Microsoft

Azure AI Training Day

Azure Machine Learning

Build models easily, scale flexibly and deploy anywhere

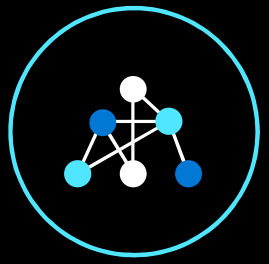
Mauro Minella
Cloud Solution Architect – Big Data & AI

Microsoft

Azure AI

AI apps & agents

Knowledge mining

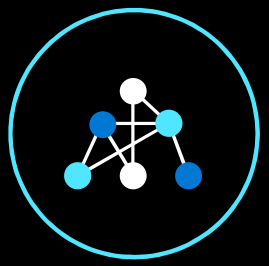


Machine learning

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

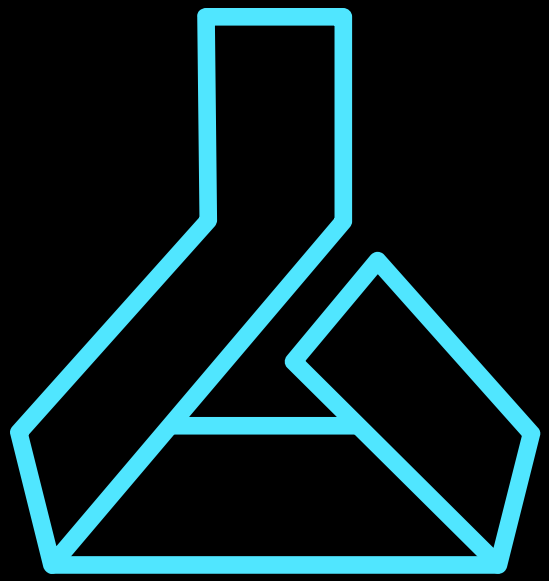
Powerful infrastructure
To accelerate deep learning


CPU


GPU

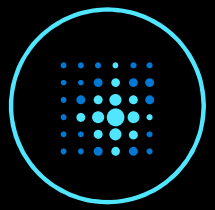

FPGA


From the Intelligent Cloud to the Intelligent Edge



Azure Machine Learning

Azure Machine Learning

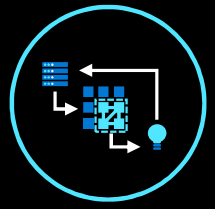


For all skill levels

Automated ML + drag & drop + code first

Open

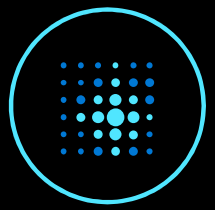
Any tool + any framework



Industry leading MLOps

Integrated with Azure DevOps

Azure Machine Learning



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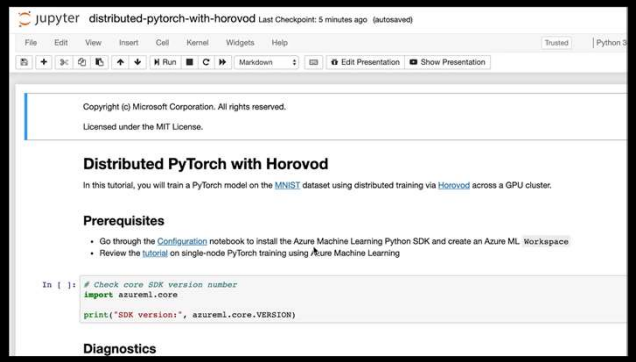
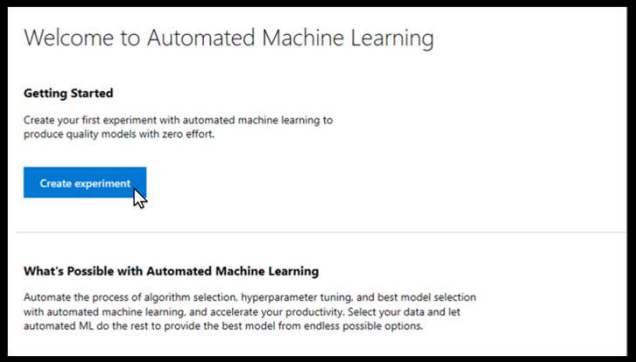
Integrated with Azure DevOps

Productive machine learning

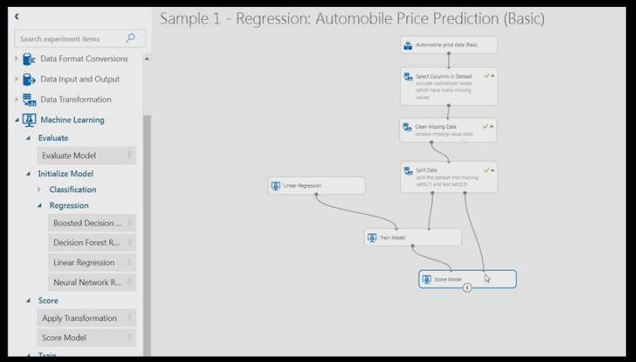
New capabilities in Azure Machine Learning service



Machine Learning Notebooks

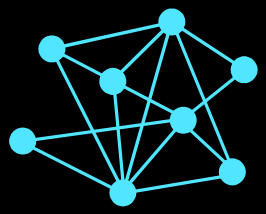


Automated machine learning UI



Visual Designer

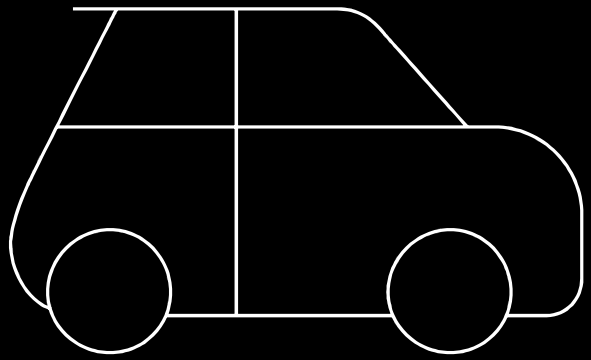
Centralized model registry



Automated machine learning

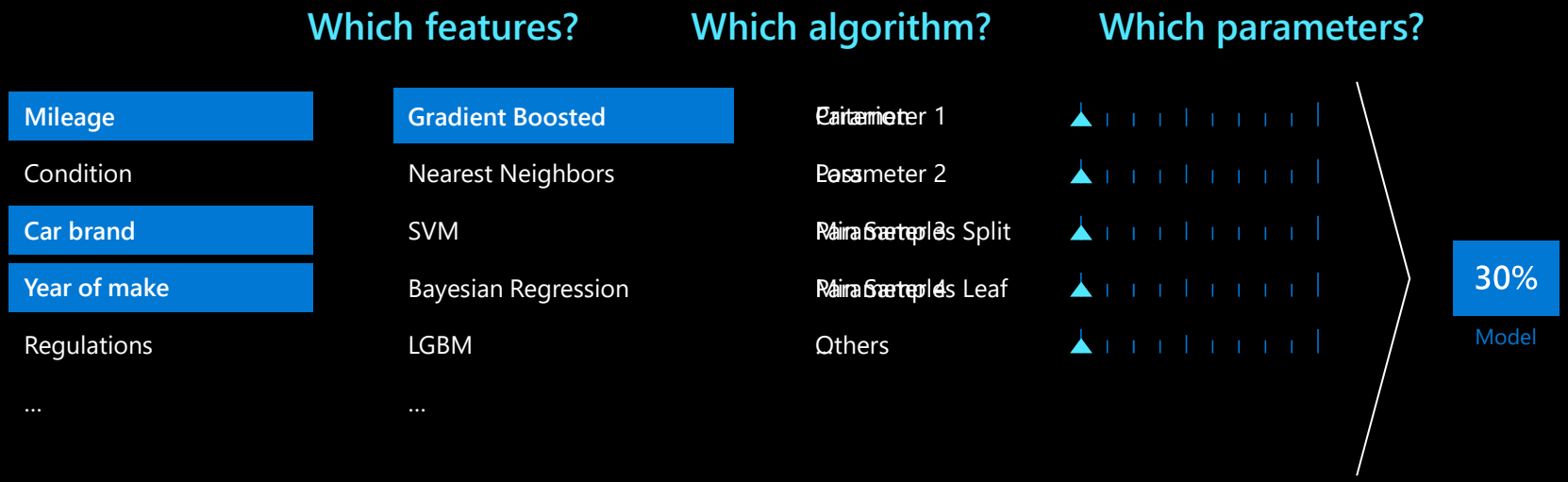
Azure Machine Learning

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?

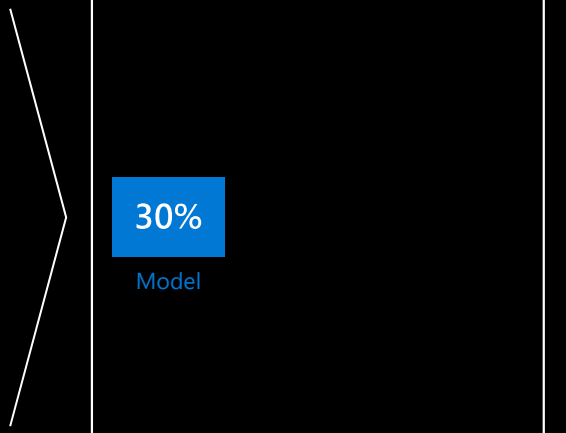
- Mileage
- Condition
- Car brand
- Year of make
- Regulations
- ...

Which algorithm?

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

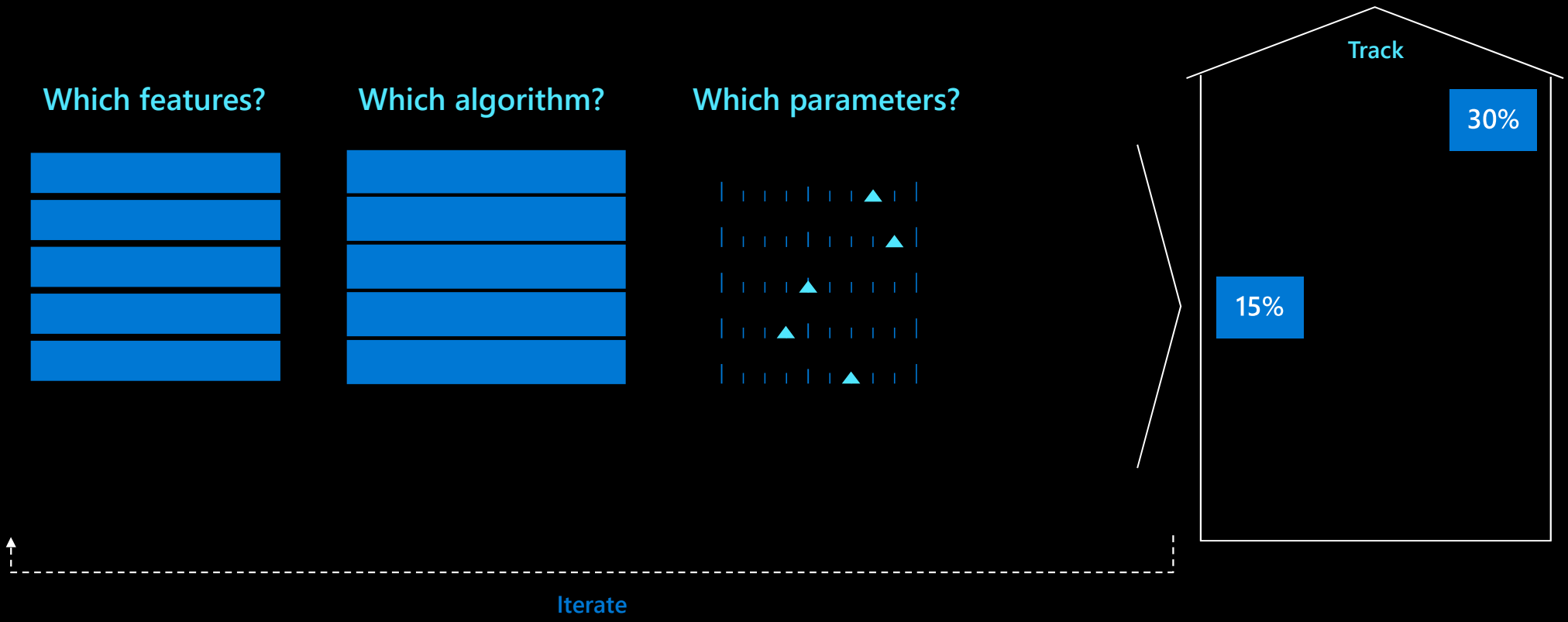
Which parameters?

- N Neighbors
- Weights
- Metric
- Min Samples Split
- Min Samples Leaf
- ZYX

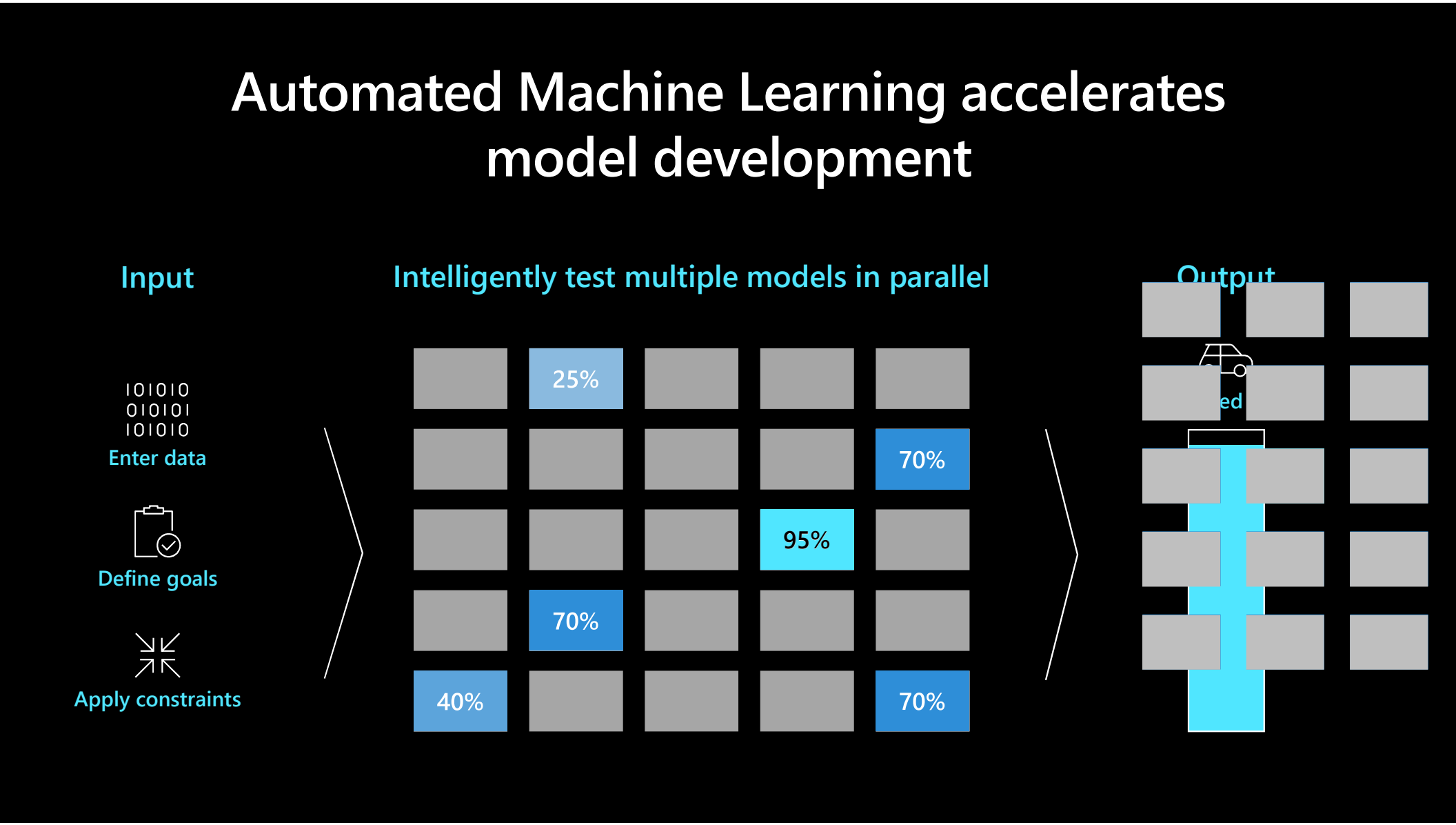


Iterate

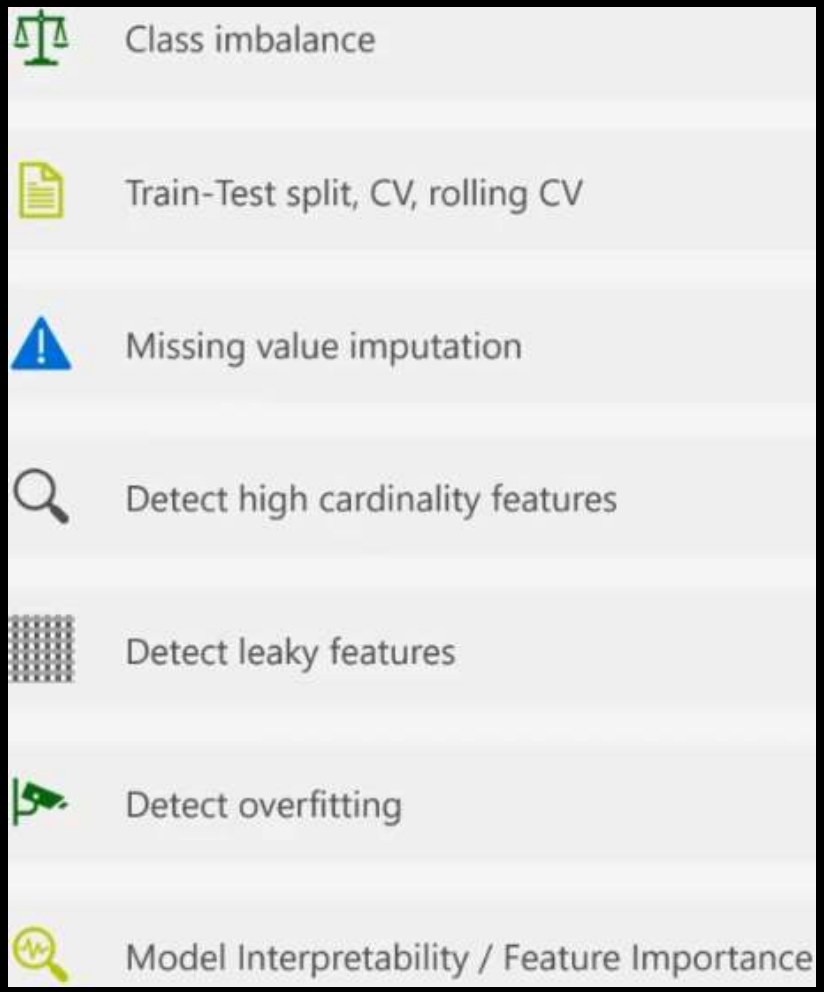
Model creation is typically a time consuming process



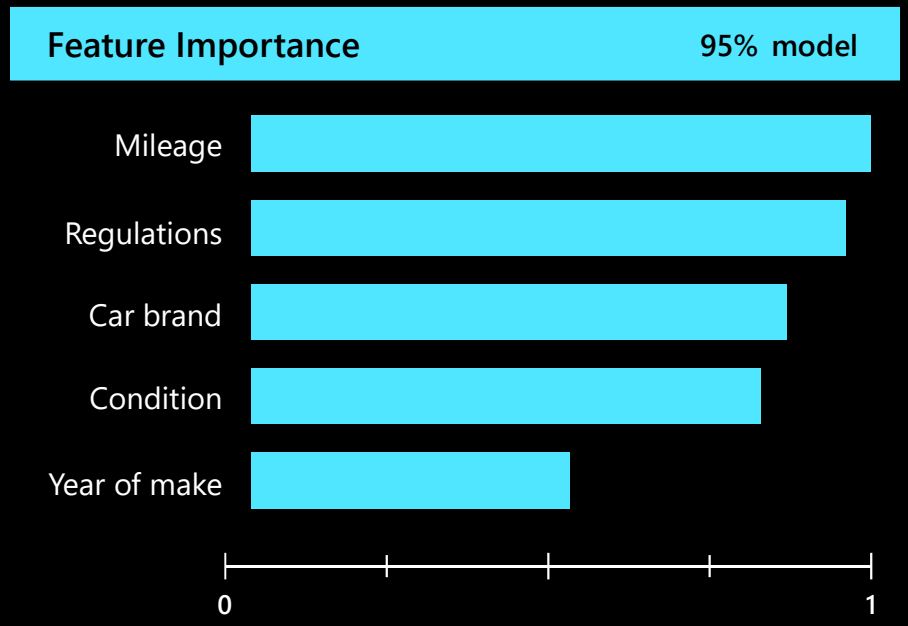
Automated Machine Learning accelerates model development

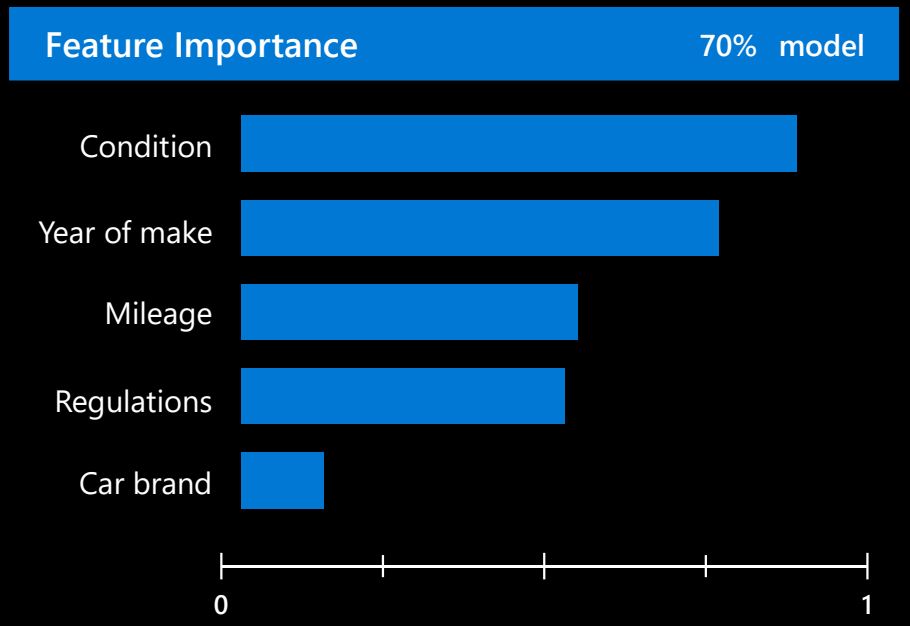


Automated ML: Guadrails



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

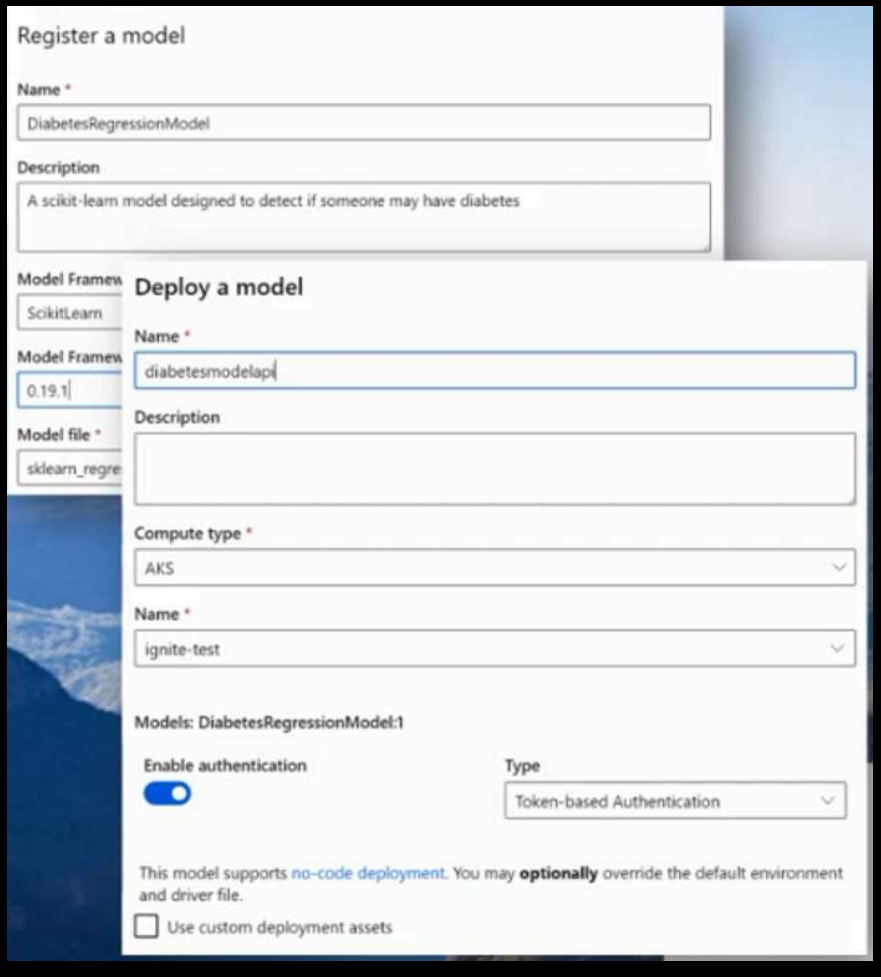
- Controlled Rollout for Models
- ML Pipelines YAML support
- Event Grid Integration
- No-code Model Deployment
- DevOps Integration
- Dataset Drift Analysis
- Data Factory Integration

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, enpoint_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, ...)`

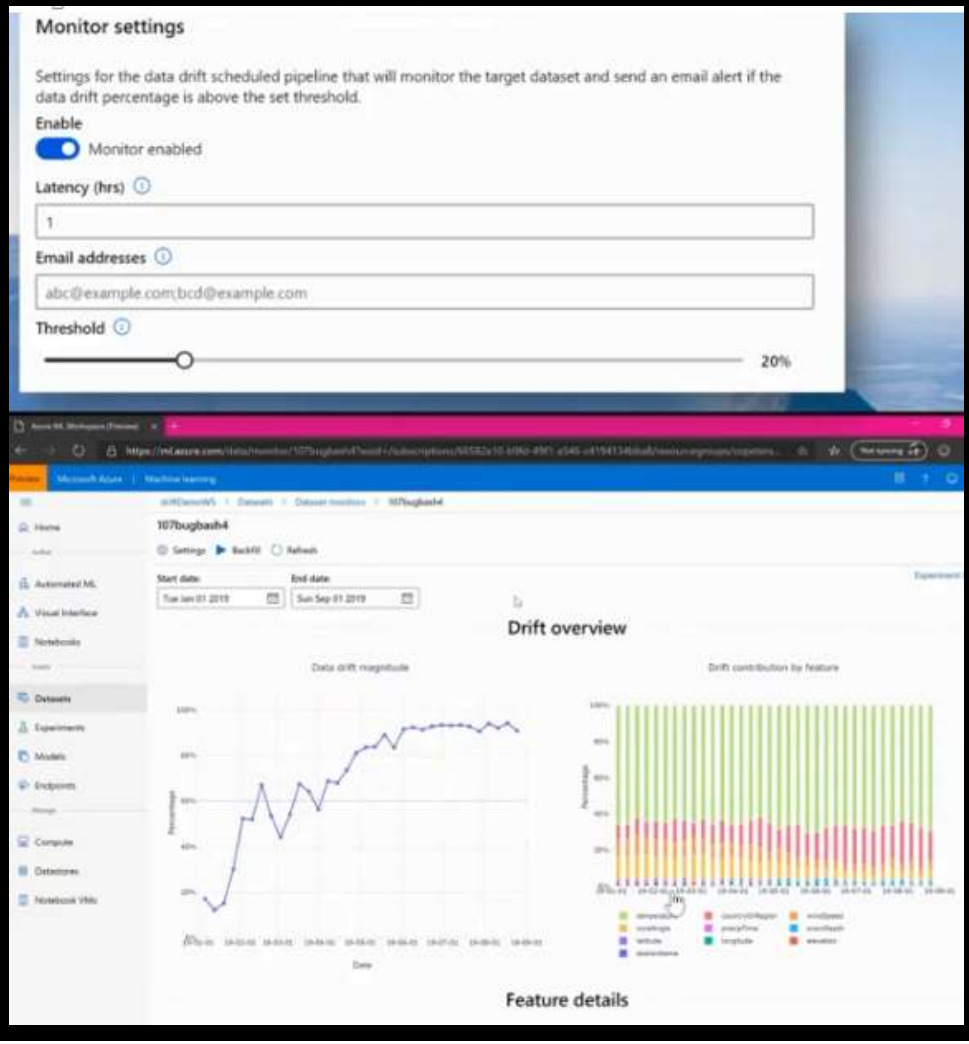
No-code Model Deployment

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



Dataset Drift Analysis

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

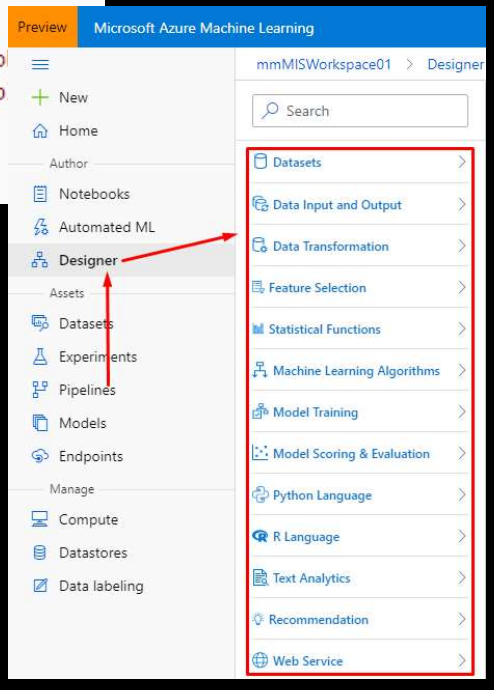


Dataset Drift Analysis

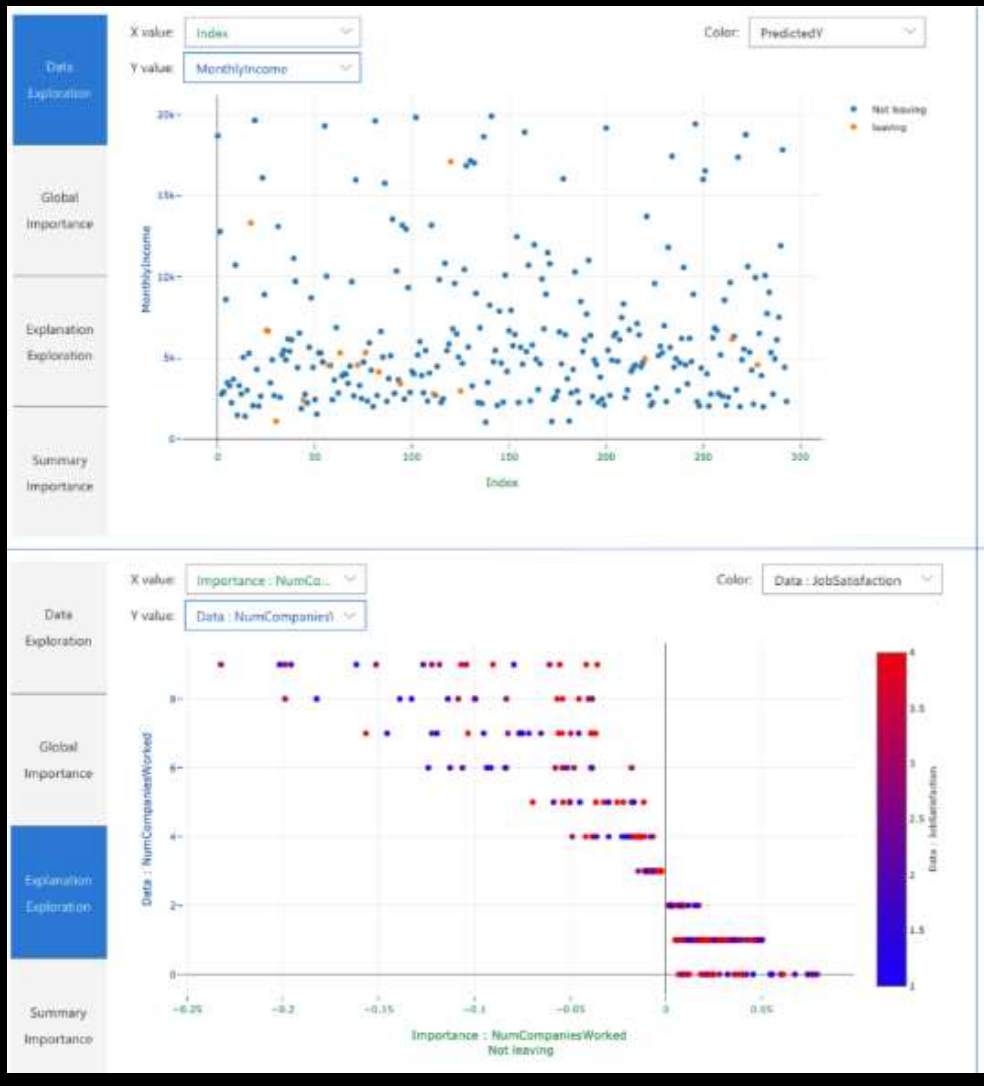
- In addition to graphical pipelines in the designer
- Machine learning extension for the Azure CLI offer many of the pipeline-related commands through a YAML file that declaratively defines the pipeline
- This makes it easy to compare/differentiate

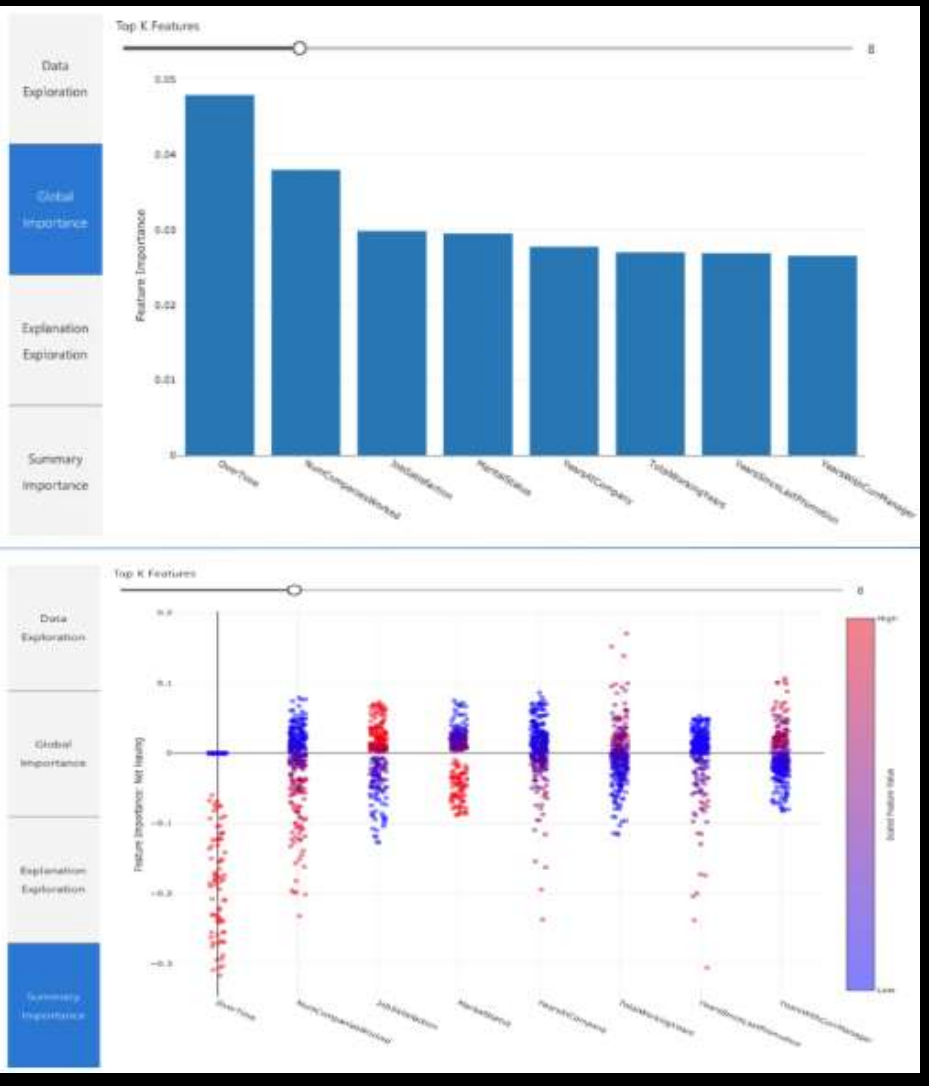
YAML

```yaml
pipeline:
    name: SamplePipelineFromYaml
    parameters:
        NumIterationsParameter:
            type: int
            default: 40
        DataPathParameter:
            type: datapath
            default:
                datastore: workspaceblo
                path_on_datastore: samp
        NodeCountParameter:
            type: int
            default: 4
```



Microsoft open-source packages for model interpretation





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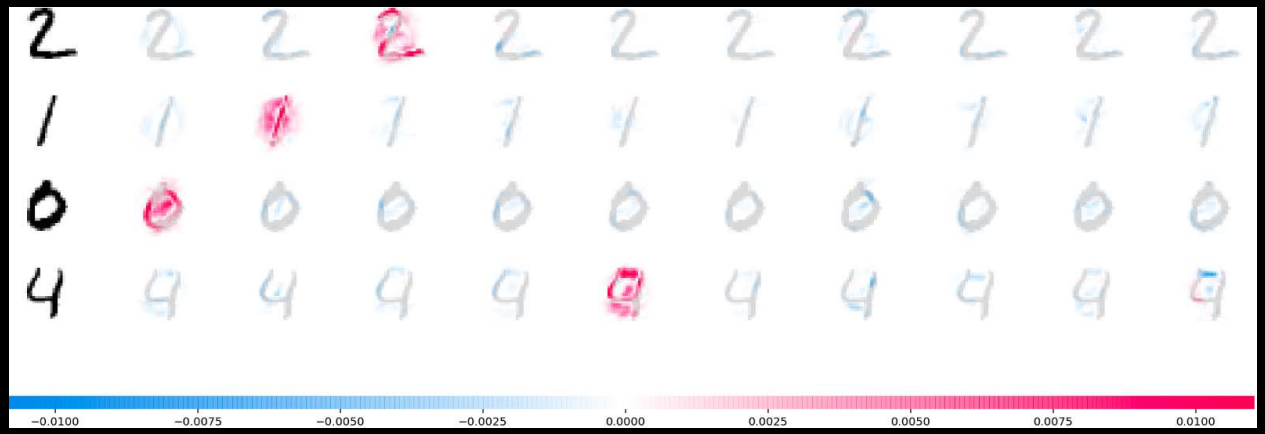
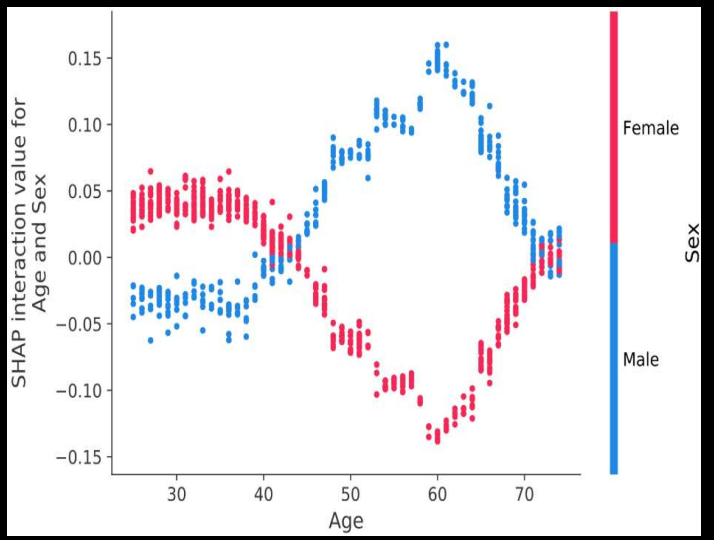
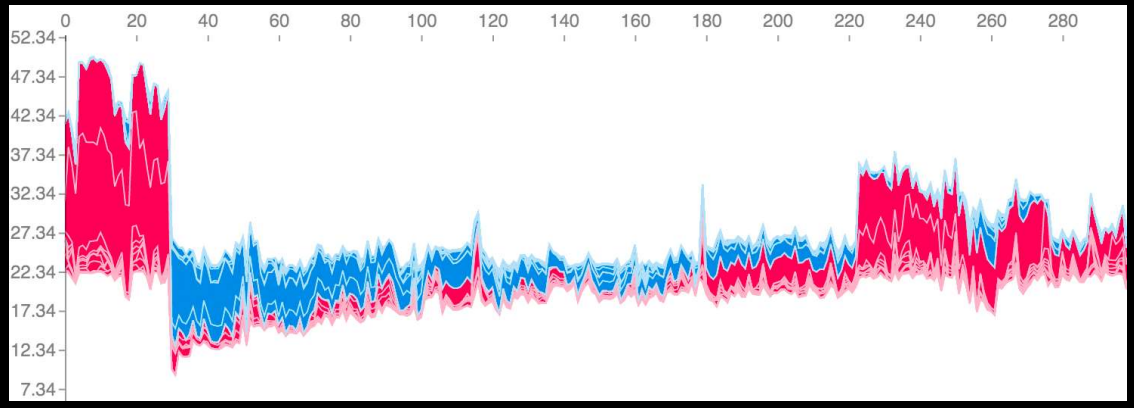






Text with highlighted words

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 an efficent . 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 aspagus . 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.

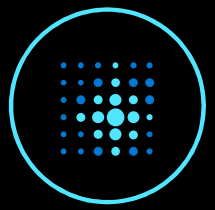
Interpretability & Explaining

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

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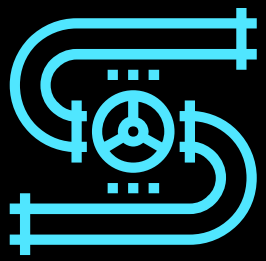
Open

Any tool + any framework

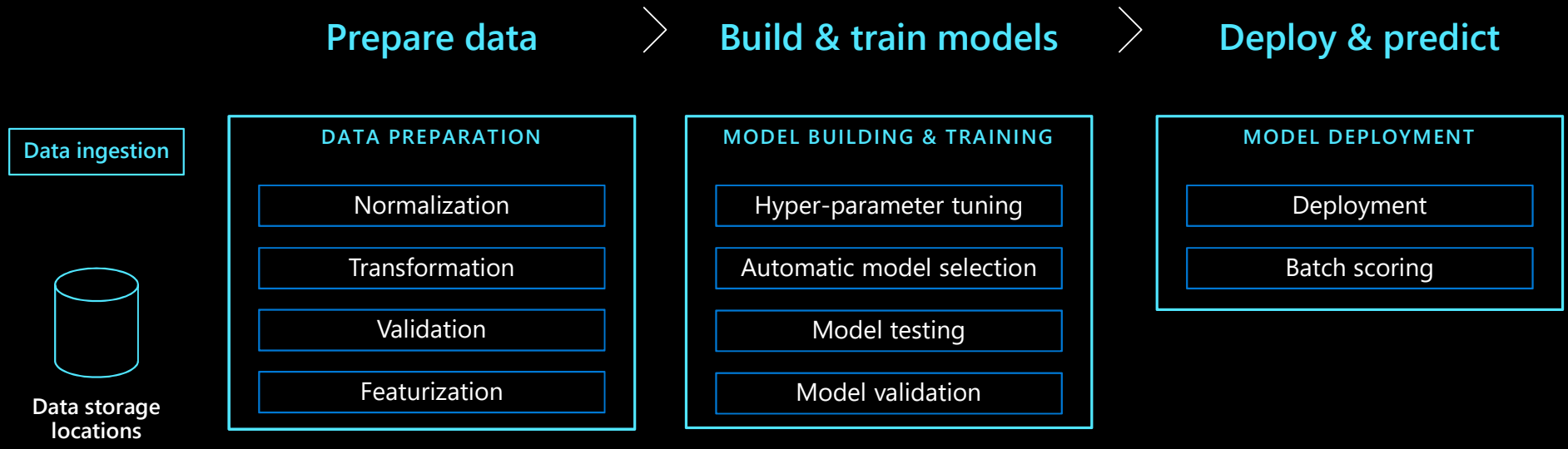
Industry leading MLOps

Integrated with Azure DevOps

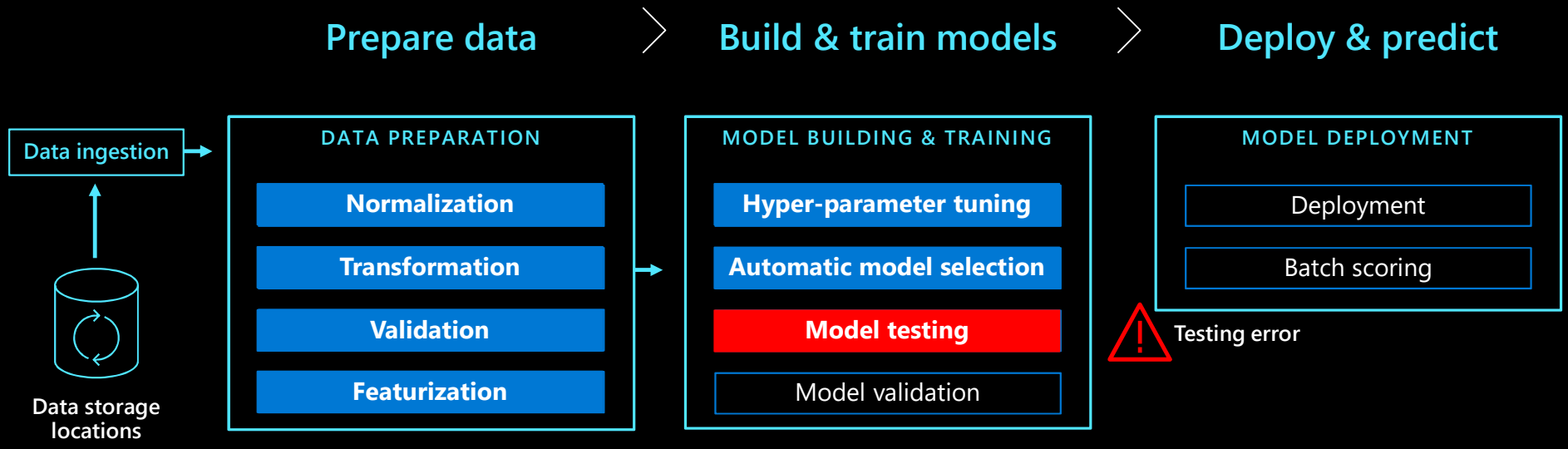


Azure Machine Learning pipelines

Azure Machine Learning pipelines



Azure Machine Learning pipelines



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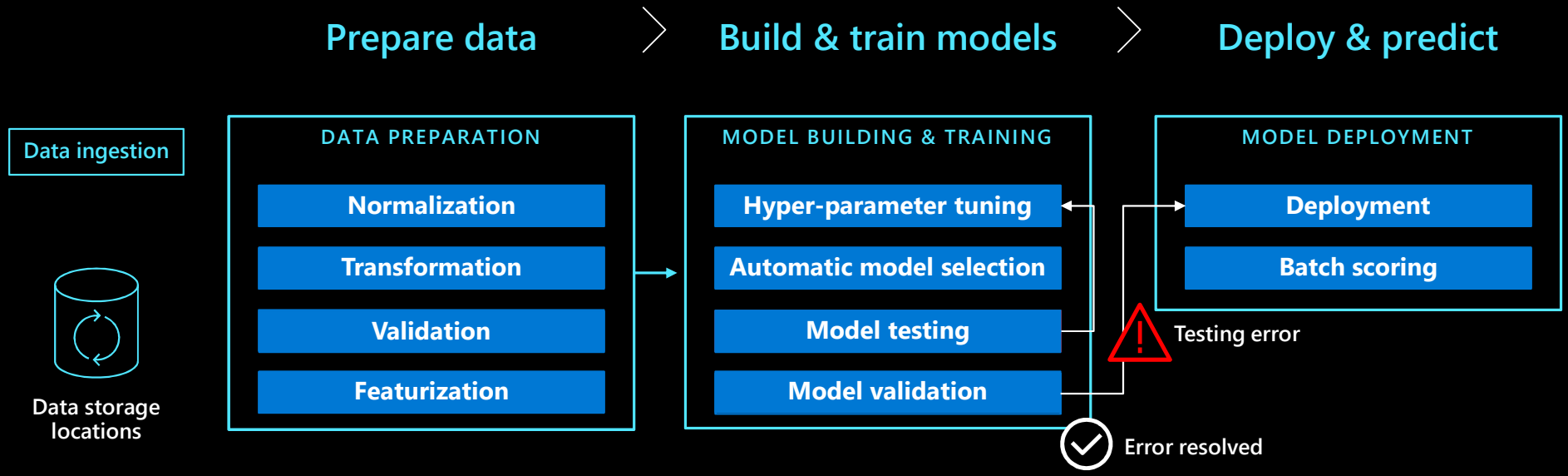
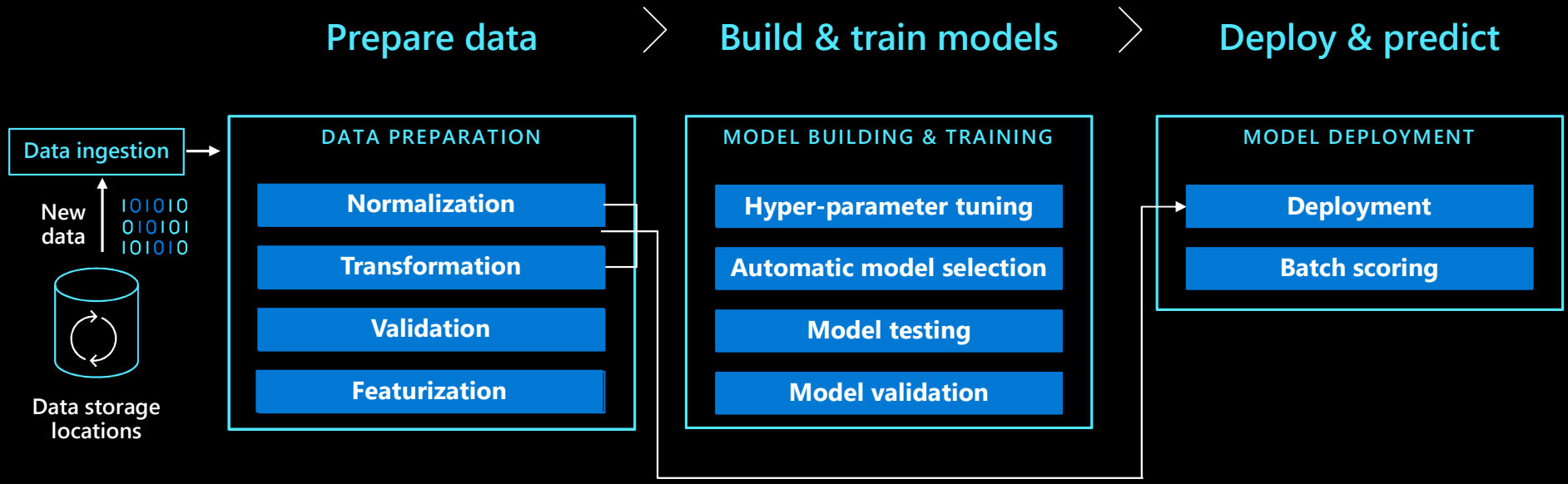


Azure Machine Learning pipelines with new data



Advantages of Azure ML Pipelines

Unattended runs

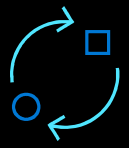
Schedule a few steps to run in parallel or in sequence to focus on other tasks while your pipeline runs

Tracking and versioning

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

Reusability

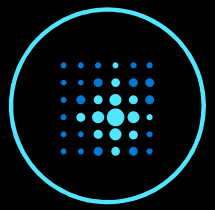
Create templates of pipelines for specific scenarios such as retraining and batch scoring



Mixed and diverse compute

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

Azure Machine Learning



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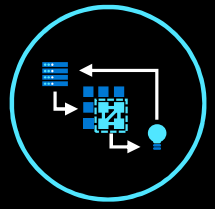
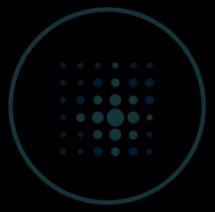


Industry leading MLOps

Integrated with Azure DevOps

Azure Machine Learning



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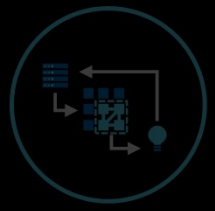


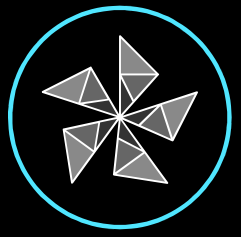
Industry leading MLOps

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

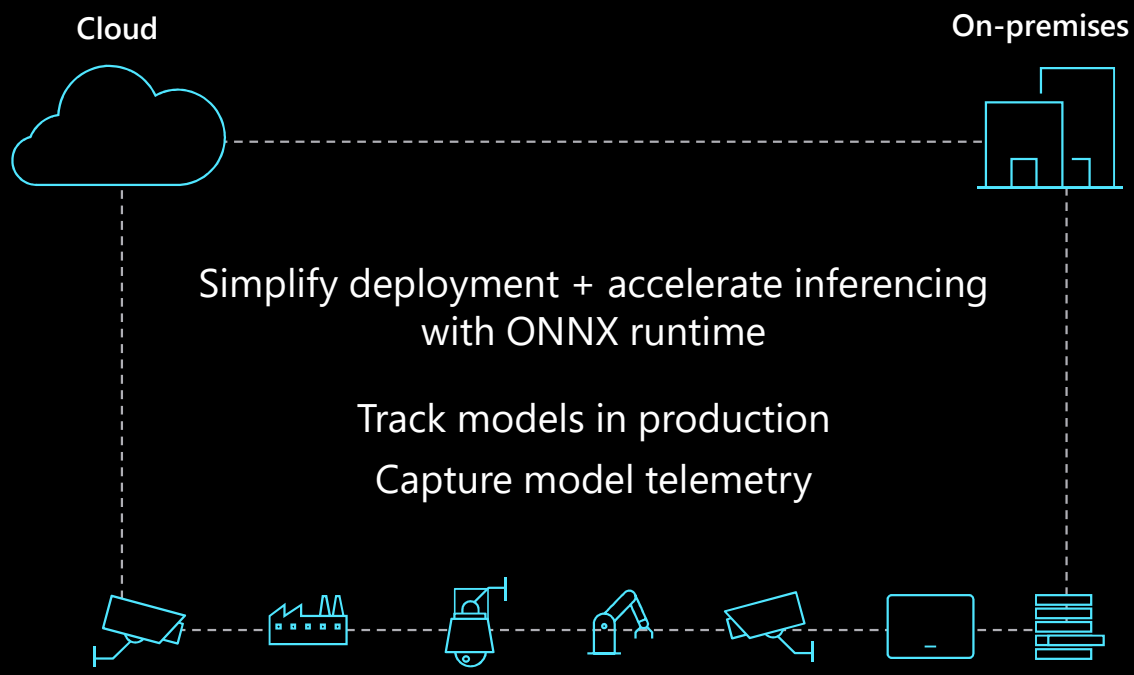

ONNX

Community project created by Facebook and Microsoft

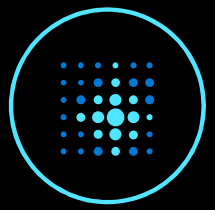
Use the best tool for the job. Train in one framework and transfer to another for inference

Flexible deployment

From the Intelligent Cloud to the Intelligent Edge



Azure Machine Learning



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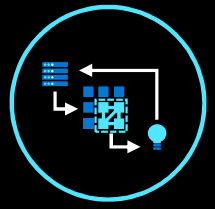
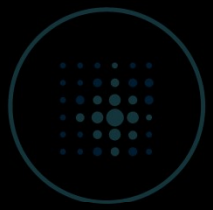


Industry leading MLOps

Integrated with Azure DevOps

Azure Machine Learning

Join us for the next section



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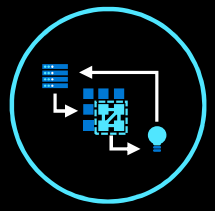

Industry leading MLOps

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.