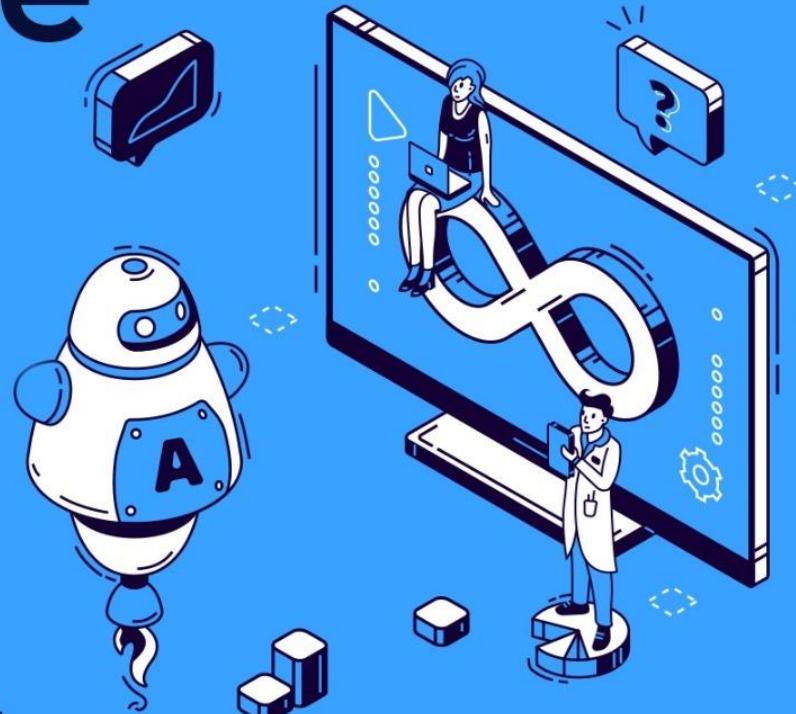


ML & MLOps in Azure



Speaker: **Sammy Deprez**
Senior Consultant, Arinti
Microsoft MVP



Brought to you by



In partnership with



Hi There!

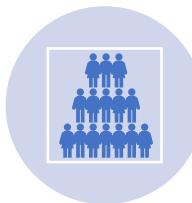
Husband, Father of 2
Founder & senior
consultant at **arinti**

Microsoft AI 
Board member of
Global AI Community



arinti

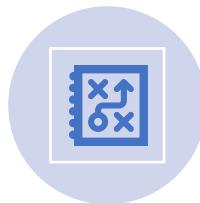
Microsoft Most Valuable Professional



WHO ARE MVPS?



WHAT IS THE MVP
AWARD?



WHAT DOES IT TAKE
TO BE AN MVP?



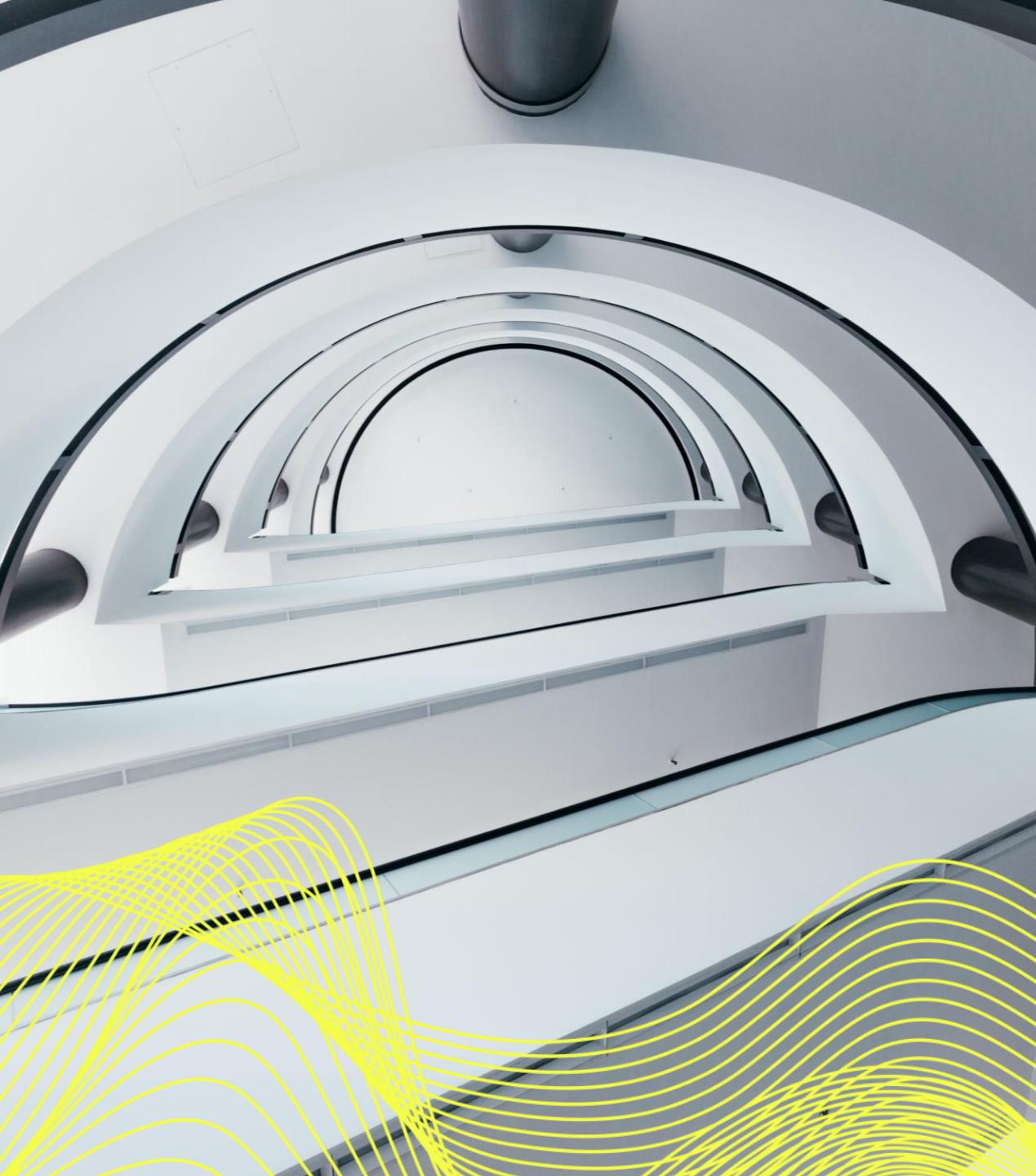
HOW CAN I BECOME
AN MVP?



WHAT ARE THE
BENEFITS

The image features the word "arinti" in a bold, black, sans-serif font. The letters are positioned centrally against a background of numerous thin, yellow, wavy lines that create a sense of motion and depth. These lines form two large, symmetrical, undulating shapes that frame the text. The overall composition is minimalist and modern.

arinti



Mission

to help organizations
grasp the power of the AI
revolution

arinti

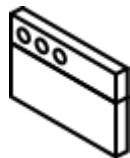
Services



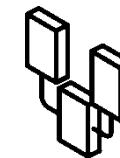
Data Science
& Machine Learning



Conversational
Interfaces



Data Engineering



AI Training

Azure Machine Learning



Azure Machine Learning

The central hub for your data science team

A screenshot of the Azure Machine Learning studio interface. The left sidebar contains a navigation menu with options like New, Home, Author, Notebooks, Automated ML, Designer, Assets, Datasets, Experiments, Pipelines, Models, Endpoints, Manage, Compute, Datastores, and Data Labeling. The main content area has a header "ntignite2019Demo > Home". It features a "Welcome to the studio!" message and four cards: "Create new" (with a plus icon), "Notebooks" (with a document icon), "Automated ML" (with a gear and lightning bolt icon), and "Designer" (with a cube icon). Below these are sections for "My recent resources" (listing runs, experiment names, status, and time) and "Runs" (a table with columns Run, Run ID, Experiment, Status, and Submitted time).

ntignite2019Demo > Home

Welcome to the studio!

Create new

Notebooks

Automated ML

Designer

My recent resources

Run	Run ID	Experiment	Status	Submitted time
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run 66	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:46 ...
Run 67	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:48 ...

View all experiments →



Build models your way

The screenshot shows the Microsoft Azure Machine Learning studio interface. On the left, a dark sidebar menu lists various features: New, Home, Author, Notebooks, Automated ML, Designer, Assets, Datasets, Experiments, Pipelines, Models, Endpoints, Manage, Compute, Datastores, and Data Labeling. The main content area has a light background. At the top, it says "ntignite2019Demo > Home" and "Welcome to the studio!". Below this, there are four cards: "Create new" (with a plus sign icon), "Notebooks" (with a document icon), "Automated ML" (with a gear and lightning bolt icon), and "Designer" (with a cube icon). Each card has a "Start now" button. Underneath these cards, the section "My recent resources" is titled "Runs". It contains a table with columns: Run, Run ID, Experiment, Status, and Submitted time. The table lists five completed runs:

Run	Run ID	Experiment	Status	Submitted time
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run 66	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:46 ...
Run 67	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:48 ...

[View all experiments →](#)



Manage all your ML assets

The screenshot shows the Microsoft Azure Machine Learning studio interface. On the left, a dark sidebar contains a navigation menu with items like New, Home, Author, Notebooks, Automated ML, Designer, Assets (which is highlighted), Datasets, Experiments, Pipelines, Models, Endpoints, Manage, Compute, Datastores, and Data Labeling. The main content area has a header "ntignite2019Demo > Home" and a welcome message "Welcome to the studio!". It features four cards: "Create new" (with a plus icon), "Notebooks" (with a document icon), "Automated ML" (with a gear and lightning bolt icon), and "Designer" (with a cube icon). Below these are sections for "My recent resources" and "Runs". The "Runs" section lists completed runs with details:

Run	Run ID	Experiment	Status	Submitted time
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run 66	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:46 ...
Run 67	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:48 ...

[View all experiments →](#)



Unified model management

The screenshot shows the Microsoft Azure Machine Learning studio interface. On the left, there is a navigation sidebar with the following items:

- New
- Home
- Author
- Notebooks
- Automated ML
- Designer
- Assets
- Datasets
- Experiments
- Pipelines
- Models** (selected)
- Endpoints
- Manage
- Compute
- Datastores
- Data Labeling

The main area is titled "Model List" and shows a table of registered models. The columns are:

Name	Version	Experiment	Run ID	Created on
customer-churn-model	3	--		Oct 29, 2019 6:38 PM
customer-churn-model	2	CustomerChurn1024	d1dac20a-560e-4e53-8c09-7c1...	Oct 29, 2019 5:17 PM
customer-churn-model	1	CustomerChurn1024	a70bdd5d-b848-4846-b63f-695...	Oct 29, 2019 5:13 PM
amlstudio-customer-churn---102	1	--		Oct 24, 2019 7:08 AM

At the bottom of the main area, there are navigation buttons: < Prev, Next >.

Azure Machine Learning

ML for all
skill levels

Full lifecycle
management with
MLOPs

State-of-the-art
Responsible ML

Open &
Interoperable

Azure Machine Learning

ML for all
skill levels

Full lifecycle
management with
MLOPs

State-of-the-art
Responsible ML

Open &
Interoperable

Automated Machine Learning

The screenshot shows the Azure Machine Learning studio interface. On the left, a sidebar menu includes options like New, Home, Author, Notebooks, Automated ML, Designer, Assets, Datasets, Experiments, Pipelines, Models, Endpoints, Manage, Compute, Datastores, and Data Labeling. The main content area displays a welcome message "Welcome to the studio!" and four cards: "Create new" (with a plus icon), "Notebooks" (with a document icon), "Automated ML" (with a gear and lightning bolt icon), and "Designer" (with a cube icon). Below these are sections for "My recent resources" and "Runs". The "Runs" section lists completed experiments:

Run	Run ID	Experiment	Status	Submitted time
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run 66	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:46 ...
Run 67	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:48 ...

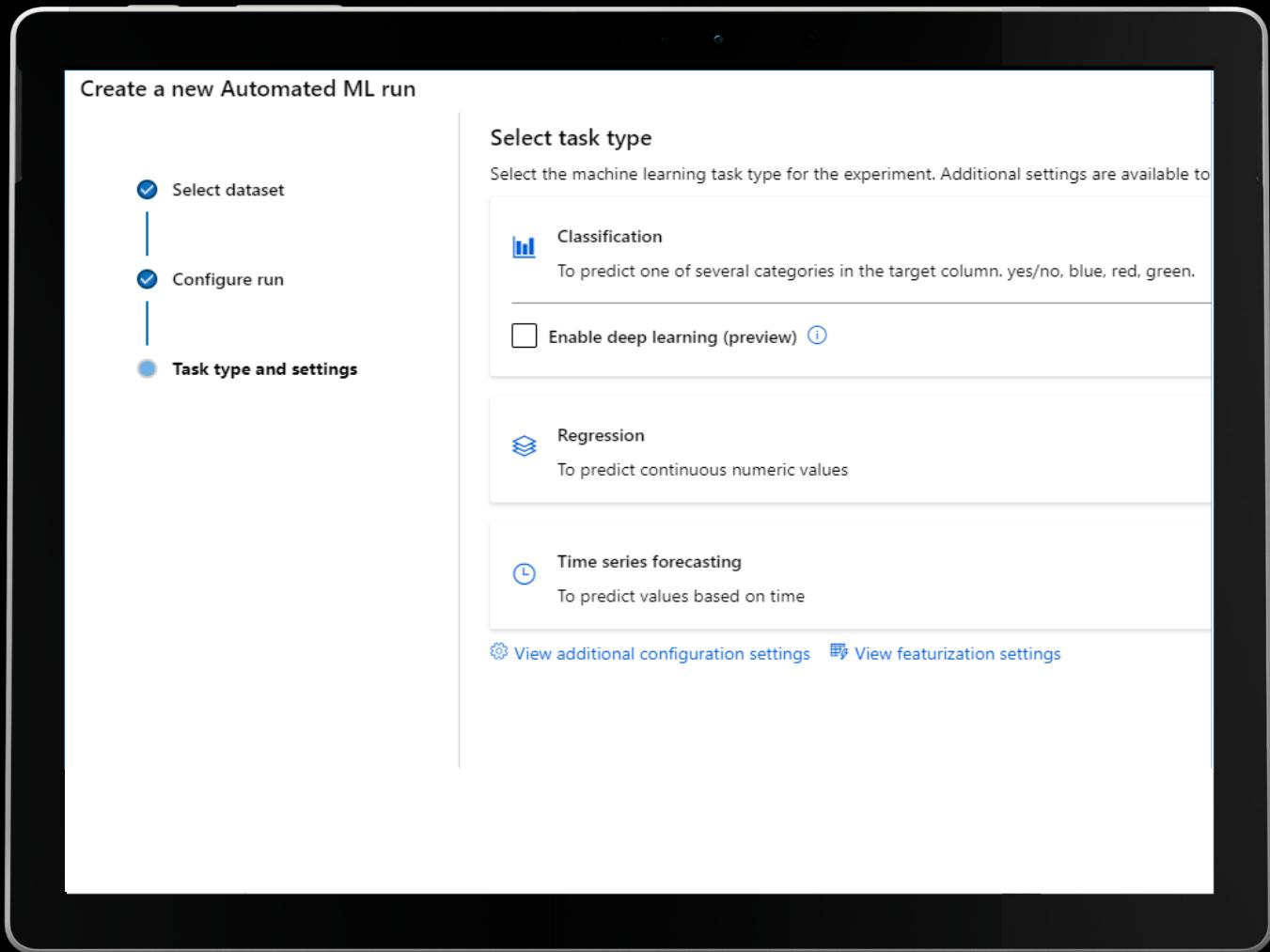
[View all experiments →](#)

Automated Machine Learning

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

Rapidly create accurate models using a wide array of algorithms

Easily explore and profile data



Drag & Drop Designer

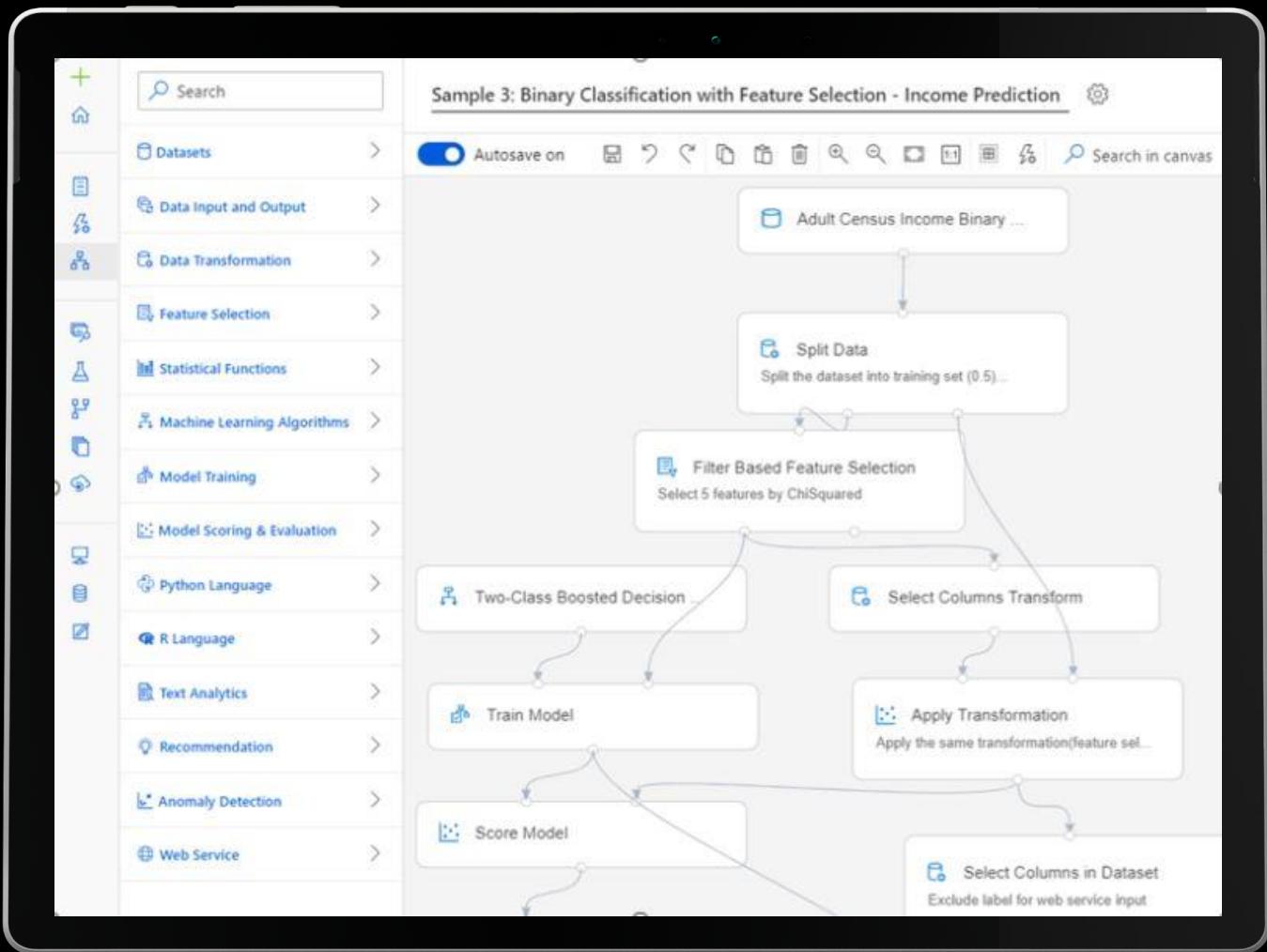
The screenshot shows the Azure Machine Learning studio interface. On the left, there is a dark sidebar with a light gray header containing the 'New' button, 'Home' (which is highlighted), 'Author', 'Notebooks', 'Automated ML', 'Designer' (which is also highlighted), 'Assets', 'Datasets', 'Experiments', 'Pipelines', 'Models', 'Endpoints', 'Manage', 'Compute', 'Datastores', and 'Data Labeling' buttons. Below this is a 'Create new' button with a dropdown arrow and a 'Start now' button. To the right of the sidebar, the main content area has a header 'ntignite2019Demo > Home'. It features a 'Welcome to the studio!' message and four cards: 'Create new' (with a plus sign icon), 'Notebooks' (with a document icon), 'Automated ML' (with a lightning bolt icon), and 'Designer' (with a 3D cube icon). Each card has a 'Start now' button. Below these cards is a section titled 'My recent resources' with a table labeled 'Runs'. The table has columns for 'Run', 'Run ID', 'Experiment', 'Status', and 'Submitted time'. It lists five runs: Run ... (AutoML_f86439d5-ec84-46ce-96a6-84c...), Run ... (AutoML_f86439d5-ec84-46ce-96a6-84c...), Run 66 (AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...), Run 67 (AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...), and Run 68 (AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...). All runs are marked as 'Completed'. At the bottom right of the table, there is a link 'View all experiments →'.

Run	Run ID	Experiment	Status	Submitted time
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run 66	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:46 ...
Run 67	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:48 ...

Drag & Drop Designer

Visual machine learning

Built-in modules for data prep,
algorithms, deployment and other
ML tasks



Collaborative Notebooks

The screenshot shows the Azure Machine Learning studio interface. On the left is a vertical navigation bar with the following items:

- New
- Home (selected)
- Author
- Notebooks
- Automated ML
- Designer
- Assets
- Datasets
- Experiments
- Pipelines
- Models
- Endpoints
- Manage
- Compute
- Datastores
- Data Labeling

The main content area displays the following:

Welcome to the studio!

Notebooks
Code with Python SDK and run sample experiments.
[Start now](#)

Automated ML
Automatically train and tune a model using a target metric.
[Start now](#)

Designer
Drag-and-drop interface from prepping data to deploying models.
[Start now](#)

My recent resources

Runs

Run	Run ID	Experiment	Status	Submitted time
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run ...	AutoML_f86439d5-ec84-46ce-96a6-84c...	CustomerChurn1024	Completed	May 13, 2020 1:35 P...
Run 66	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:46 ...
Run 67	AutoML_a919f33a-1fb2-4e18-9cd5-5f9a...	BharatChurnExample	Completed	May 13, 2020 11:48 ...

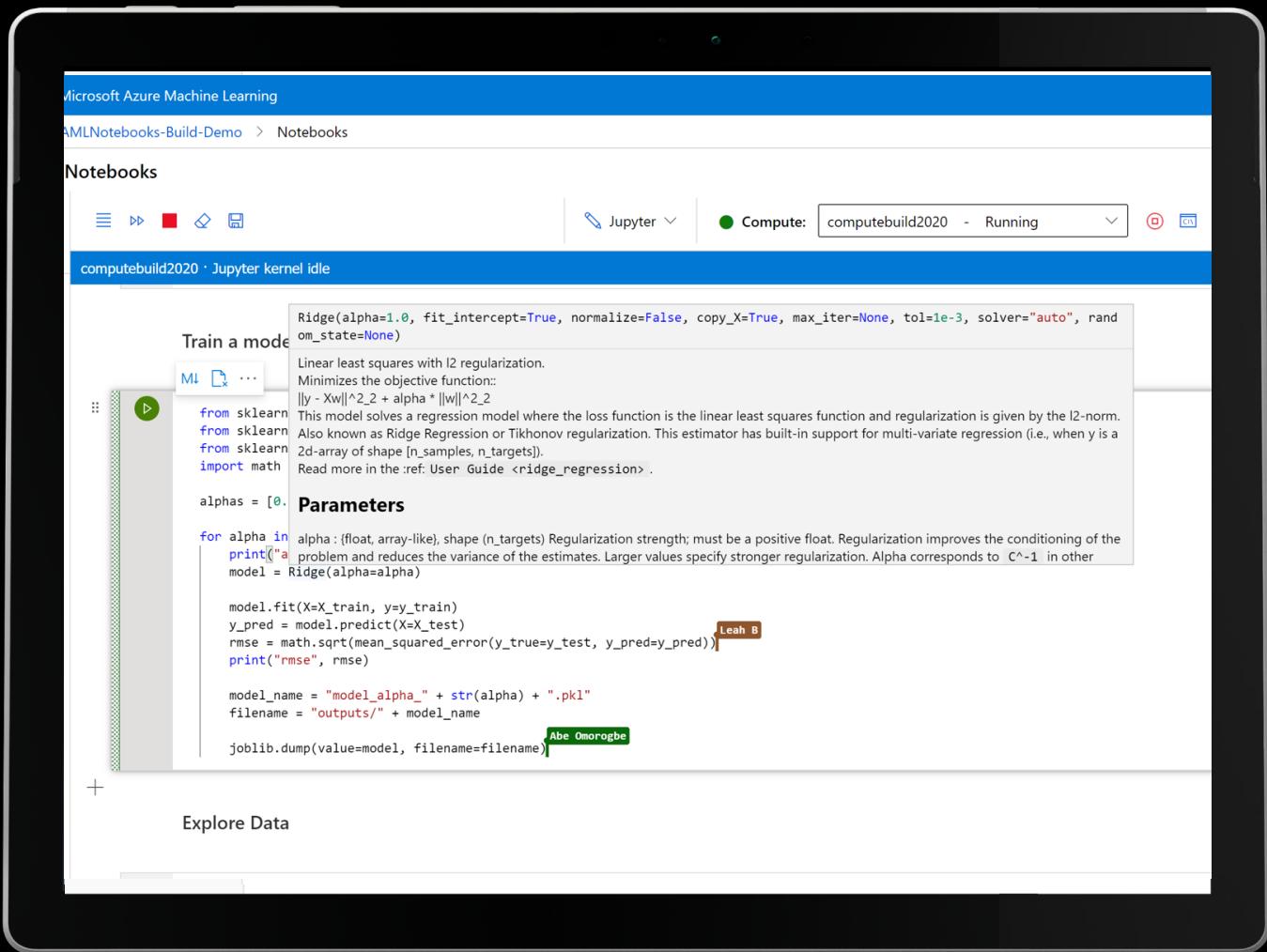
[View all experiments →](#)

Collaborative Notebooks

Code-first development experience

Collaborative live authoring with shared notebooks

Powerful editor with Intellisense and code suggestions



Azure Machine Learning

ML for all
skill levels

Full lifecycle
management with
MLOPs

State-of-the-art
Responsible ML

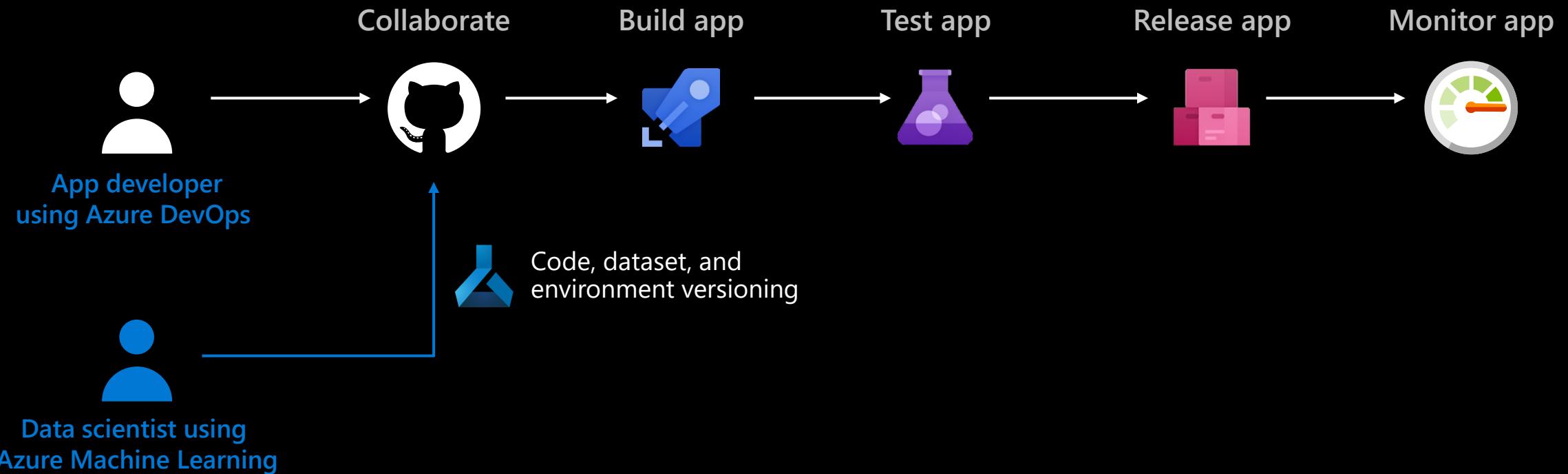
Open &
Interoperable

MLOps



Model reproducibility | Model validation | Model deployment | Model retraining

MLOps with Azure Machine Learning



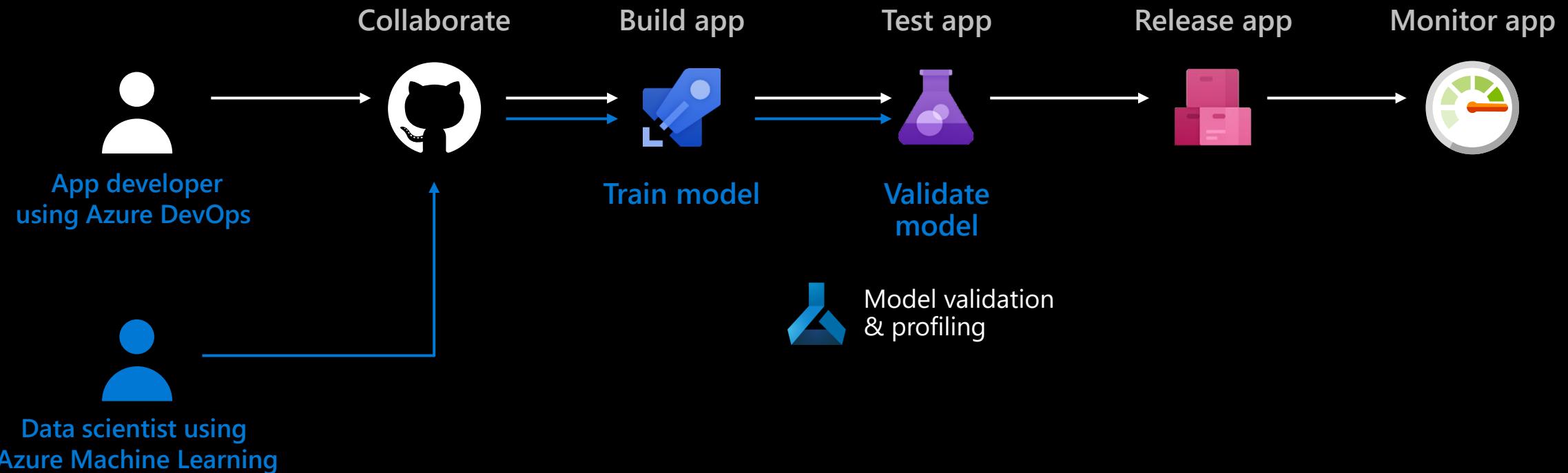
Model reproducibility

Model validation

Model deployment

Model retraining

MLOps with Azure Machine Learning



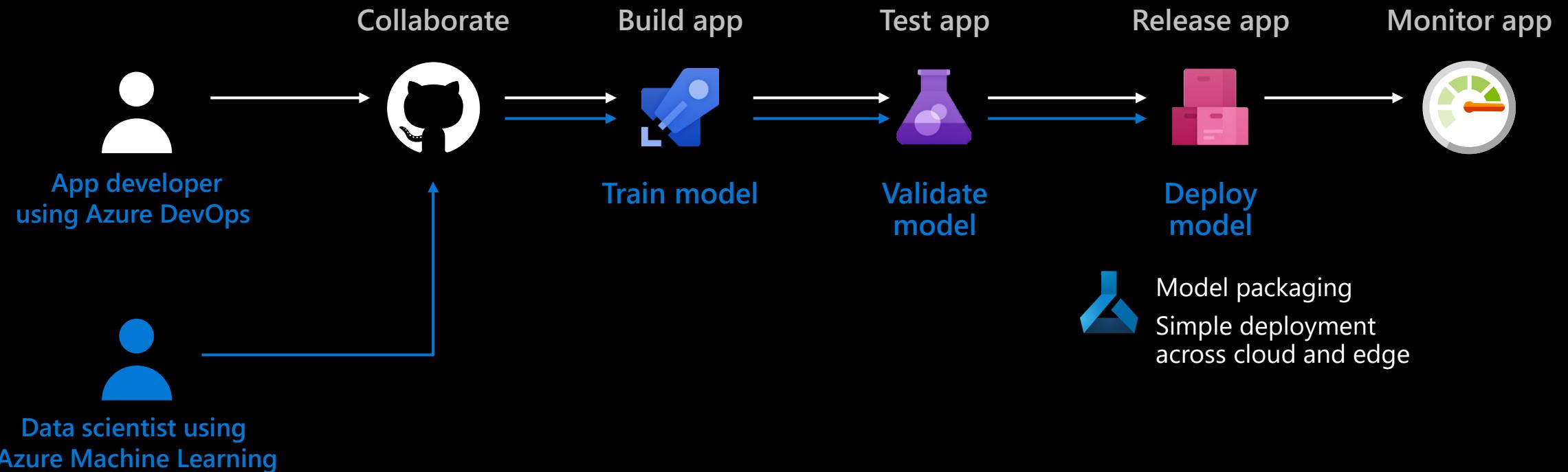
Model reproducibility

Model validation

Model deployment

Model retraining

MLOps with Azure Machine Learning



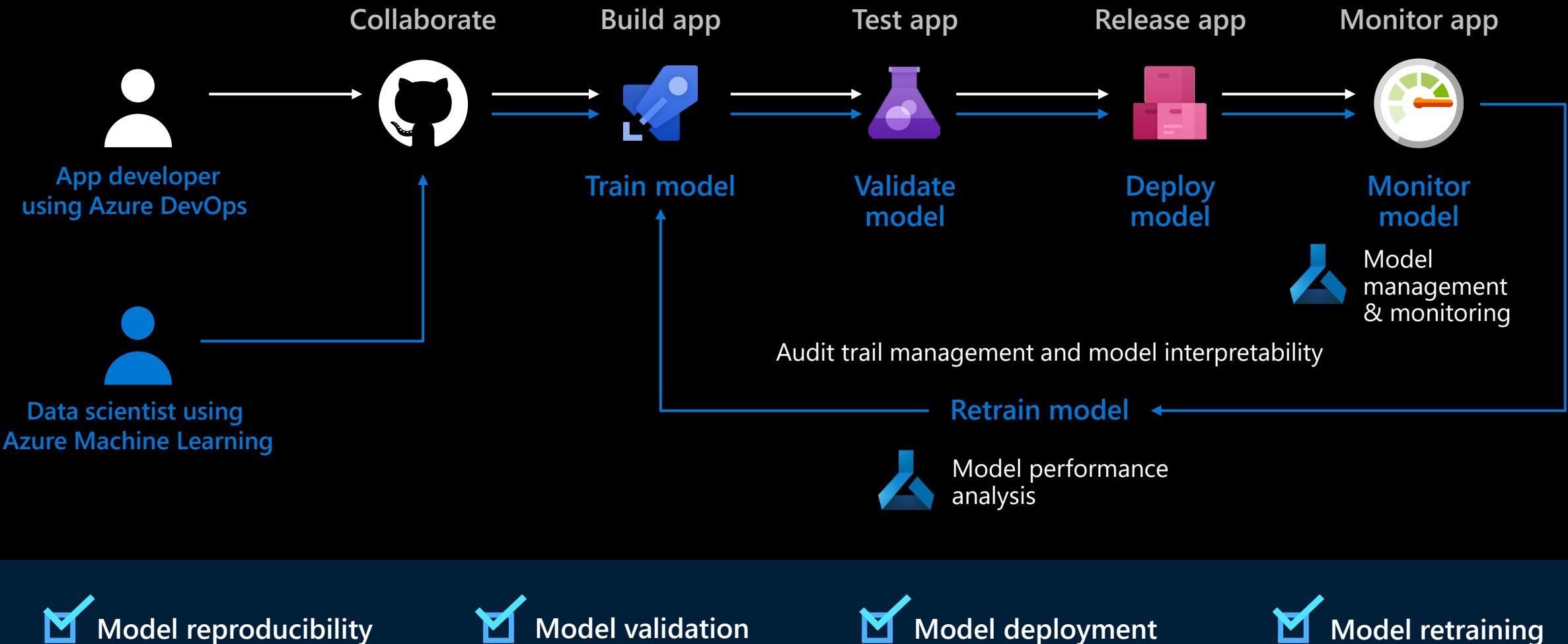
Model reproducibility

Model validation

Model deployment

Model retraining

MLOps with Azure Machine Learning



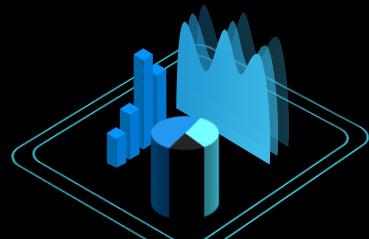
Azure Machine Learning

State-of-the-art
Responsible ML

Understand

Interpretability

Fairness



Control

Audit trail

Datasheets

Azure Machine Learning

Responsible ML

Protect

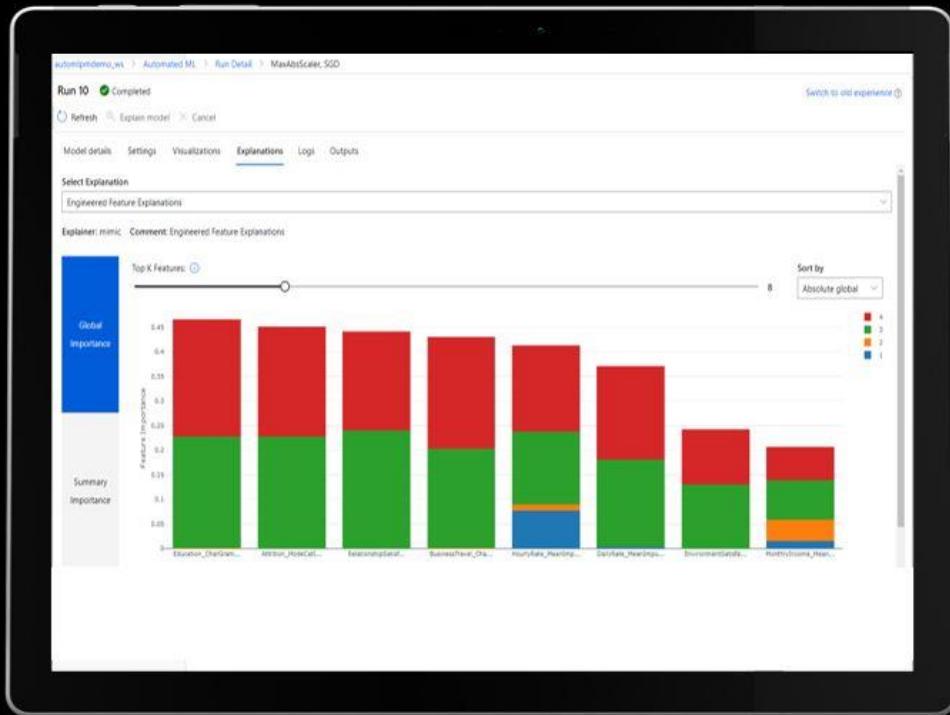
Differential privacy

Confidential machine learning

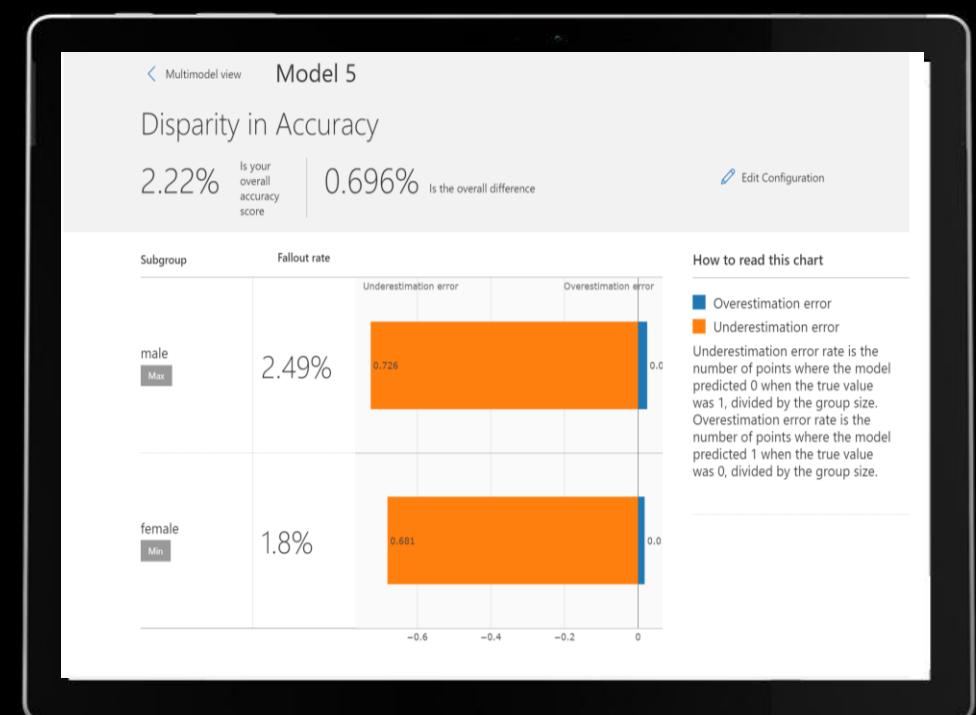


Understand models

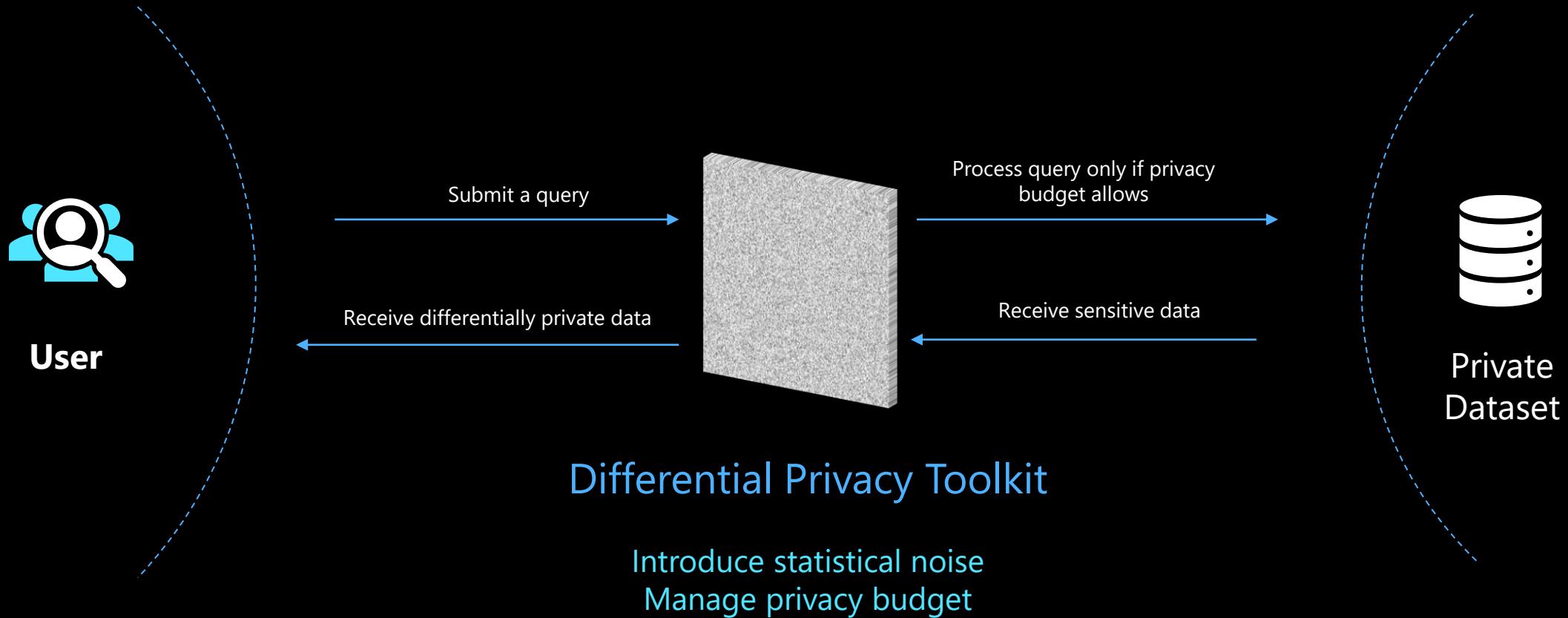
Model Interpretability



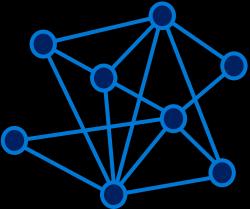
Fairness assessment and unfairness mitigation



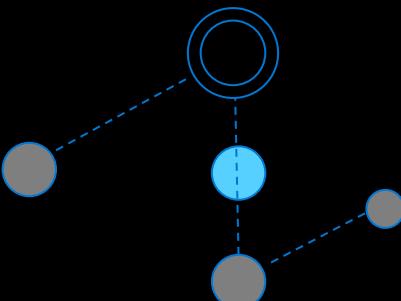
Protect data and models



Control and manage the ML process



Model



Audit Trail

Track the end to end lineage and build audit trail



Datasheets

Documenting model metadata

Azure Machine Learning

ML for all
skill levels

Full lifecycle
management with
MLOPs

State-of-the-art
Responsible ML

Open &
Interoperable

Familiar Data Science tools

Code in Python or R in a development environment of your choice



Visual Studio Code



Jupyter



PyCharm



Zeppelin



Command line

Increase data science productivity

The screenshot shows a Jupyter Notebook interface. In the top cell, code is run to display experiment details. Below, a table lists completed experiments with columns for Best Metric, Status, Started, Duration, and Run Id. A progress bar at the bottom indicates 66% completed and 33% canceled.

Interactive widgets for Jupyter Notebooks

The screenshot shows the Visual Studio Code interface with an 'Azure Machine Learning' extension. On the left, a 'Python Interactive' window displays a Jupyter notebook cell with code and its output. On the right, a 'Data Explorer' view shows a table of data with columns: num_preg, glucose_conc, diastolic_bp, thickness, insulin, bmi, and class.

Azure Machine Learning for Visual Studio Code extension

Powerful frameworks

Use your favorite deep learning frameworks



TensorFlow



PyTorch



Scikit-Learn



MXNet



Chainer



Keras



NVIDIA



vespa



skymizer



ONNX Runtime



Qualcomm



NETRON



SOPHON



MathWorks



Visual DL

Thank You! Questions?!

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@arinti
www.arinti.ai
hello@arinti.ai

Code + Slides:
<https://github.com/sammydeprez/MLOpsTalk>

arinti