Microsoft

Présentation Azure ML

16 mars 2020

Vos interlocuteurs

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- AI&ML specialist
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Version du document

- V 1.0
- 12 mars 2020

Machine Learning on Azure

Domain specific pretrained models
To simplify solution development


Vision


Speech


Language


Search

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 Databricks


Azure Machine Learning


Machine Learning VMs

Powerful infrastructure
To accelerate deep learning


CPU


GPU

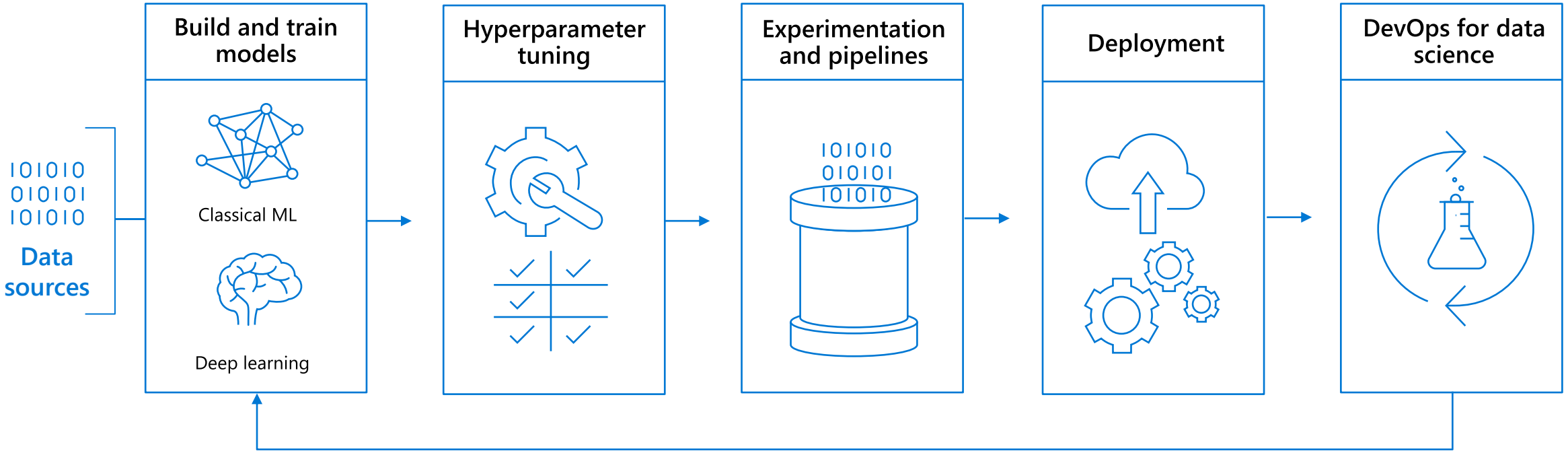

FPGA


From the Intelligent Cloud to the Intelligent Edge

Azure Machine Learning

https://azure.microsoft.com/fr-fr/services/machine-learning/

Building blocks for a Data Science Project



Azure Machine Learning

Set of Azure Cloud Services

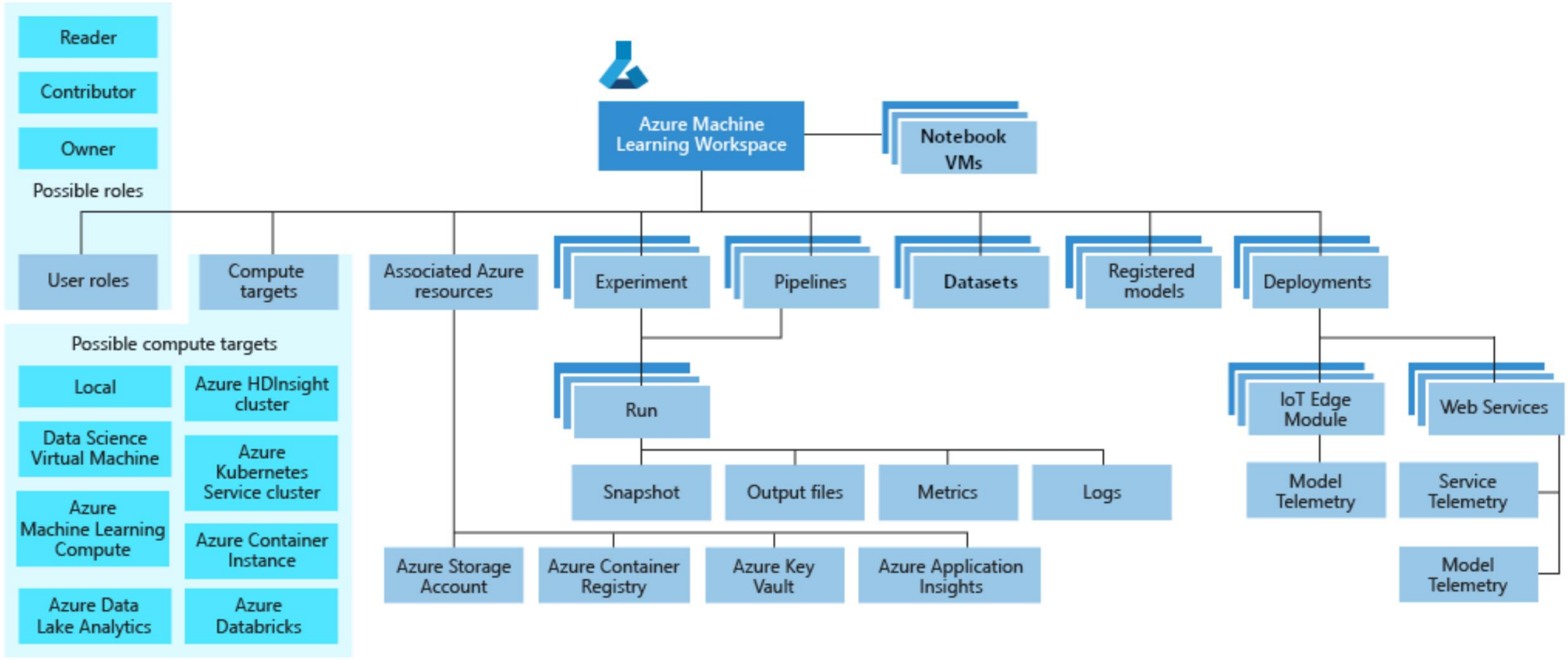
Python
& R SDK, CLI, UX

That enables you to:

- ✓ Prepare Data
- ✓ Build Models
- ✓ Train Models
- ✓ Manage Models
- ✓ Track Experiments
- ✓ Deploy Models

Composants Azure ML

Azure Machine Learning components

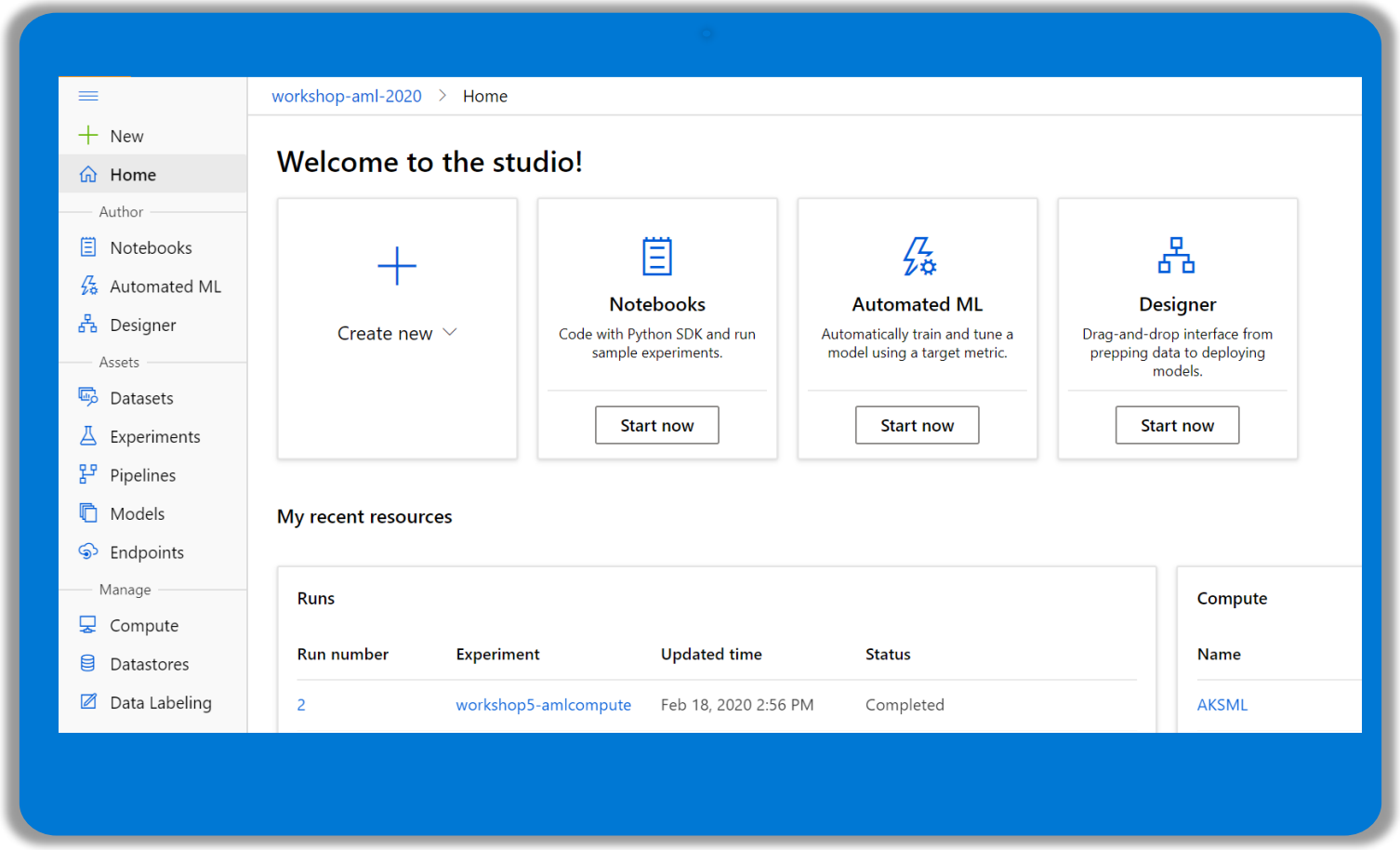


Azure ML Studio

Azure ML Studio

For all skill levels

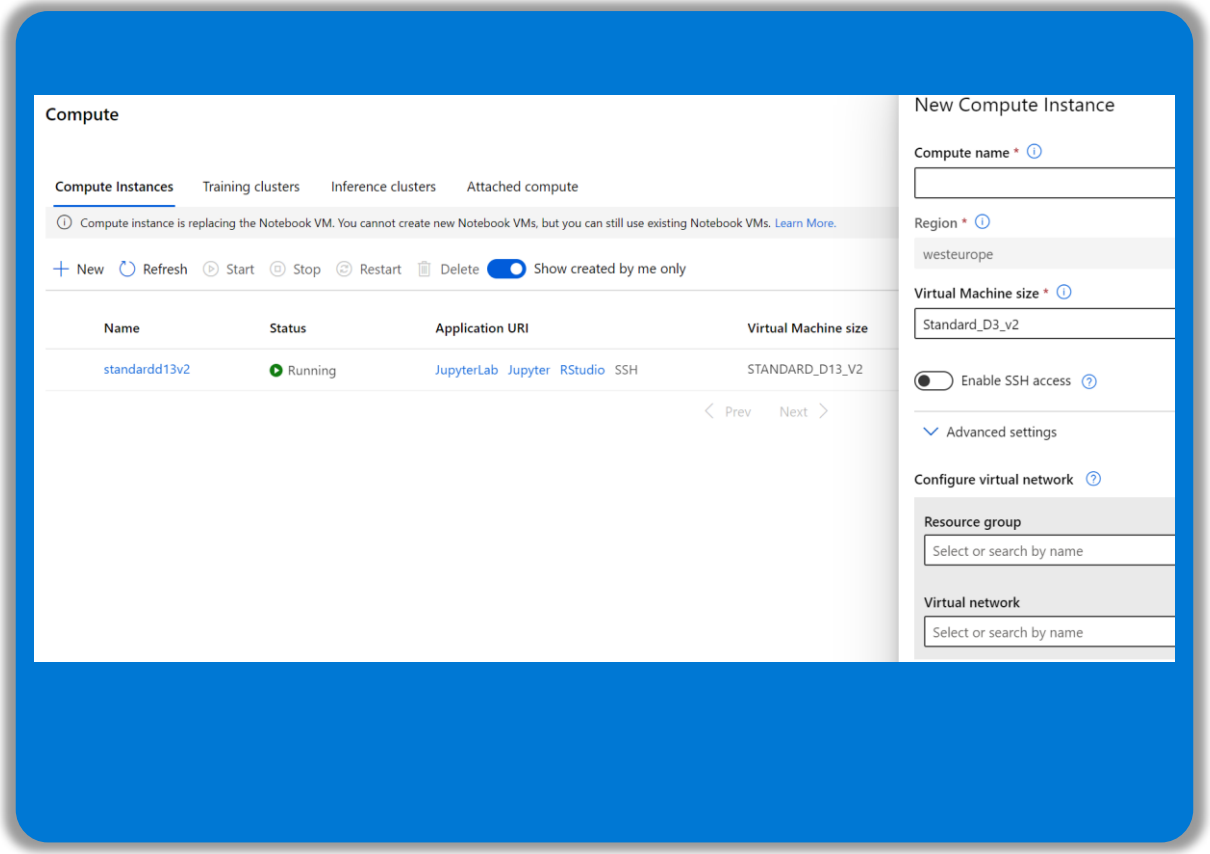
studio web experience



Notebooks

Machine Learning notebooks

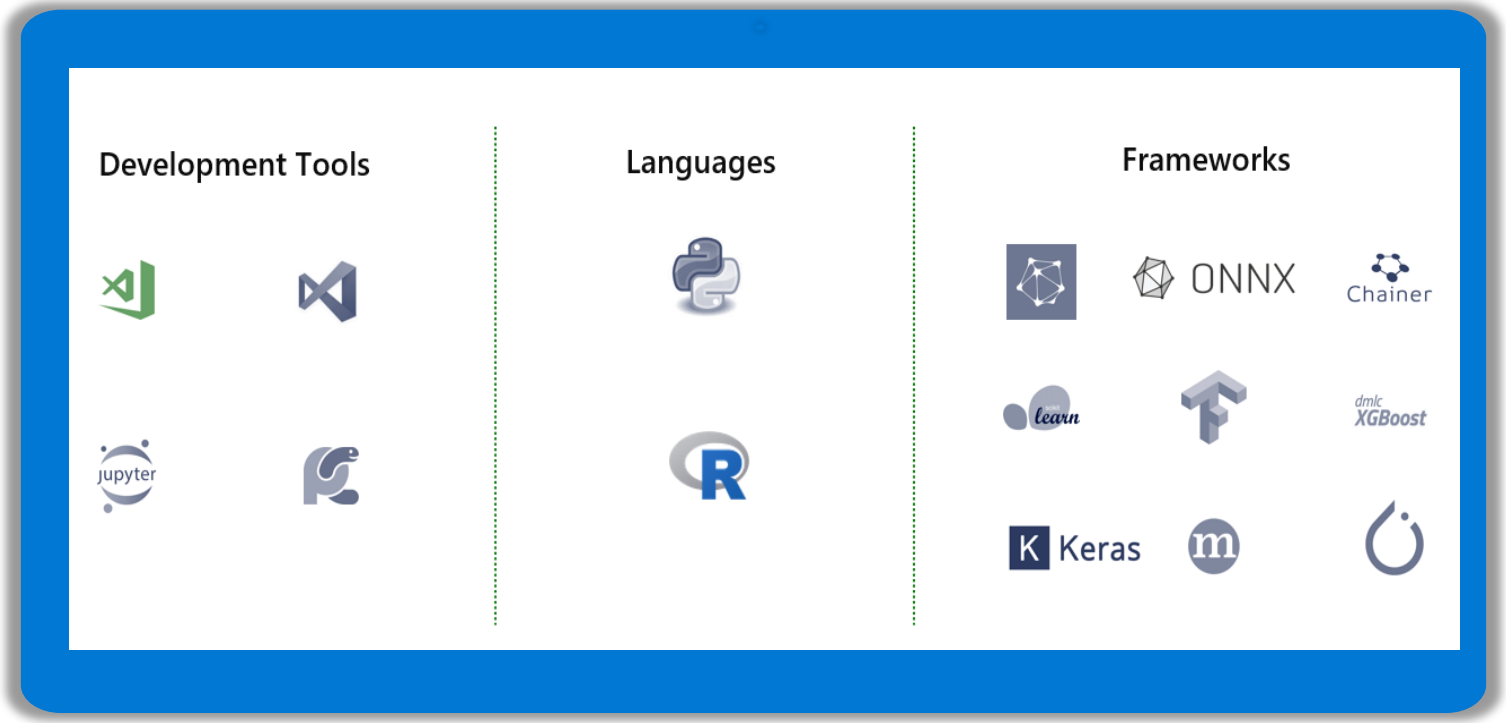
- Fully managed cloud-based solution for data scientists to get started with ML machine learning
- Deeply integrated with Azure ML workspaces and datastores
- First-class experience for model authoring through integrated notebooks using Azure ML Python and R SDK.
- Management and enterprise readiness capabilities for IT administrators.



Platform

Azure Machine Learning

Open and interoperable platform



Powerful infrastructure

Accelerate deep learning

CPUs

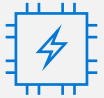
General purpose machine learning

D, F, L, M, H Series

GPUs

Deep learning

N Series



FPGAs

Specialized hardware accelerated deep learning

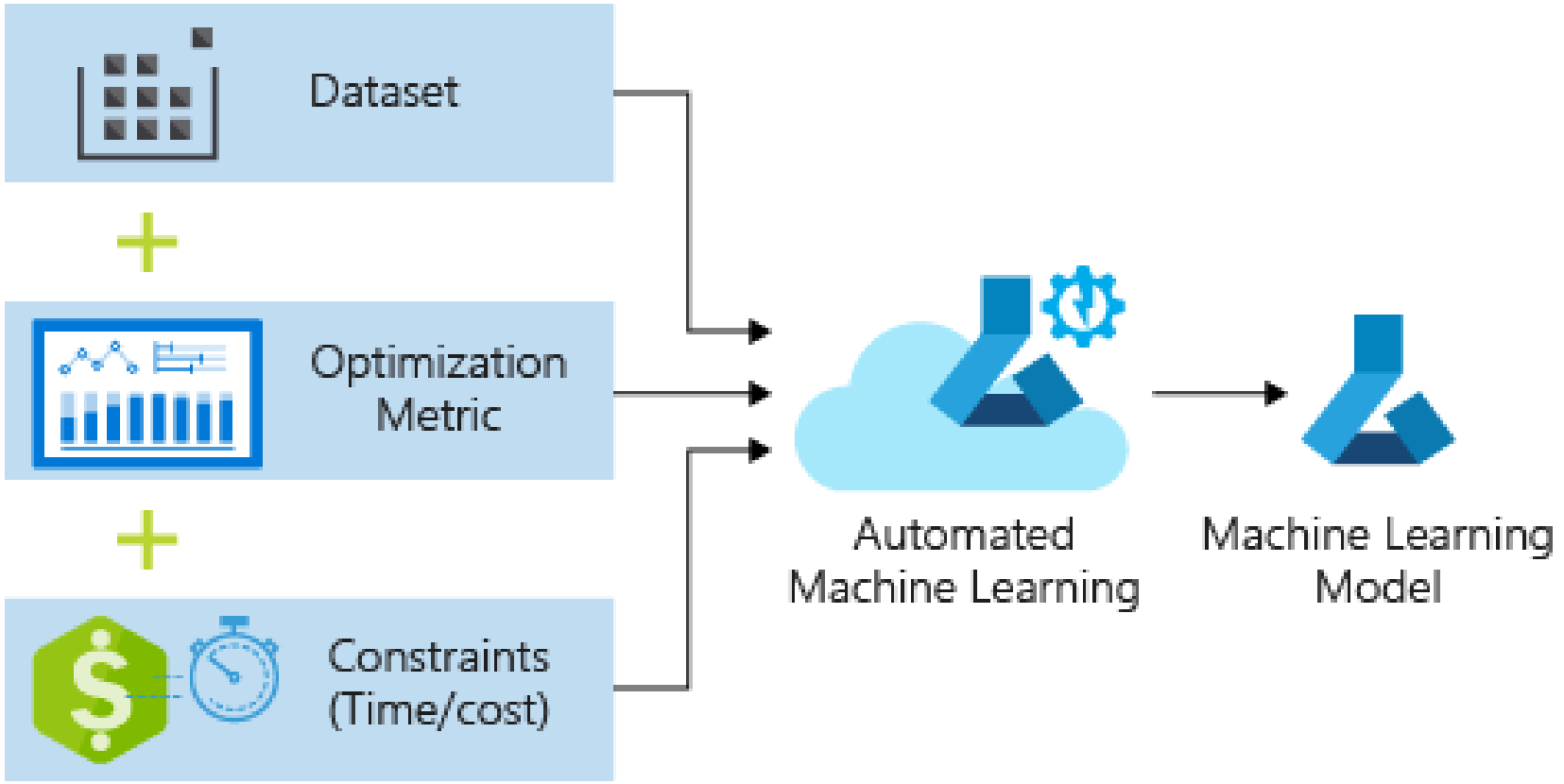
AML hardware accelerated models (Project Brainwave)

Optimized for flexibility

Optimized for performance

AutoML

Automated ML



Azure Machine Learning accelerates model development

with automated machine learning

Input

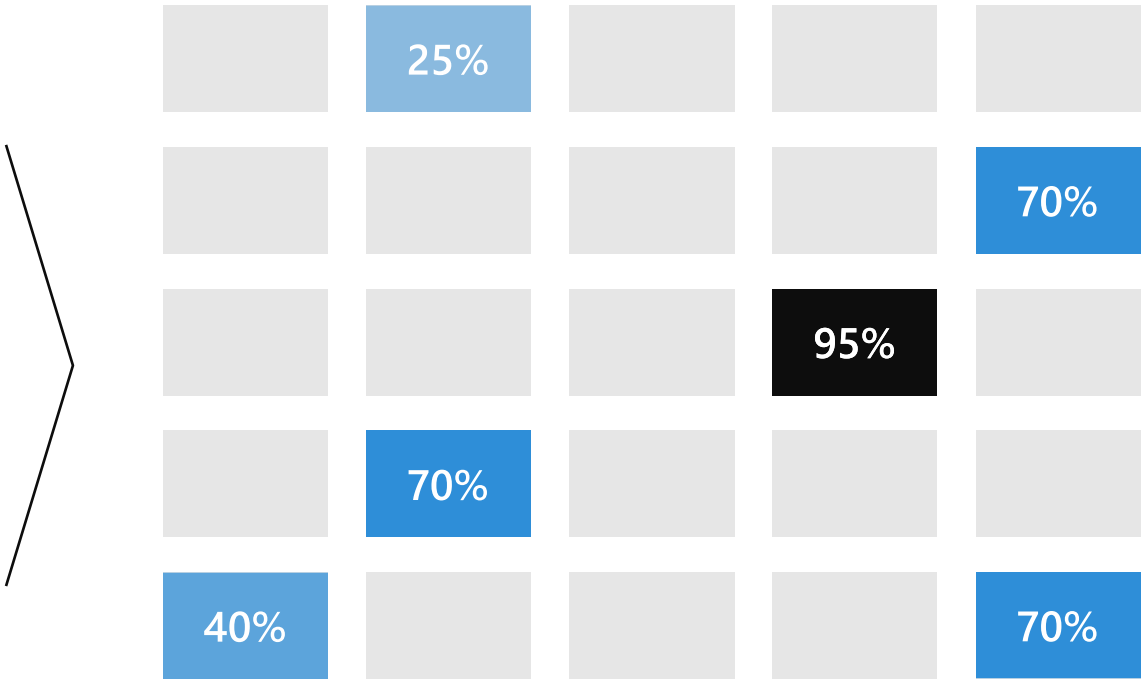
101010
010101
101010

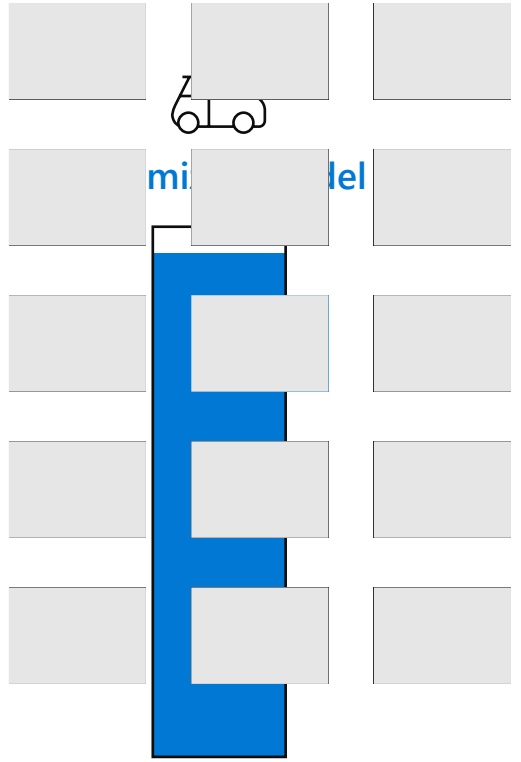
Enter data

Define goals

Apply constraints

Intelligently test multiple models in parallel





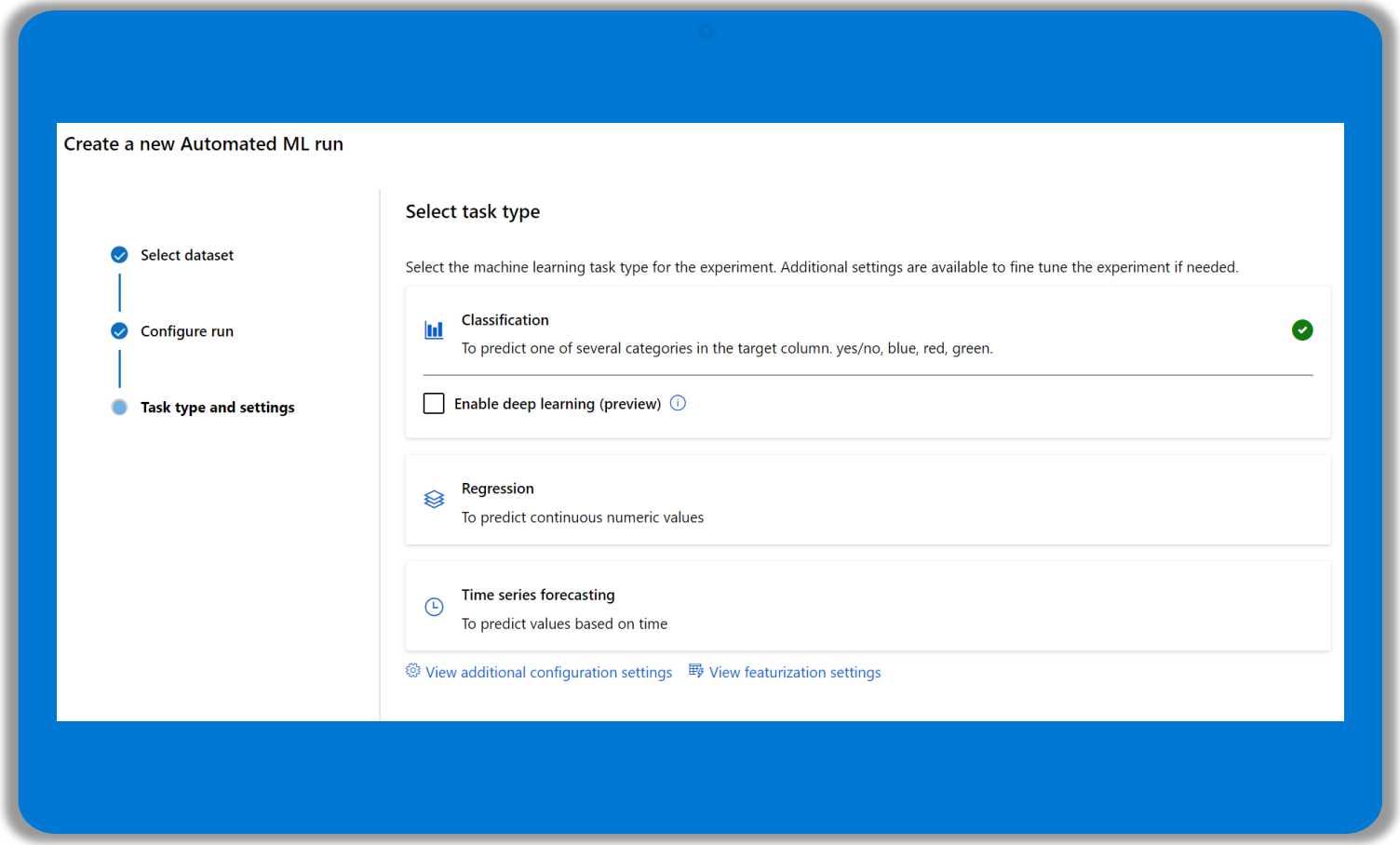
Automated ML

Automatically build and deploy predictive models using the no-code UI or through a code-first notebooks experience.

Increase productivity with easy data exploration and profiling and with intelligent feature engineering.

Easily create accurate models customized to your data and refined by a wide array of algorithms and hyperparameters.

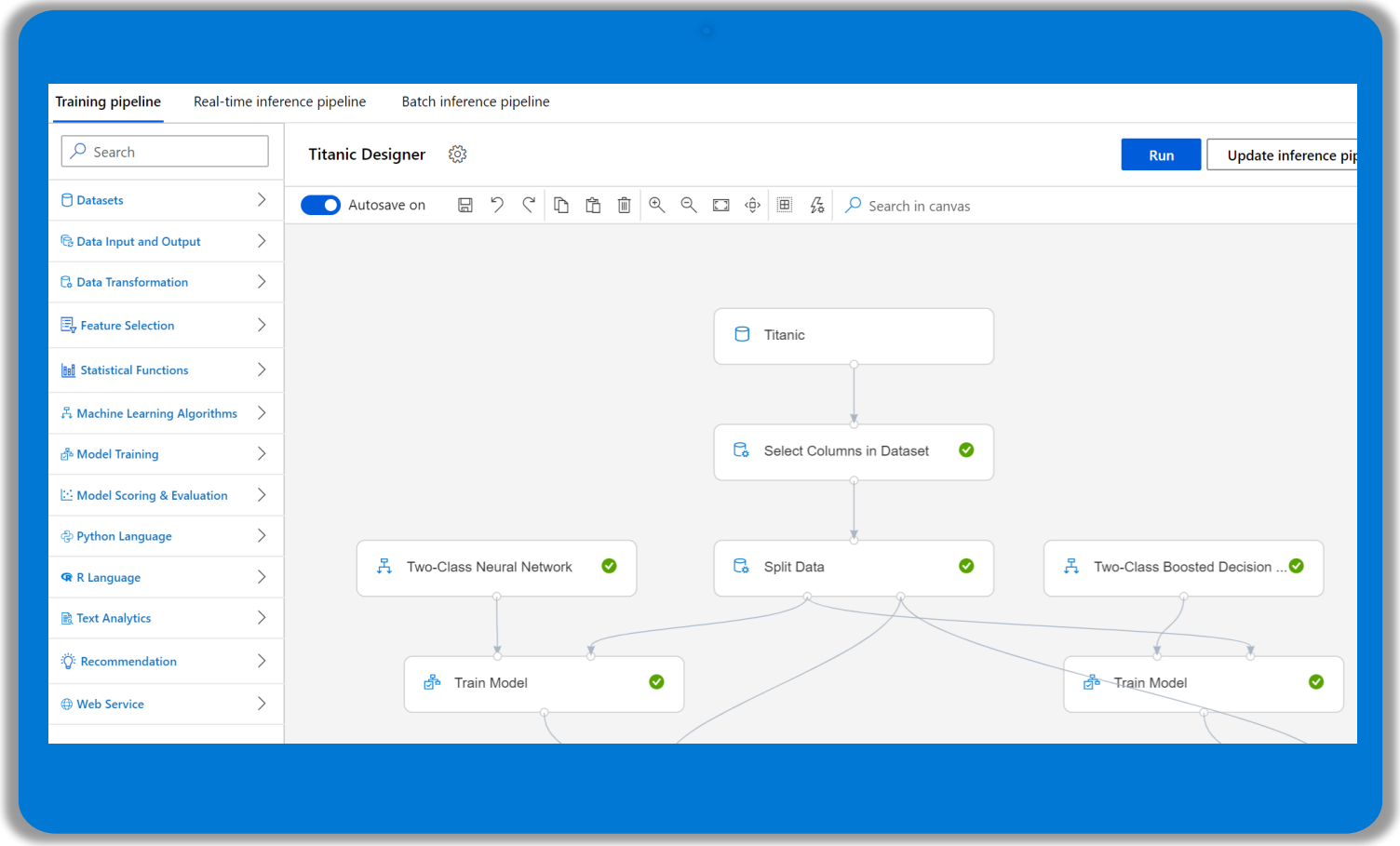
Build responsible AI solutions with model interpretability, and fine-tune your models to improve accuracy.



Designer

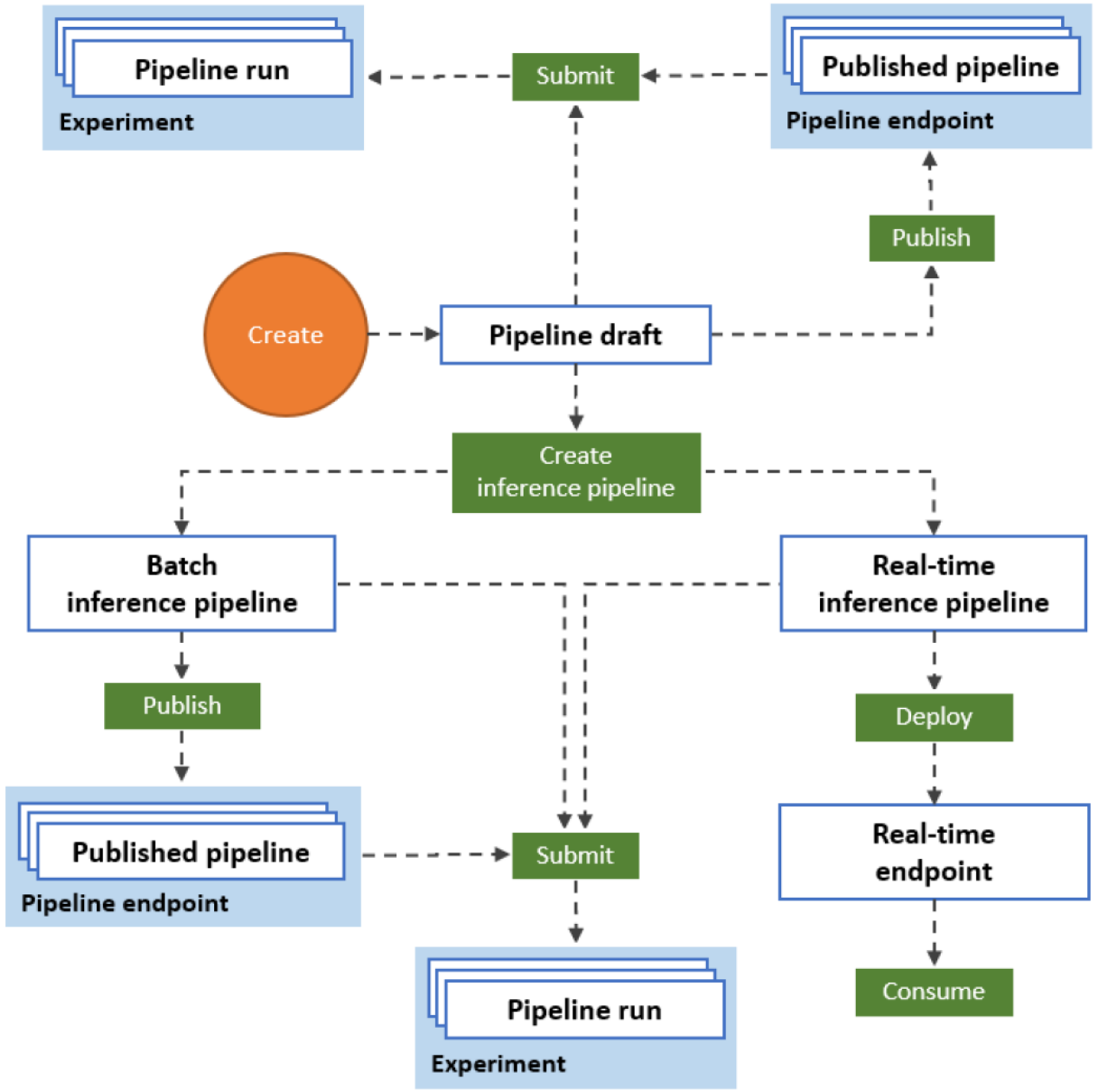
Designer

- Drag-n-drop workflow capability
- Simplify the process of building, testing, and operating machine learning models
- Create new pipelines



Pipelines

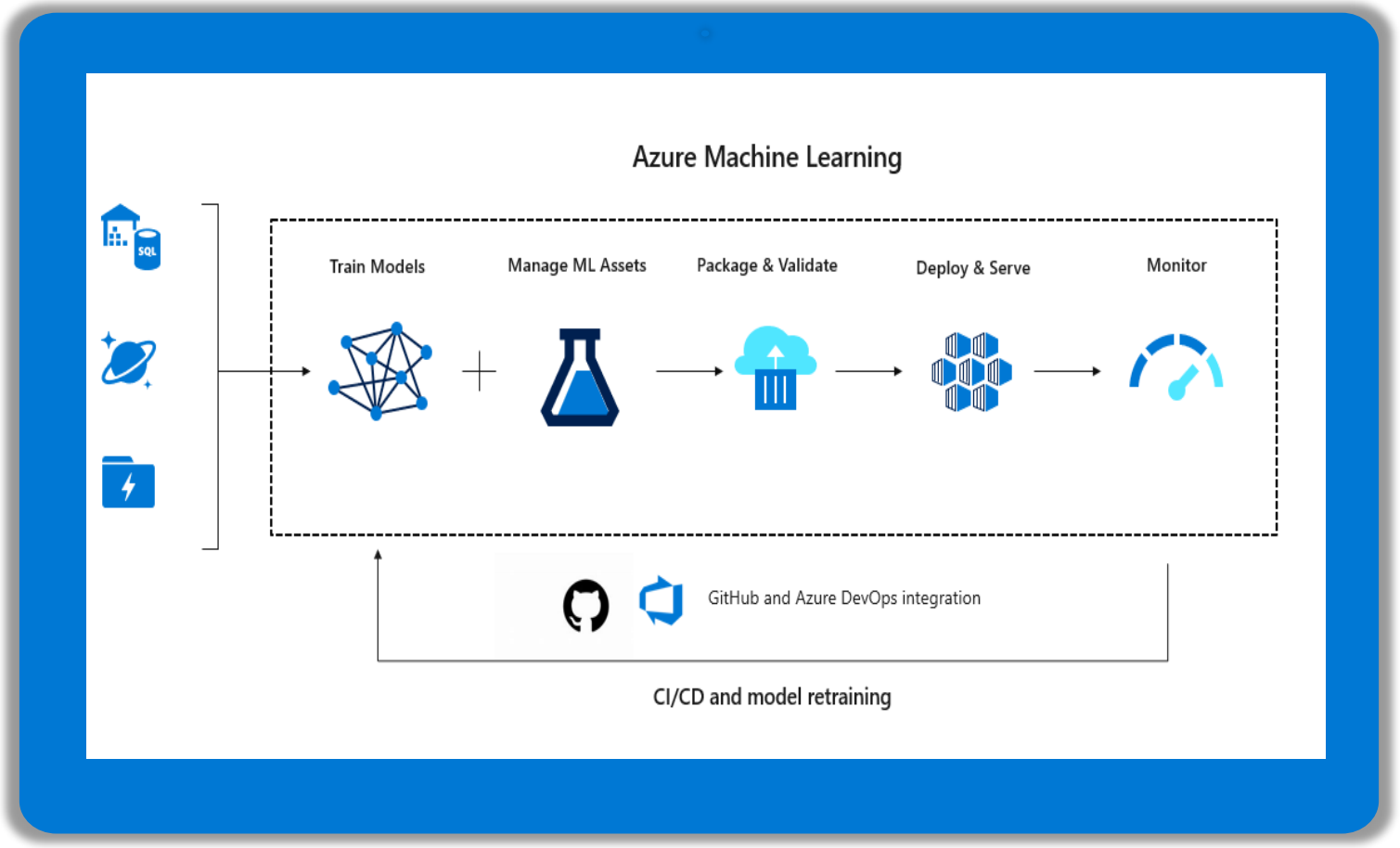
Pipelines


Pipeline run
Experiment
Submit
Published pipeline
Pipeline endpoint
Publish
Create
Pipeline draft
Create
inference pipeline
Batch
inference pipeline
Real-time
inference pipeline
Publish
Deploy
Published pipeline
Pipeline endpoint
Submit
Real-time
endpoint
Pipeline run
Experiment
Consume

MLOps

Azure Machine Learning

Industry leading MLOps



DevOps

Code reproducibility

Code testing

App deployment

MLOps

Model reproducibility

Model validation

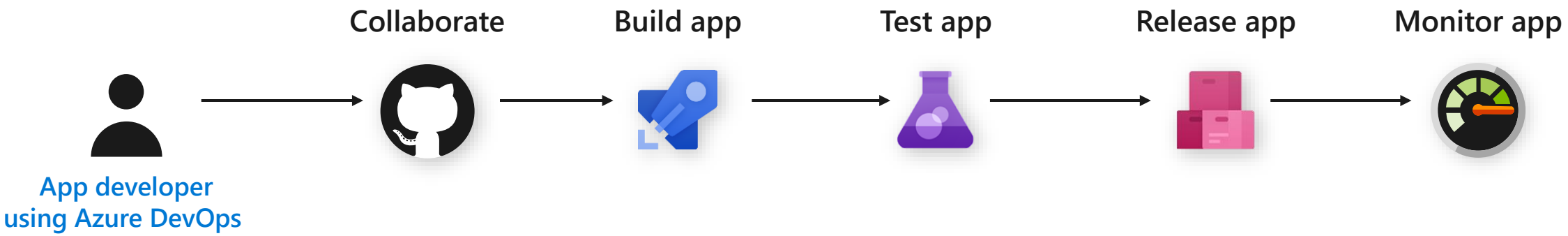
Model deployment

Model retraining

MLOps

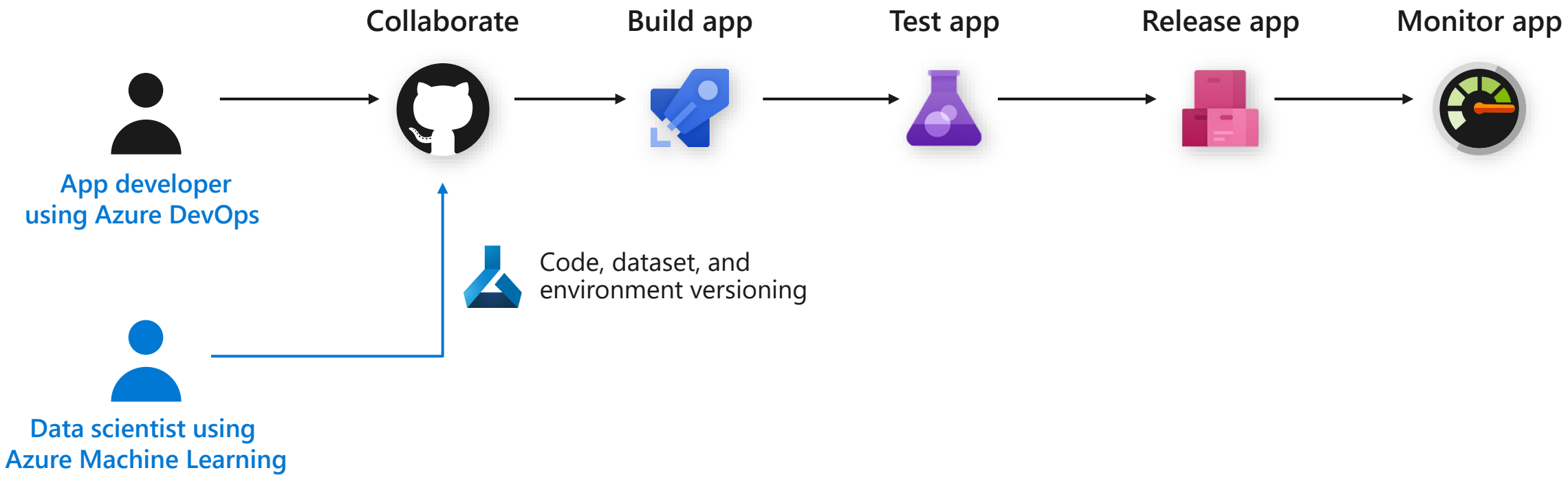
- **Create reproducible ML pipelines.**
  Pipelines allow you to define repeatable and reusable steps for your data preparation, training, and scoring processes.
- **Register, package, and deploy models** from anywhere and track associated metadata required to use the model.
- **Capture the governance** data required for capturing the end-to-end ML lifecycle, including who is publishing models, why changes are being made, and when models were deployed or used in production.
- **Notify and alert on events in the ML lifecycle** such as experiment completion, model registration, model deployment, and data drift detection.
- **Monitor ML applications** for operational and ML-related issues.
  Compare model inputs between training and inference, explore model-specific metrics, and provide monitoring and alerts on your ML infrastructure.
- **Automate the end-to-end ML lifecycle with Azure Machine Learning and Azure DevOps** to frequently update models, test new models, and continuously roll out new ML models alongside your other applications and services.

MLOps with Azure Machine Learning



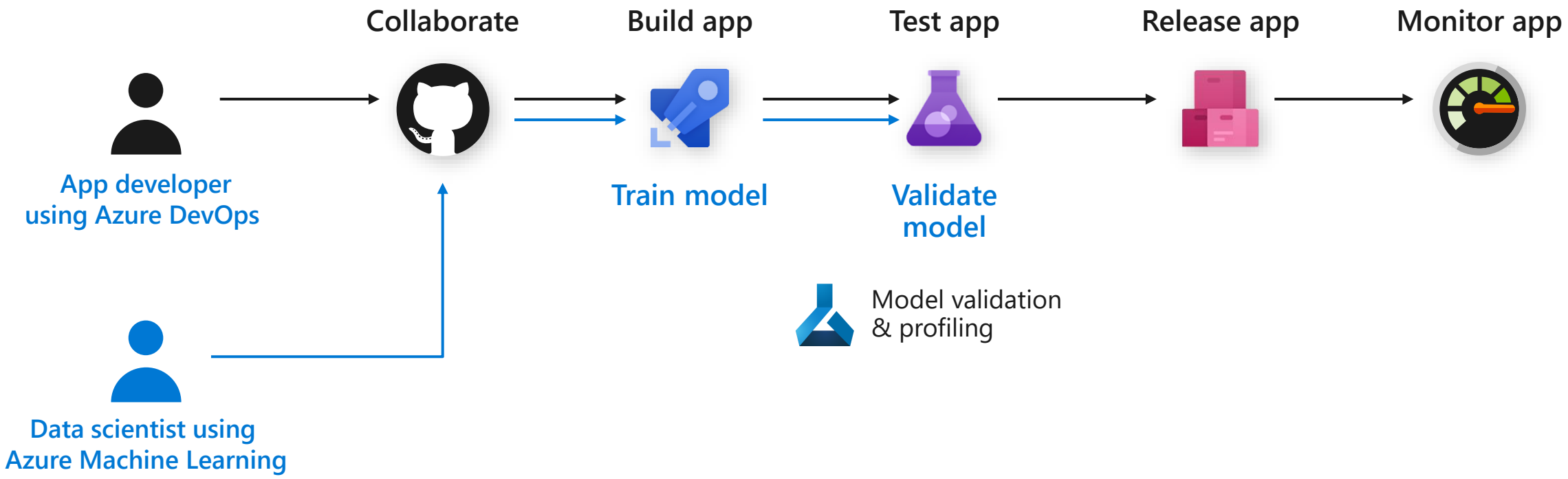
- ☐ Model reproducibility
- ☐ Model validation
- ☐ Model deployment
- ☐ Model retraining

MLOps with Azure Machine Learning



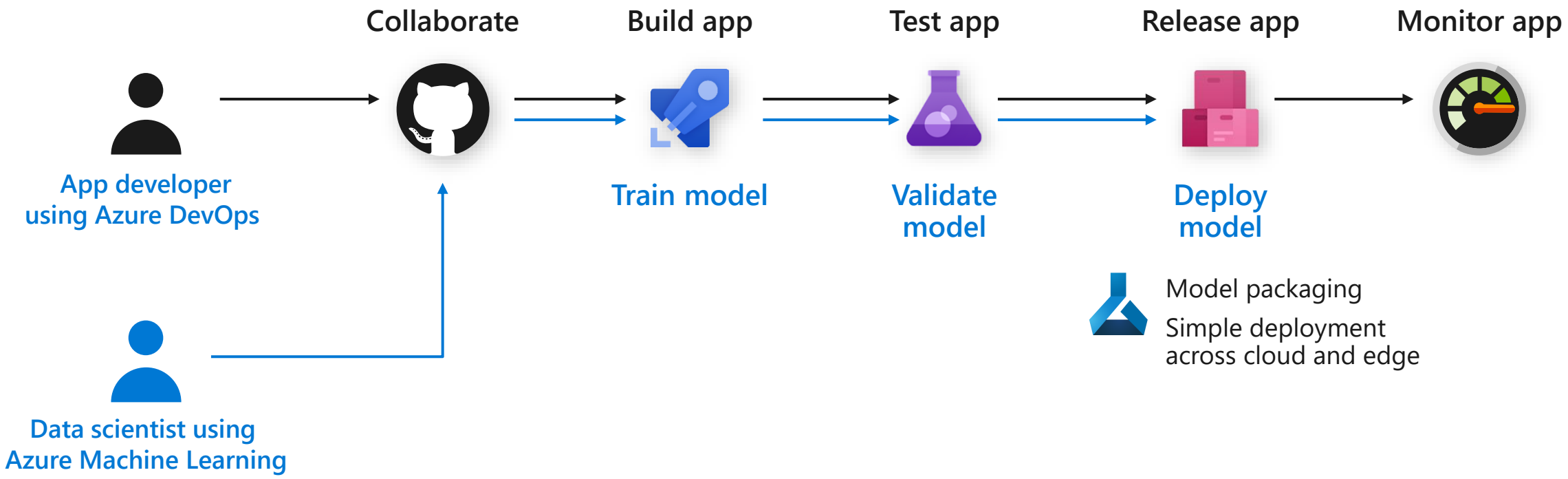
- [x] Model reproducibility
- [ ] Model validation
- [ ] Model deployment
- [ ] Model retraining

MLOps with Azure Machine Learning



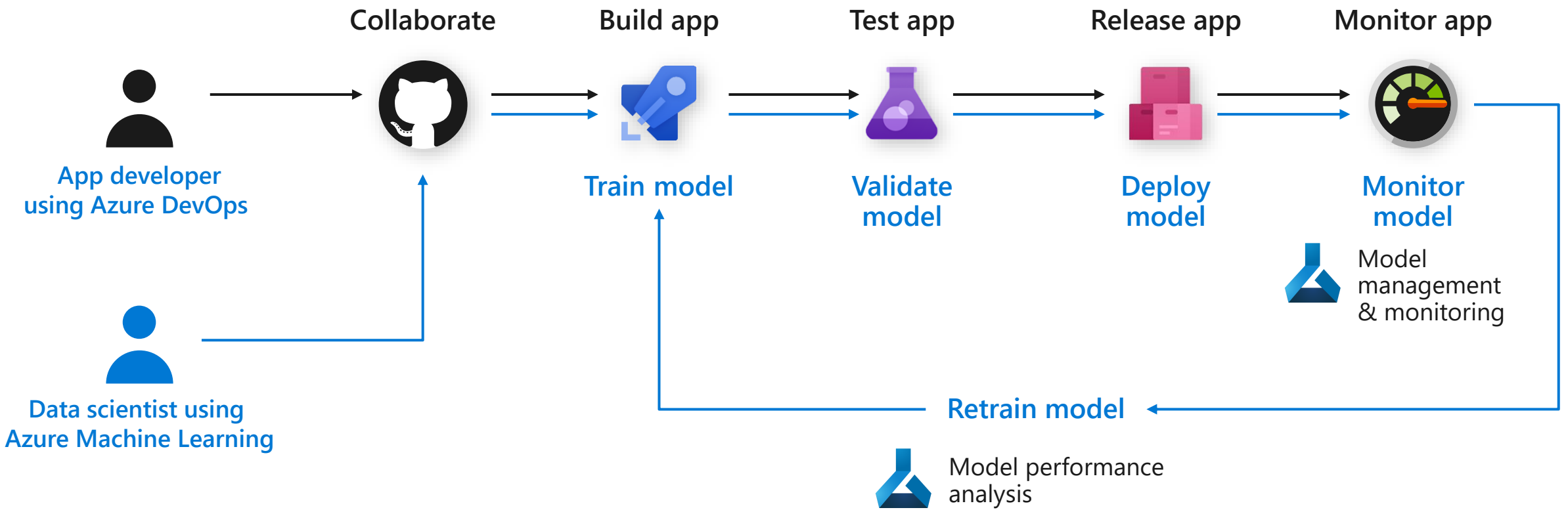
- [x] Model reproducibility
- [x] Model validation
- [ ] Model deployment
- [ ] Model retraining

MLOps with Azure Machine Learning



- [x] Model reproducibility
- [x] Model validation
- [x] Model deployment
- [ ] Model retraining

MLOps with Azure Machine Learning



- Model reproducibility
- Model validation
- Model deployment
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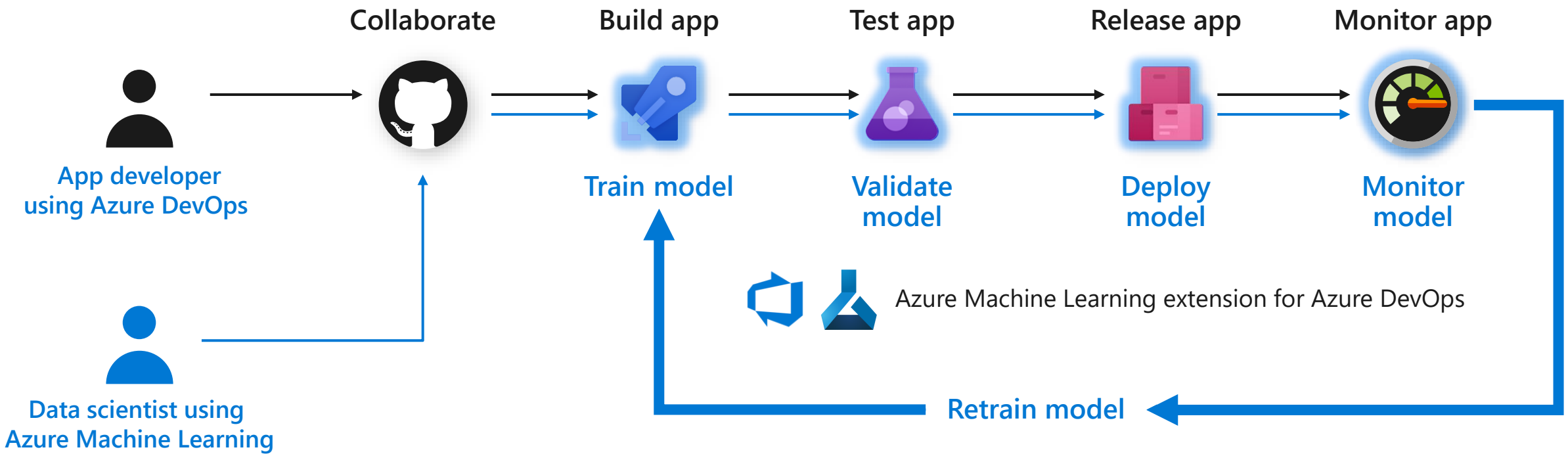
MLOps with Azure Machine Learning



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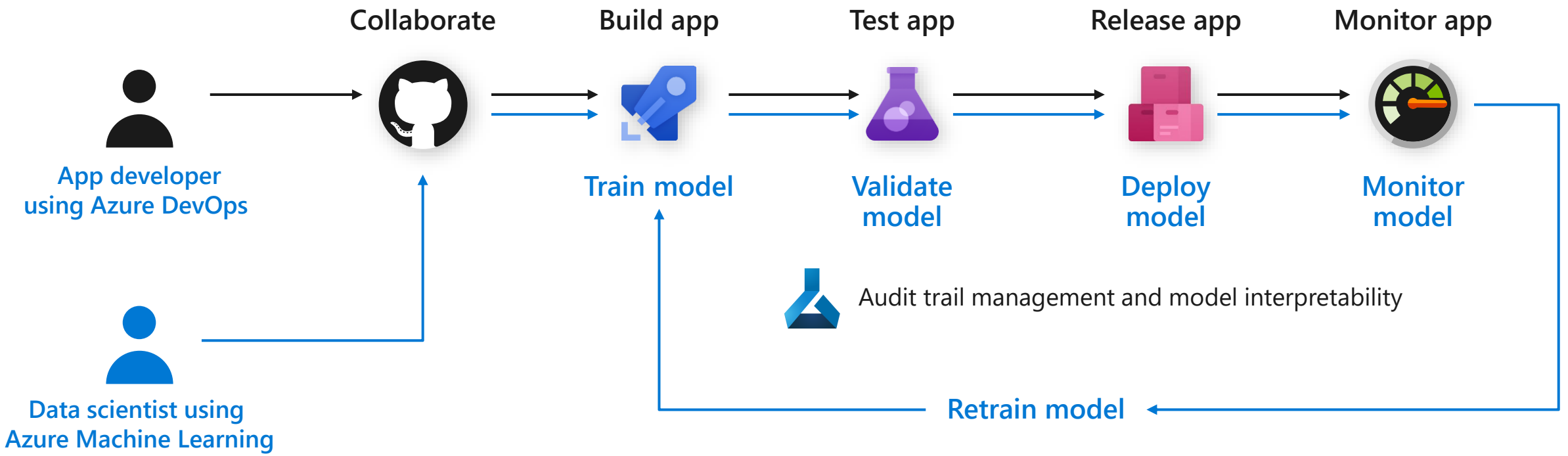
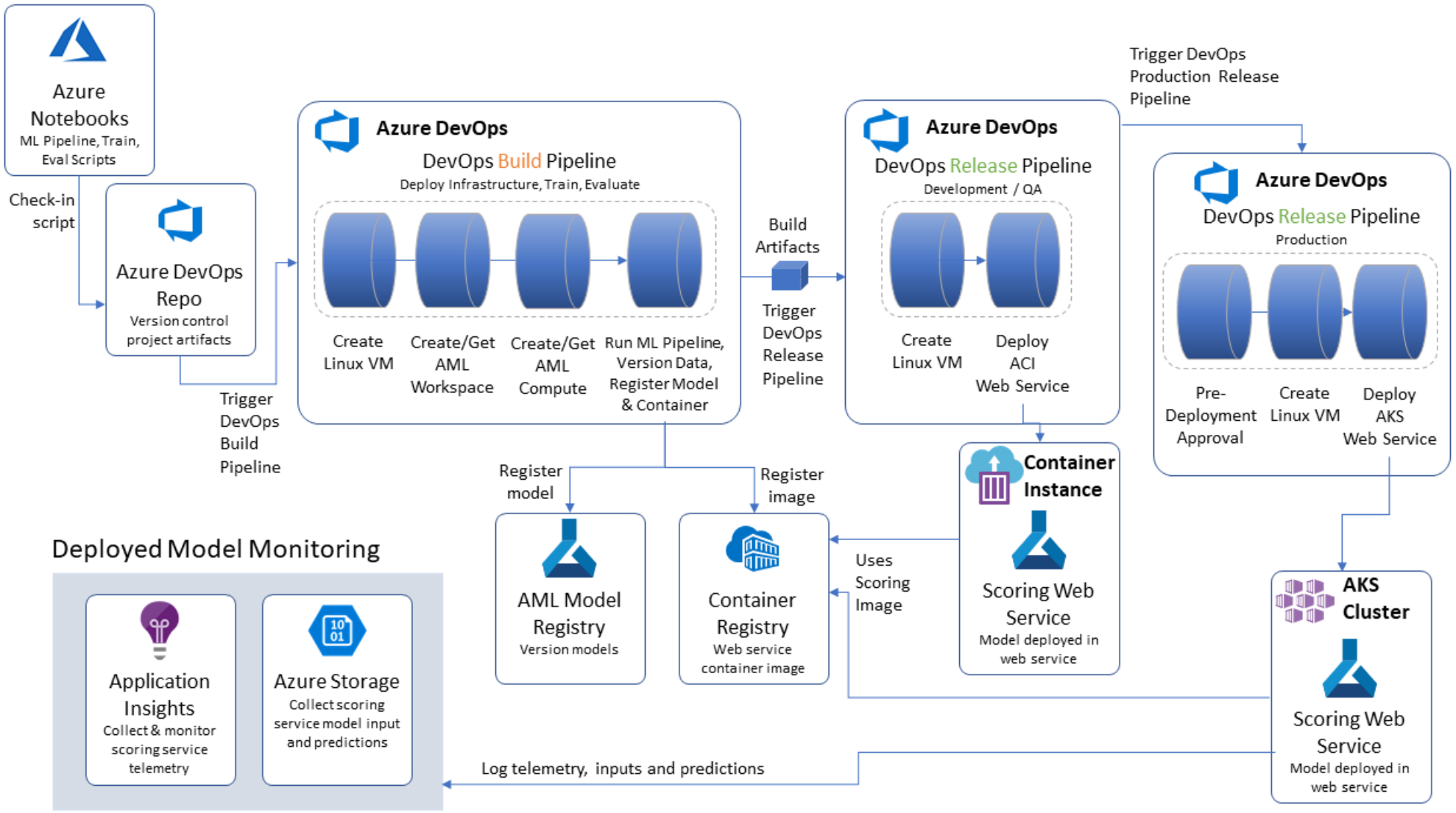
MLOps with Azure Machine Learning

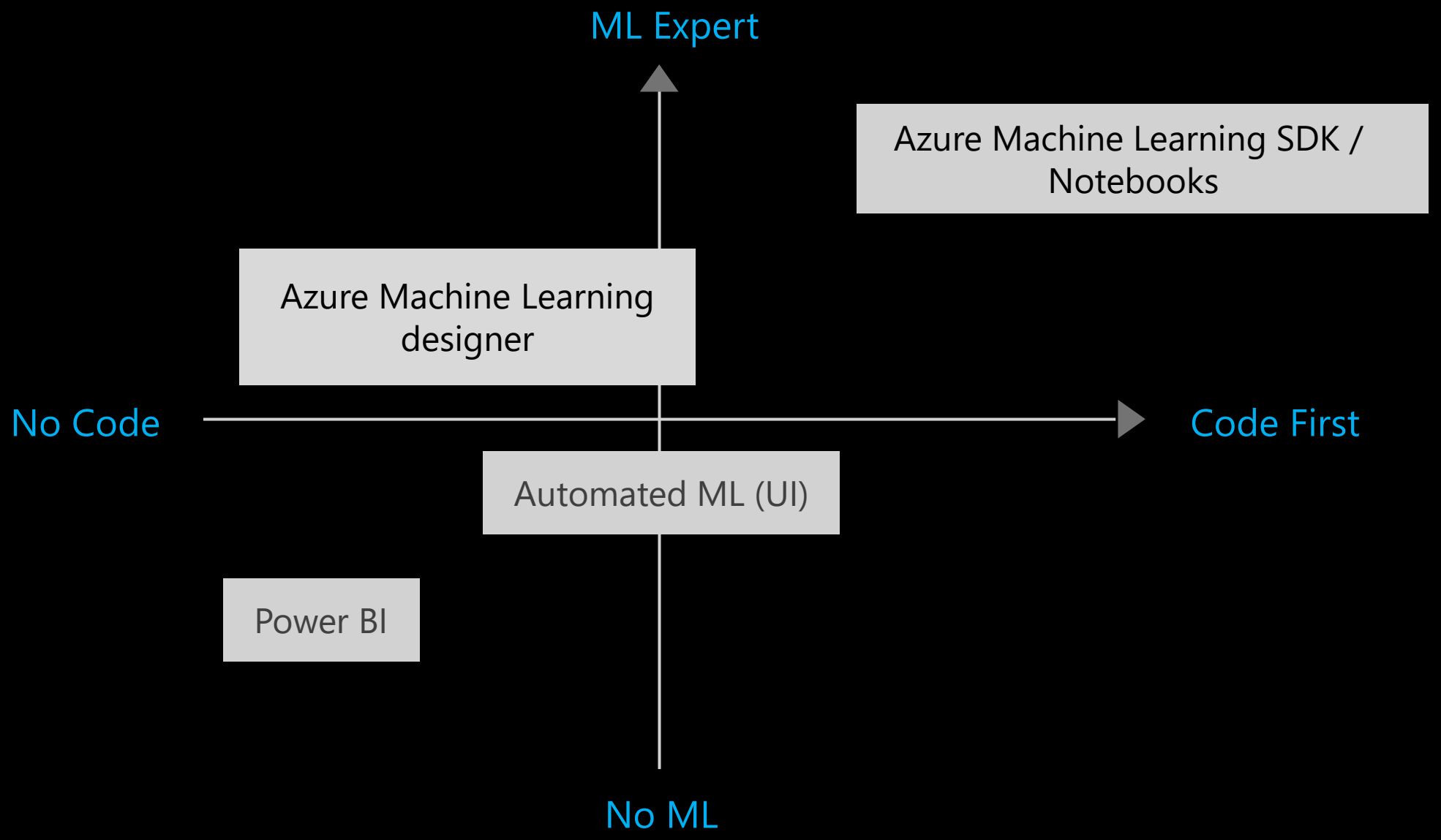


- Model reproducibility
- Model validation
- Model deployment
- Model retraining



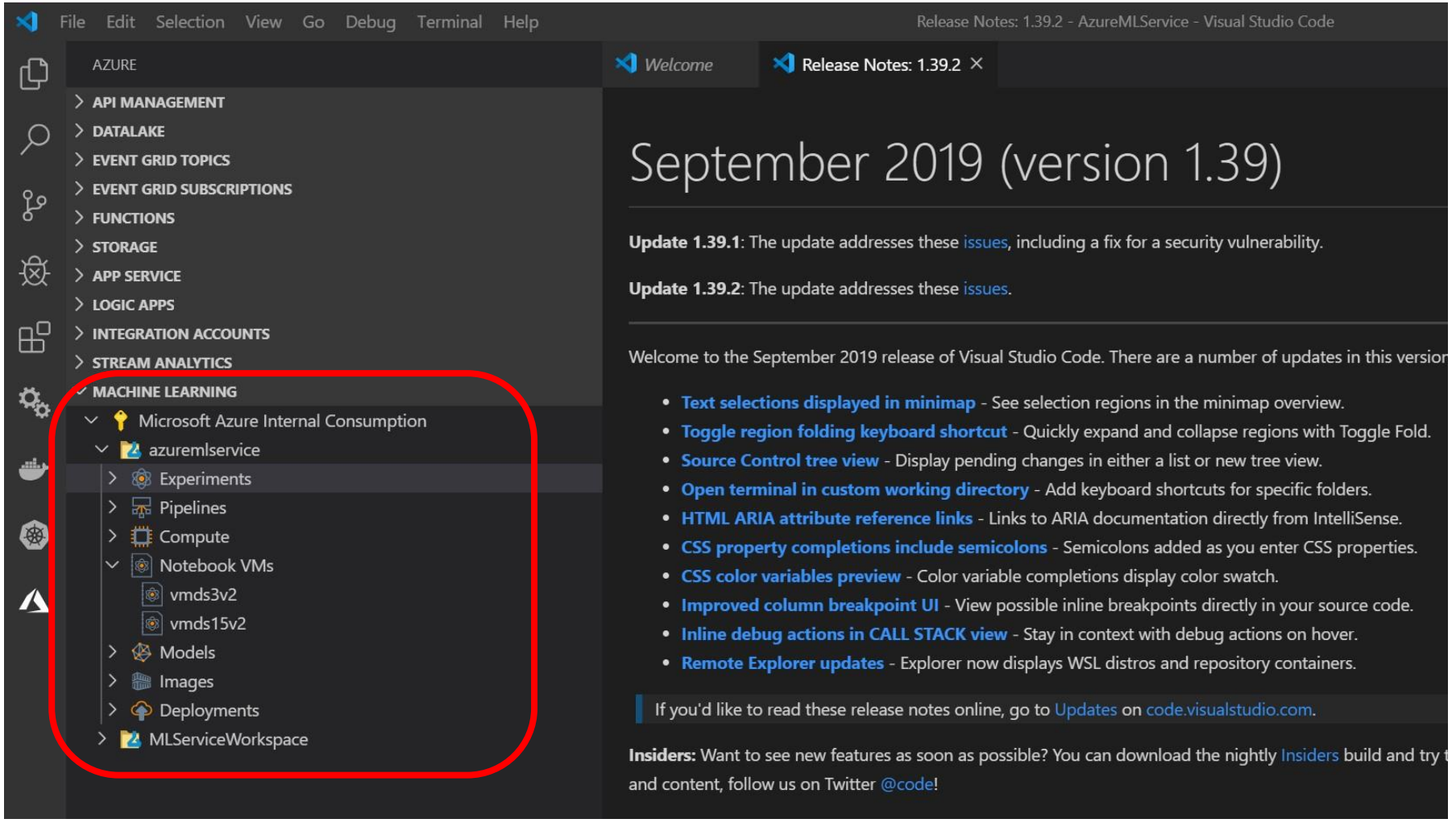
- Model reproducibility
- Model validation
- Model deployment
- Model retraining

Build across skill levels with Azure Machine Learning



Integration with VS Code

Integration with Visual Studio



Roles

Roles

- Standard roles
- Custom roles

Azure Machine Learning operation	Owner	Contributor	Reader
Create workspace	✓	✓	
Share workspace	✓		
Upgrade workspace to Enterprise edition	✓		
Create compute target	✓	✓	
Attach compute target	✓	✓	
Attach data stores	✓	✓	
Run experiment	✓	✓	
View runs/metrics	✓	✓	✓
Register model	✓	✓	
Create image	✓	✓	
Deploy web service	✓	✓	
View models/images	✓	✓	✓
Call web service	✓	✓	✓

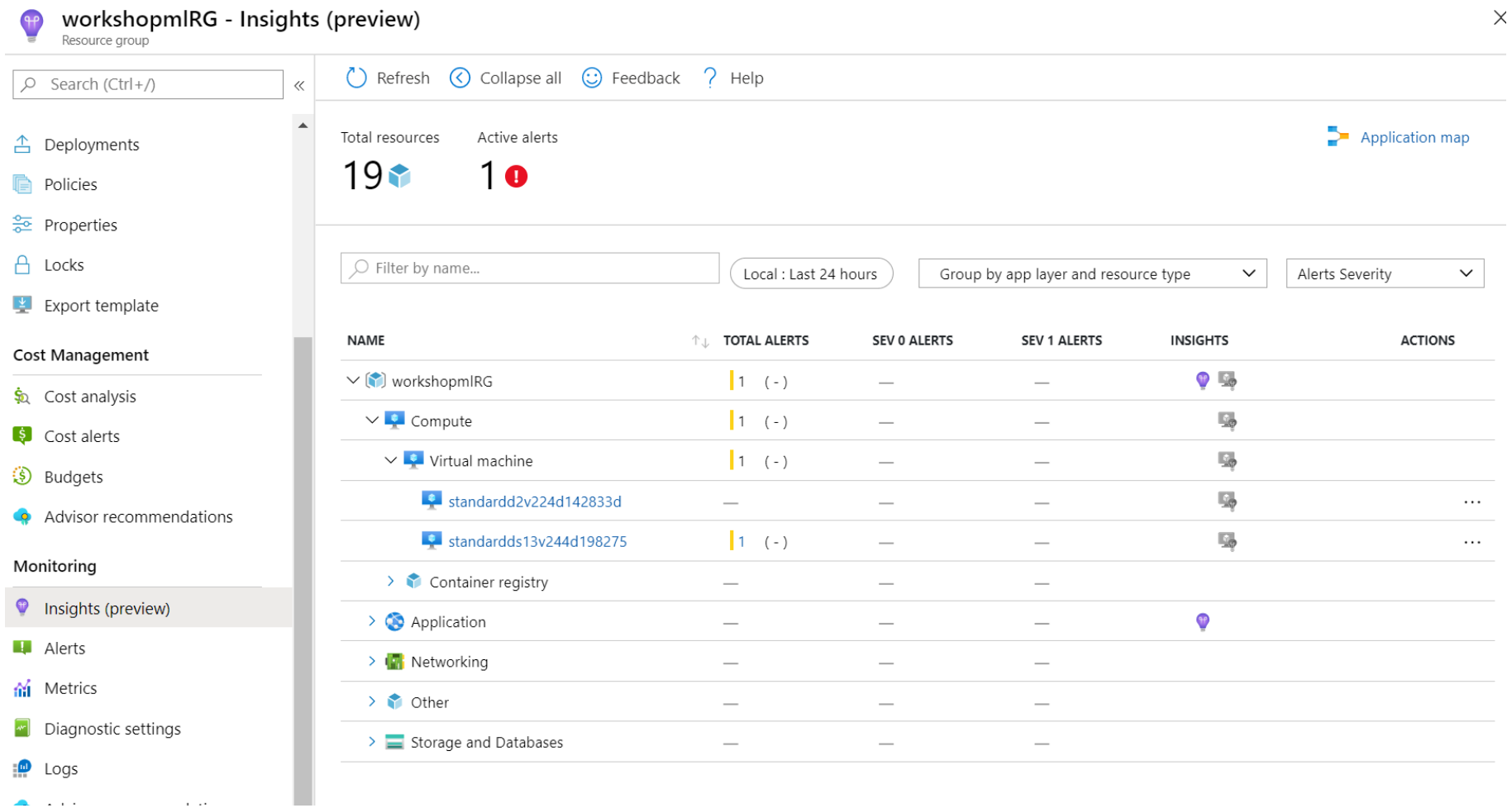
Roles

```
{
  "Name": "Data Scientist Demo",
  "Description": "Can create experiments, submit runs, deploy models to test envionments; Cannot create compute or register datastores",
  "Actions": [
    "Microsoft.MachineLearningServices/workspaces/*/read",
    "Microsoft.MachineLearningServices/workspaces/*/action"
  ],
  "NotActions": [
    "Microsoft.MachineLearningServices/workspaces/computes/listKeys/action",
    "Microsoft.MachineLearningServices/workspaces/listKeys/action"
  ],
  "DataActions": [
    "Microsoft.MachineLearningServices/workspaces/*/read",
    "Microsoft.MachineLearningServices/workspaces/*/write",
    "Microsoft.MachineLearningServices/workspaces/*/delete",
    "Microsoft.MachineLearningServices/workspaces/*/action"
  ],
  "NotDataActions": [
    "Microsoft.MachineLearningServices/workspaces/services/aks/prod/write",
    "Microsoft.MachineLearningServices/workspaces/services/aks/prod/delete",
    "Microsoft.MachineLearningServices/workspaces/endpoints/pipelines/write",
    "Microsoft.MachineLearningServices/workspaces/endpoints/pipelines/delete",
    "Microsoft.MachineLearningServices/workspaces/datastores/write"
  ],
  "AssignableScopes": [
        "/subscriptions/e9b2ec51-5c94-4fa8-809a-dc1e695e4896"
  ]
}
```

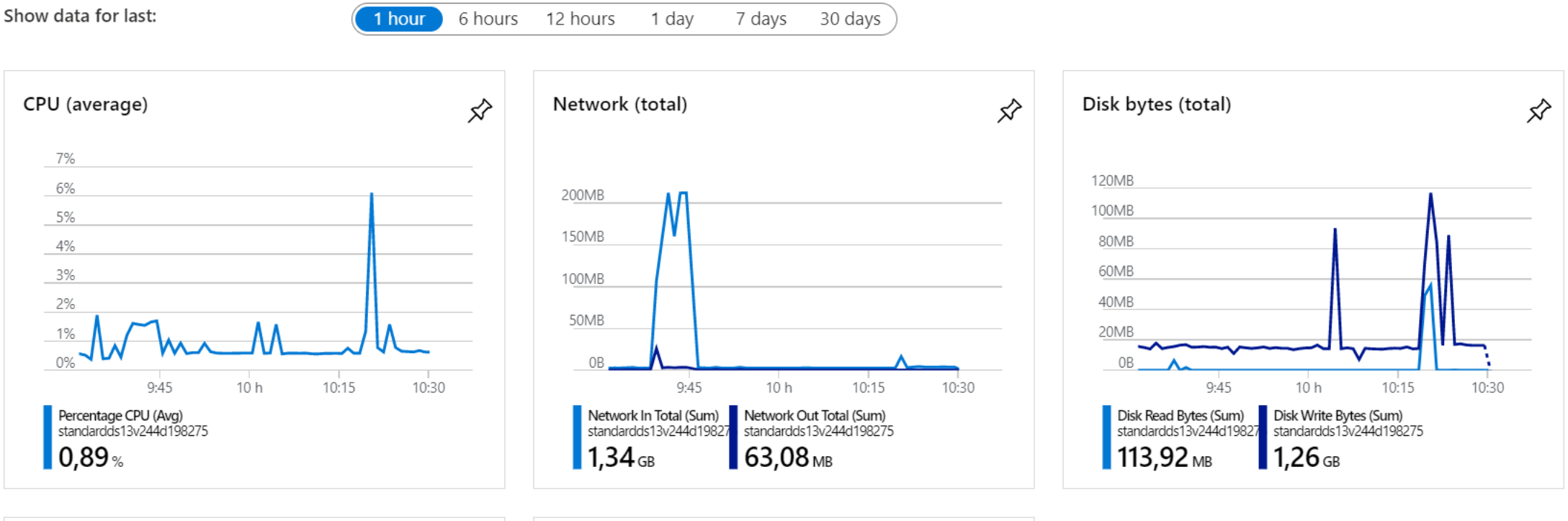
https://docs.microsoft.com/en-us/azure/machine-learning/service/how-to-assign-roles

Monitoring Azure ML

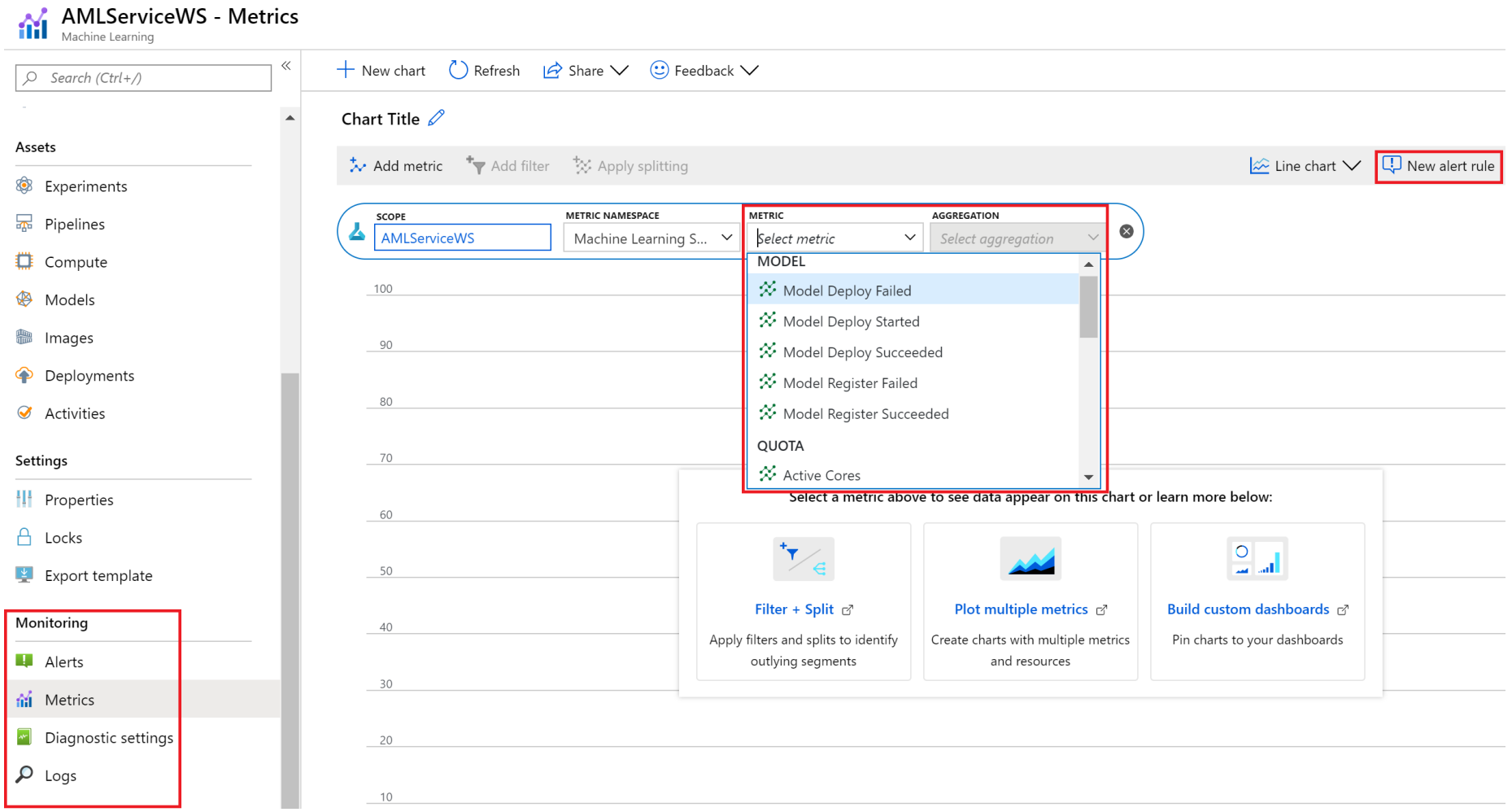
Monitoring Azure ML with Azure Monitor



Monitoring Azure ML with Azure Monitor



Monitoring Azure ML models



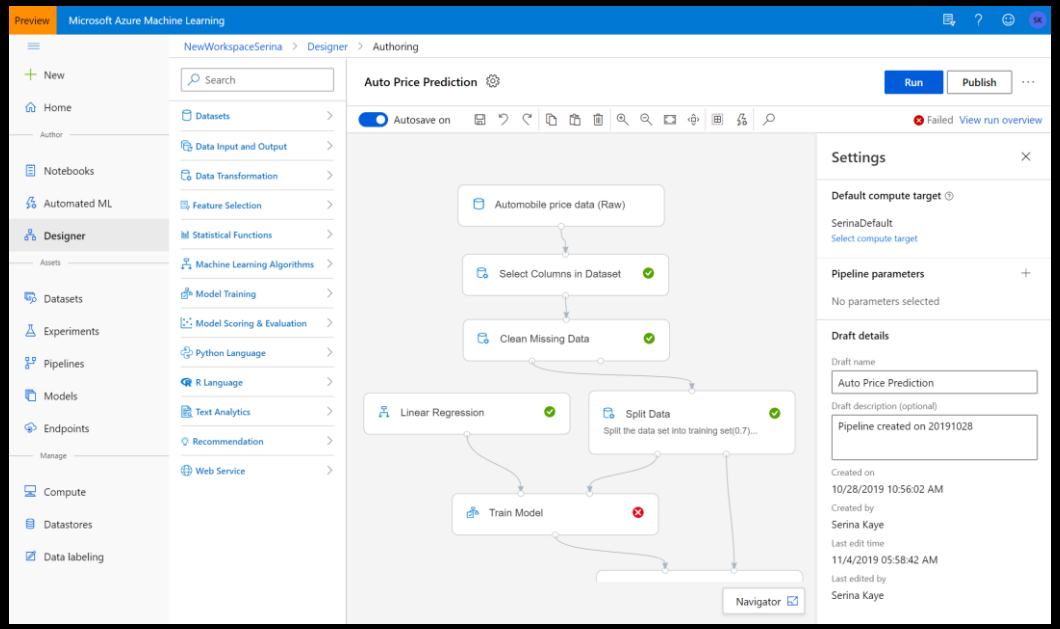
Azure ML Editions

Azure Machine Learning Enterprise Edition

- **Enterprise Edition**
  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 currently in preview. 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.



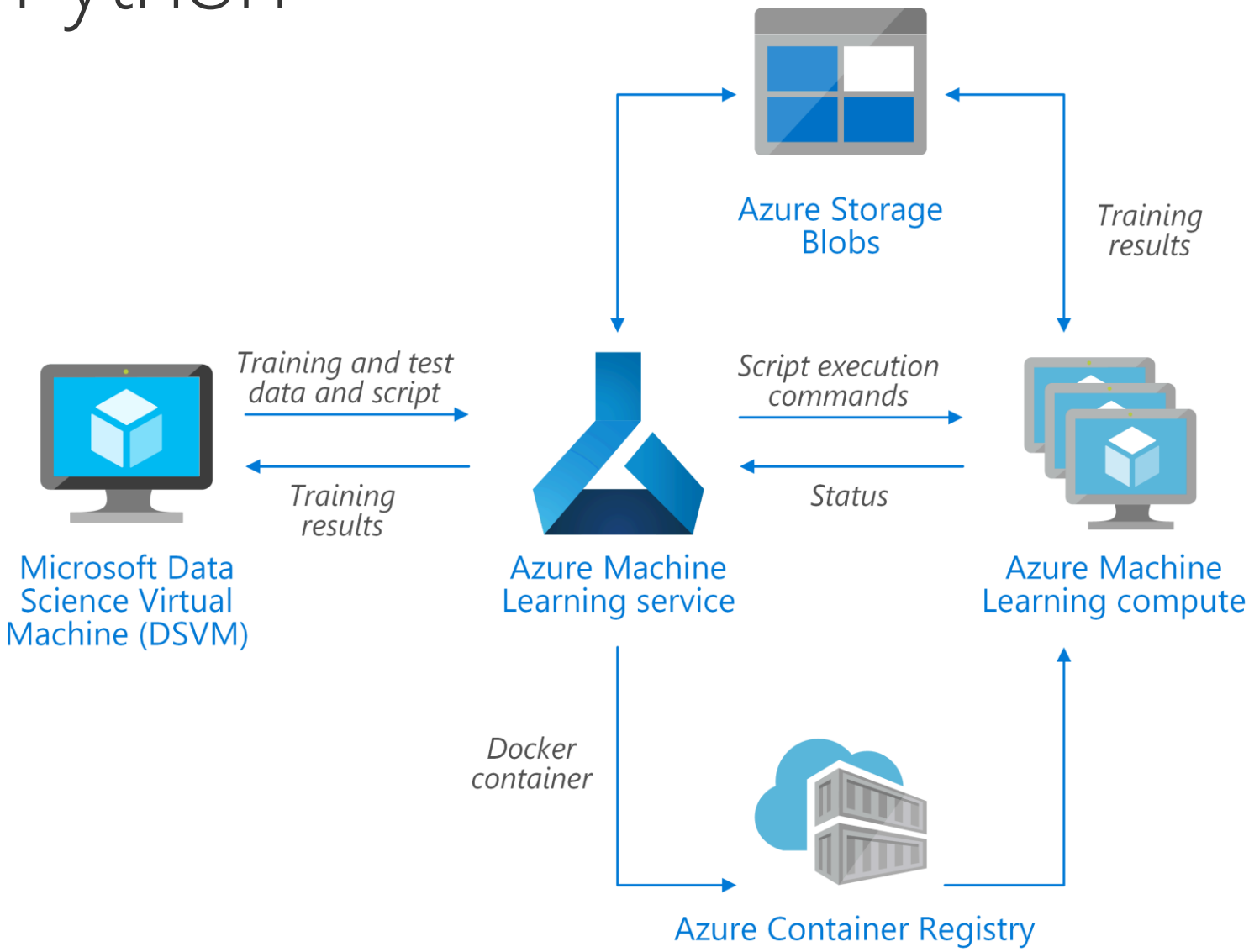
Enterprise and Basic: Summary

- Azure Machine Learning offers two editions: Enterprise and Basic
- Basic edition is available in GA / Enterprise edition currently in preview
- More detail on our pricing page: https://azure.microsoft.com/en-us/pricing/details/machine-learning/

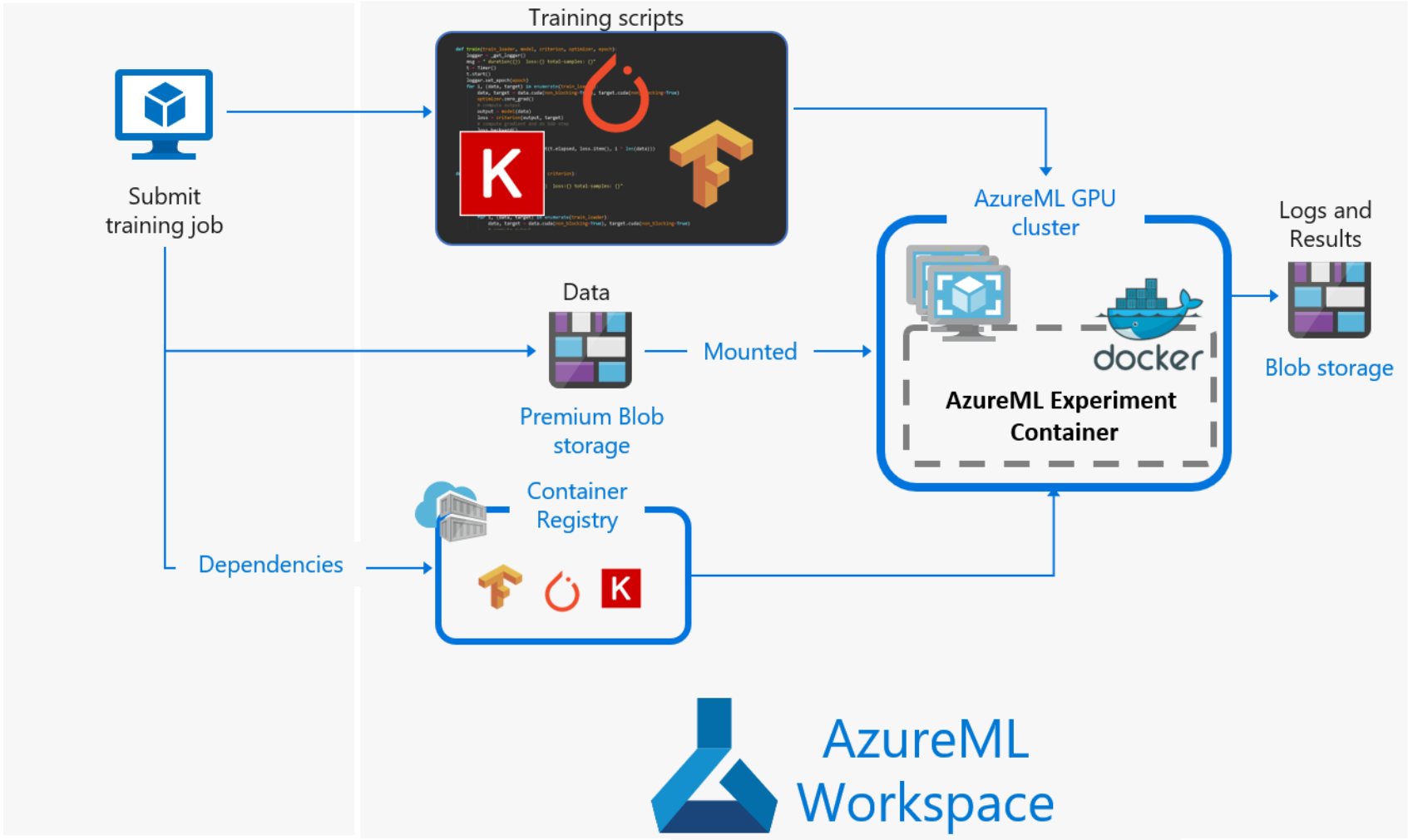
	Basic	**Enterprise**
Pricing structure	• Pay only for Azure resources consumed • No charge for AzureML	• No up-front cost – scale as you need, pay for what you consume • Compute surcharge for ML activities: data prep, training, inferencing
Audience	• Experienced data scientists who like a code-first environment • Single data scientists or small data science teams who don't need enterprise price controls, or large-scale ML Ops	• Large enterprises with mixed data science, data engineering and analyst teams who would benefit from both code-forward and drag-and-drop ML • Large data science teams that need to share compute across workspaces, or access other enterprise features
Messages	• The best place for open source ML • Use your existing tools and IDE when scaling to the cloud • Best in class code-first experience	Basic level + • Best in class ML for all skill levels including no-code ML • Enterprise-grade security, governance and cost control • Comprehensive ML lifecycle management
[Roadmap features]	• Responsible AI toolkit • Reinforcement learning • Batch inferencing • Manual data labelling	• Data drift capabilities • Automated ML ensemble models and deep learning • Automated model retraining • Managed inferencing • ML assisted labelling

Architectures

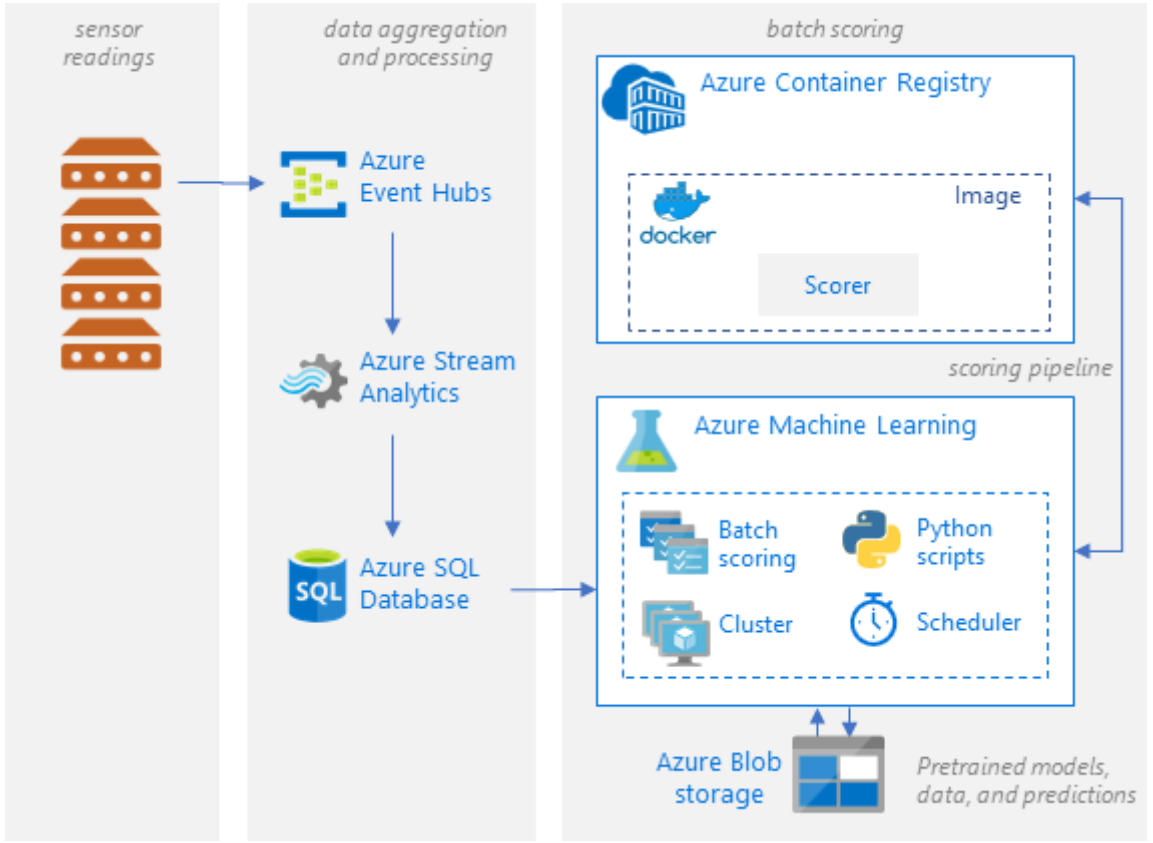
Training Python



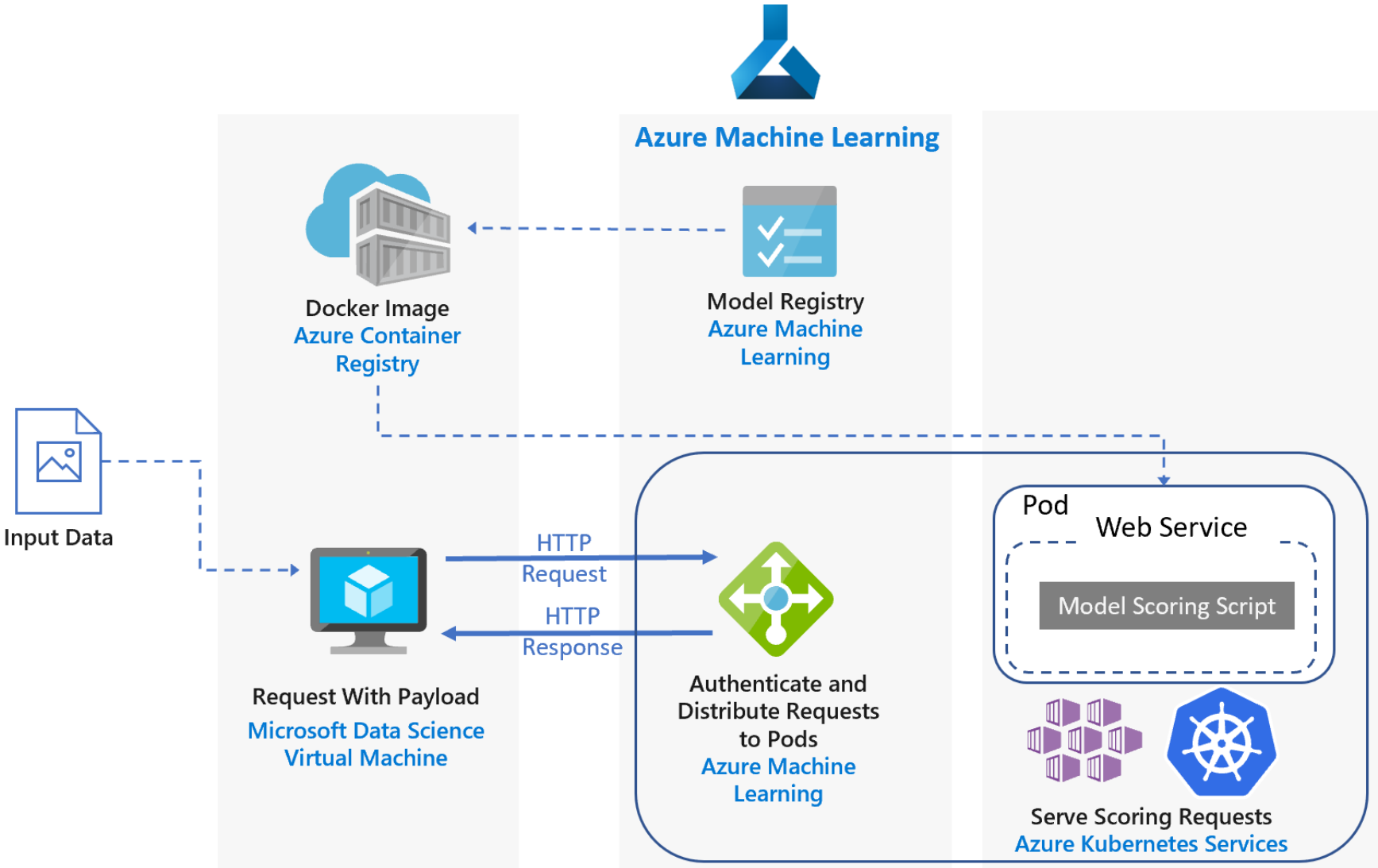
Deep Learning



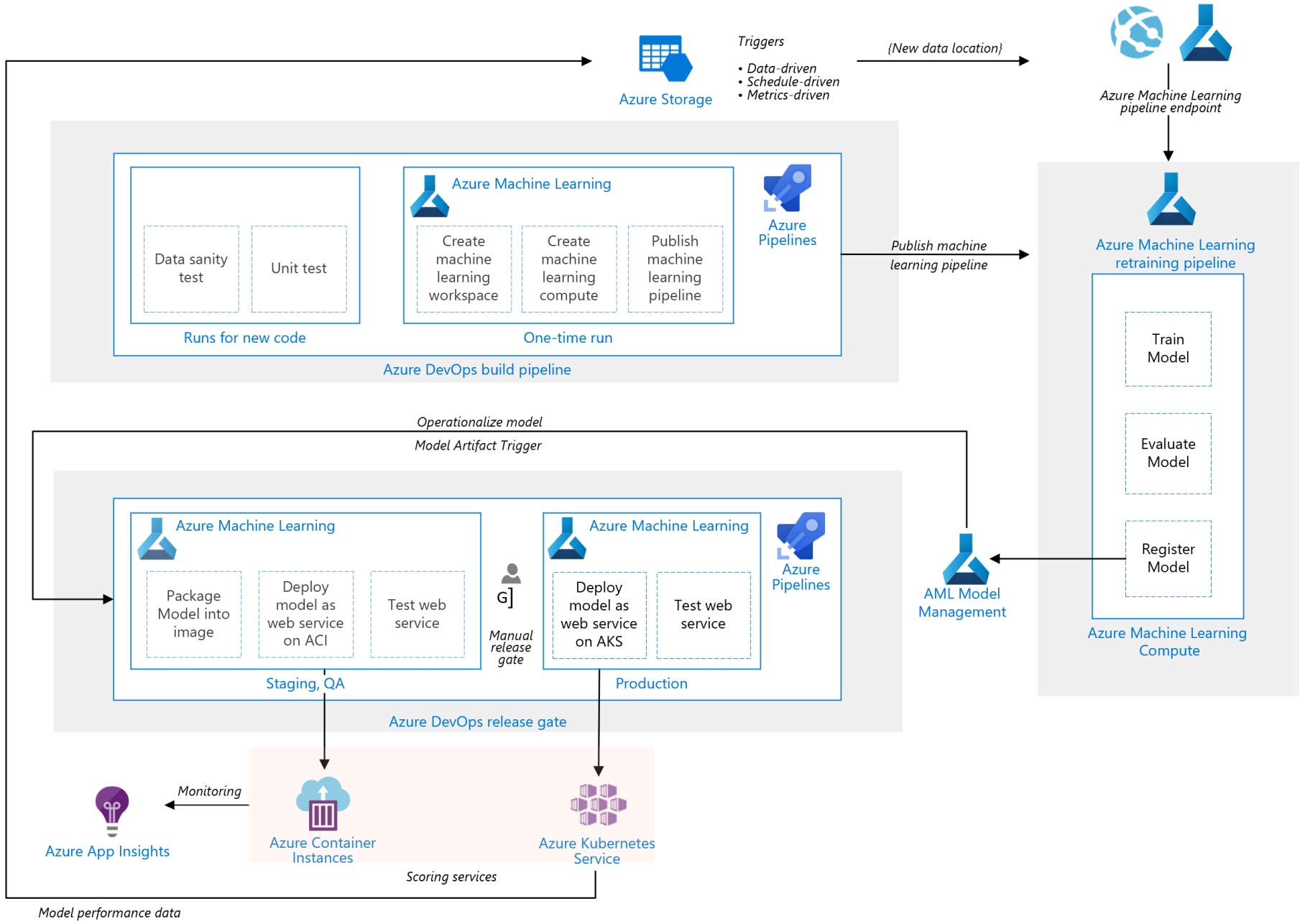
Batch scoring of Python models



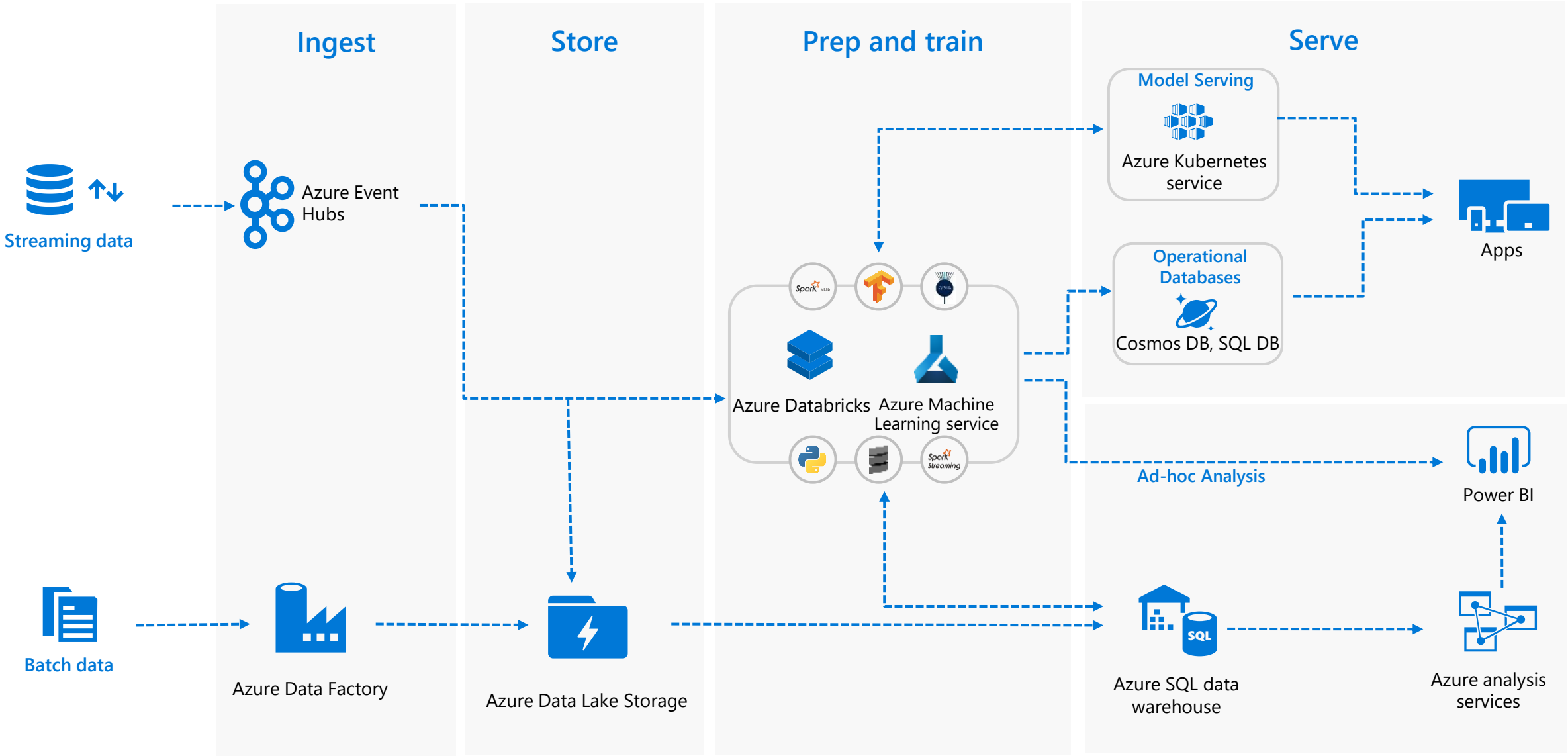
Real time scoring



MLOps


Azure Storage
Triggers
• Data-driven
• Schedule-driven
• Metrics-driven
{New data location}
Azure Machine Learning pipeline endpoint
Azure Machine Learning
Data sanity test
Unit test
Runs for new code
Azure Machine Learning
Create machine learning workspace
Create machine learning compute
Publish machine learning pipeline
One-time run
Azure Pipelines
Azure DevOps build pipeline
Publish machine learning pipeline
Azure Machine Learning retraining pipeline
Train Model
Evaluate Model
Register Model
Azure Machine Learning Compute
Operationalize model
Model Artifact Trigger
AML Model Management
Azure Machine Learning
Package Model into image
Deploy model as web service on ACI
Test web service
Staging, QA
Manual release gate
Azure Machine Learning
Deploy model as web service on AKS
Test web service
Production
Azure Pipelines
Azure DevOps release gate
Monitoring
Azure App Insights
Azure Container Instances
Azure Kubernetes Service
Scoring services
Model performance data

Azure Databricks + Azure ML



Documentation

Documentation Azure ML

Lien général :
https://azure.microsoft.com/en-us/services/machine-learning-service/

Pricing :
https://azure.microsoft.com/en-us/pricing/details/machine-learning-service/

Documentation :
https://docs.microsoft.com/en-us/azure/machine-learning/service/

Concepts :
https://docs.microsoft.com/en-us/azure/machine-learning/service/concept-azure-machine-learning-architecture

Forum
https://social.msdn.microsoft.com/Forums/en-US/home?forum=AzureMachineLearningService

Addin Visual Studio
https://marketplace.visualstudio.com/items?itemName=ms-toolsai.vscode-ai#overview

Power BI Intégration
https://docs.microsoft.com/en-us/power-bi/service-machine-learning-automated

AutoML with Azure ML References

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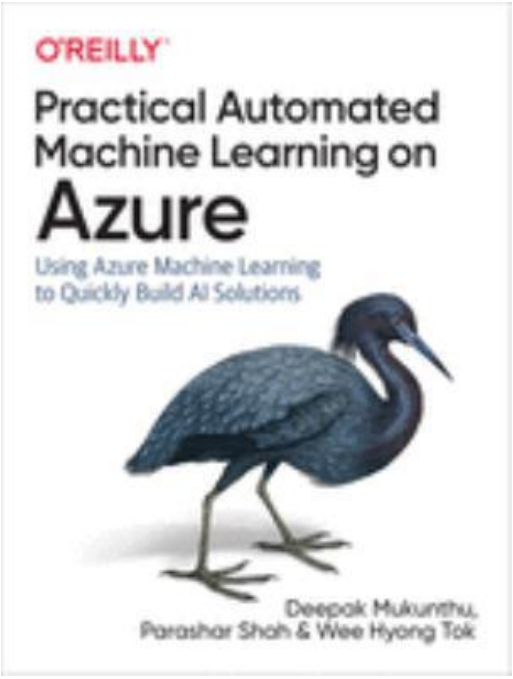
https://customers.microsoft.com/en-us/story/724164-macaw-partner-professional-services-power-bi

Blog : https://azure.microsoft.com/blog/announcing-automated-ml-capability-in-azure-machine-learning/

Book: https://www.amazon.com/Practical-Automated-Machine-Learning-Azure-ebook/dp/B07Y8X2HH4/ref=sr_1_1?keywords=automl+azure&qid=1573050215&s=digital-text&sr=1-1

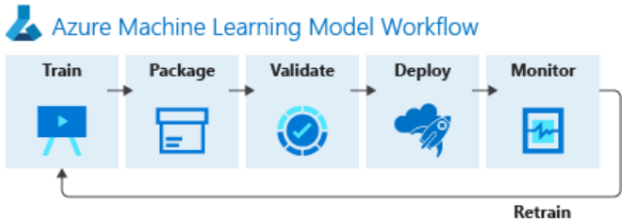


Azure ML Git

https://github.com/Azure/MachineLearningNotebooks/

Azure Machine Learning service example notebooks

This repository contains example notebooks demonstrating the Azure Machine Learning Python SDK which allows you to build, train, deploy and manage machine learning solutions using Azure. The AML SDK allows you the choice of using local or cloud compute resources, while managing and maintaining the complete data science workflow from the cloud.



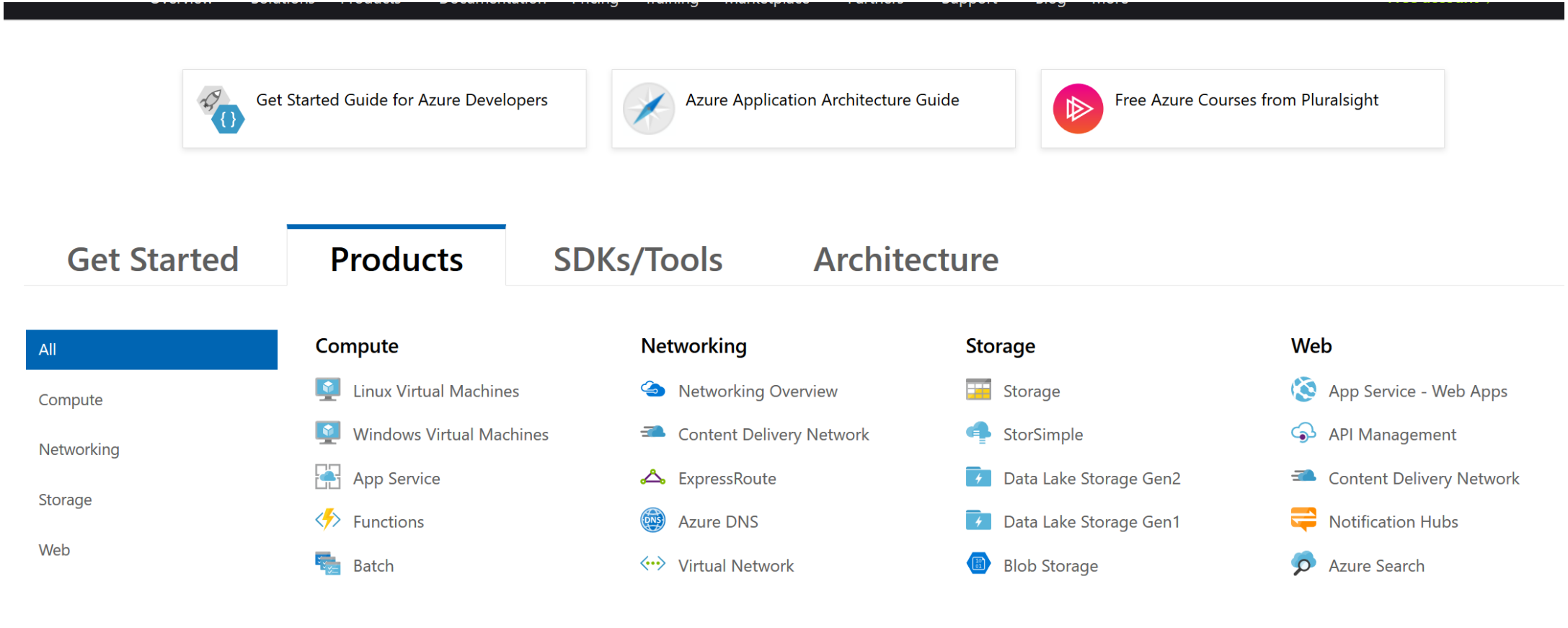
Quick installation

```
pip install azureml-sdk
```

Read more detailed instructions on how to set up your environment using Azure Notebook service, your own Jupyter notebook server, or Docker.

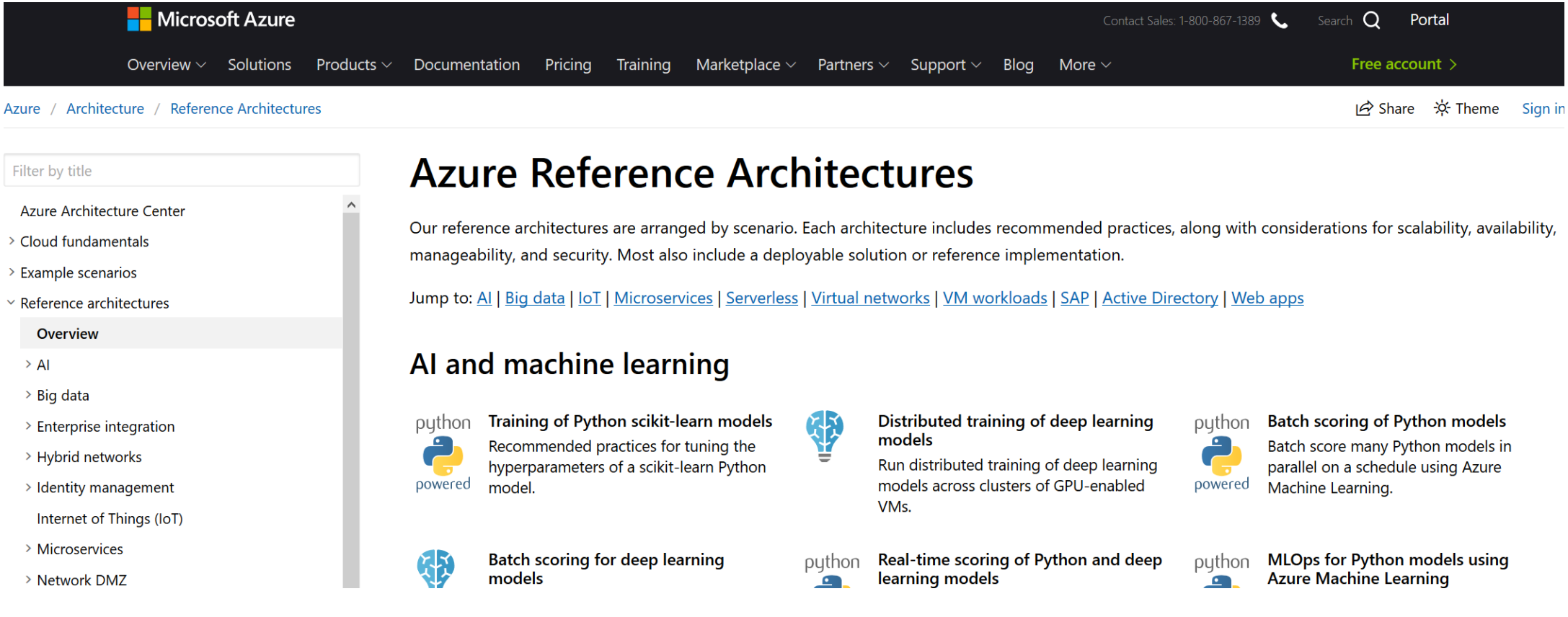
How to navigate and use the example notebooks?

If you are using an Azure Machine Learning Notebook VM, you are all set. Otherwise, you should always run the Configuration notebook first when setting up a notebook library on a new machine or in a new environment. It configures your notebook library to connect to an Azure Machine Learning workspace, and sets up your workspace and compute to be used by many of the other examples.



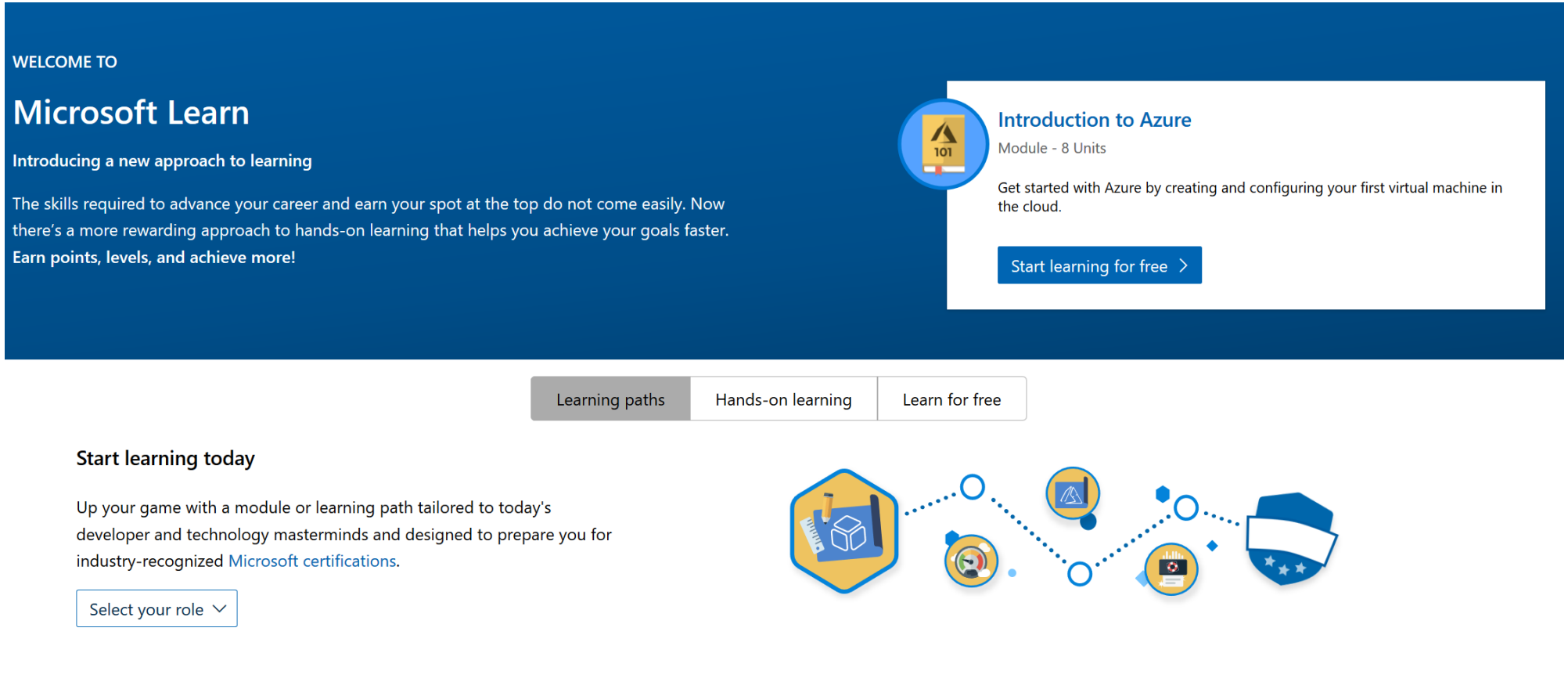
Documentation Microsoft

https://docs.microsoft.com/en-us/azure/#pivot=products



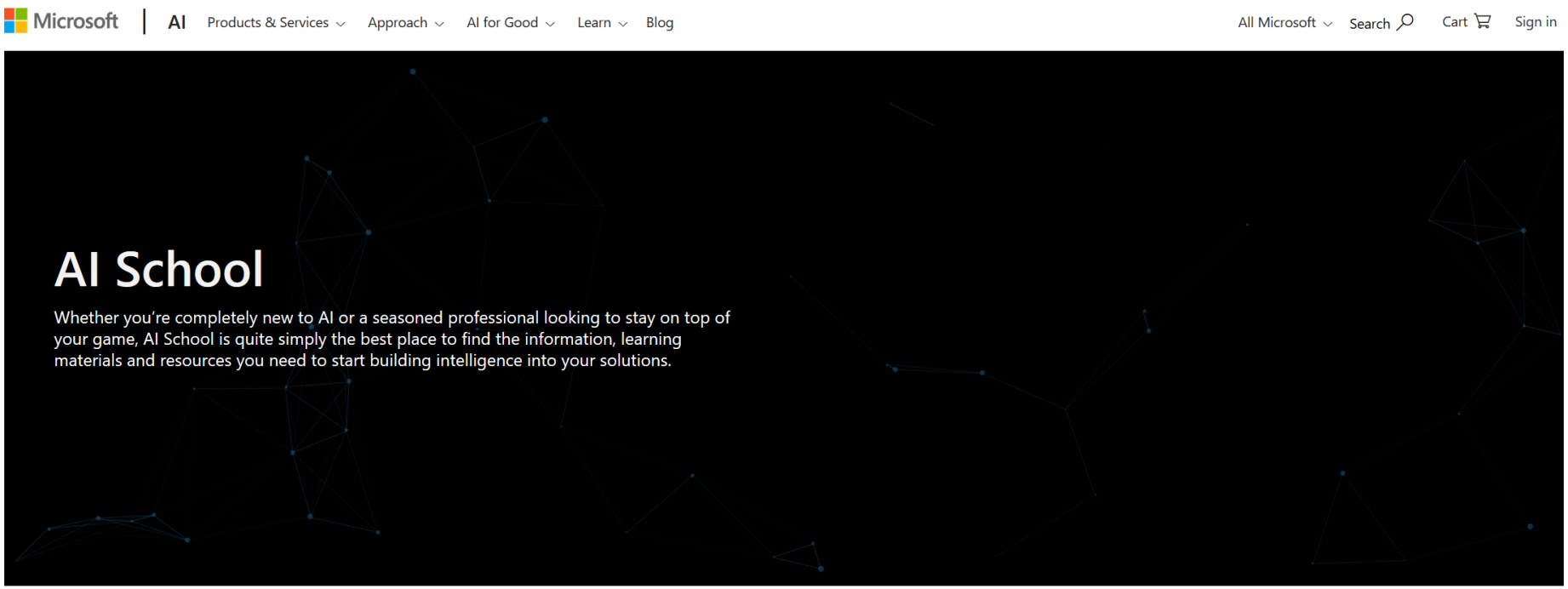
Architectures Microsoft

https://docs.microsoft.com/en-us/azure/architecture/



Microsoft Learn

https://docs.microsoft.com/en-us/learn/



Microsoft AI School

https://aischool.microsoft.com/en-us/home