



Azure AI Training Day

Azure Machine Learning

Build models easily, scale flexibly and deploy anywhere

Mauro Minella

Cloud Solution Architect – Big Data & AI

Microsoft

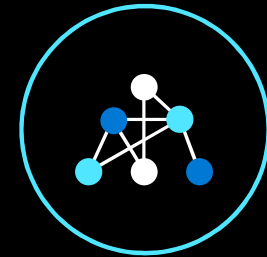
Azure AI



AI apps & agents



Knowledge mining



Machine learning

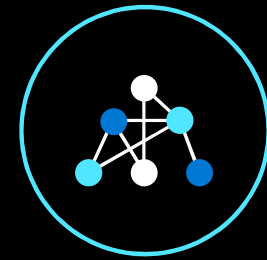
Azure AI



AI apps & agents



Knowledge mining



Machine learning

Machine Learning on Azure

Domain specific pretrained models

To simplify solution development



Vision



Speech



Language



Web search



Decision

Familiar data science tools

To simplify model development



Visual Studio Code



Azure Notebooks



Jupyter



Command line

Popular frameworks

To build advanced deep learning solutions



PyTorch



TensorFlow



Scikit-Learn



ONNX

Productive services

To empower data science and development teams



Azure Machine Learning



Azure Databricks



Machine Learning VMs

Powerful infrastructure

To accelerate deep learning



CPU



GPU

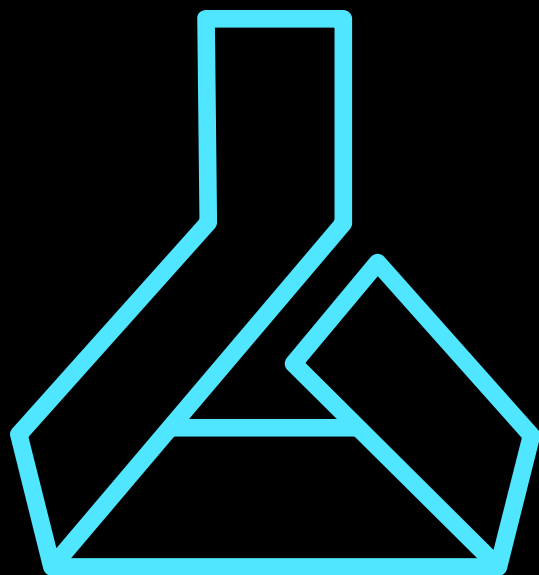


FPGA



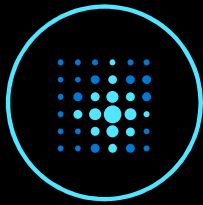
From the Intelligent Cloud to the Intelligent Edge





Azure Machine Learning

Azure Machine Learning



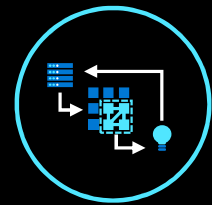
For all skill levels

Automated ML + drag & drop + code first



Open

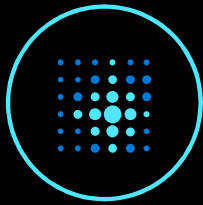
Any tool + any framework



Industry leading MLOps

Integrated with Azure DevOps

Azure Machine Learning



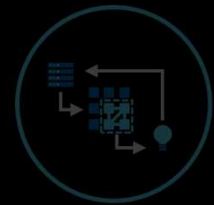
For all skill levels

Automated ML + drag & drop + code first



Open

Any tool + any framework

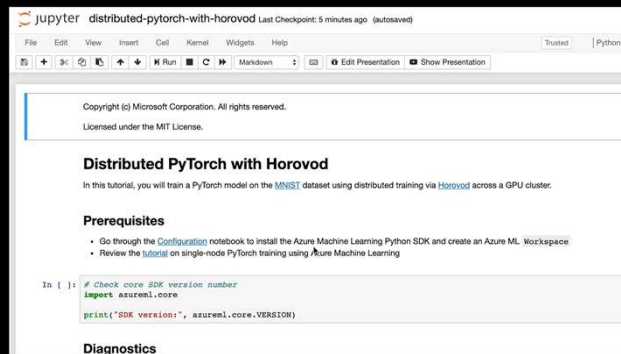


Industry leading MLOps

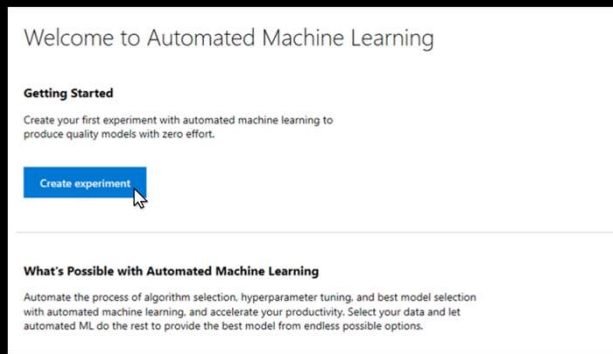
Integrated with Azure DevOps

Productive machine learning

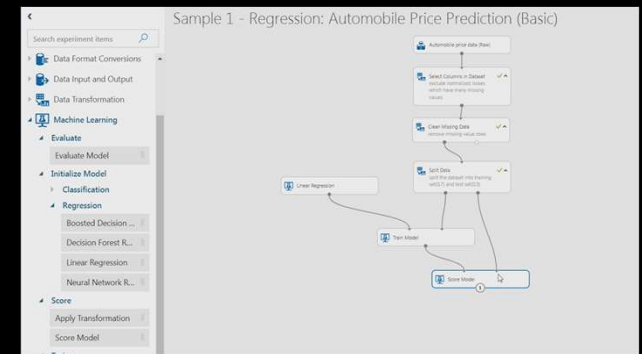
New capabilities in Azure Machine Learning service



Machine Learning
Notebooks

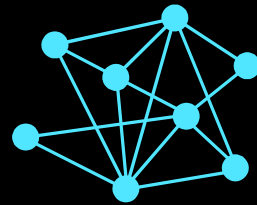


Automated
machine learning UI



Visual Designer

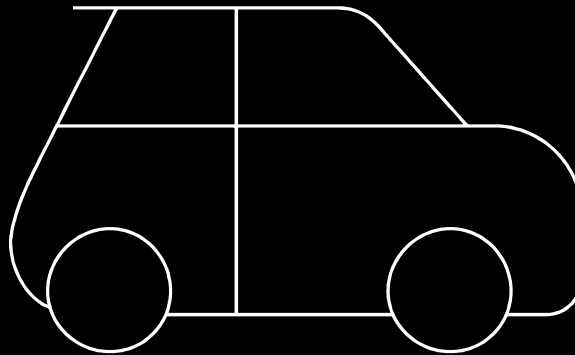
Centralized model registry



Automated machine learning

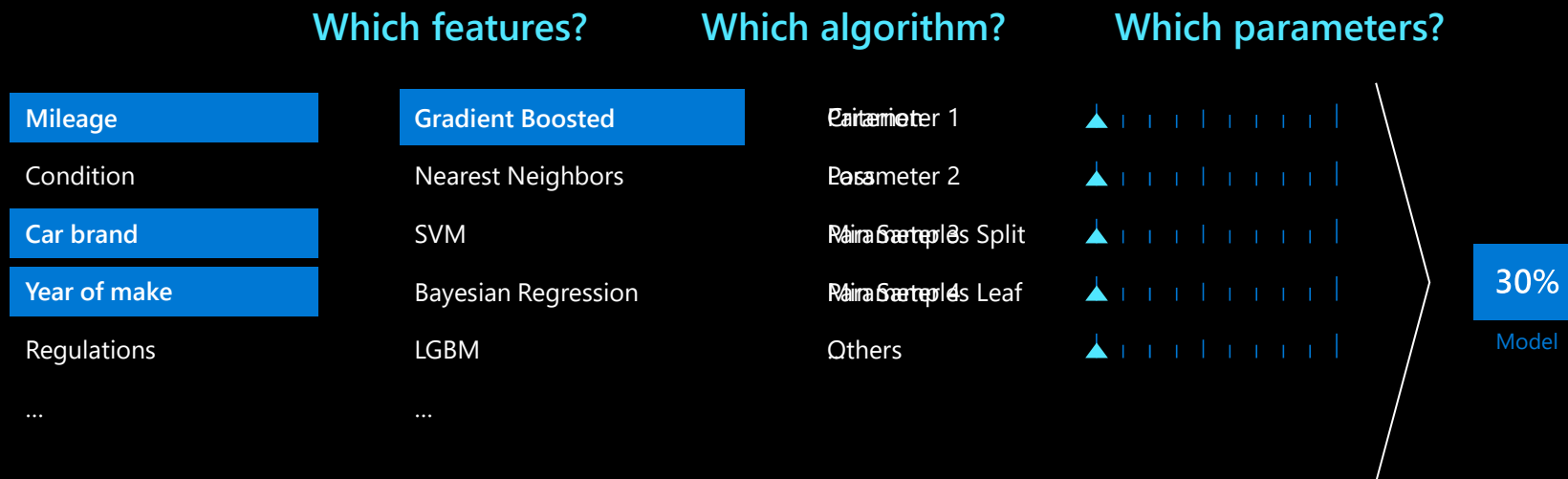
Azure Machine Learning

Automated machine learning



How much is this car worth?

Model creation is typically a time consuming process



Model creation is typically a time consuming process

Which features?

Mileage

Condition

Car brand

Year of make

Regulations

...

Which algorithm?

Gradient Boosted

Nearest Neighbors

SGD

Bayesian Regression

LGBM

...

Which parameters?

N Neighbors

Weights

Min Samples Split

Min Samples Leaf

ZYX

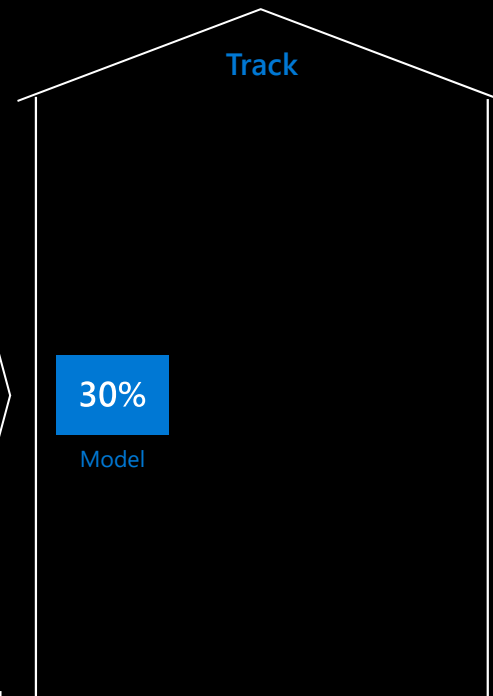
| | | | | ▲ | |

| | ▲ | | | | |

| | | ▲ | | | |

| ▲ | | | | | |

| | | | | ▲ | |



Iterate

Model creation is typically a time consuming process

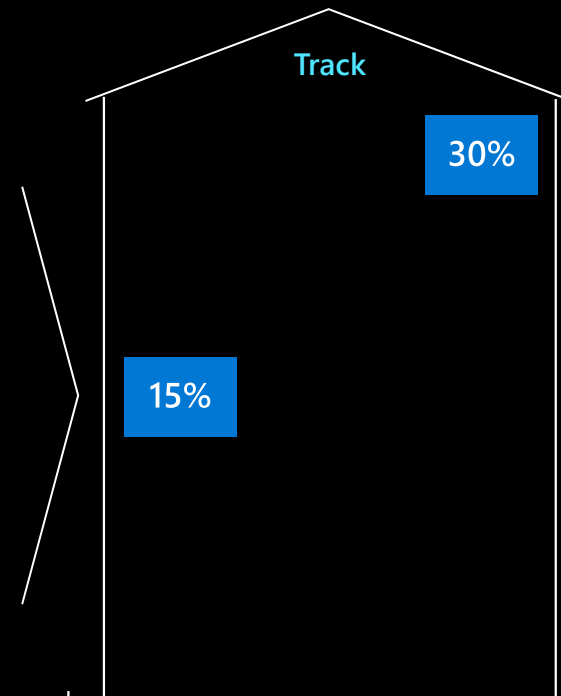
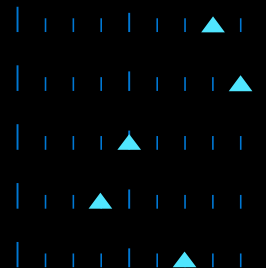
Which features?



Which algorithm?

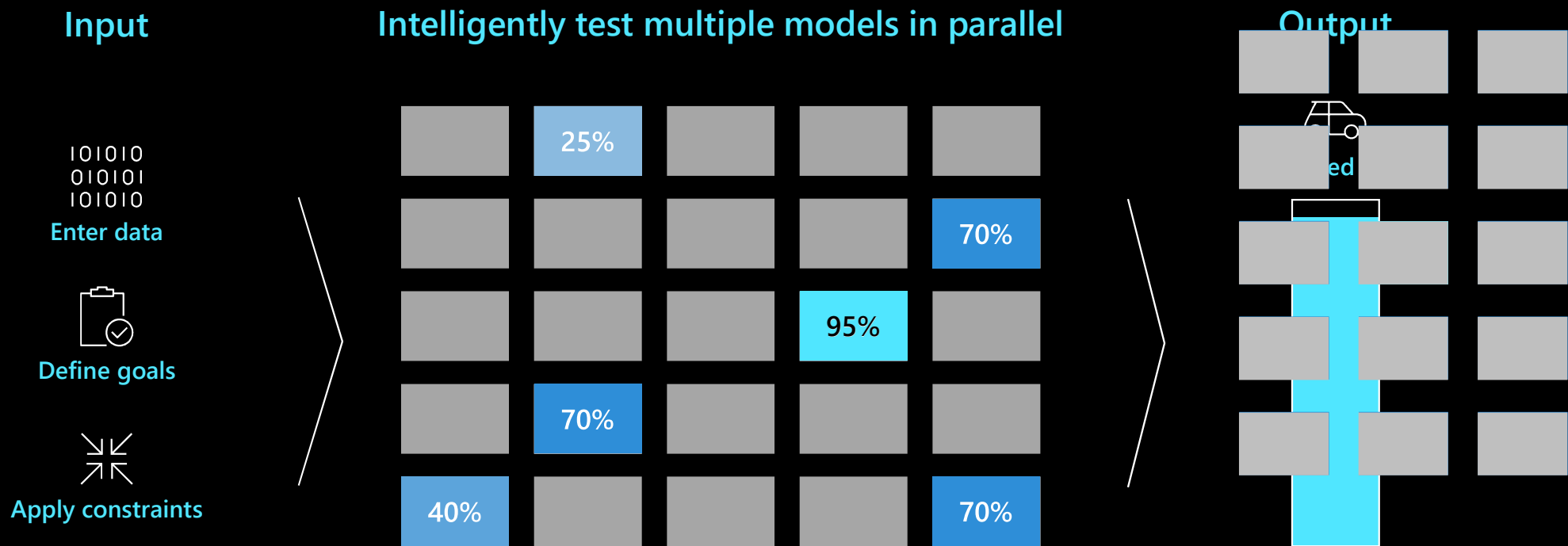


Which parameters?










Iterate

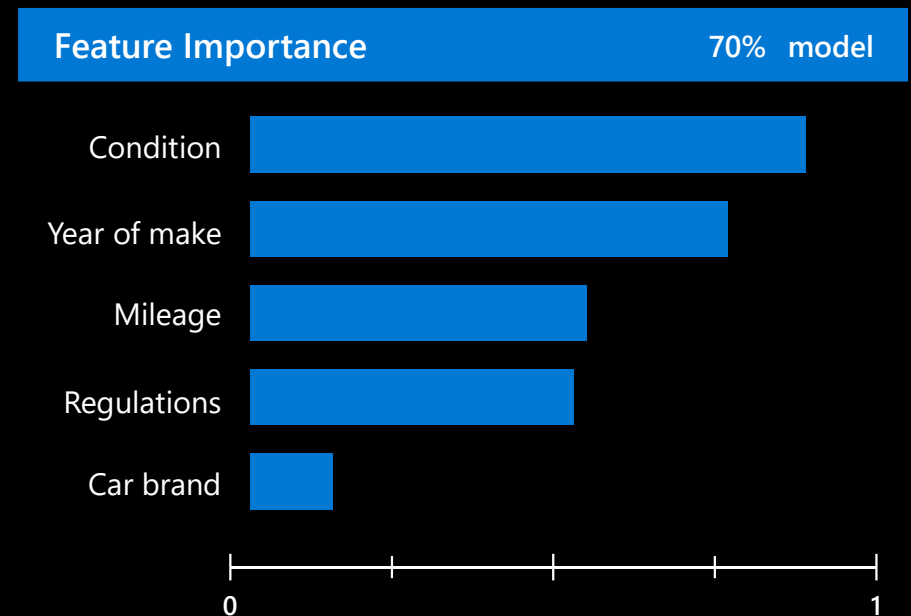
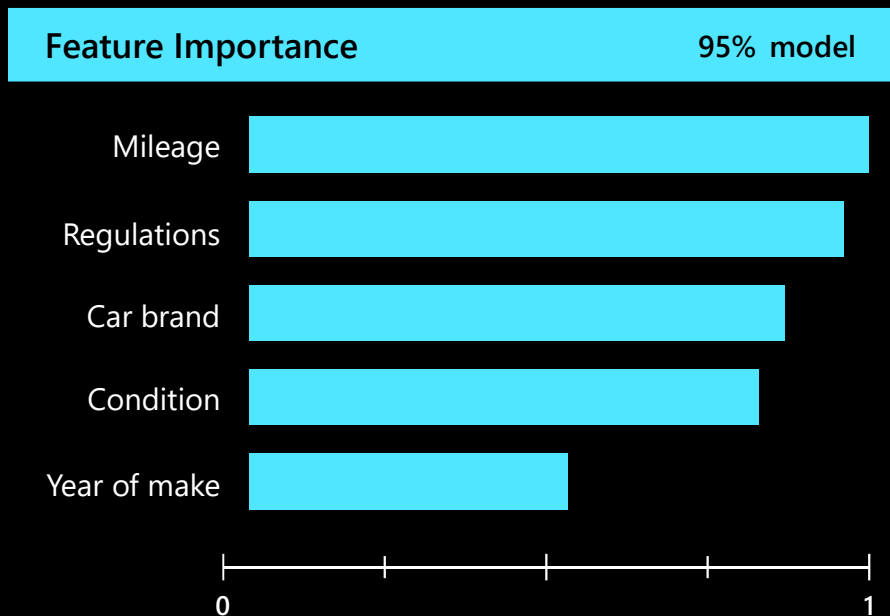
Automated Machine Learning accelerates model development



Automated ML: Guadrails

	Class imbalance
	Train-Test split, CV, rolling CV
	Missing value imputation
	Detect high cardinality features
	Detect leaky features
	Detect overfitting
	Model Interpretability / Feature Importance

Understand the inner workings of ML by analyzing feature importance



Enable model explain-ability for every automated ML iteration, not just the optimal model

Azure ML: new MLOps Capabilities

- Controlled Rollout for Models
- ML Pipelines YAML support
- Event Grid Integration
- No-code Model Deployment
- DevOps Integration
- Dataset Drift Analysis
- Data Factory Integration

Controlled Rollout for Models

- Once you are ready to deploy your models, create a scoring endpoint and deploy your first version:
 - Create a scoring file (score.py)
 - Run `endpoint = Model.deploy(ws, endpoint_name, model, compute, ...)`
- The first deployment will be defined as the default version which means that unspecified traffic percentile across all versions will go to the default version.
- Then you may add another version to your endpoint and configure the scoring traffic percentile going to the version:
 - Run `endpoint.create_version(new_version_name, model, traffic_percentile, description, ...)`

No-code Model Deployment

- Improved model packaging and deployment
- Supported frameworks:
 - Scikit-learn
 - Tensorflow (saved model)
 - ONNX (all models)

The screenshot displays the Azure Machine Learning web interface for model management. It is divided into two main sections: 'Register a model' and 'Deploy a model'.

Register a model section:

- Name ***: A text input field containing 'DiabetesRegressionModel'.
- Description**: A text input field containing 'A scikit-learn model designed to detect if someone may have diabetes'.
- Model Framework**: A dropdown menu with 'ScikitLearn' selected.
- Model Framework version**: A dropdown menu with '0.19.1' selected.
- Model file ***: A dropdown menu with 'sklearn_regre' selected.

Deploy a model section:

- Name ***: A text input field containing 'diabetesmodelap'.
- Description**: An empty text input field.
- Compute type ***: A dropdown menu with 'AKS' selected.
- Name ***: A dropdown menu with 'ignite-test' selected.
- Models**: A label indicating 'DiabetesRegressionModel:1'.
- Enable authentication**: A toggle switch that is currently turned on (blue).
- Type**: A dropdown menu with 'Token-based Authentication' selected.

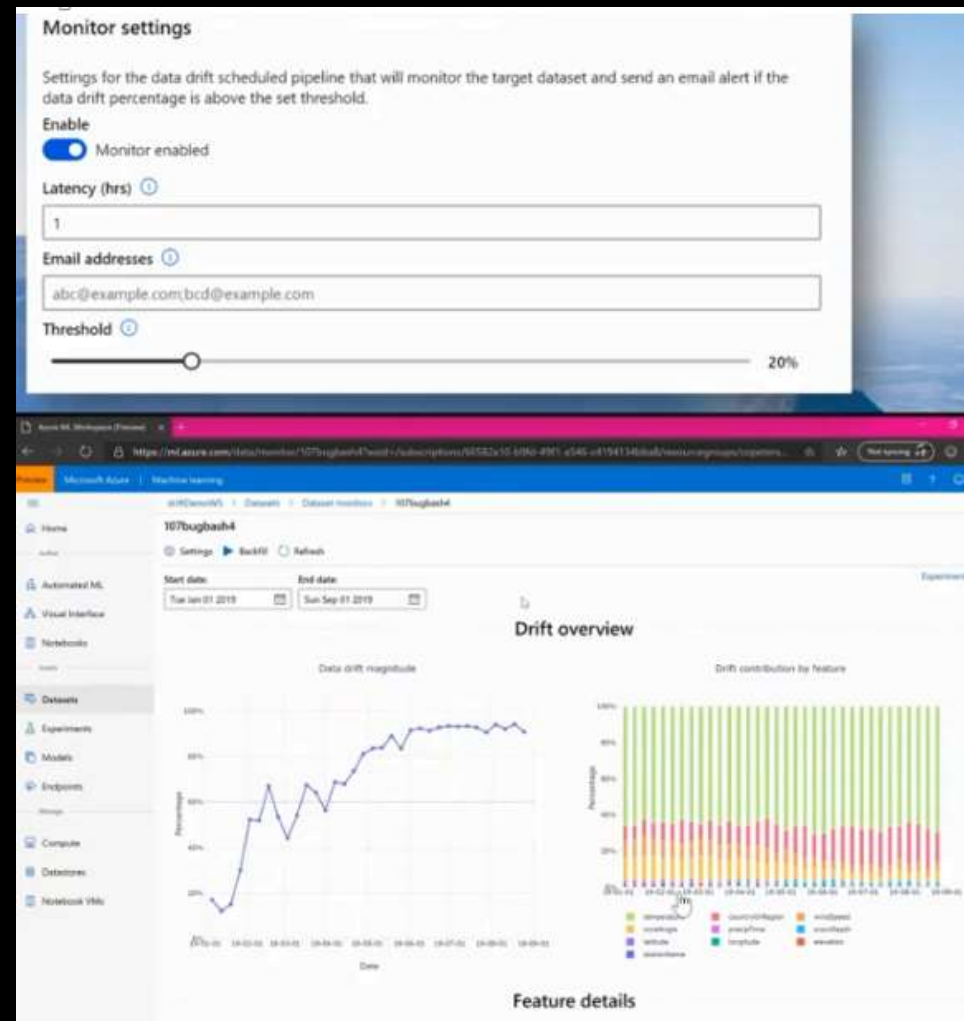
Footer text:

This model supports **no-code deployment**. You may **optionally** override the default environment and driver file.

☐ Use custom deployment assets

Dataset Drift Analysis

- Setup a dataset drift monitor
- Compare datasets over time
- Determine when to take a closer look



Dataset Drift Analysis

- In addition to graphical pipelines in the designer
- Machine learning extension for the Azure CLI offer many of the pipeline-related commands through a YAML file that declaratively defines the pipeline
- This makes it easy to compare/differentiate

The image displays the Azure Machine Learning Designer interface. On the left, a YAML file defines a pipeline named 'SamplePipelineFromYaml' with three parameters: 'NumIterationsParameter' (type: int, default: 40), 'DataPathParameter' (type: datapath, default: workspaceblob), and 'NodeCountParameter' (type: int, default: 4). On the right, the 'Designer' menu is open, showing a list of assets including Datasets, Experiments, Pipelines, Models, Endpoints, Compute, Datastores, and Data labeling. A red arrow points from the 'Designer' menu item to the 'Data Input and Output' asset in the list.

```
YAML

pipeline:
  name: SamplePipelineFromYaml
  parameters:
    NumIterationsParameter:
      type: int
      default: 40
    DataPathParameter:
      type: datapath
      default: workspaceblob
    NodeCountParameter:
      type: int
      default: 4
```

Microsoft Azure Machine Learning

mmMISWorkspace01 > Designer

Search

Datasets >

Data Input and Output >

Data Transformation >

Feature Selection >

Statistical Functions >

Machine Learning Algorithms >

Model Training >

Model Scoring & Evaluation >

Python Language >

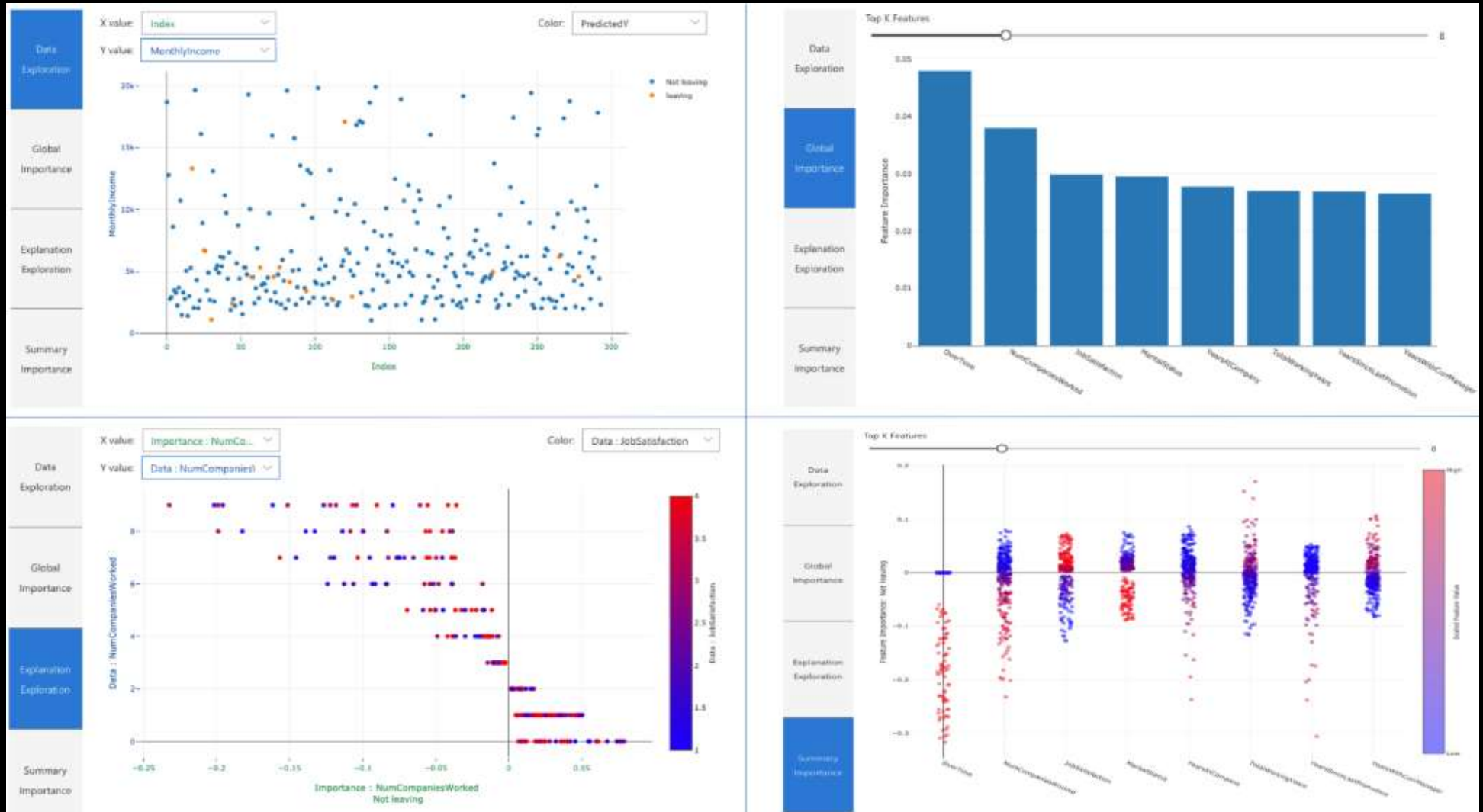
R Language >

Text Analytics >

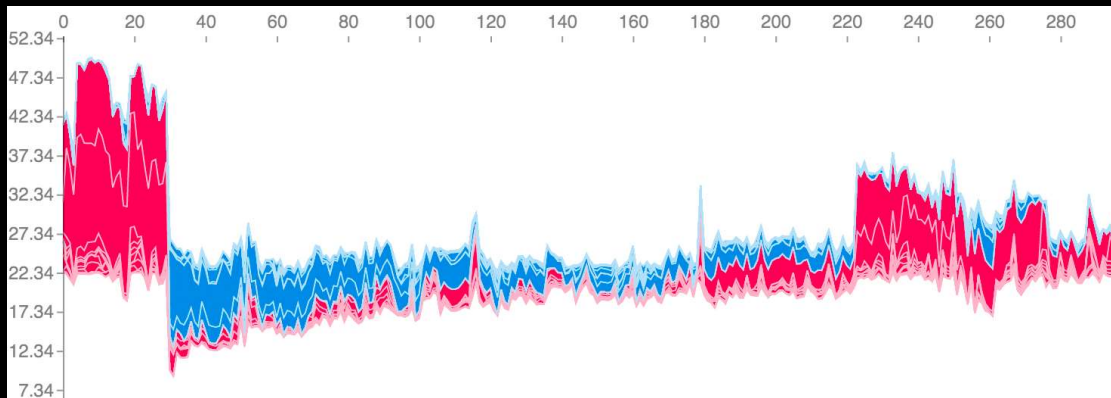
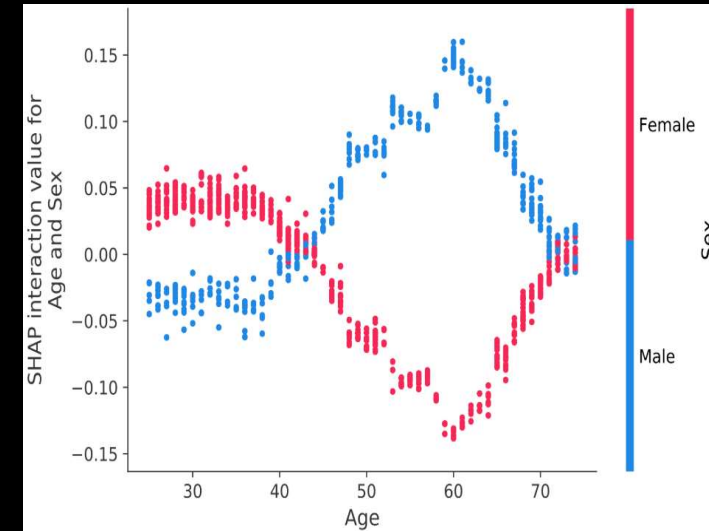
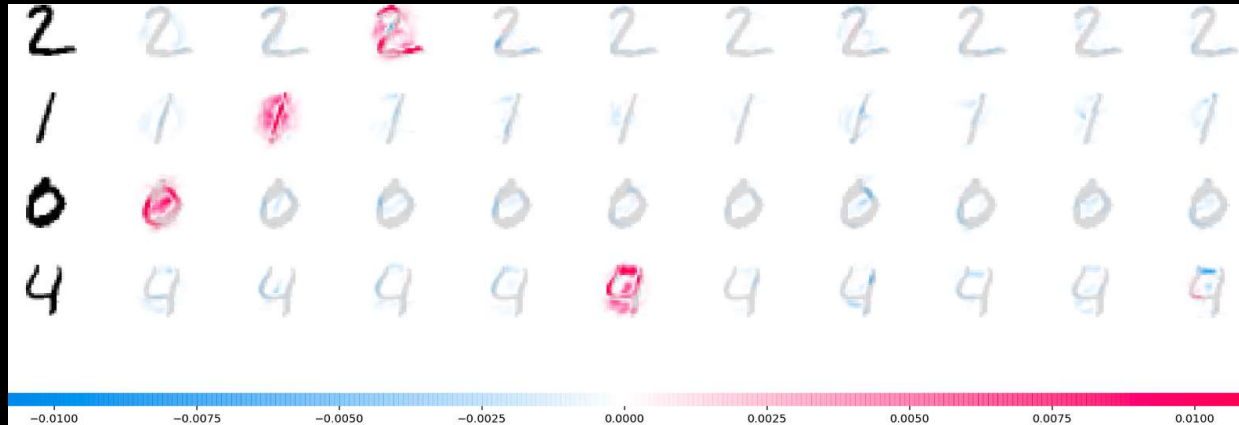
Recommendation >

Web Service >

Microsoft open-source packages for model interpretation



Microsoft open-source packages for model interpretation



Text with highlighted words

we **had** a late 8:30pm reservation . the restaurant wasn't busy but got busier at about 10pm , **likely** after the theaters let out . **bonnie** , our server was **fantastic** . loved the way she said y **all** , great attentive **service** , **professional** and efficient . started out with a bowl of the lobster bisque . big chunks of lobster , hot and yummy . the calamari wasn't great . it was **breaded** but soggy . that was our only disappointment . i had the porcini rib eye with aged balsamic **vinigar** which was **perfect** . delicious . my husband had the tenderloin with two lobster **tales** . both **steaks** were **perfectly** cooked . sides of wild mushrooms and asparagus . cheesecake for dessert was yummy and nicely presented .

Azure MLOps Key Phases

1. Build and train reproducible models

Turn your training process into a reproducible pipeline using machine learning pipelines to stitch together all the steps, from data preparation to model evaluation.

2. Package and deploy models

Package the model into a container image and then deploy it. Use profiling to determine the ideal CPU and memory settings, and to validate models.

3. Automate workflows, monitor and manage

Automate the end-to-end machine learning lifecycle with Azure Machine Learning and GitHub to frequently update models, test new models and continuously roll out new machine learning models alongside your other applications and services.

4. Apply governance and control

Capture the data required for establishing an end-to-end audit trail of the machine learning lifecycle, including who's publishing models, why changes are being made and when models were deployed or used in production.

Automated ML - recap



Data Preprocessing

Automated ML currently supports automated data cleaning



Feature Engineering

Most time-consuming part when done manually can now be done within minutes.



Algorithm Selection

Testing many different algorithms at once.



Hyper-parameter Tuning

Hyperparameter tuning what to include what to leave out



Model Recommendation

Having an overview of the best performing models based on accuracy & speed.



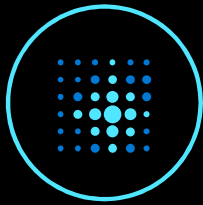
Interpretability & Explaining

Being able to explain what created an outcome and what features had the most significant impact

CUSTOMER VIDEO - TAL

Add link to video-coming soon

Azure Machine Learning



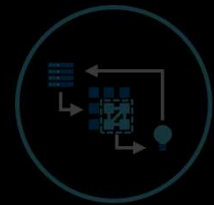
For all skill levels

Automated ML + drag & drop + code first



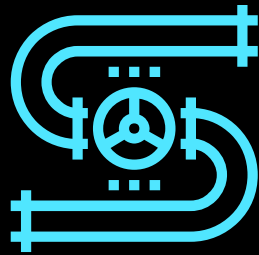
Open

Any tool + any framework



Industry leading MLOps

Integrated with Azure DevOps



Azure Machine Learning pipelines

Azure Machine Learning pipelines

Prepare data

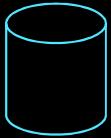


Build & train models



Deploy & predict

Data ingestion



Data storage
locations

DATA PREPARATION

Normalization

Transformation

Validation

Featurization

MODEL BUILDING & TRAINING

Hyper-parameter tuning

Automatic model selection

Model testing

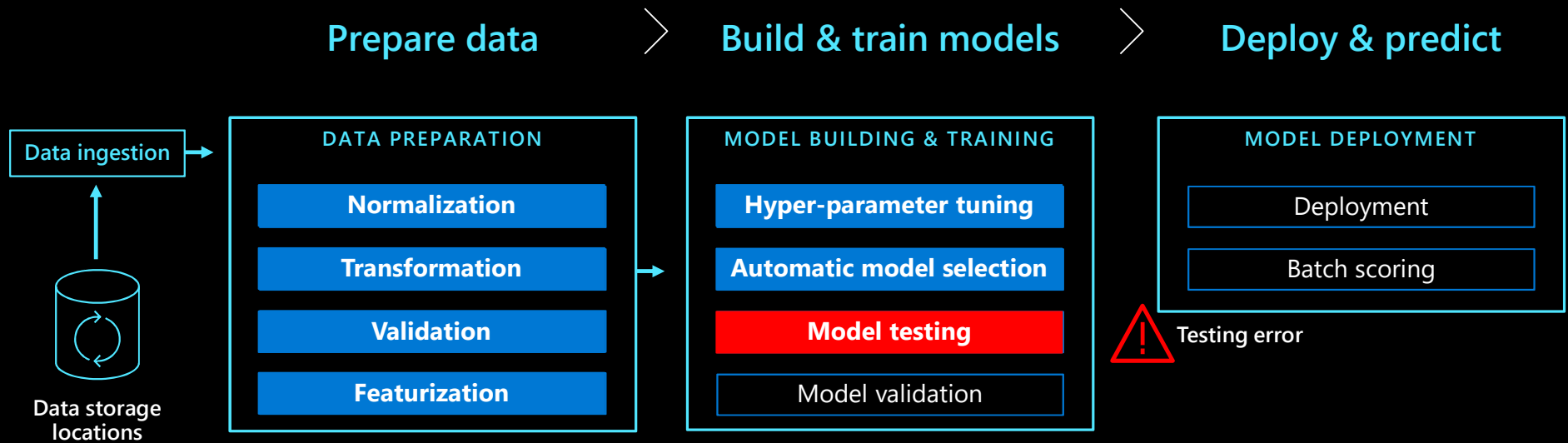
Model validation

MODEL DEPLOYMENT

Deployment

Batch scoring

Azure Machine Learning pipelines



Azure Machine Learning pipelines

Prepare data

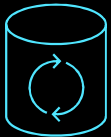


Build & train models



Deploy & predict

Data ingestion



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

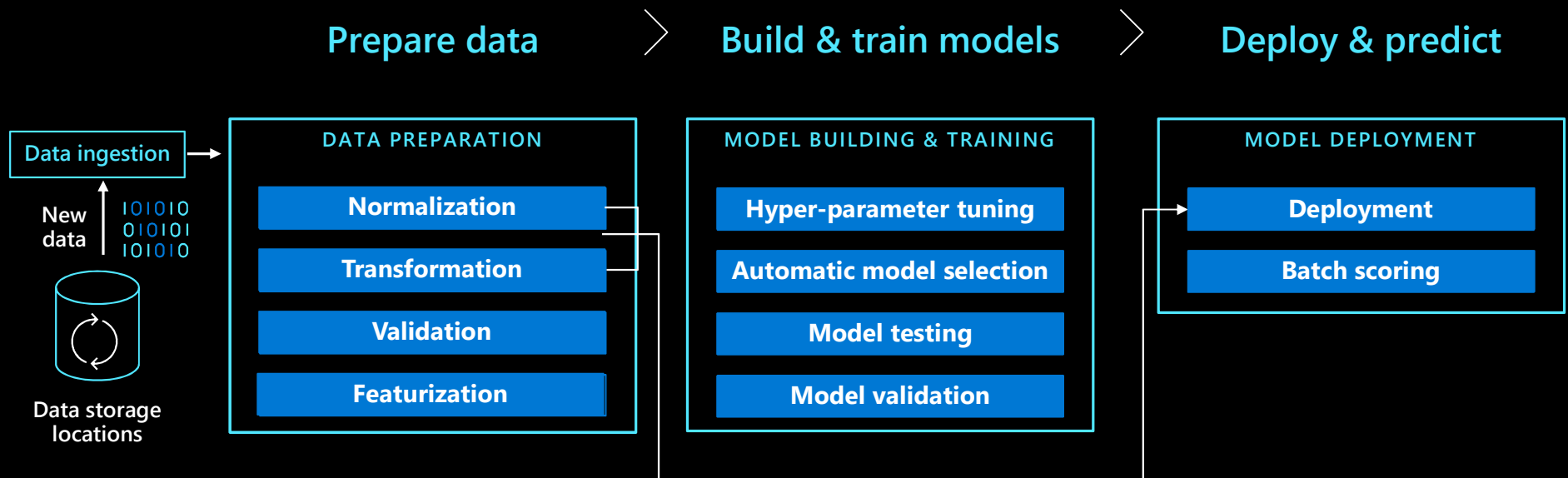


Testing error



Error resolved

Azure Machine Learning pipelines with new data

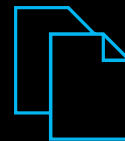


Advantages of Azure ML Pipelines



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

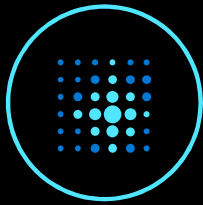
Create templates of pipelines for specific scenarios such as retraining and batch scoring



Mixed and diverse compute

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

Azure Machine Learning



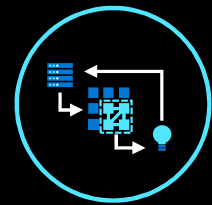
For all skill levels

Automated ML + drag & drop + code first



Open

Any tool + any framework



Industry leading MLOps

Integrated with Azure DevOps

Azure Machine Learning



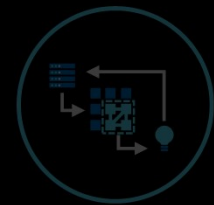
For all skill levels

Automated ML + drag & drop + code first



Open

Any tool + any framework



Industry leading MLOps

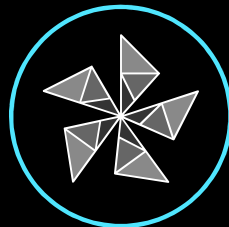
Integrated with Azure DevOps

Open platform

New offerings and integrations



Native MLflow support



ONNX Runtime updates



Azure Open Datasets

Powerful frameworks

Build advanced deep learning solutions

Use your favorite deep learning frameworks



TensorFlow



PyTorch



Scikit-Learn



MXNet



Chainer



Keras



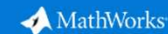
without getting locked into one framework



ONNX

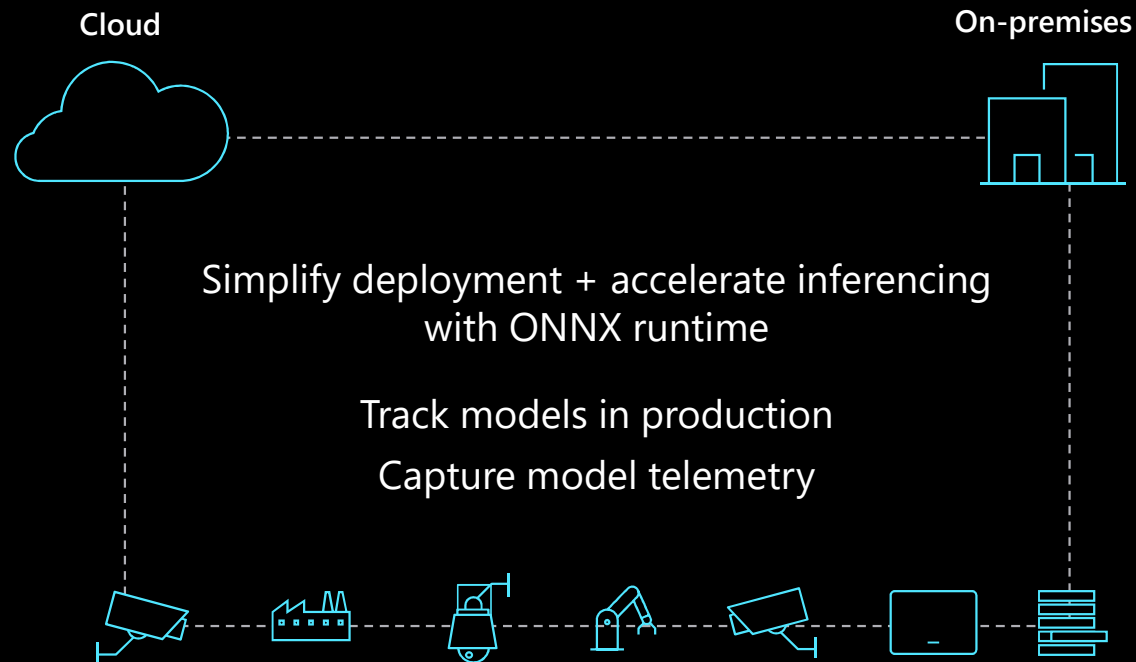
Community project created by Facebook and Microsoft

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

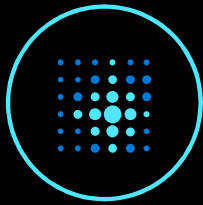


Flexible deployment

From the Intelligent Cloud to the Intelligent Edge



Azure Machine Learning



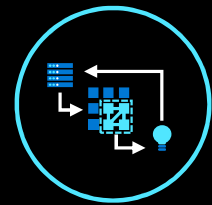
For all skill levels

Automated ML + drag & drop + code first



Open

Any tool + any framework



Industry leading MLOps

Integrated with Azure DevOps

Azure Machine Learning

Join us for the next section



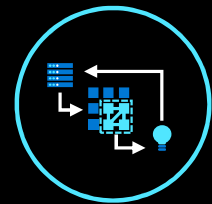
For all skill levels

Automated ML + drag & drop + code first



Open

Any tool + any framework



Industry leading MLOps

Integrated with Azure DevOps

Thank You!

EXPERIENCE 3

Better models made easy with
automated machine learning

EXPERIENCE 4

Creating repeatable processes with Azure
Machine Learning pipelines

EXPERIENCE 5

Making deep learning portable with ONNX

Announcing Azure Machine Learning Enterprise Edition

What are we announcing?

At Ignite, we announced the new Azure Machine Learning Enterprise and Basic editions. The Enterprise edition contains our no-code ML capabilities (AutoML and designer) as well as cutting edge AutoML features such as DNNs, enterprise grade ML Ops capabilities such as data drift monitoring, and cross-workspace compute management.

The Enterprise edition is in preview at this time. While in preview, customers with Enterprise workspaces will pay only for Azure resources consumed.

All capabilities of AzureML that were in general availability before Ignite are now available in the "Basic" edition, now in GA. Basic workspaces will incur costs only for consumed Azure resources.

