End-to-End Machine Learning with ML.NET and Azure

CodeCampNYC 2018

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Hello ☺

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Code & Slides

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Agenda

01 What is Machine Learning?

02 From Data to Machine Learning

03 Building a Model

04 Deploying a Model

What is Machine Learning?

Artificial Intelligence

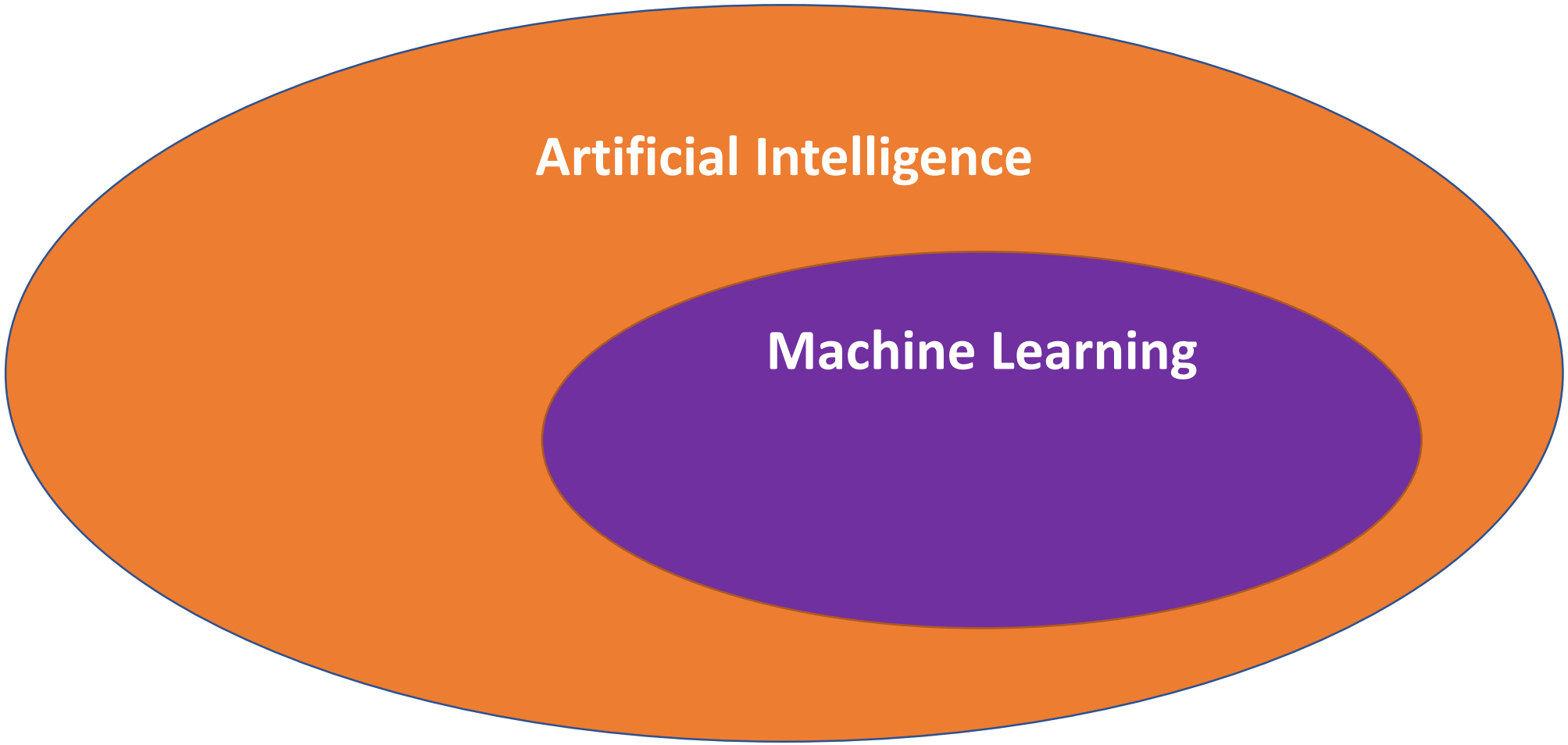
what people think it is

what amateur programmers think it is

```
1
2  // 10,000 if-statements
3
4  if() {
5      if() {
6          if() {
7              if() {
8                  if() {
9                      if() {
10                         if() {
11                             if() {
12                                 if() {
13                                     if() {
14                                         if() .
```

what actually it is

AI vs ML



Machine Learning Tasks

Supervised Learning

Regression

What is the price of a home in NYC?

Classification

Is this a dog or cat?

Unsupervised Learning

Clustering

Customer segments in a database

Classification Example

Training Data

Species	Is Independent	Class
Canine	False	Dog
Feline	True	Cat
Feline	True	Cat
Canine	False	Dog
Canine	True	Dog

Features

Label

New Data

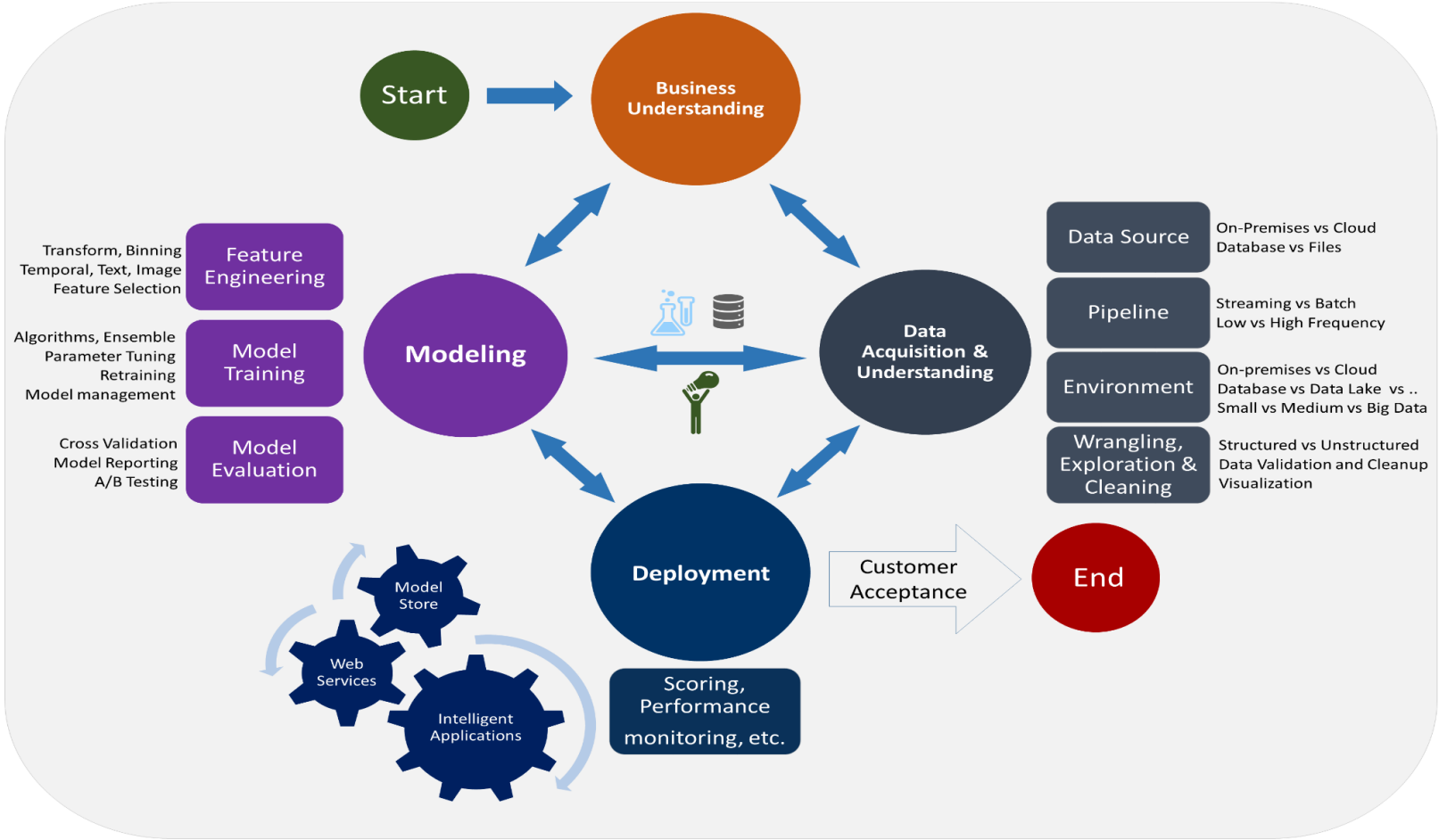
Species	Is Independent
Canine	False

Prediction

Class
Dog

From Data to Machine Learning

The Continuous Machine Learning Process



What is a model?

$f(x)$

True

False

Input

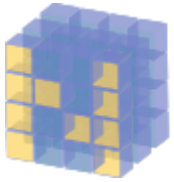
Model

Output

Building a Machine Learning Model

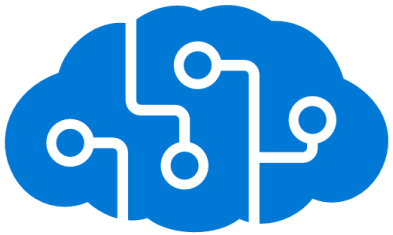
Machine Learning Tools

Cloud AutoML Vision



NumPy

Amazon SageMaker



Cloud Datalab

@ljquintanilla

Automated vs. Custom

.NET Tools

MATH.NET

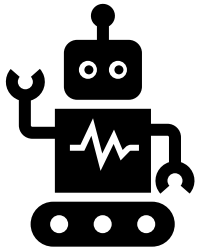
Opensource Mathematics for .NET

Microsoft CNTK

Accord Framework .NET

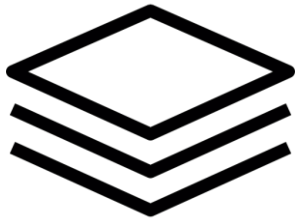
ML.NET

ML.NET



Framework for Machine Learning

.NET Standard



Proven & Extensible

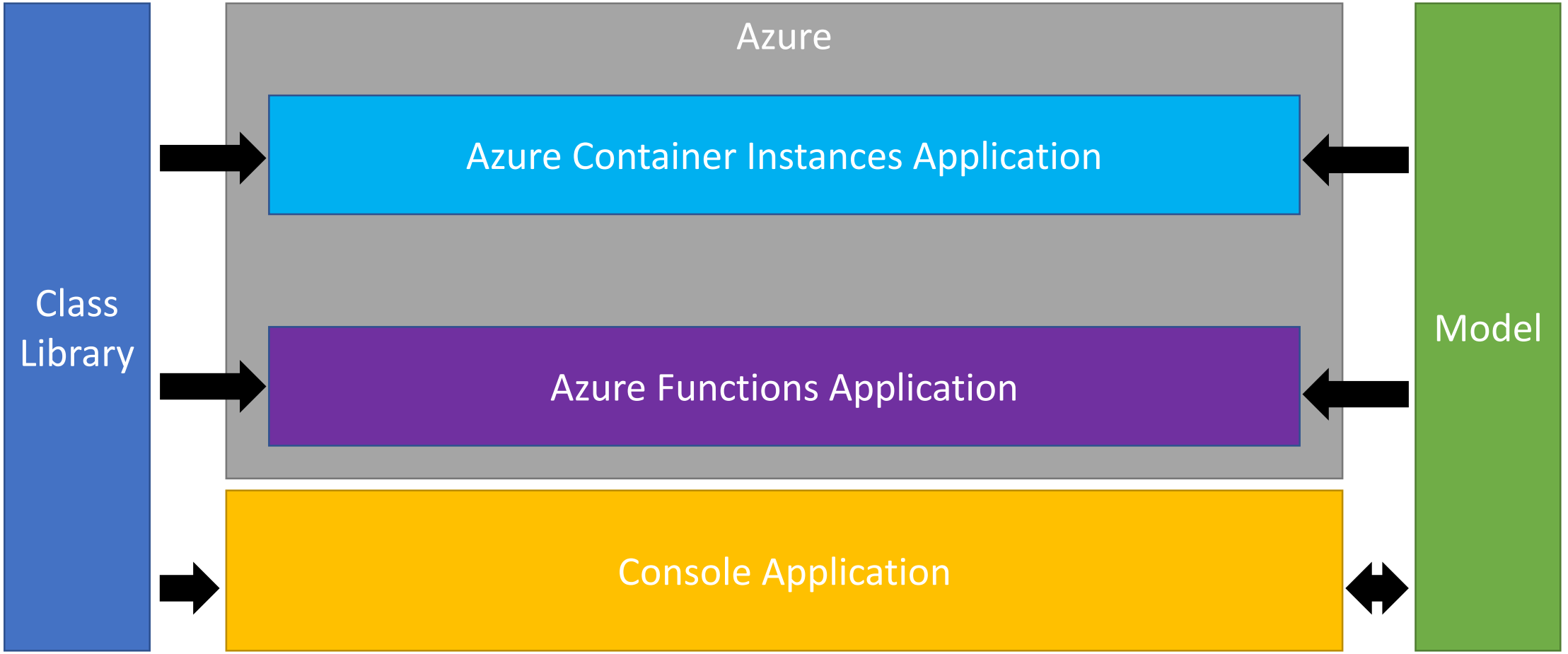
Open Source

Cross Platform

What can you do with ML.NET?

Transformations	Learners	Misc	Extensions
• Missing Values • Feature Selection • Normalization	• SVM • K-Means • Boosted Trees	• Data Loaders • Evaluators	• TensorFlow • CNTK • ONNX • Accord.NET

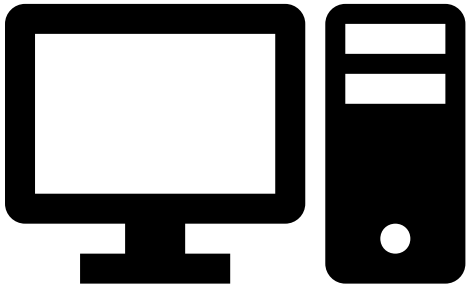
Iris Classification Model



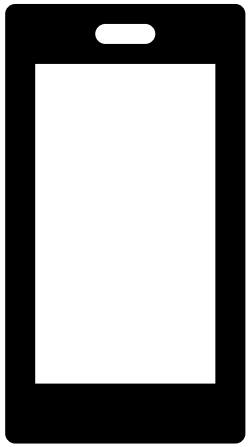
Demo: Training a Model

Consuming a Machine Learning Model

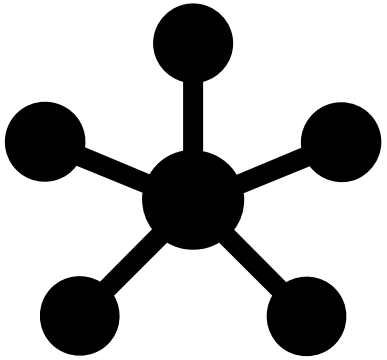
Model Consumption Methods



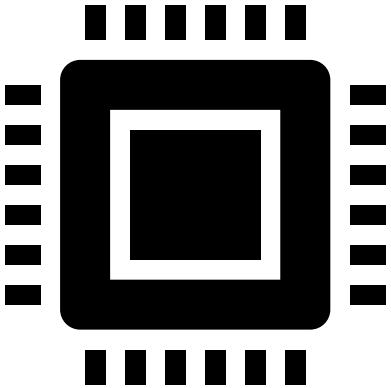
Desktop



Mobile

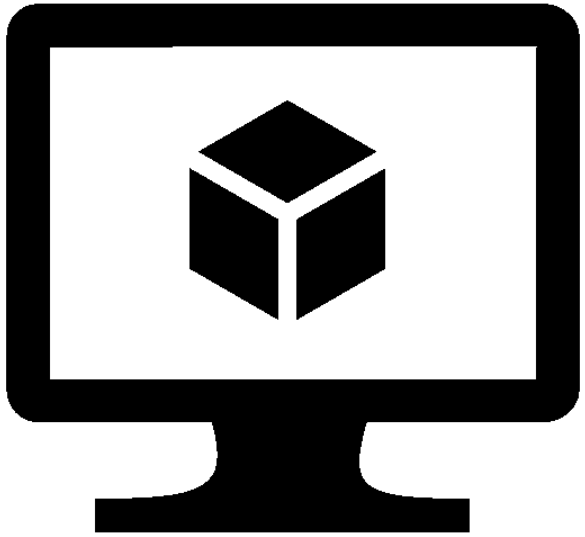


Web

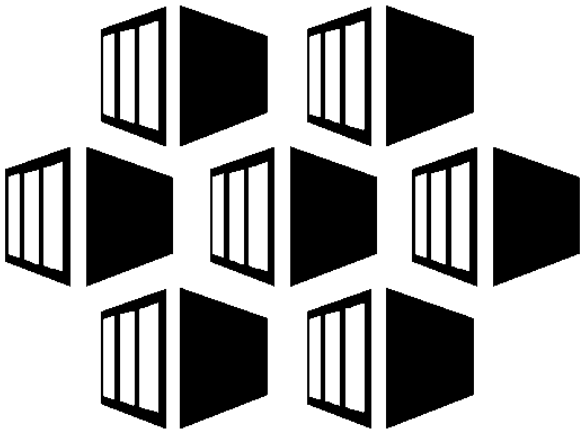


IoT

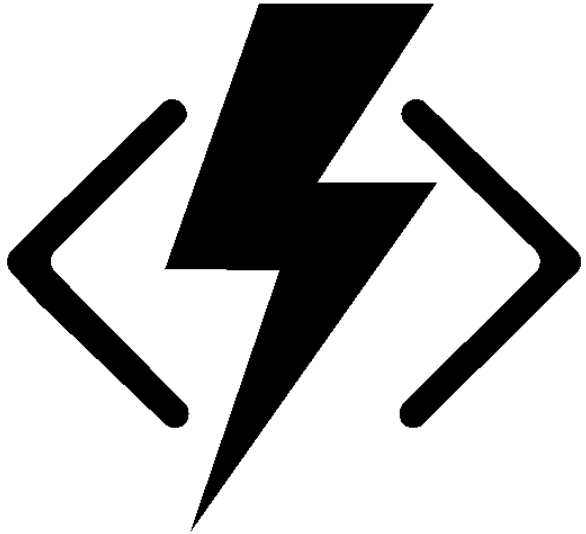
Deploying to the Web



Virtual Machines



Containers



Serverless

Demo: Deploying a Model to Azure Container Instances

Demo: Deploying a Model to Azure Functions

Takeaways

- ML.NET is a proven, open-source, cross-platform machine learning framework for building custom models in the .NET ecosystem.
- ML.NET is still in its early stages but is quickly maturing with strong support from open source community and Microsoft.
- Model persistence provides great flexibility in model deployment phase.
- Azure (Container Instances and Functions) reduces friction and management overhead associated with deployment of ML.NET models to the web.

Questions?

Resources

- https://docs.microsoft.com/en-us/azure/container-instances/
- https://docs.microsoft.com/en-us/azure/azure-functions/functions-run-local
- https://blogs.msdn.microsoft.com/dotnet/2018/10/08/announcing-ml-net-0-6-machine-learning-net/
- https://docs.microsoft.com/en-us/dotnet/machine-learning/resources/glossary
- https://docs.microsoft.com/en-us/dotnet/machine-learning/tutorials/