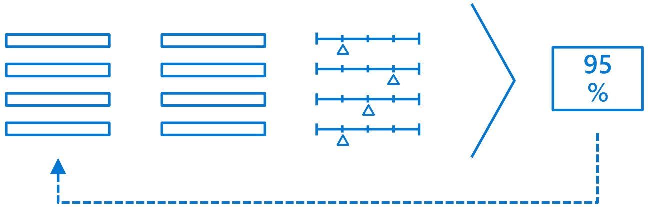
Leverage service-side capture of run metrics, output logs and models



Manage training jobs locally, scaled-up or scaled-out

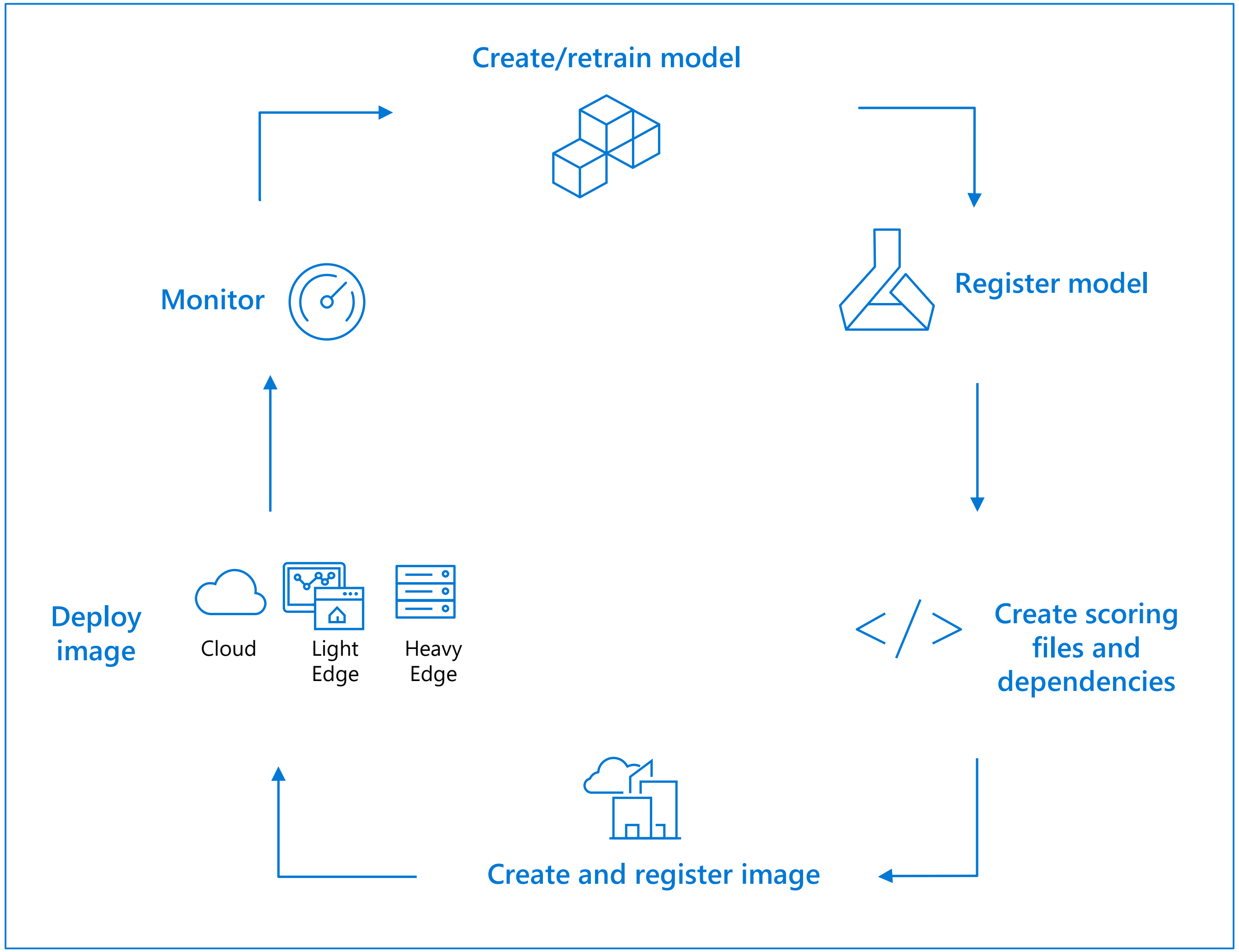


Use leaderboards, side by side run comparison and model selection



Conduct a hyperparameter search on traditional ML or DNN

Model management in Azure Machine Learning



Model management in detail

Create/Retrain Model

Enable DevOps with full CI/CD integration with VSTS

Register Model

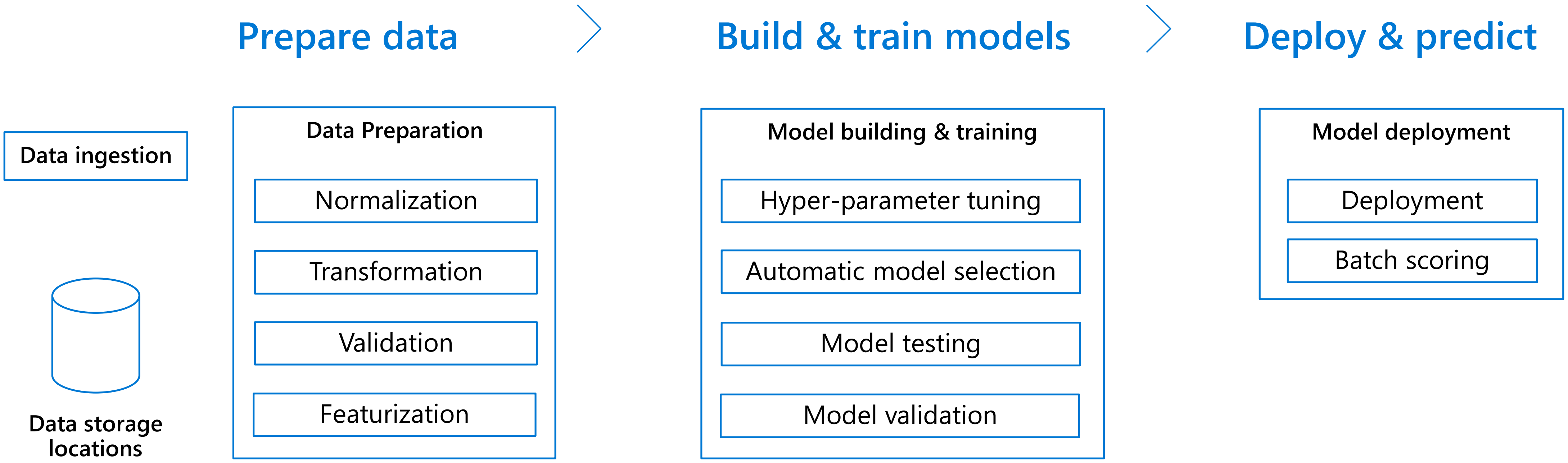
Track model versions with a central model registry

Monitor

Oversea deployments through Azure AppInsights

Azure Machine Learning pipelines

Azure Machine Learning pipelines



Data ingestion

Data storage locations

Prepare data

Data Preparation

- Normalization
- Transformation
- Validation
- Featurization

Build & train models

Model building & training

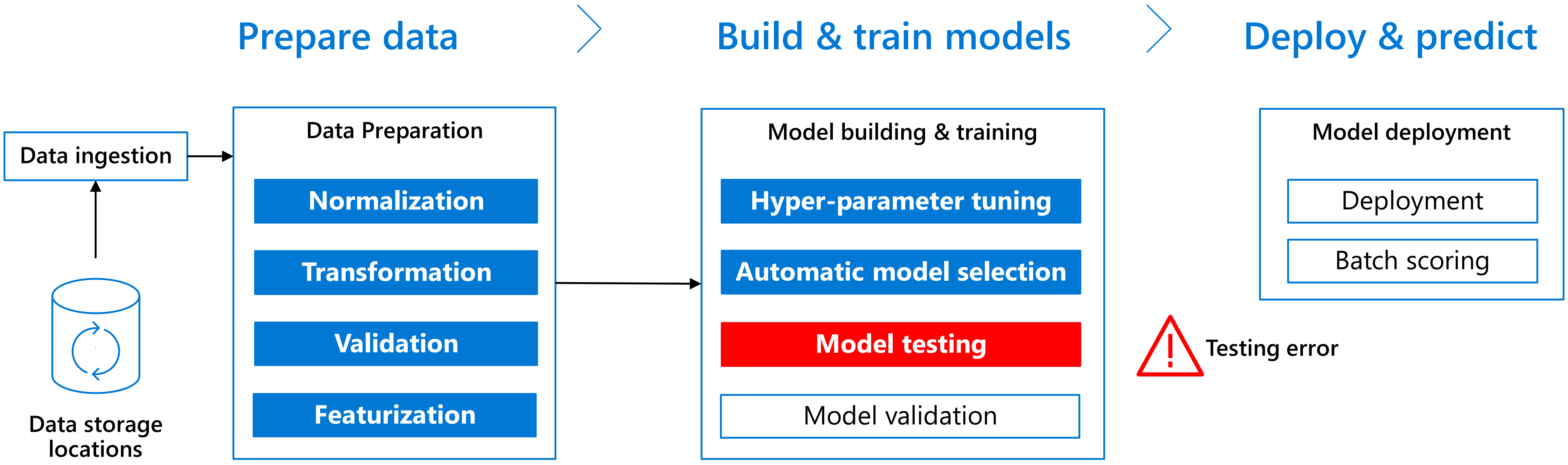
- Hyper-parameter tuning
- Automatic model selection
- Model testing
- Model validation

Deploy & predict

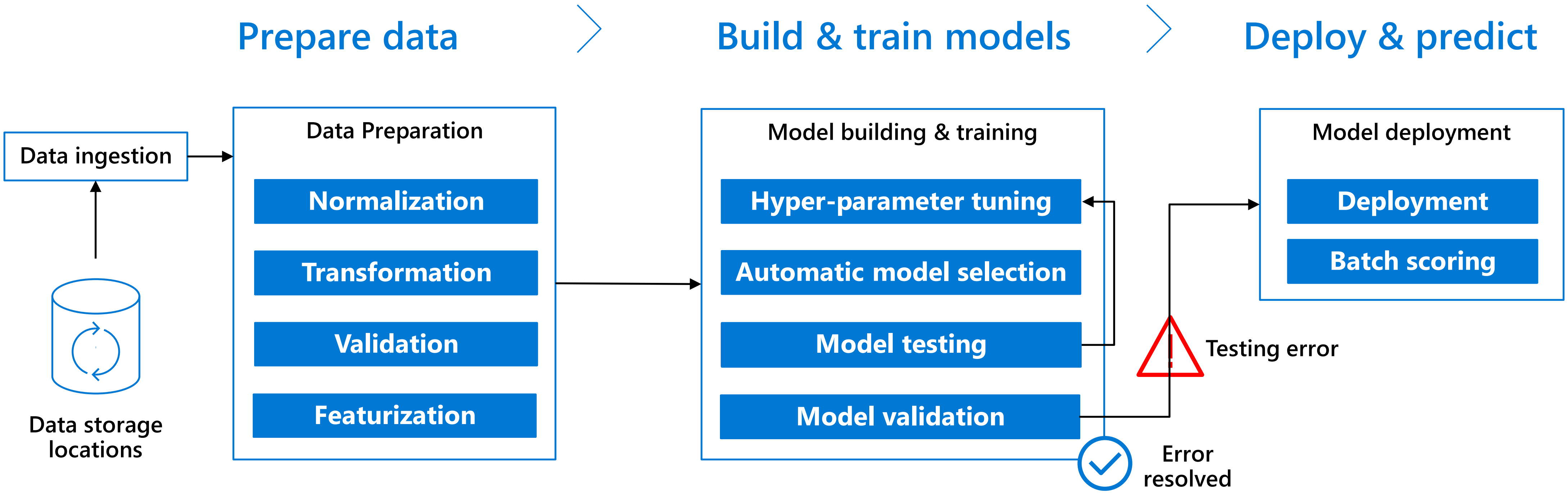
Model deployment

- Deployment
- Batch scoring

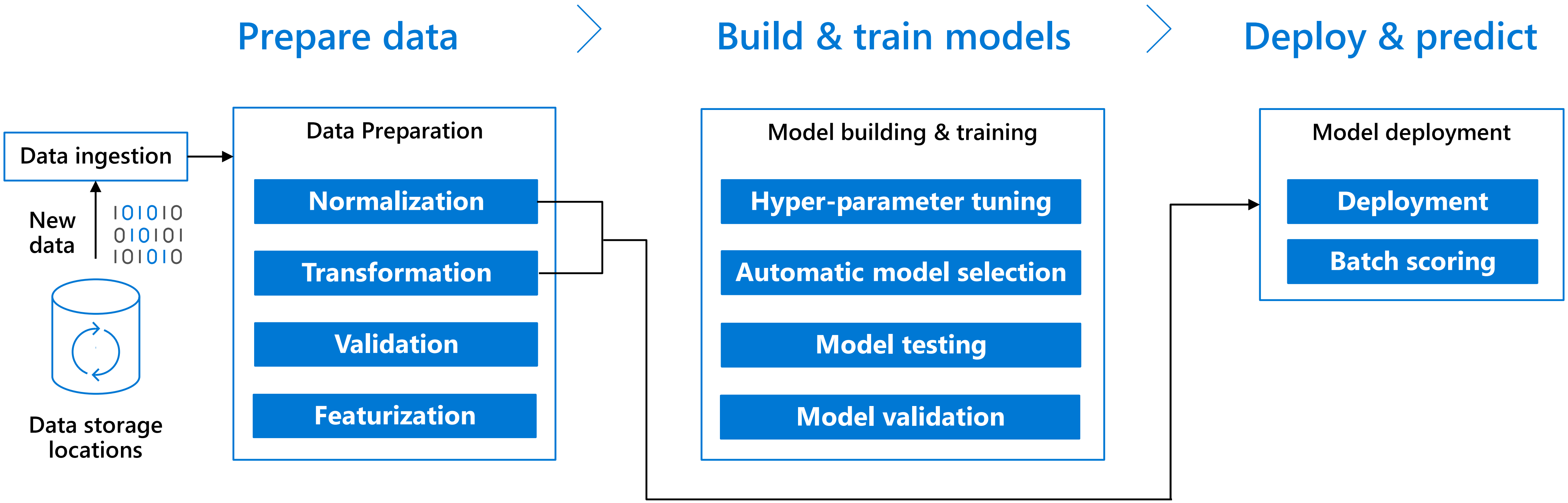
Azure Machine Learning pipelines



Azure Machine Learning pipelines



Azure Machine Learning pipelines with new data



Prepare data

Build & train models

Deploy & predict

Data ingestion

New data

Data storage locations

Data Preparation

- Normalization
- Transformation
- Validation
- Featurization

Model building & training

- Hyper-parameter tuning
- Automatic model selection
- Model testing
- Model validation

Model deployment

- Deployment
- Batch scoring

Advantages of Azure ML Pipelines

Unattended runs

Schedule a few steps to run in parallel or in sequence to focus on other tasks while your pipeline runs

Tracking and versioning

Name and version your data sources, inputs and outputs with the pipelines SDK

Reusability

Create templates of pipelines for specific scenarios such as retraining and batch scoring

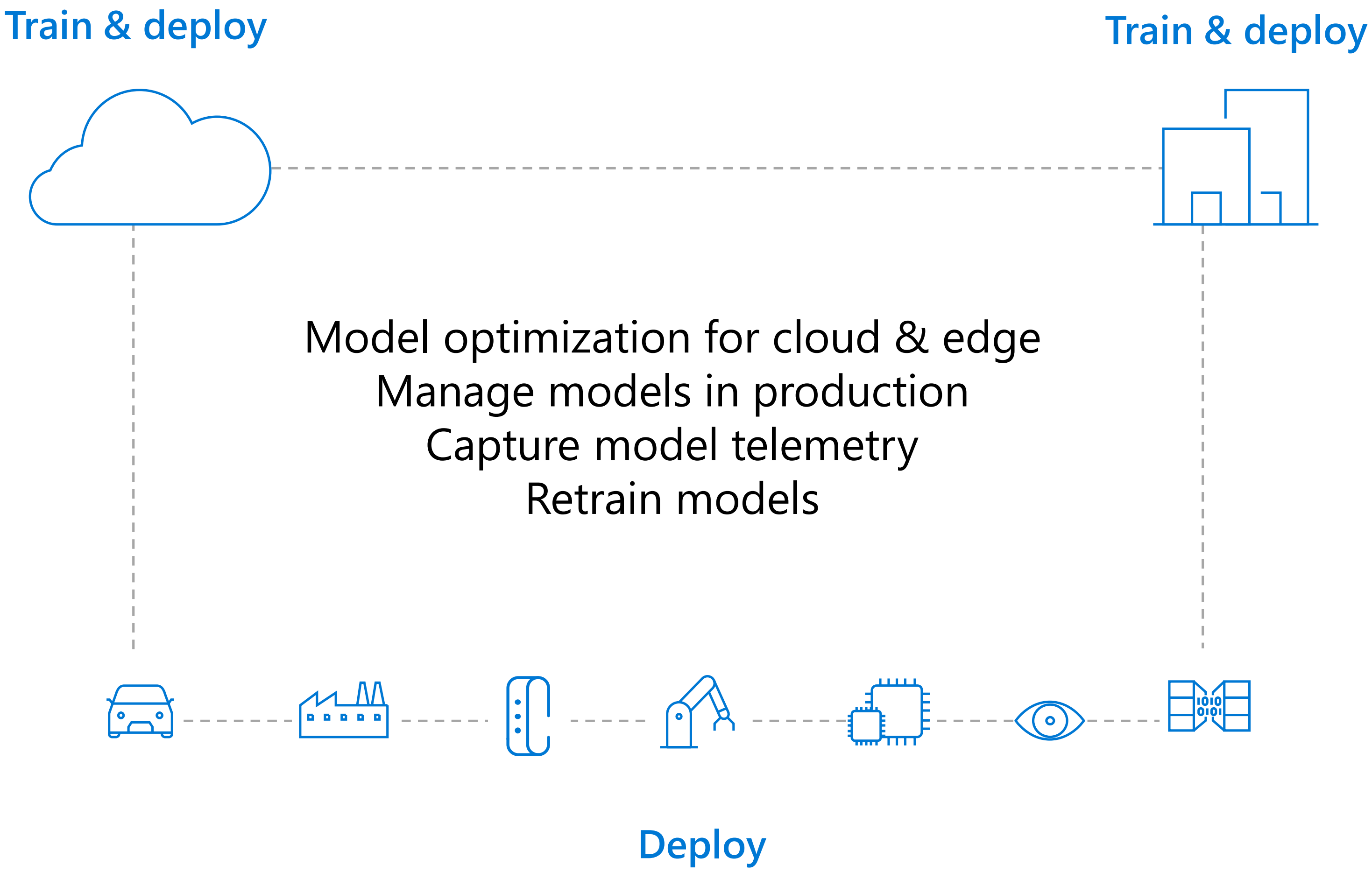
Mixed and diverse compute

Use multiple pipelines that are reliably coordinated across heterogeneous and scalable computes and storages

Simple deployment

Flexible deployment

Deploy and manage models on intelligent cloud and edge



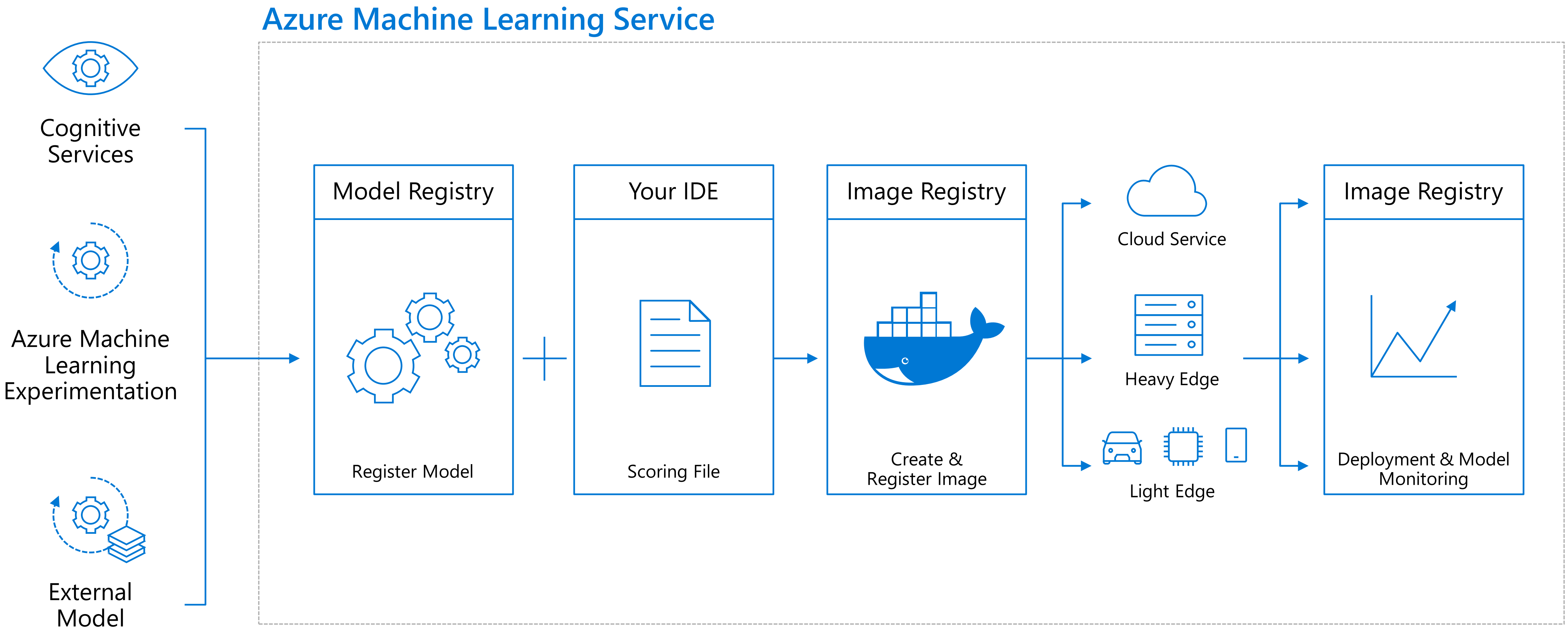
Train & deploy

Train & deploy

Model optimization for cloud & edge
Manage models in production
Capture model telemetry
Retrain models

Deploy

Deploy Azure ML models at scale



Support for open source frameworks

Popular frameworks

Use your favorite deep learning frameworks

TensorFlow

PyTorch

Scikit-Learn

MXNet

Chainer

Keras

+

without getting locked into one framework

ONNX

Community project created by Facebook and Microsoft

Use the best tool for the job. Train in one framework and transfer to another for inference

NVIDIA QUALCOMM Windows vespa SOPHON

intel skymizer MathWorks NETRON Visual DL

Tool agnostic Python SDK

Tool Agnostic Python SDK

PyCharm Jupyter Visual Studio Code

Use your favorite IDEs, editors, notebooks, and frameworks

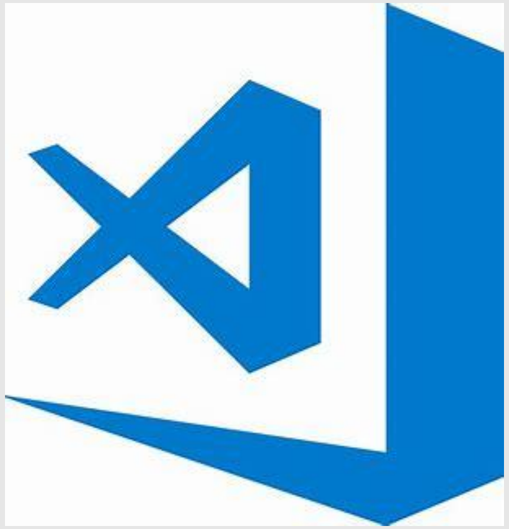
Flexibility of your local environment or curated cloud environment

Integrate with other services like Azure Databricks

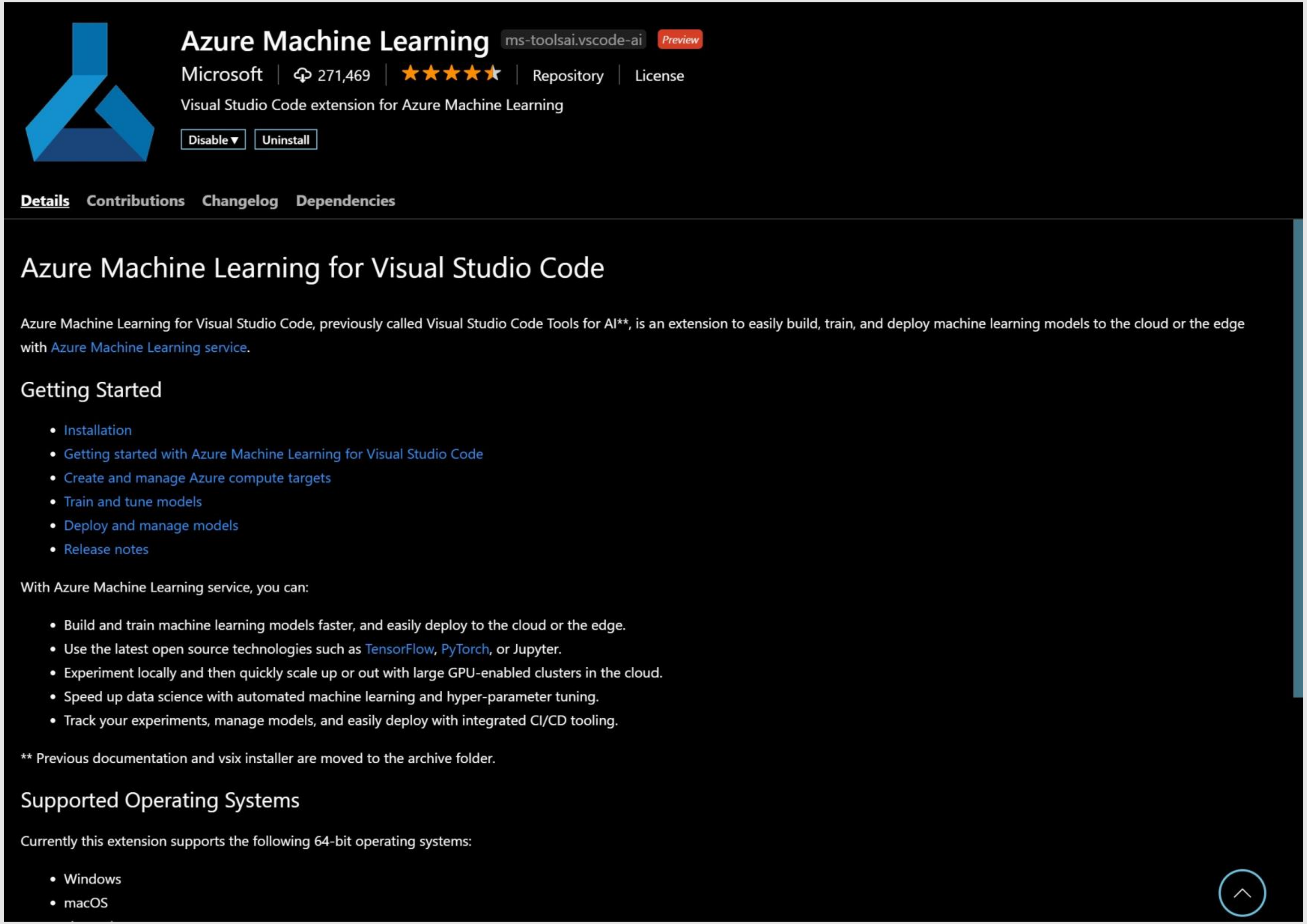
Get started quickly without any complex pre-requisites

一个简单的示例

从开发工具谈起



Visual Studio Code



Azure Machine Learning for Visual Studio Code

Azure Machine Learning for Visual Studio Code, previously called Visual Studio Code Tools for AI**, is an extension to easily build, train, and deploy machine learning models to the cloud or the edge with Azure Machine Learning service.

Getting Started

- Installation
- Getting started with Azure Machine Learning for Visual Studio Code
- Create and manage Azure compute targets
- Train and tune models
- Deploy and manage models
- Release notes

With Azure Machine Learning service, you can:

- Build and train machine learning models faster, and easily deploy to the cloud or the edge.
- Use the latest open source technologies such as TensorFlow, PyTorch, or Jupyter.
- Experiment locally and then quickly scale up or out with large GPU-enabled clusters in the cloud.
- Speed up data science with automated machine learning and hyper-parameter tuning.
- Track your experiments, manage models, and easily deploy with integrated CI/CD tooling.

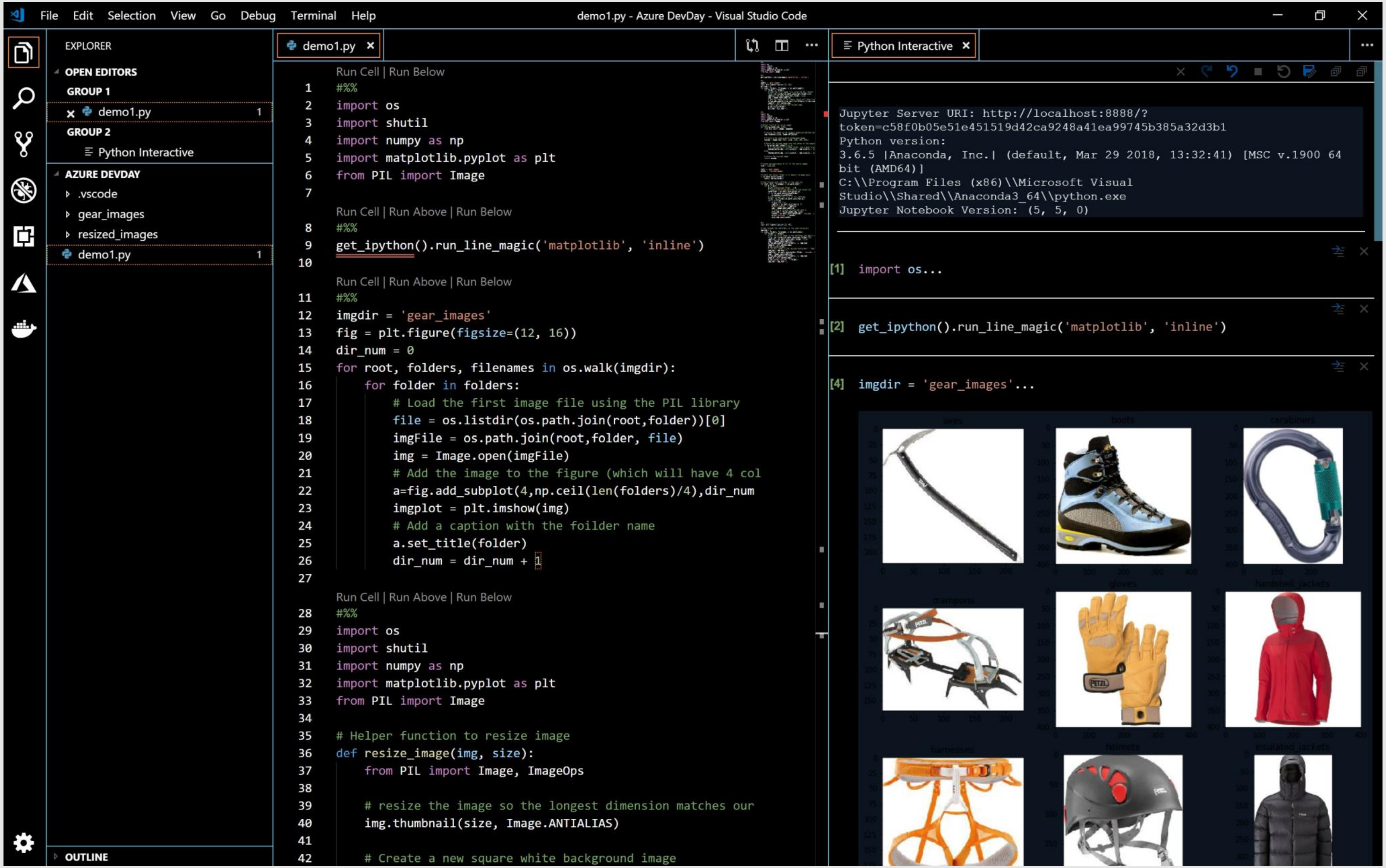
** Previous documentation and vsix installer are moved to the archive folder.

Supported Operating Systems

Currently this extension supports the following 64-bit operating systems:

- Windows
- macOS

示例



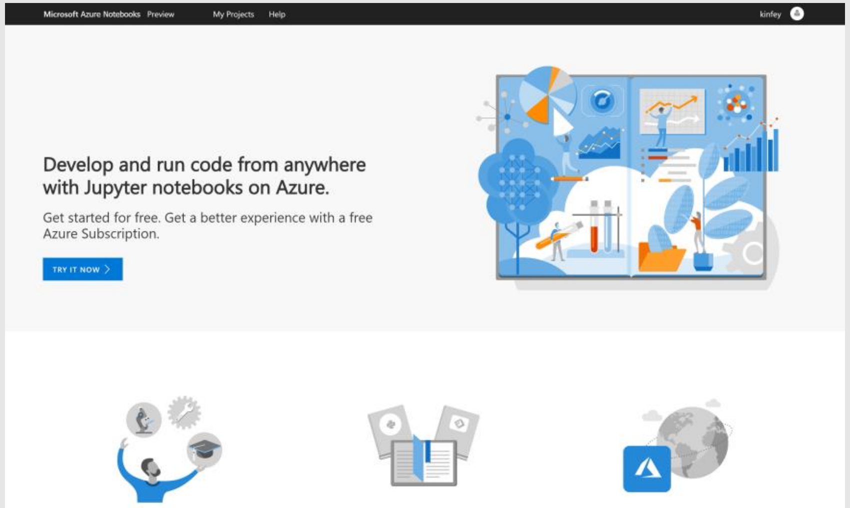
```
Run Cell | Run Below
#%%
import os
import shutil
import numpy as np
import matplotlib.pyplot as plt
from PIL import Image

Run Cell | Run Above | Run Below
#%%
get_ipython().run_line_magic('matplotlib', 'inline')

Run Cell | Run Above | Run Below
#%%
imgdir = 'gear_images'
fig = plt.figure(figsize=(12, 16))
dir_num = 0
for root, folders, filenames in os.walk(imgdir):
    for folder in folders:
        # Load the first image file using the PIL library
        file = os.listdir(os.path.join(root,folder))[0]
        imgFile = os.path.join(root,folder, file)
        img = Image.open(imgFile)
        # Add the image to the figure (which will have 4 col
        a=fig.add_subplot(4,np.ceil(len(folders)/4),dir_num
        imgplot = plt.imshow(img)
        # Add a caption with the foilder name
        a.set_title(folder)
        dir_num = dir_num + 1

Run Cell | Run Above | Run Below
#%%
import os
import shutil
import numpy as np
import matplotlib.pyplot as plt
from PIL import Image

# Helper function to resize image
def resize_image(img, size):
    from PIL import Image, ImageOps

    # resize the image so the longest dimension matches our
    img.thumbnail(size, Image.ANTIALIAS)

    # Create a new square white background image
```

```
Jupyter Server URI: http://localhost:8888/?
token=c58f0b05e51e451519d42ca9248a41ea99745b385a32d3b1
Python version:
3.6.5 |Anaconda, Inc.| (default, Mar 29 2018, 13:32:41) [MSC v.1900 64
bit (AMD64)]
C:\\Program Files (x86)\\Microsoft Visual
Studio\\Shared\\Anaconda3_64\\python.exe
Jupyter Notebook Version: (5, 5, 0)
```

```
[1]  import os...

[2]  get_ipython().run_line_magic('matplotlib', 'inline')

[4]  imgdir = 'gear_images'...
```

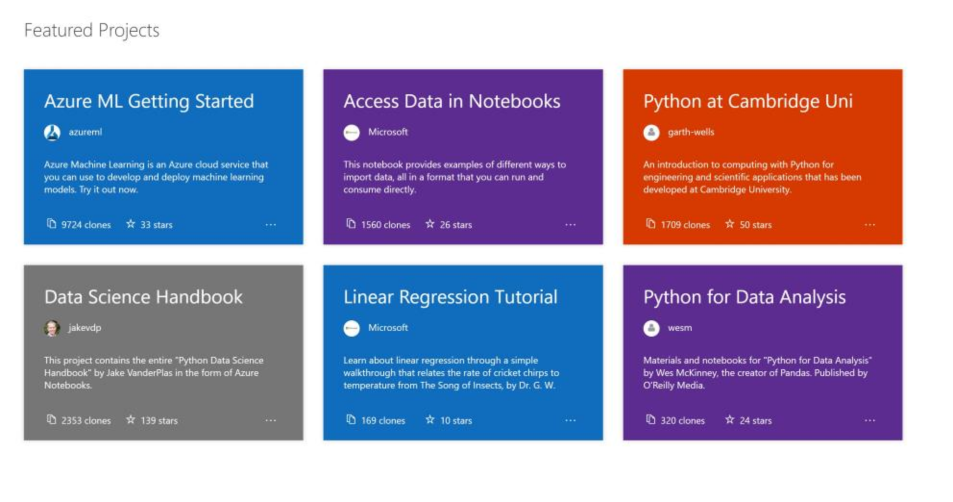
Azure Notebook https://notebooks.azure.com/

Develop and run code from anywhere with Jupyter notebooks on Azure.



Develop and run code from anywhere with Jupyter notebooks on Azure.

Get started for free. Get a better experience with a free Azure Subscription.



Featured Projects

Azure ML Getting Started
azureml
Azure Machine Learning is an Azure cloud service that you can use to develop and deploy machine learning models. Try it out now.
9724 clones ☆ 33 stars

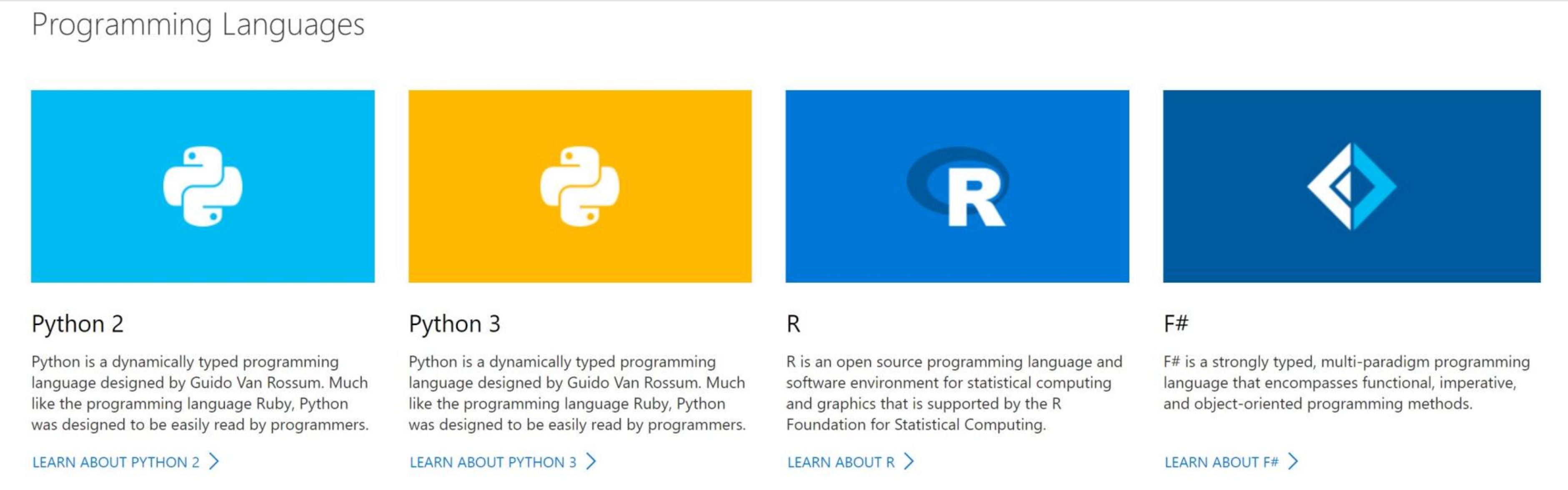
Access Data in Notebooks
Microsoft
This notebook provides examples of different ways to import data, all in a format that you can run and consume directly.
1560 clones ☆ 26 stars

Python at Cambridge Uni
garth-wells
An introduction to computing with Python for engineering and scientific applications that has been developed at Cambridge University.
1709 clones ☆ 50 stars

Data Science Handbook
jakevdp
This project contains the entire "Python Data Science Handbook" by Jake VanderPlas in the form of Azure Notebooks.
2353 clones ☆ 139 stars

Linear Regression Tutorial
Microsoft
Learn about linear regression through a simple walkthrough that relates the rate of cricket chirps to temperature from The Song of Insects, by Dr. G. W.
169 clones ☆ 10 stars

Python for Data Analysis
wesm
Materials and notebooks for "Python for Data Analysis" by Wes McKinney, the creator of Pandas. Published by O'Reilly Media.
320 clones ☆ 24 stars



Programming Languages

Python 2
Python is a dynamically typed programming language designed by Guido Van Rossum. Much like the programming language Ruby, Python was designed to be easily read by programmers.
LEARN ABOUT PYTHON 2 >

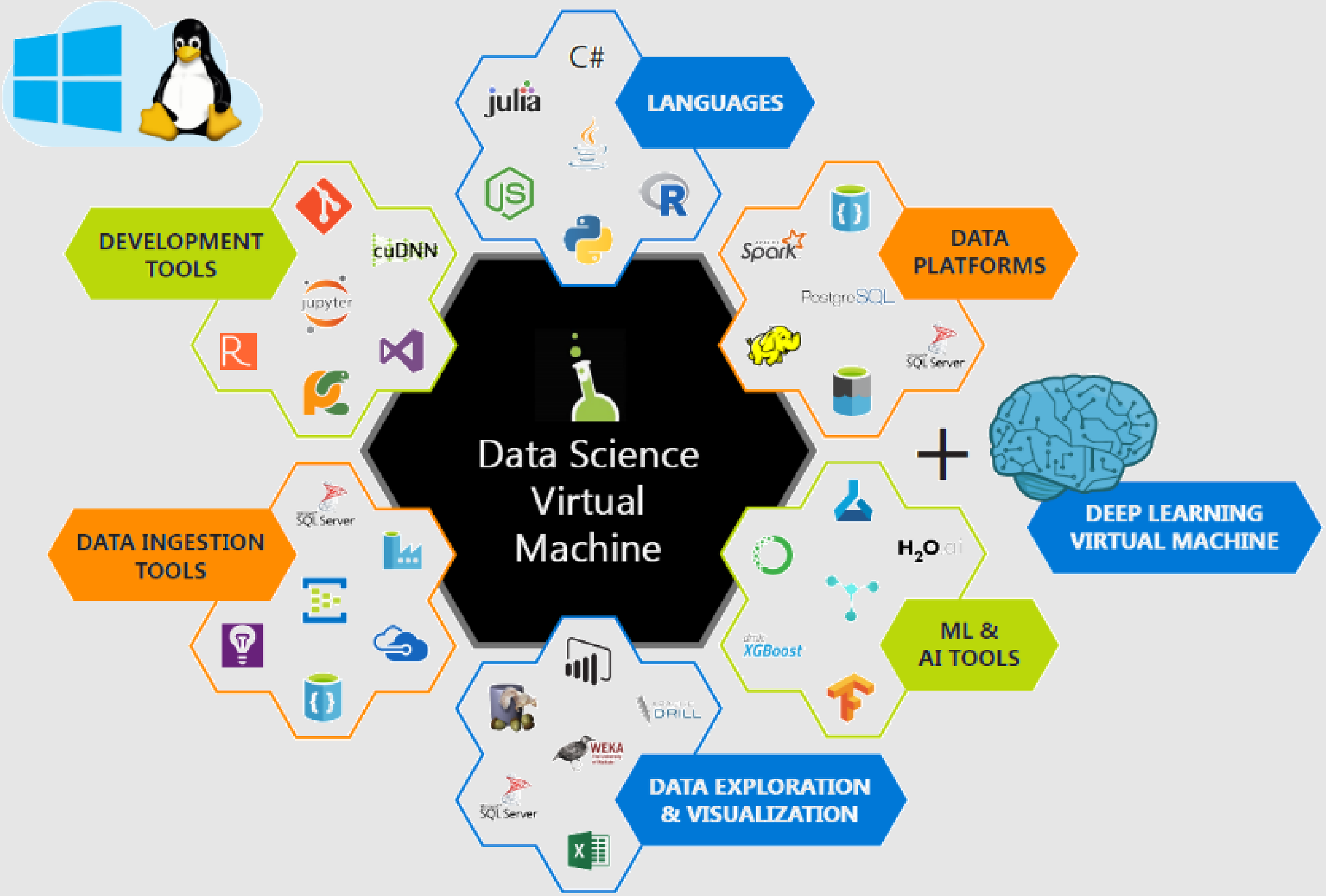
Python 3
Python is a dynamically typed programming language designed by Guido Van Rossum. Much like the programming language Ruby, Python was designed to be easily read by programmers.
LEARN ABOUT PYTHON 3 >

R
R is an open source programming language and software environment for statistical computing and graphics that is supported by the R Foundation for Statistical Computing.
LEARN ABOUT R >

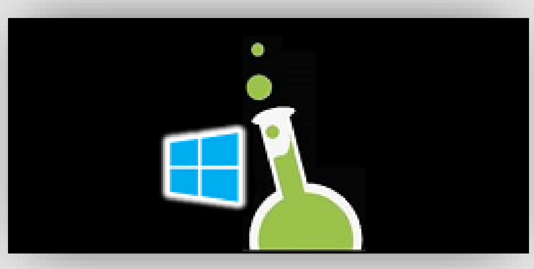
F#
F# is a strongly typed, multi-paradigm programming language that encompasses functional, imperative, and object-oriented programming methods.
LEARN ABOUT F# >

Data Science Virtual Machine(DSVM)

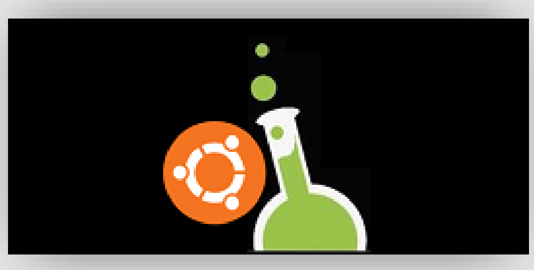
Pre-Configured environments in the cloud for
Data Science & AI Modeling, Development & Deployment.



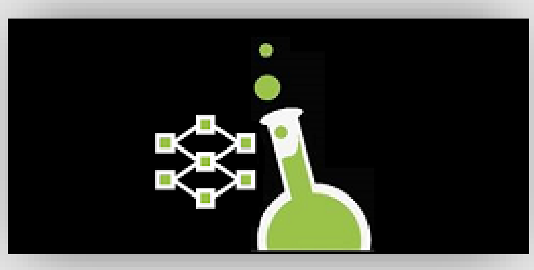
Data Science Virtual Machine(DSVM)



DSVM – Windows Server 2016

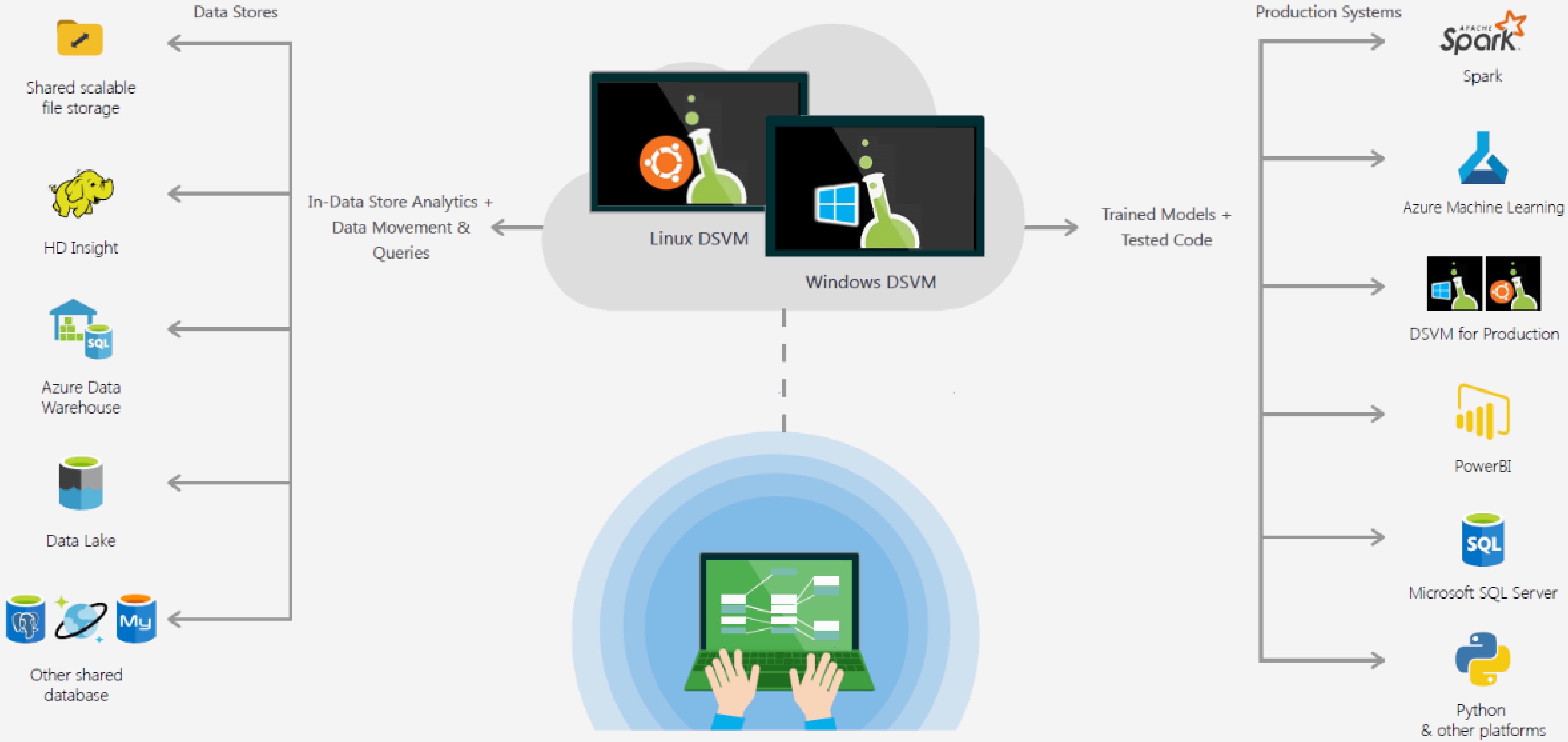


DSVM – Linux – Ubuntu



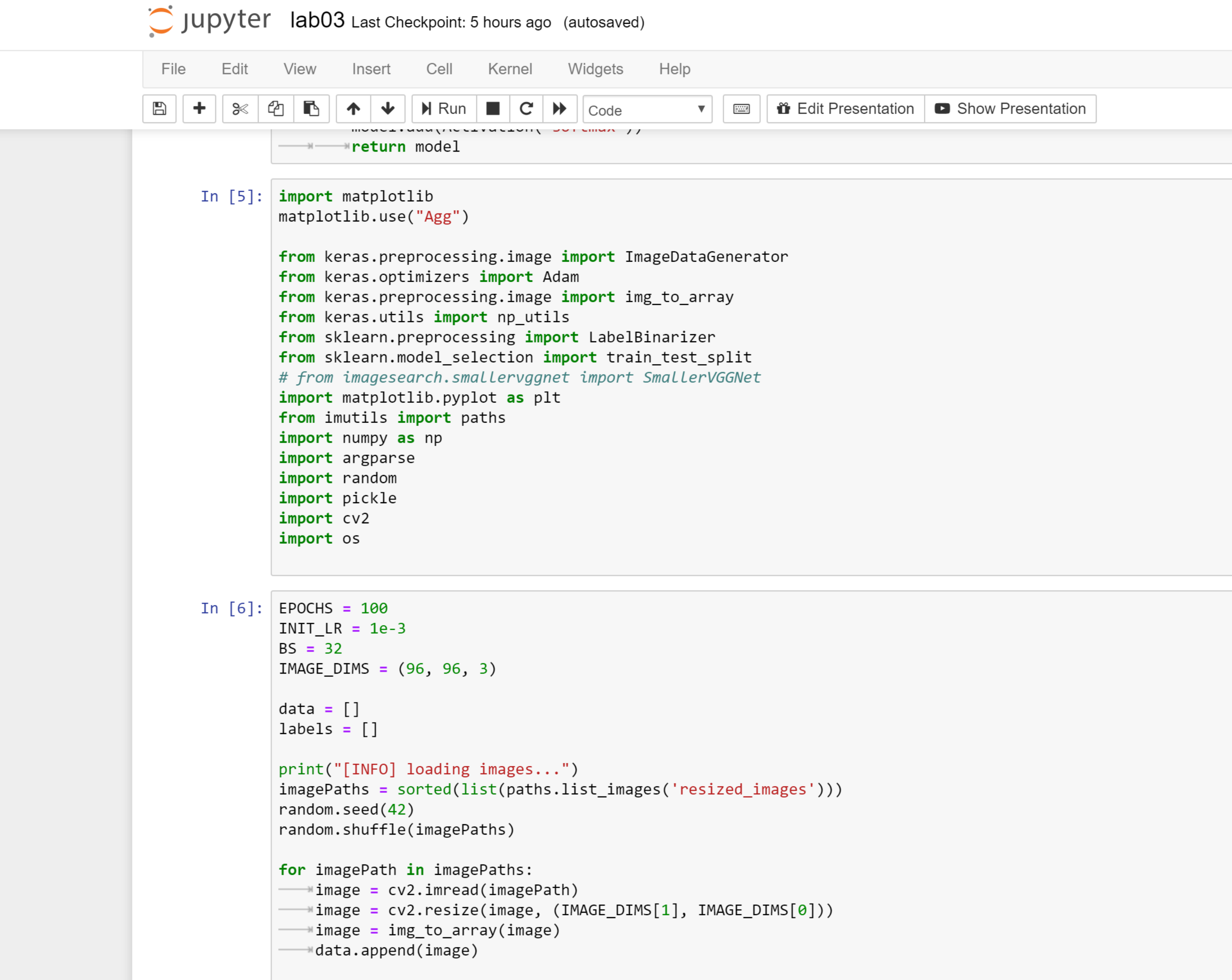
Deep Learning Virtual Machines

End-to-End AI Development Workflow using Data Science Virtual Machines (DSVM)



Demo

Jupyterhub on DSVM



```
        model.add(Activation("softmax"))
        return model
```

In [5]:

```
import matplotlib
matplotlib.use("Agg")

from keras.preprocessing.image import ImageDataGenerator
from keras.optimizers import Adam
from keras.preprocessing.image import img_to_array
from keras.utils import np_utils
from sklearn.preprocessing import LabelBinarizer
from sklearn.model_selection import train_test_split
# from imagesearch.smallervggnet import SmallerVGGNet
import matplotlib.pyplot as plt
from imutils import paths
import numpy as np
import argparse
import random
import pickle
import cv2
import os
```

In [6]:

```
EPOCHS = 100
INIT_LR = 1e-3
BS = 32
IMAGE_DIMS = (96, 96, 3)

data = []
labels = []

print("[INFO] loading images...")
imagePaths = sorted(list(paths.list_images('resized_images')))
random.seed(42)
random.shuffle(imagePaths)

for imagePath in imagePaths:
    image = cv2.imread(imagePath)
    image = cv2.resize(image, (IMAGE_DIMS[1], IMAGE_DIMS[0]))
    image = img_to_array(image)
    data.append(image)
```

Azure Machine Learning service

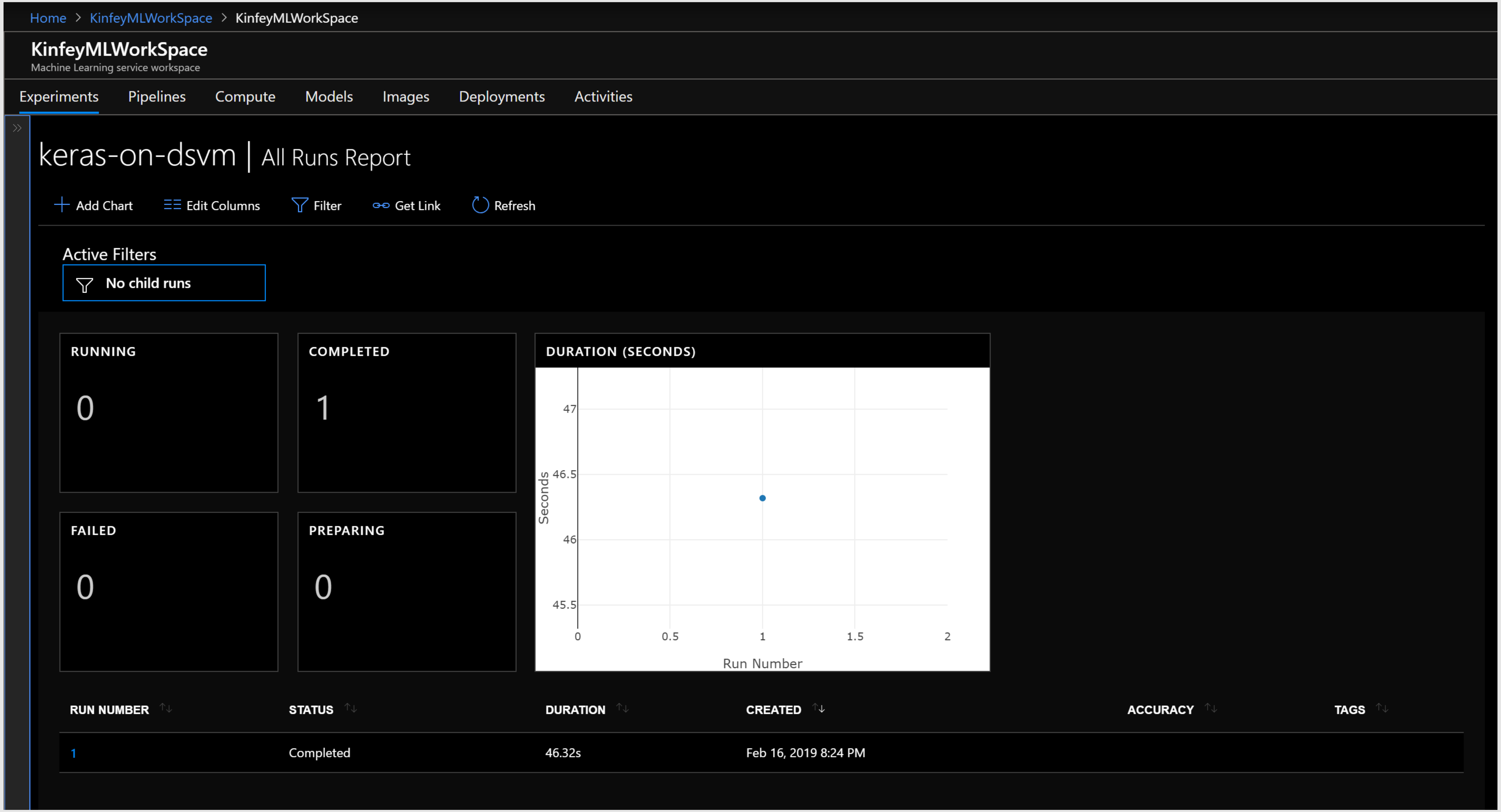
Azure Cloud Services + Python SDK

帮助你完成:

- ✓ 数据准备
- ✓ 编译模型
- ✓ 训练模型

- ✓ 管理模型
- ✓ 跟踪训练
- ✓ 部署模型

Azure Machine Learning Workbench



Home > KinfeyMLWorkSpace > KinfeyMLWorkSpace

KinfeyMLWorkSpace

Machine Learning service workspace

keras-on-dsvm | All Runs Report

Active Filters

No child runs

RUNNING

0

COMPLETED

1

FAILED

0

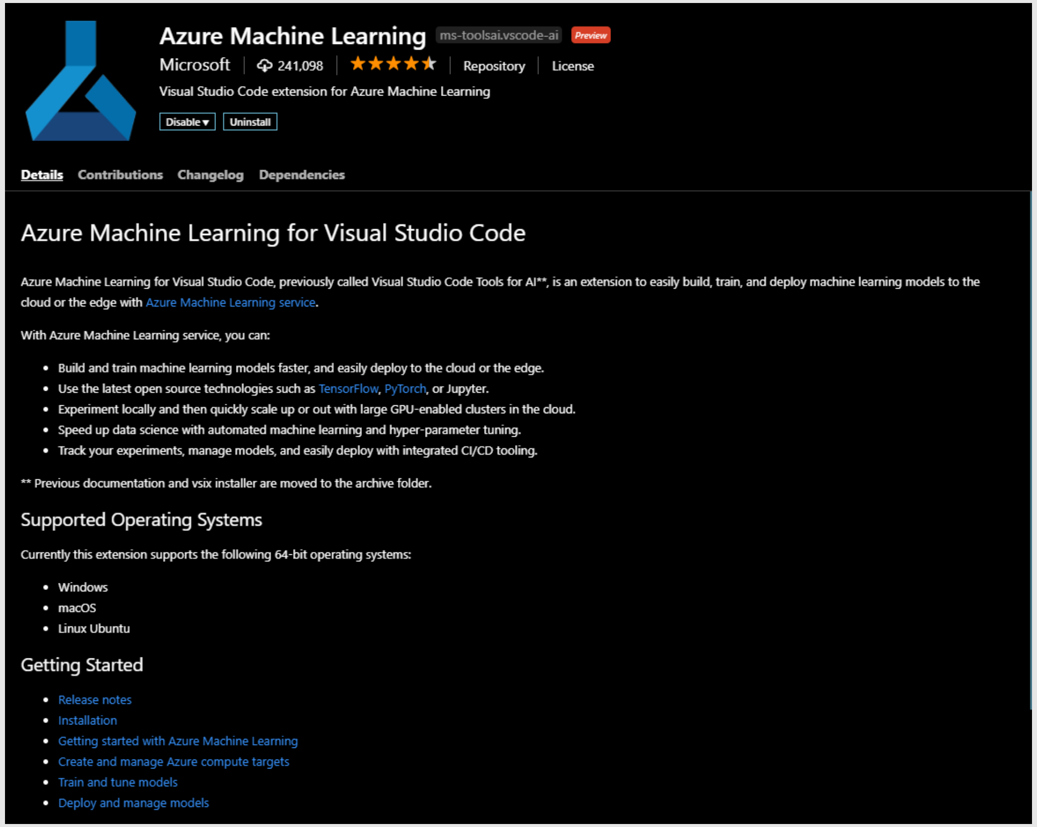
PREPARING

0

DURATION (SECONDS)

RUN NUMBER	STATUS	DURATION	CREATED	ACCURACY	TAGS
1	Completed	46.32s	Feb 16, 2019 8:24 PM		

Azure Machine Learning Tools for VS Code



Azure Machine Learning for Visual Studio Code

Azure Machine Learning for Visual Studio Code, previously called Visual Studio Code Tools for AI**, is an extension to easily build, train, and deploy machine learning models to the cloud or the edge with Azure Machine Learning service.

With Azure Machine Learning service, you can:

- Build and train machine learning models faster, and easily deploy to the cloud or the edge.
- Use the latest open source technologies such as TensorFlow, PyTorch, or Jupyter.
- Experiment locally and then quickly scale up or out with large GPU-enabled clusters in the cloud.
- Speed up data science with automated machine learning and hyper-parameter tuning.
- Track your experiments, manage models, and easily deploy with integrated CI/CD tooling.

** Previous documentation and vsix installer are moved to the archive folder.

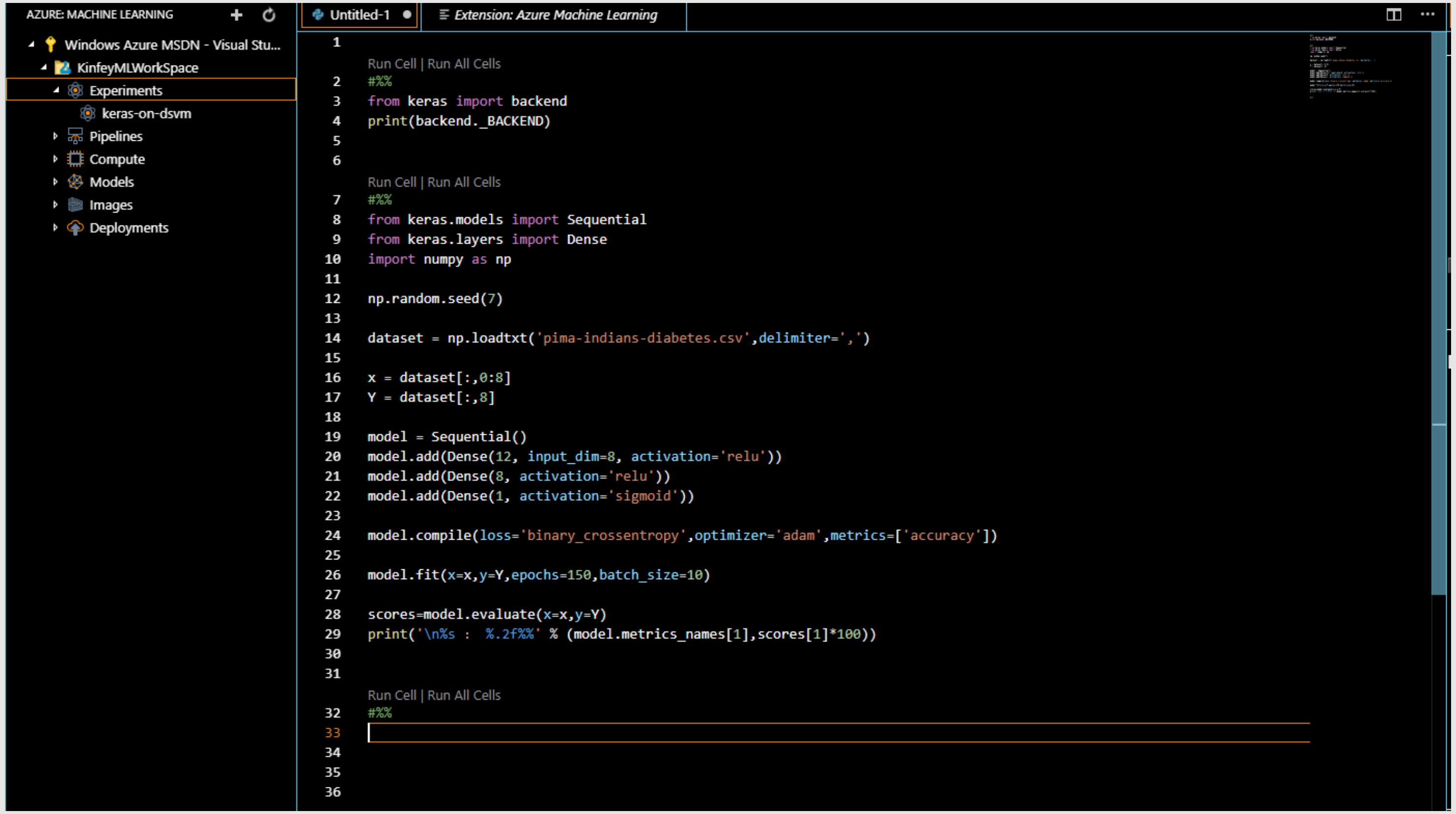
Supported Operating Systems

Currently this extension supports the following 64-bit operating systems:

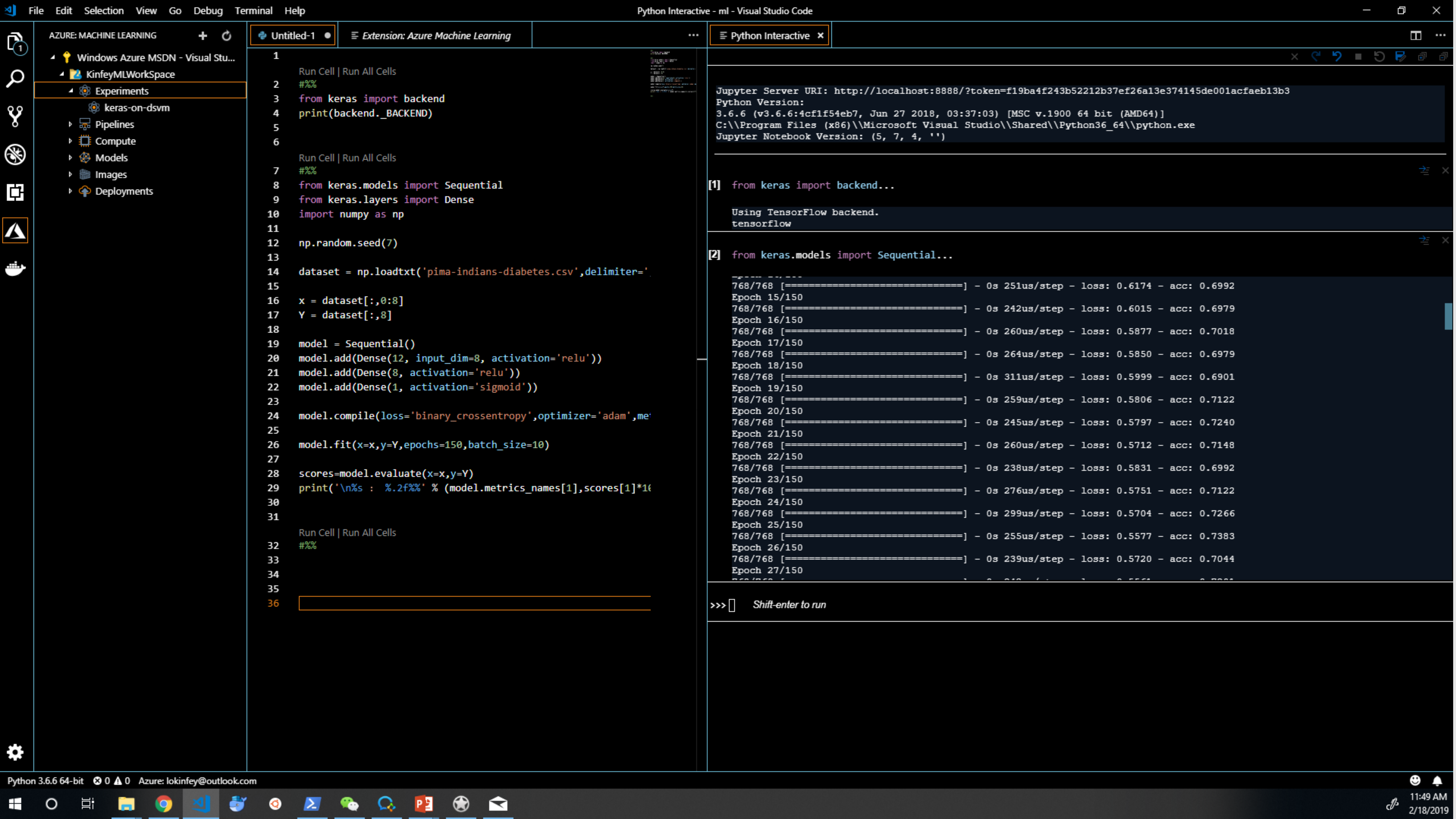
- Windows
- macOS
- Linux Ubuntu

Getting Started

- Release notes
- Installation
- Getting started with Azure Machine Learning
- Create and manage Azure compute targets
- Train and tune models
- Deploy and manage models



```
#%%
from keras import backend
print(backend._BACKEND)


#%%
from keras.models import Sequential
from keras.layers import Dense
import numpy as np

np.random.seed(7)

dataset = np.loadtxt('pima-indians-diabetes.csv',delimiter=',')

x = dataset[:,0:8]
Y = dataset[:,8]

model = Sequential()
model.add(Dense(12, input_dim=8, activation='relu'))
model.add(Dense(8, activation='relu'))
model.add(Dense(1, activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam',metrics=['accuracy'])

model.fit(x=x,y=Y,epochs=150,batch_size=10)

scores=model.evaluate(x=x,y=Y)
print('\n%s :  %.2f%%' % (model.metrics_names[1],scores[1]*100))


#%%
```



```
Run Cell | Run All Cells
#%%
from keras import backend
print(backend._BACKEND)


Run Cell | Run All Cells
#%%
from keras.models import Sequential
from keras.layers import Dense
import numpy as np

np.random.seed(7)

dataset = np.loadtxt('pima-indians-diabetes.csv',delimiter='

x = dataset[:,0:8]
Y = dataset[:,8]

model = Sequential()
model.add(Dense(12, input_dim=8, activation='relu'))
model.add(Dense(8, activation='relu'))
model.add(Dense(1, activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam',me

model.fit(x=x,y=Y,epochs=150,batch_size=10)

scores=model.evaluate(x=x,y=Y)
print('\n%s :  %.2f%%' % (model.metrics_names[1],scores[1]*1(


Run Cell | Run All Cells
#%%
```

```
Jupyter Server URI: http://localhost:8888/?token=f19ba4f243b52212b37ef26a13e374145de001acfaeb13b3
Python Version:
3.6.6 (v3.6.6:4cf1f54eb7, Jun 27 2018, 03:37:03) [MSC v.1900 64 bit (AMD64)]
C:\\Program Files (x86)\\Microsoft Visual Studio\\Shared\\Python36_64\\python.exe
Jupyter Notebook Version: (5, 7, 4, '')
```

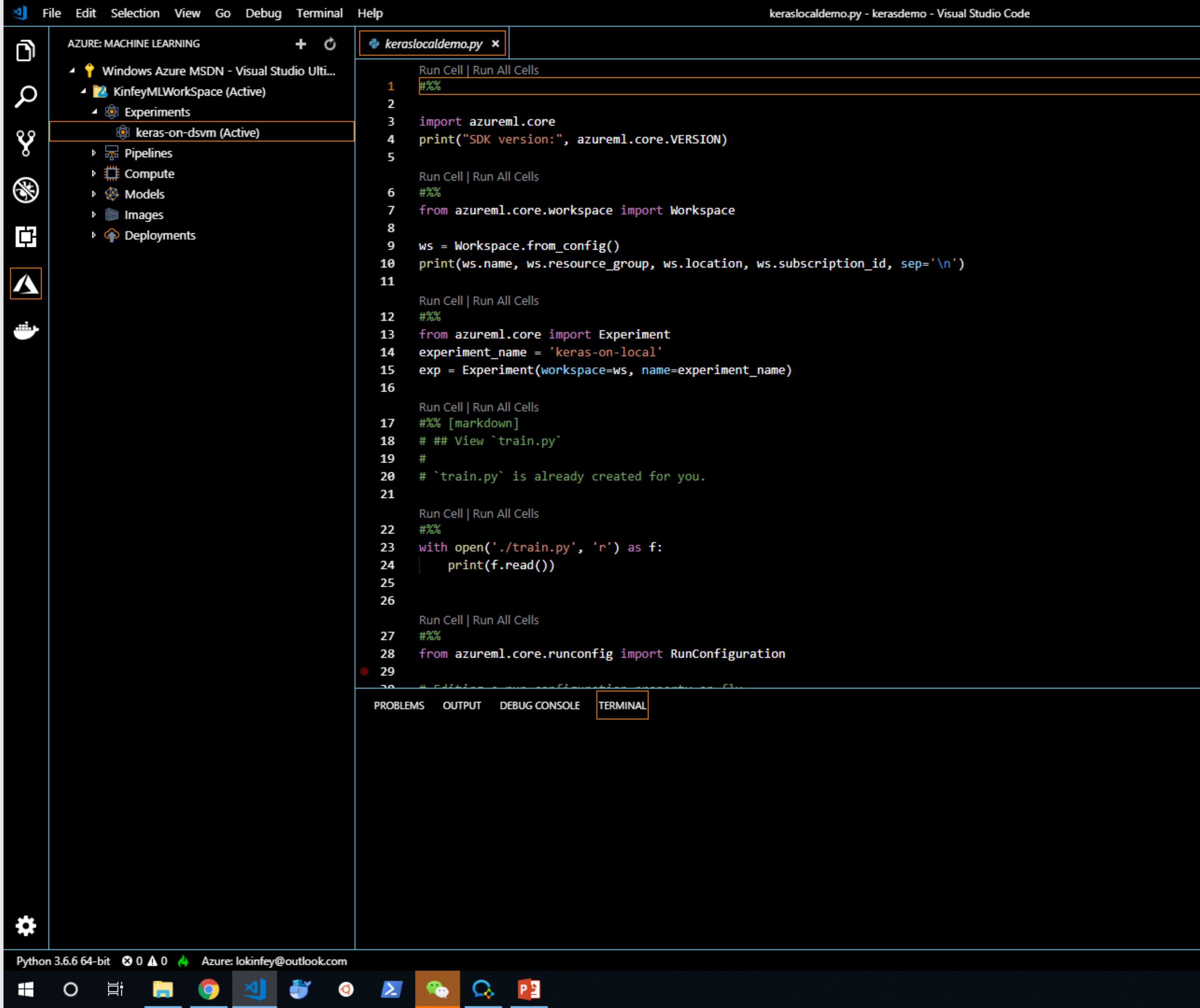
```
[1]  from keras import backend...

     Using TensorFlow backend.
     tensorflow
```

```
[2]  from keras.models import Sequential...

     768/768 [==============================] - 0s 251us/step - loss: 0.6174 - acc: 0.6992
     Epoch 15/150
     768/768 [==============================] - 0s 242us/step - loss: 0.6015 - acc: 0.6979
     Epoch 16/150
     768/768 [==============================] - 0s 260us/step - loss: 0.5877 - acc: 0.7018
     Epoch 17/150
     768/768 [==============================] - 0s 264us/step - loss: 0.5850 - acc: 0.6979
     Epoch 18/150
     768/768 [==============================] - 0s 311us/step - loss: 0.5999 - acc: 0.6901
     Epoch 19/150
     768/768 [==============================] - 0s 259us/step - loss: 0.5806 - acc: 0.7122
     Epoch 20/150
     768/768 [==============================] - 0s 245us/step - loss: 0.5797 - acc: 0.7240
     Epoch 21/150
     768/768 [==============================] - 0s 260us/step - loss: 0.5712 - acc: 0.7148
     Epoch 22/150
     768/768 [==============================] - 0s 238us/step - loss: 0.5831 - acc: 0.6992
     Epoch 23/150
     768/768 [==============================] - 0s 276us/step - loss: 0.5751 - acc: 0.7122
     Epoch 24/150
     768/768 [==============================] - 0s 299us/step - loss: 0.5704 - acc: 0.7266
     Epoch 25/150
     768/768 [==============================] - 0s 255us/step - loss: 0.5577 - acc: 0.7383
     Epoch 26/150
     768/768 [==============================] - 0s 239us/step - loss: 0.5720 - acc: 0.7044
     Epoch 27/150
```

>>> *Shift-enter to run*

Demo

Azure ML Workbench Demo


File Edit Selection View Go Debug Terminal Help
keraslocaldemo.py - kerasdemo - Visual Studio Code
AZURE: MACHINE LEARNING
Windows Azure MSDN - Visual Studio Ulti...
KinfeyMLWorkSpace (Active)
Experiments
keras-on-dsvm (Active)
Pipelines
Compute
Models
Images
Deployments
keraslocaldemo.py
Run Cell | Run All Cells
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
Python 3.6.6 64-bit
0
0
Azure: lokinfey@outlook.com

```
#%%

import azureml.core
print("SDK version:", azureml.core.VERSION)

#%%
from azureml.core.workspace import Workspace

ws = Workspace.from_config()
print(ws.name, ws.resource_group, ws.location, ws.subscription_id, sep='\n')

#%%
from azureml.core import Experiment
experiment_name = 'keras-on-local'
exp = Experiment(workspace=ws, name=experiment_name)

#%% [markdown]
# ## View `train.py`
#
# `train.py` is already created for you.

#%%
with open('./train.py', 'r') as f:
    print(f.read())


#%%
from azureml.core.runconfig import RunConfiguration

# Editing a run configuration property on-fly.
```

特别感谢

STUDY4
Study For Love

MVP
Microsoft®
Most Valuable
Professional

2019
Global Azure
BOOTCAMP

广东职业教育信息化研究会

CloudRiches
宏富云信息科技有限公司

.NET
foundation