MATLAB EXPO

What's New in MATLAB R2020a

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MathWorks®

2,611

Agenda

1. Core MATLAB
2. Server Suite
3. AI Applications
4. Industrial Tools
5. Financial Models

“High level to low level –
Deep or Wide
– you choose for you”

Core MATLAB

1. Live scripts and task
2. Stateflow for MATLAB
3. Projects

“Abstraction allows for rapid development”

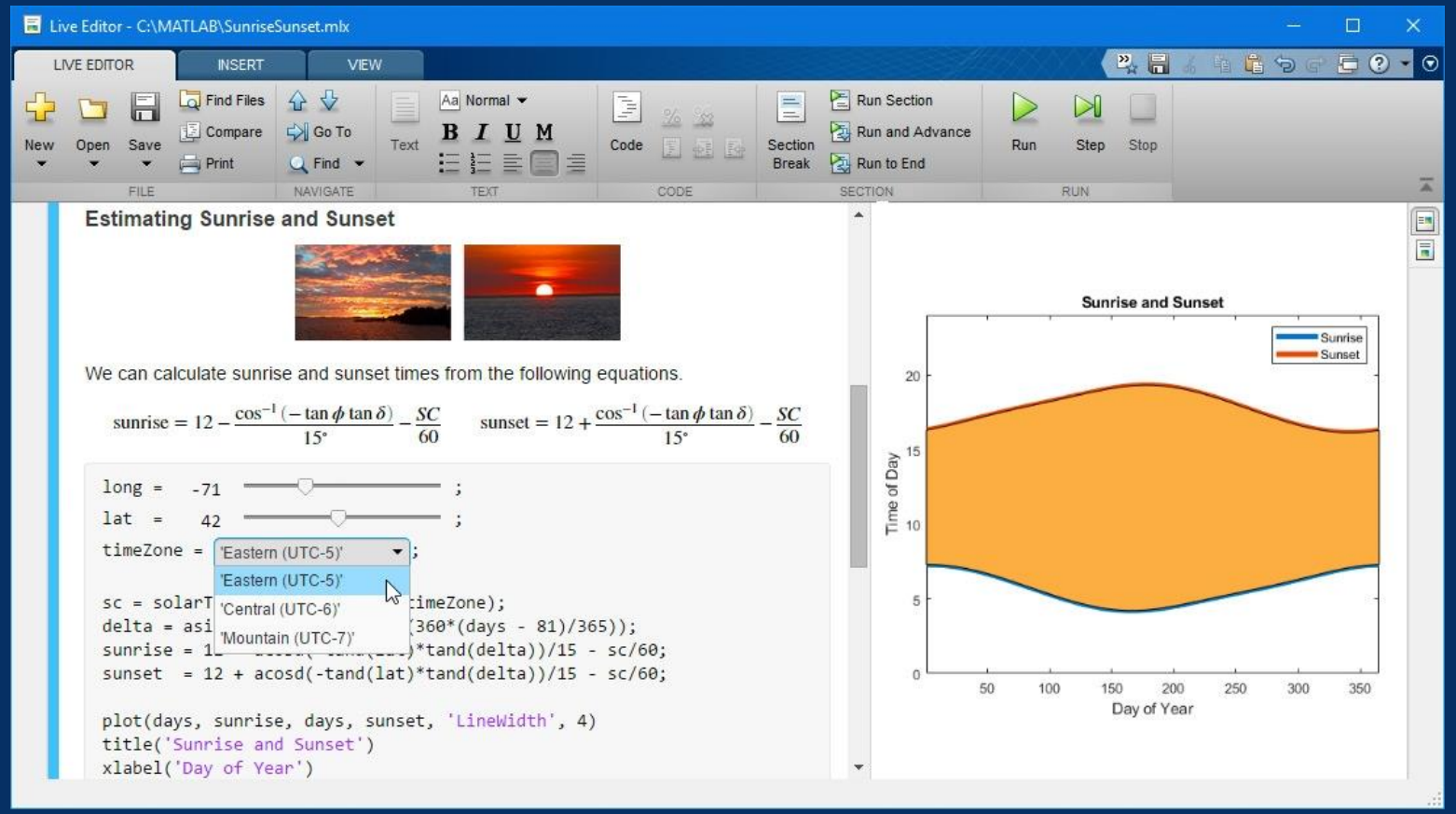
Create executable notebooks for sharing, presenting, teaching

Code + Output + Formatted Text = Executable Notebook

Contextual hints while coding

View interactive outputs next to the code

Add rich text formatting, equations, images, and hyperlinks



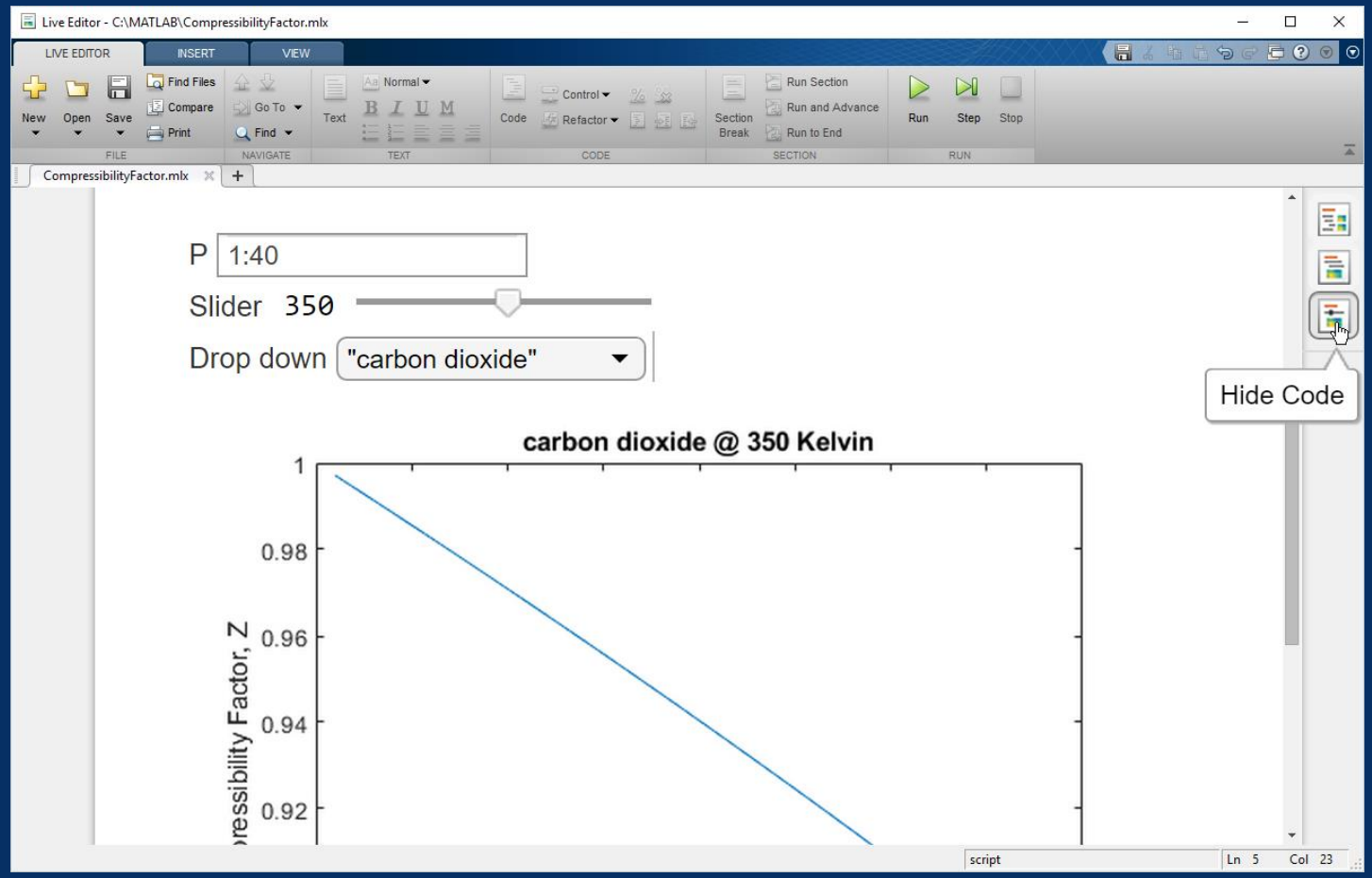
Live Editor

Turn a script into a simple app

Add **interactive controls** to modify script variables

- Numeric sliders
- Drop-down lists
- Edit fields

Hide the code to create simple applications and dashboards

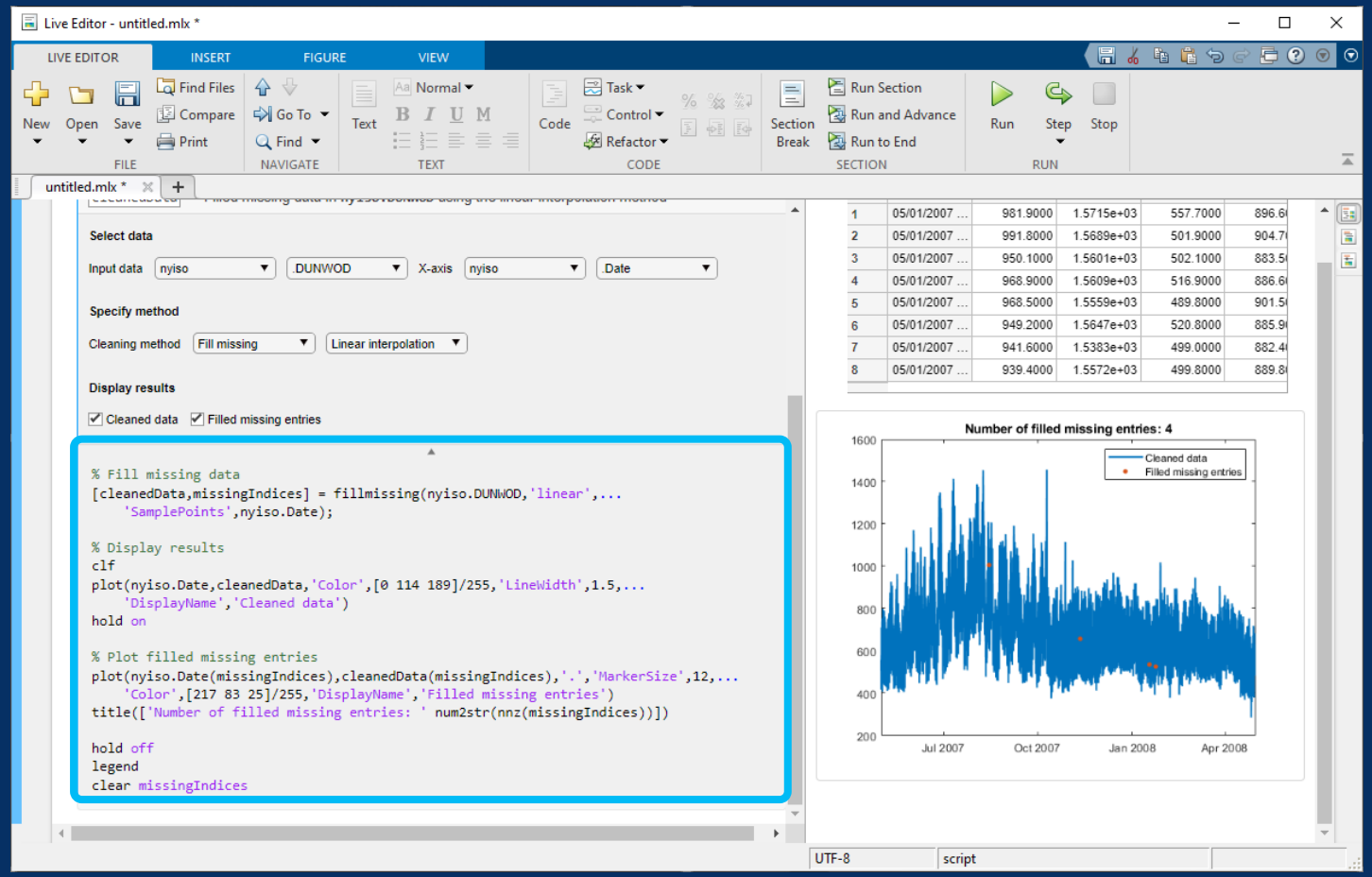


Live Editor

Complete steps interactively

Use **tasks** to explore parameters and options

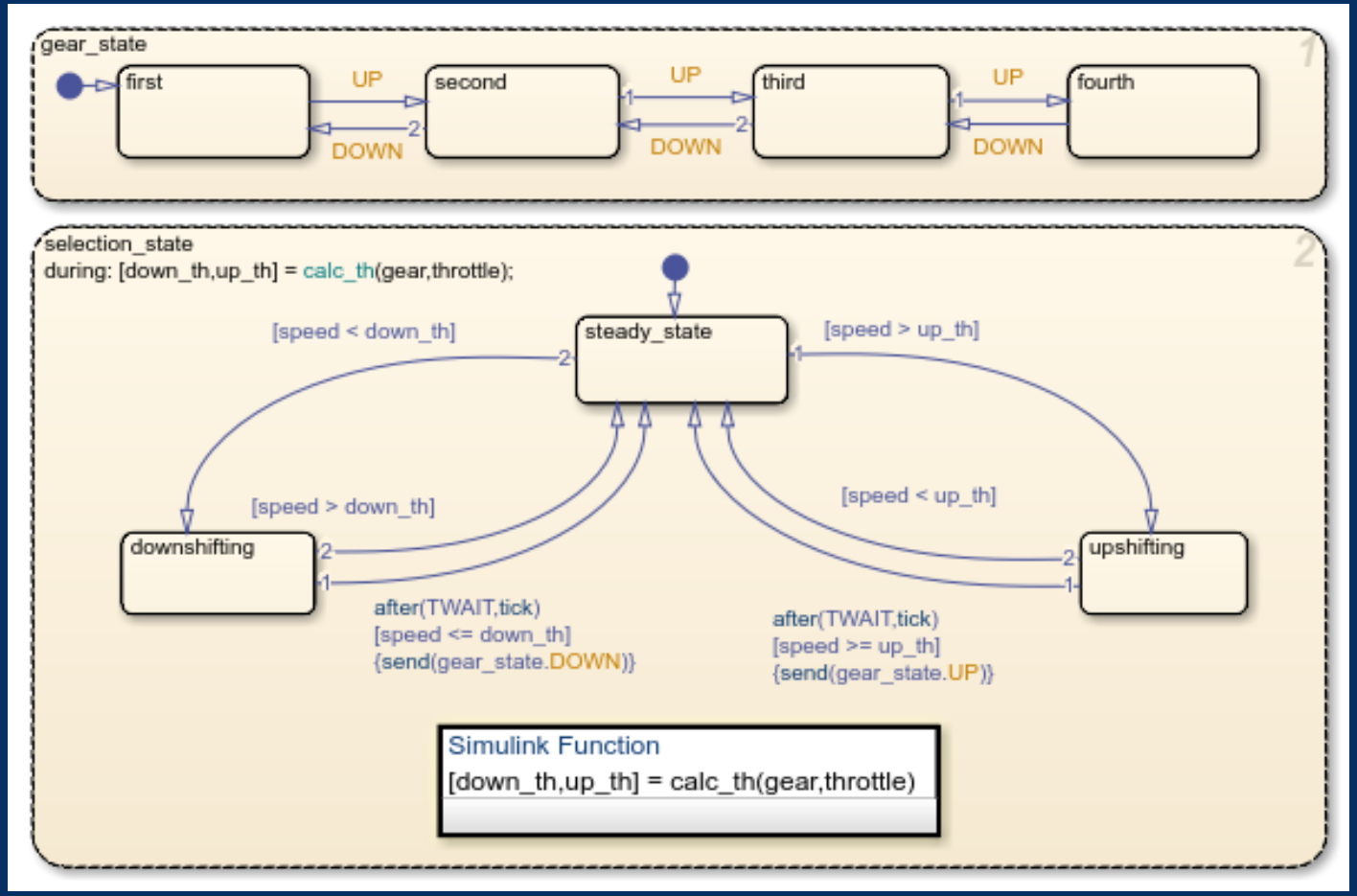
Automatically generate MATLAB code for the completed task



Live Editor

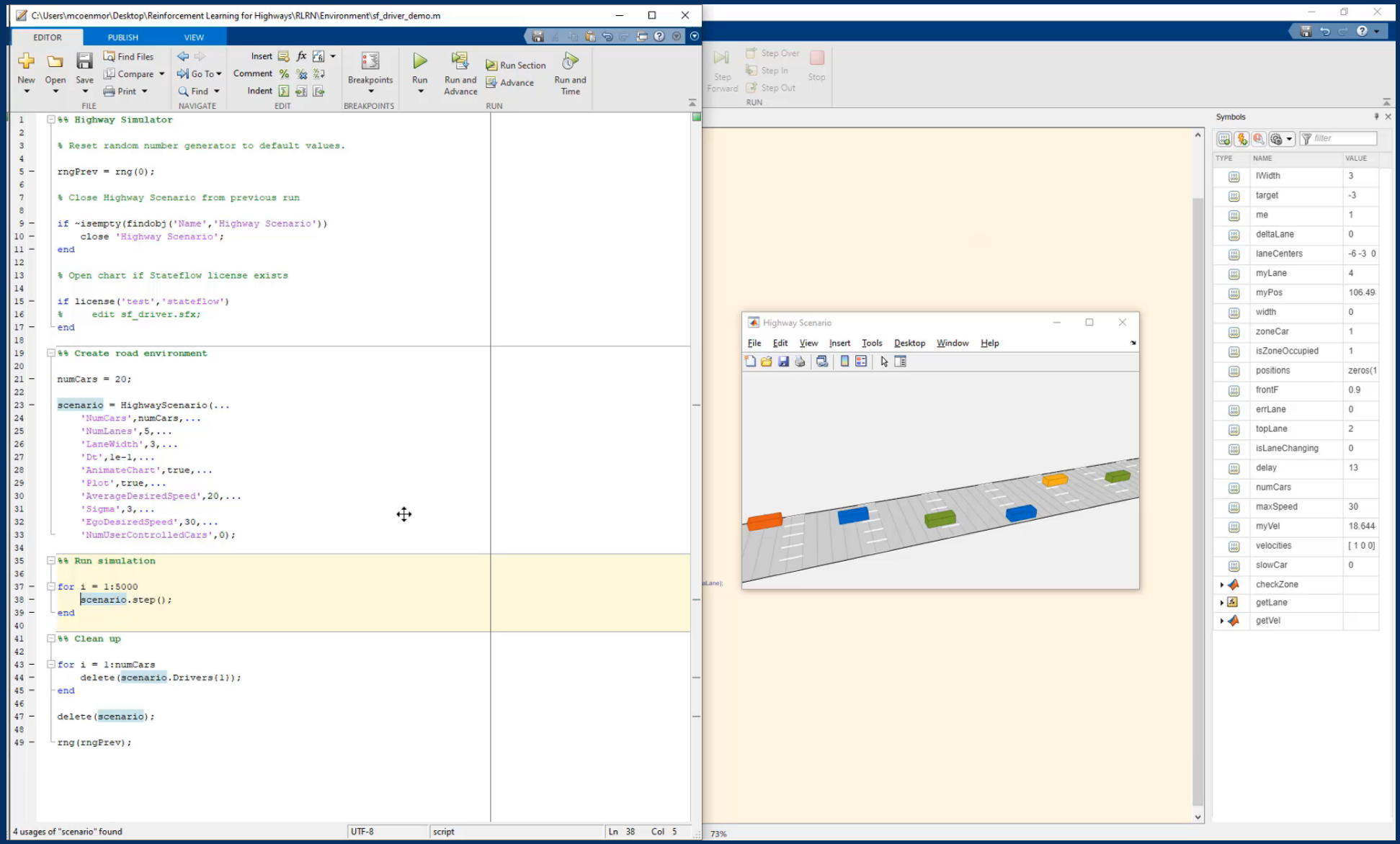
Design decision logic at a higher level of abstraction

Graphically program, debug and execute state machines



Stateflow

Design decision logic at a higher level of abstraction – in MATLAB



MATLAB
Stateflow

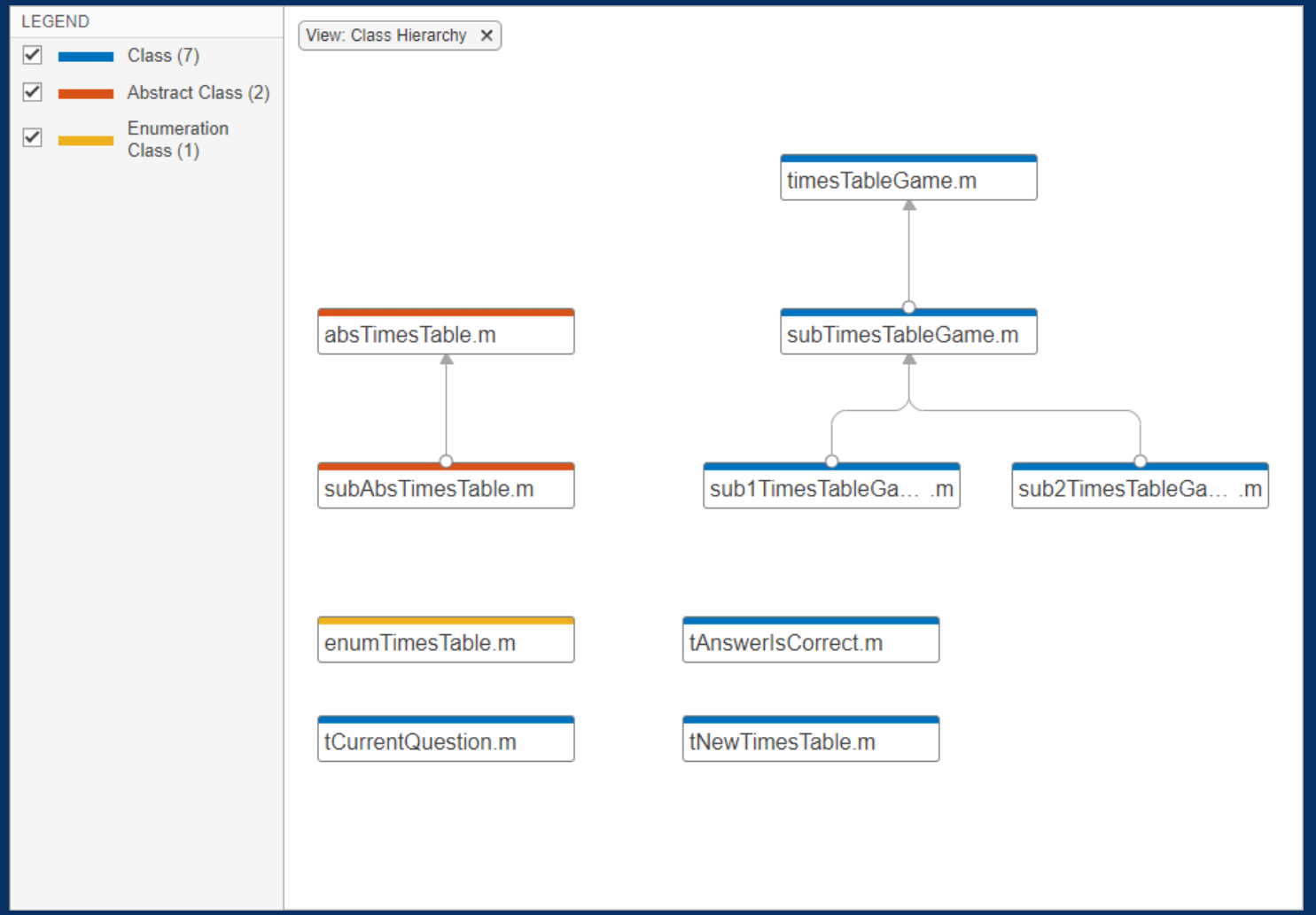
Manage system complexity with projects

Projects in MATLAB help you to organize, manage, and share your code and models

Simulink
MATLAB

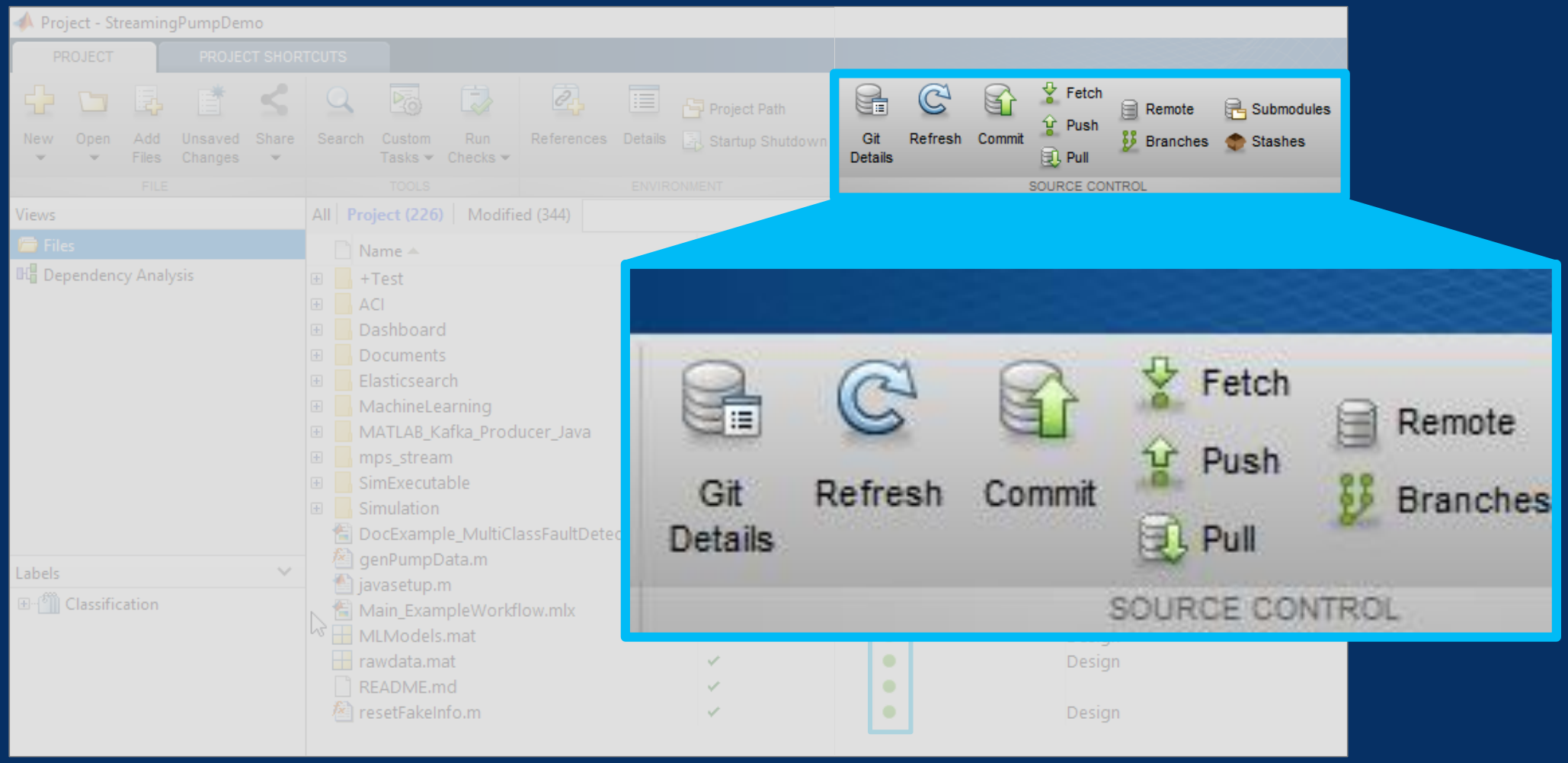
Explore file dependencies and impact analysis

Explore and visualize project structure



Simulink
MATLAB

Use source control systems (Git, Subversion) with projects



Simulink
MATLAB

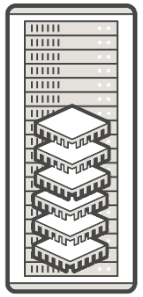
Server Products

1. Overview of our server products
2. New WebApp Server
3. Scaling with reference architectures
4. Support DevOps workflows

“Server suite scales with your needs”

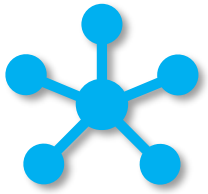
Big picture of our server products

I want to….



Speed up computation

→ MATLAB Parallel Server



Integrate with enterprise applications

→ MATLAB Production Server

Publish Web Apps

→ MATLAB Web App Server

Use MATLAB in a browser

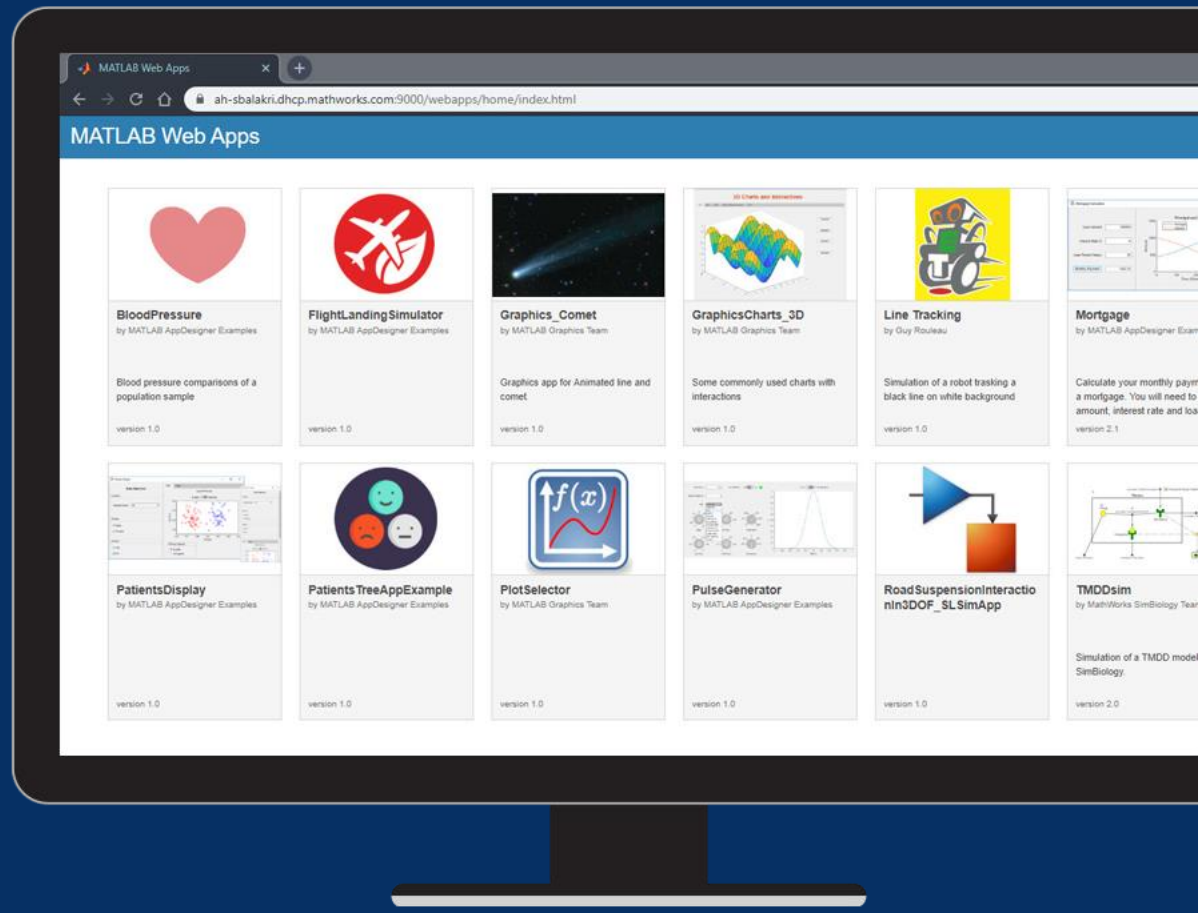
→ MATLAB Online Server

Share MATLAB apps as browser-based web apps

Create apps using App Designer and host them using MATLAB Web App Server

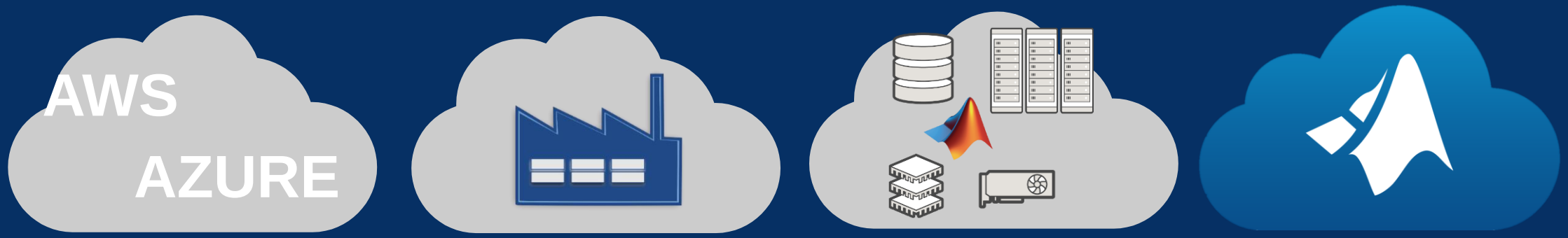
For IT: full authentication support

For domain experts: upload your app on demand



MATLAB Web App Server **NEW PRODUCT**

Scale as you need



Public Clouds | On-Premise/Private Cloud | Hosting Provider | MathWorks Cloud

Reference Architectures

Cloud Data Services

Cloud Center

MATLAB Dockerfile

NVIDIA NGC **Deep Learning Container**

MATLAB Online Server

NIMBIX

PENGUIN COMPUTING

rescale

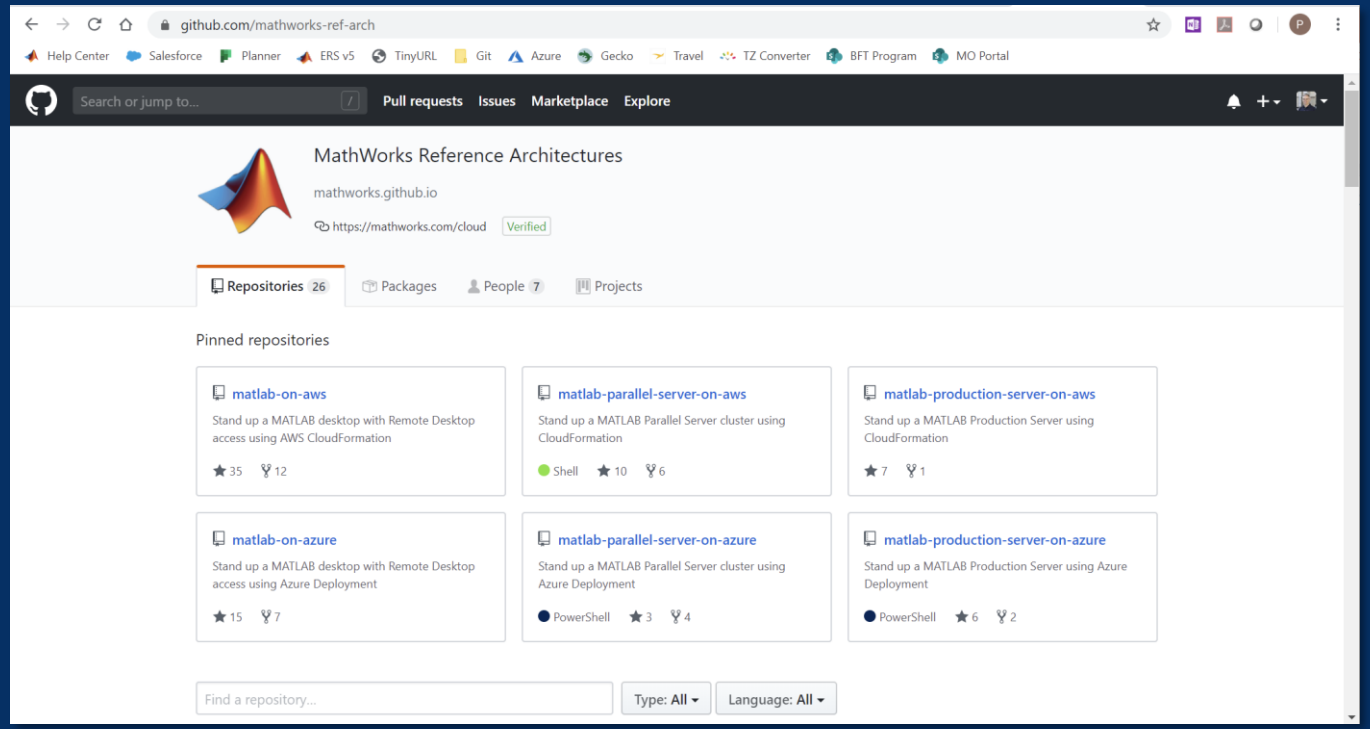
SABALCORE

Uber Cloud

MATLAB Online
MATLAB Drive

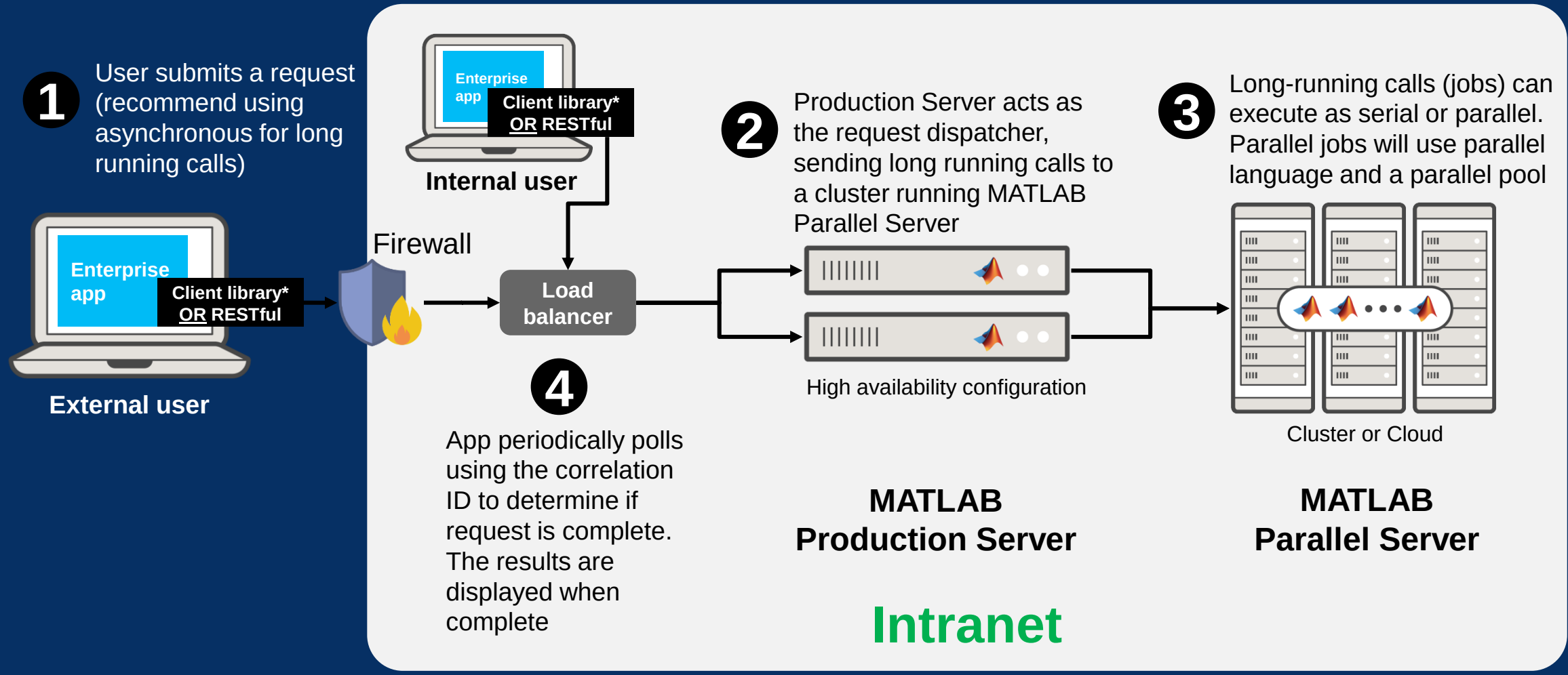
Reference Architectures on GitHub

- Official MathWorks guidelines
- One click to deploy
  - After some initial setup 😒
- Monolithic Architectures
- Connectors/Utilities
- Containers



https://github.com/mathworks-ref-arch

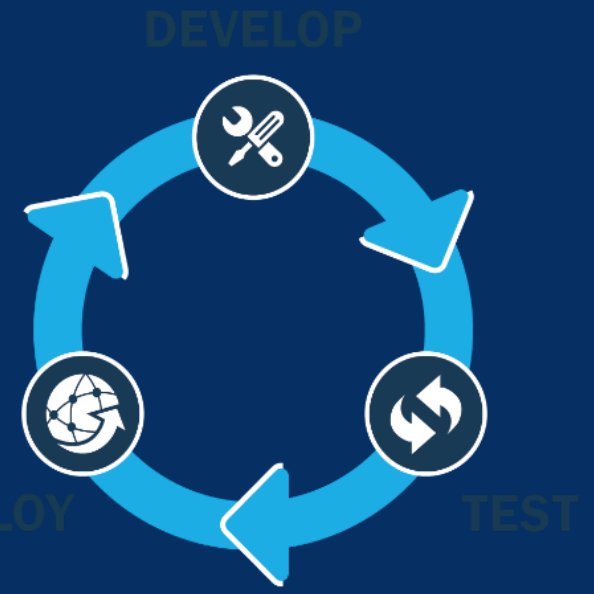
Scale Out Production Server with Parallel Server



* Provided by MathWorks https://www.mathworks.com/products/matlab-production-server/client-libraries.html

Automated Testing with Continuous Integration (CI)

- A system to automate the building, testing, integration, and deployment of code as it is being developed and maintained
- Popular CI systems: Jenkins, Travis, CircleCI , Azure DevOps, and others…
- Benefits:
  - Detect integration bugs early
  - Allow you to stop bugs from being accepted
  - Track and report testing history
  - Flexible testing schedules and triggers

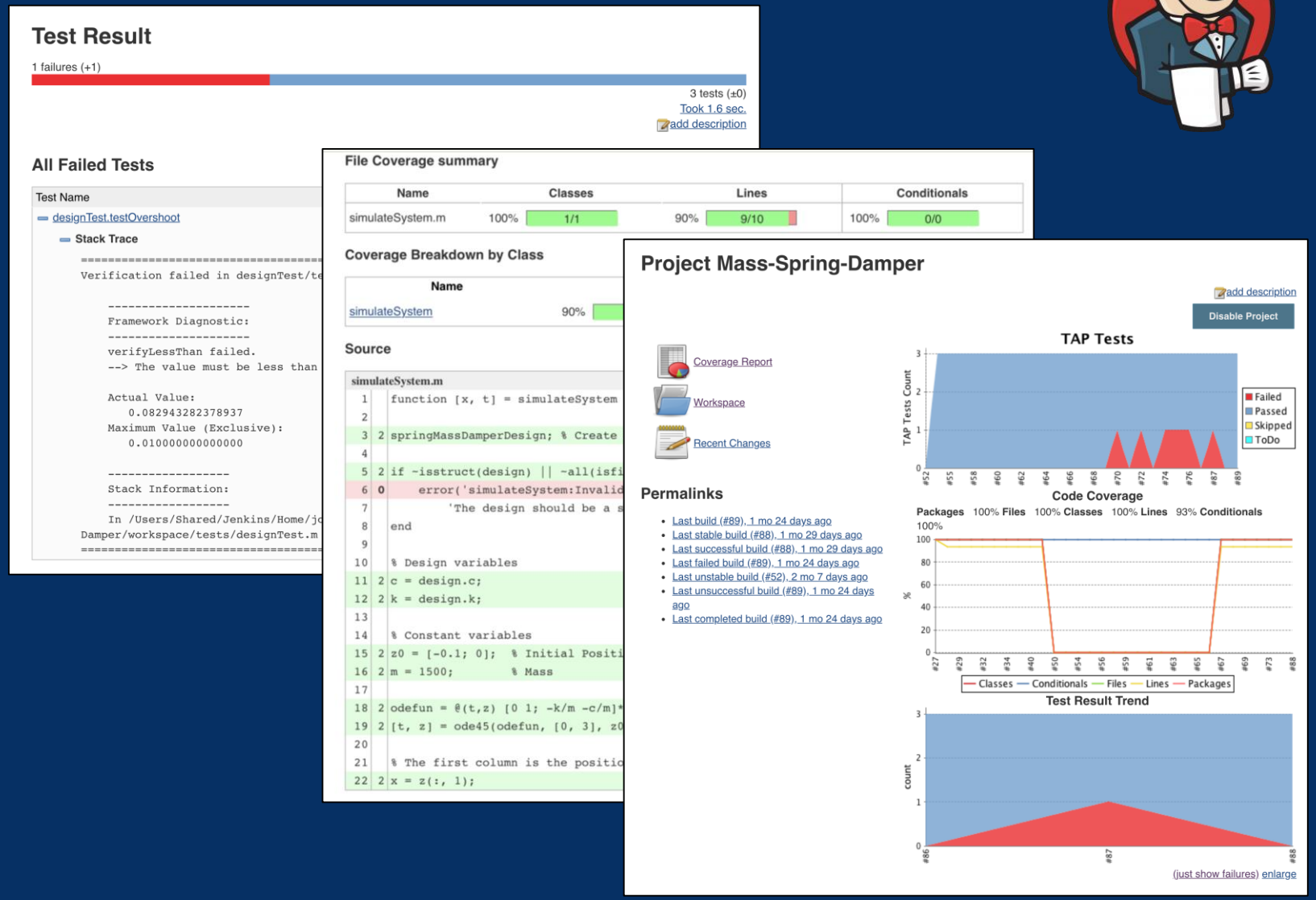


MATLAB Plugin for Jenkins

- Install MATLAB Plugin for Jenkins directly from the Jenkins Plugin Manager
- Easily connect and configure MATLAB with Jenkins
- Schedule automatic code and model testing
  - MATLAB Unit Test Framework
  - Simulink Test

Testing Reports in Jenkins

- View testing results
- View code coverage
- View testing reports

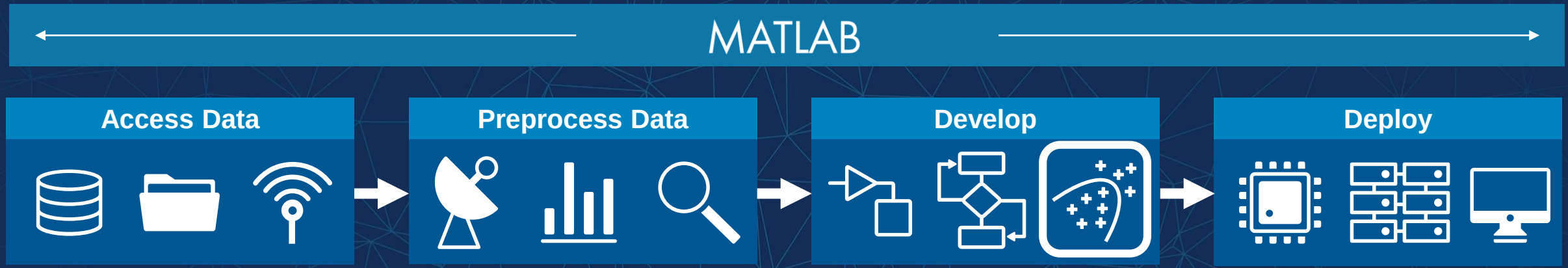


AI: Machine and Deep Learning

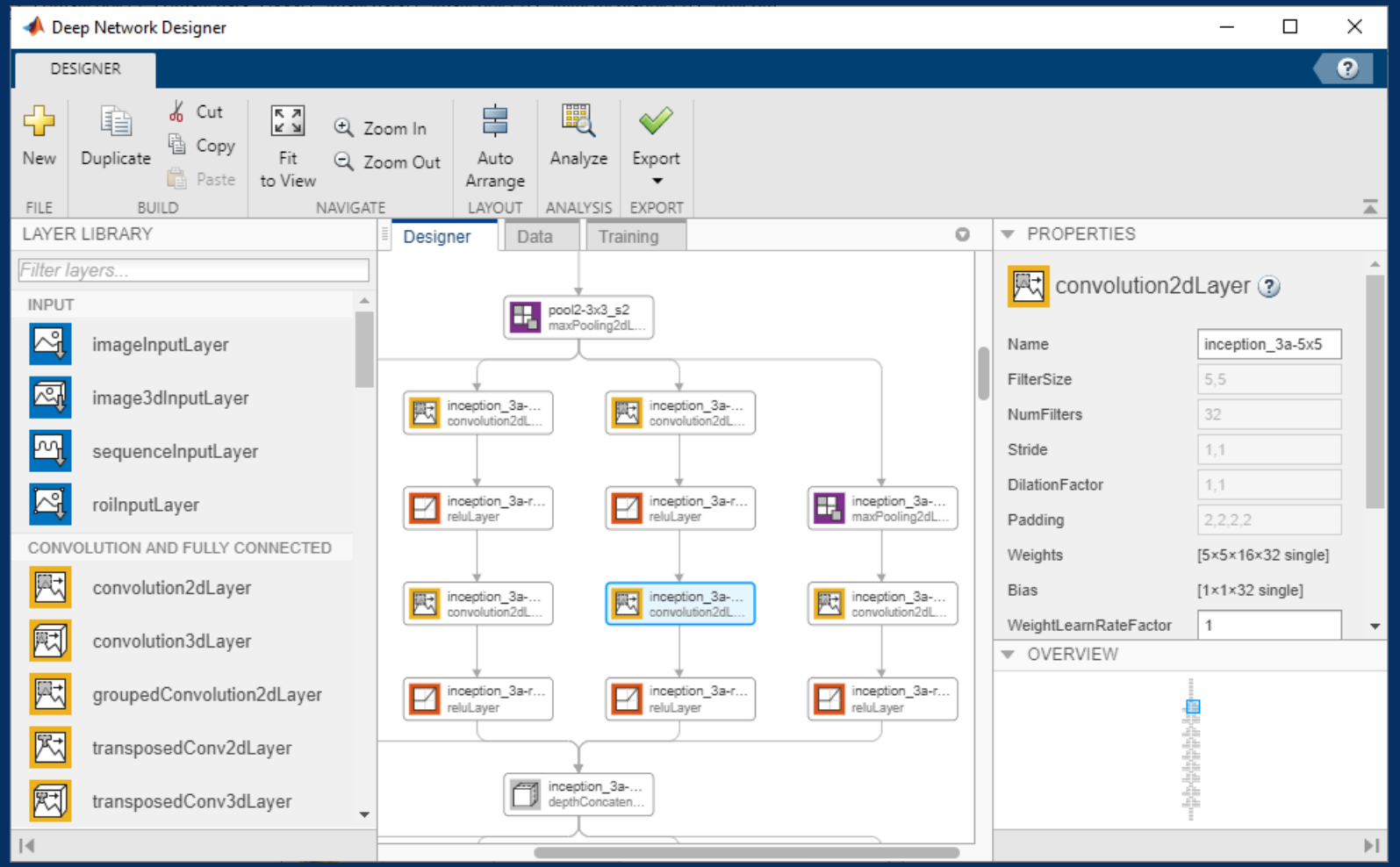
1. The MATLAB Advantage
2. Deep Network Designer App
3. Experiment Manager App
4. AutoML

“Apps to simplify your dev cycle with code to scale”

Artificial Intelligence (AI)



Interactively access models, and develop and train networks

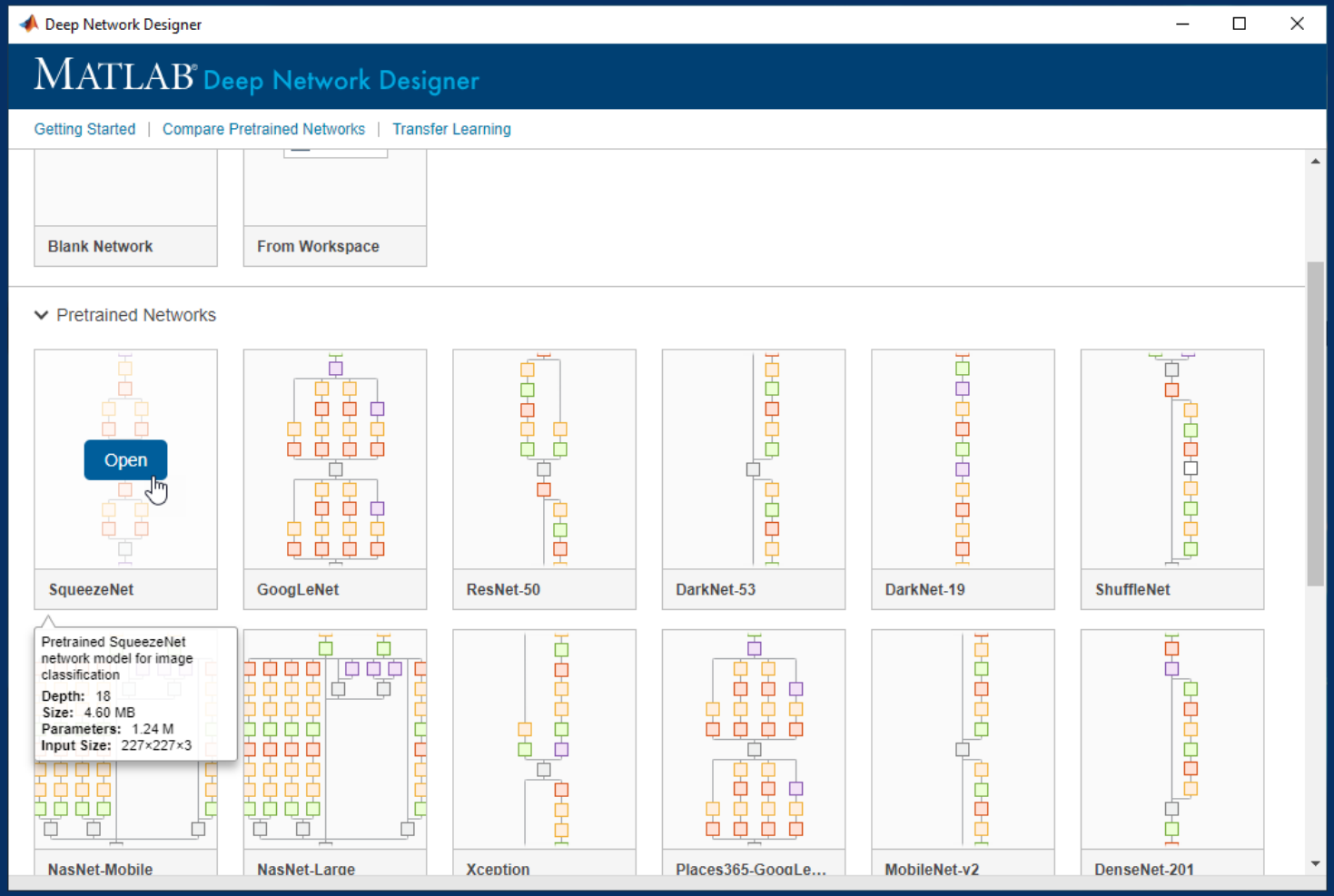


Deep Network Designer App

Deep Learning Toolbox

Interactively access models, and develop and train networks

Import pretrained networks for transfer learning



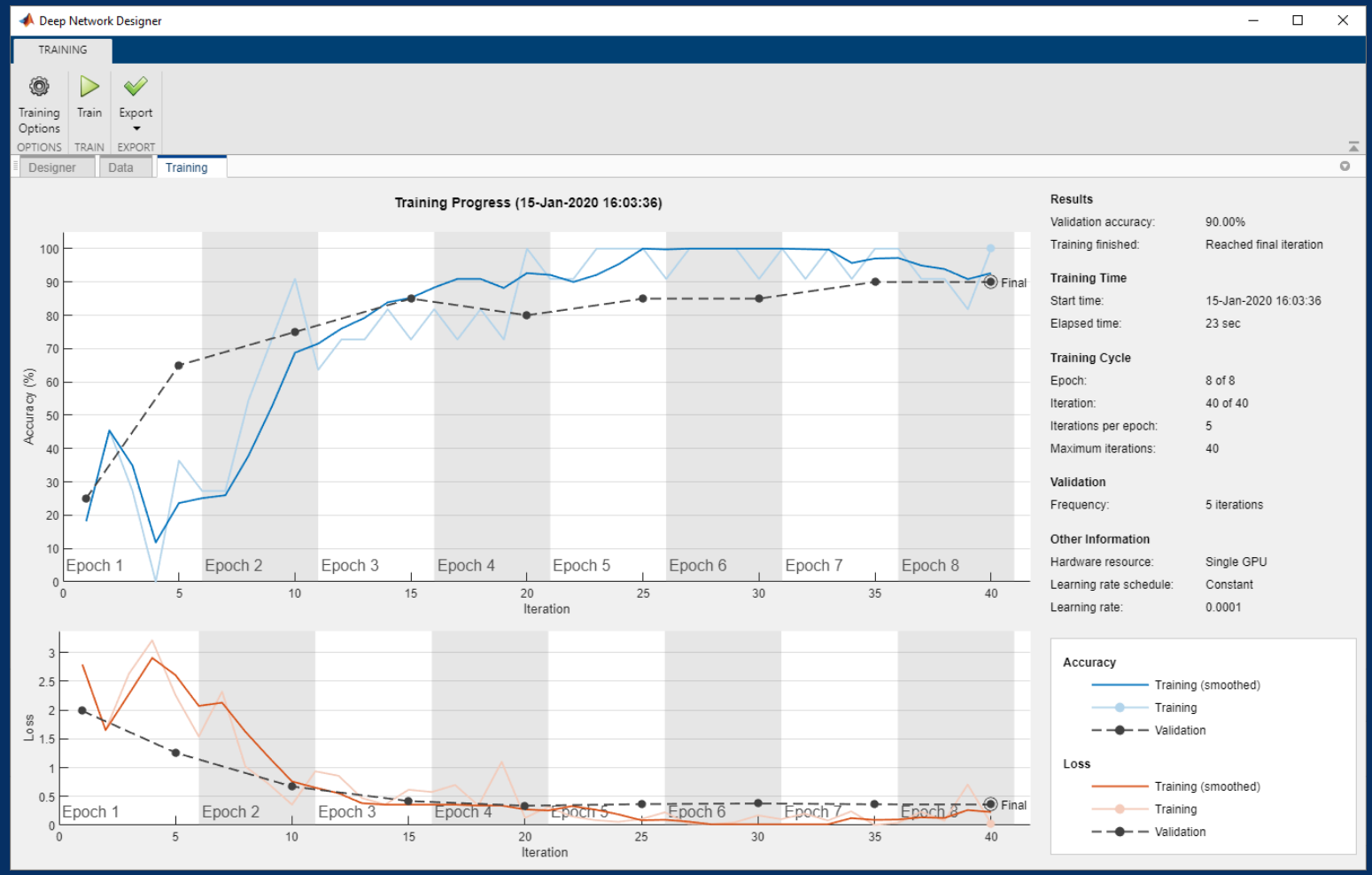
Deep Network Designer App

Deep Learning Toolbox

Interactively access models, and develop and train networks

Import pretrained networks for transfer learning

Train networks and generate MATLAB code



Deep Network Designer App

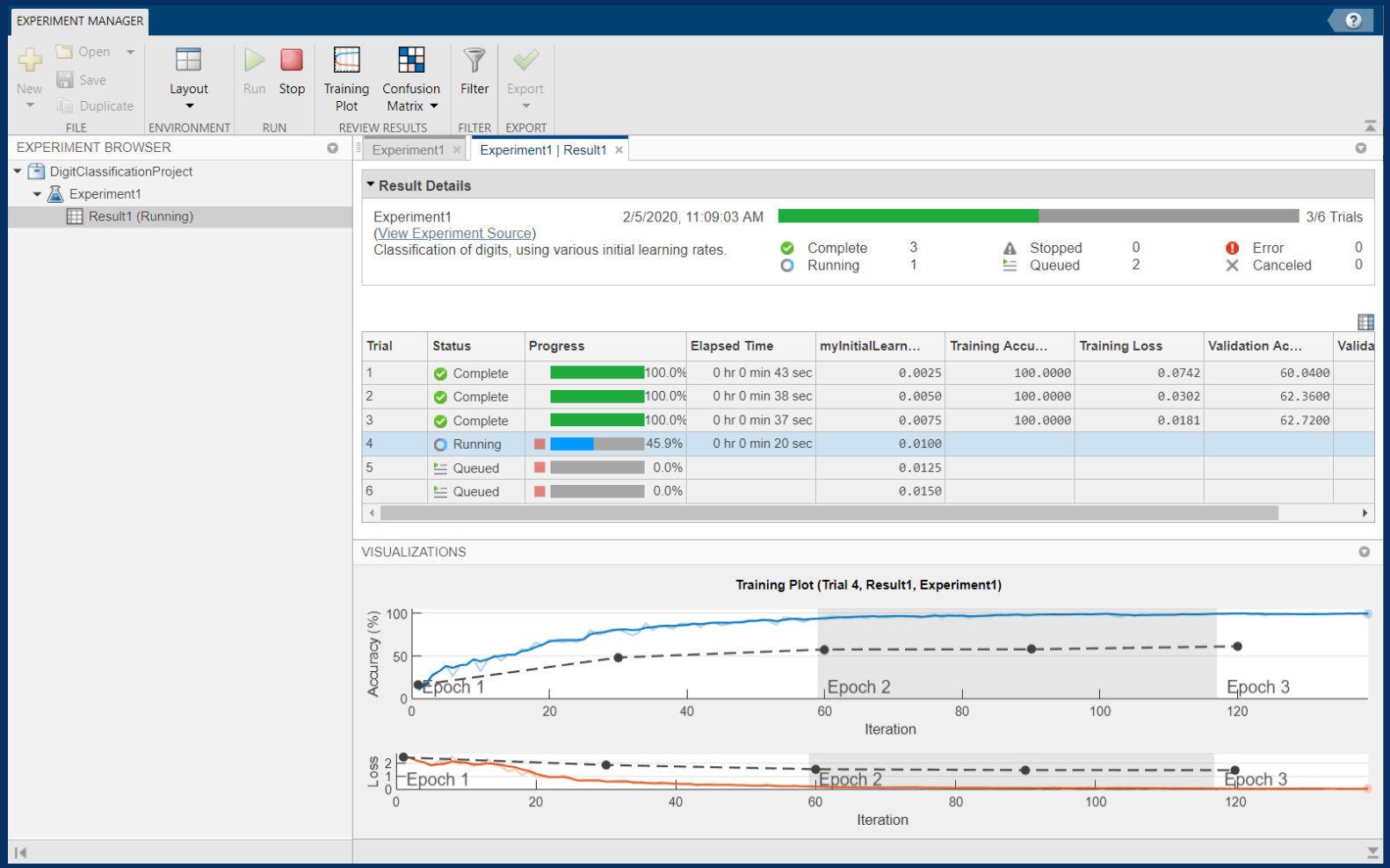
Deep Learning Toolbox

Manage multiple deep learning experiments

Keep track of training parameters

Reuse training data across multiple networks

Analyze and compare results

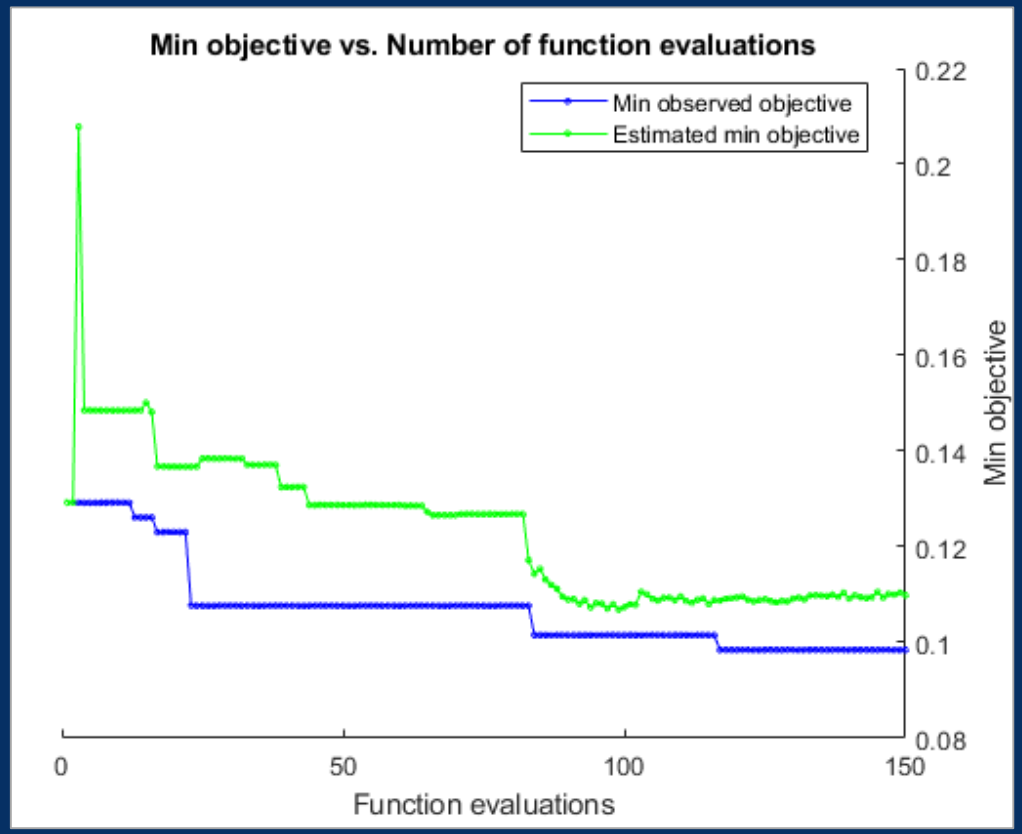


Experiment Manager App

Deep Learning Toolbox

Machine Learning – AutoML

- Automated machine learning
  - Choose a classification model automatically, across a selection of classifier types and hyperparameter values (`fitcauto`)
  - Uses Bayesian optimization



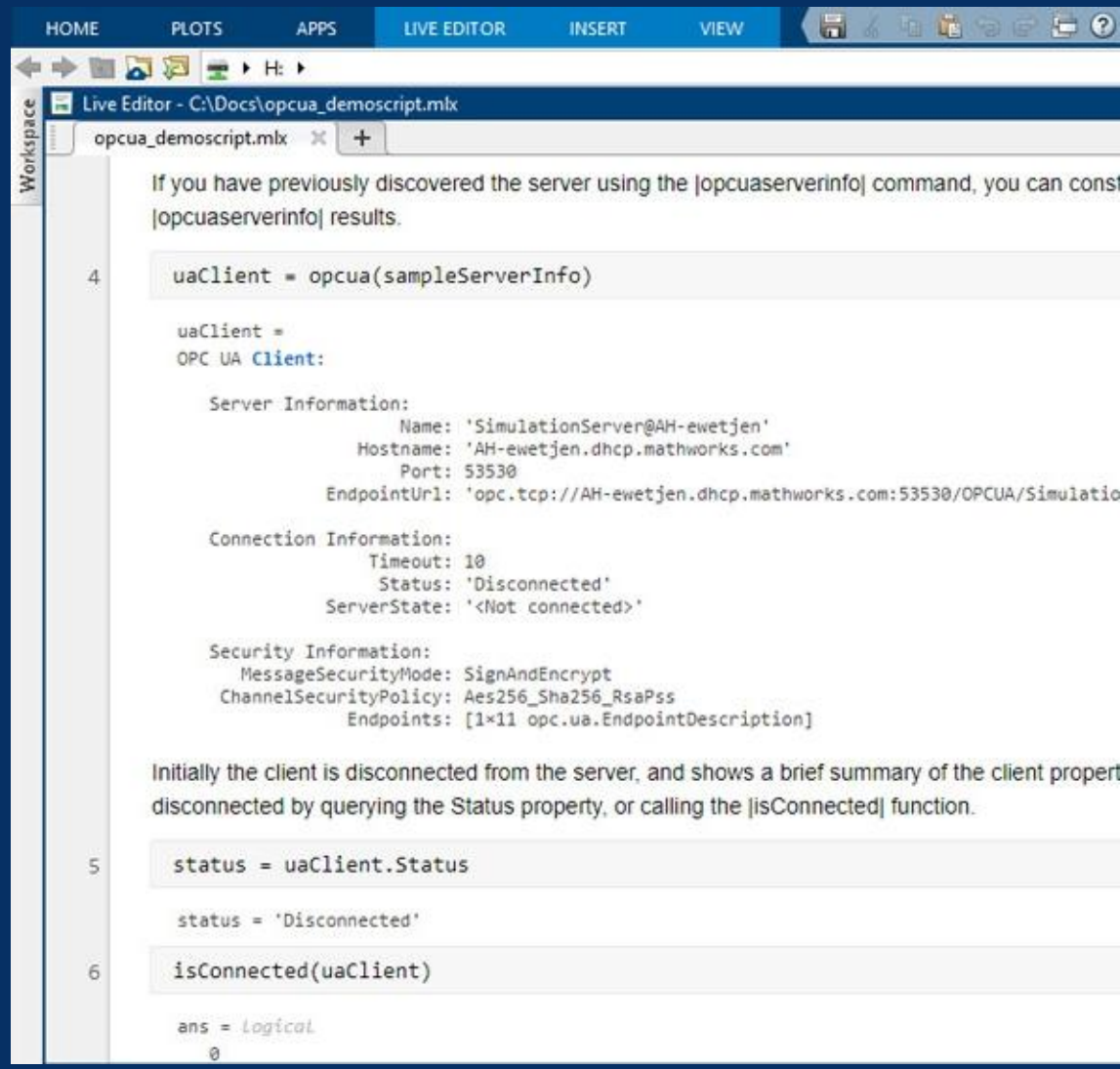
Industrial Tools

1. OPC UA
2. Feature Extraction

“Secure data connectivity with MATLAB analytics drives your insights”

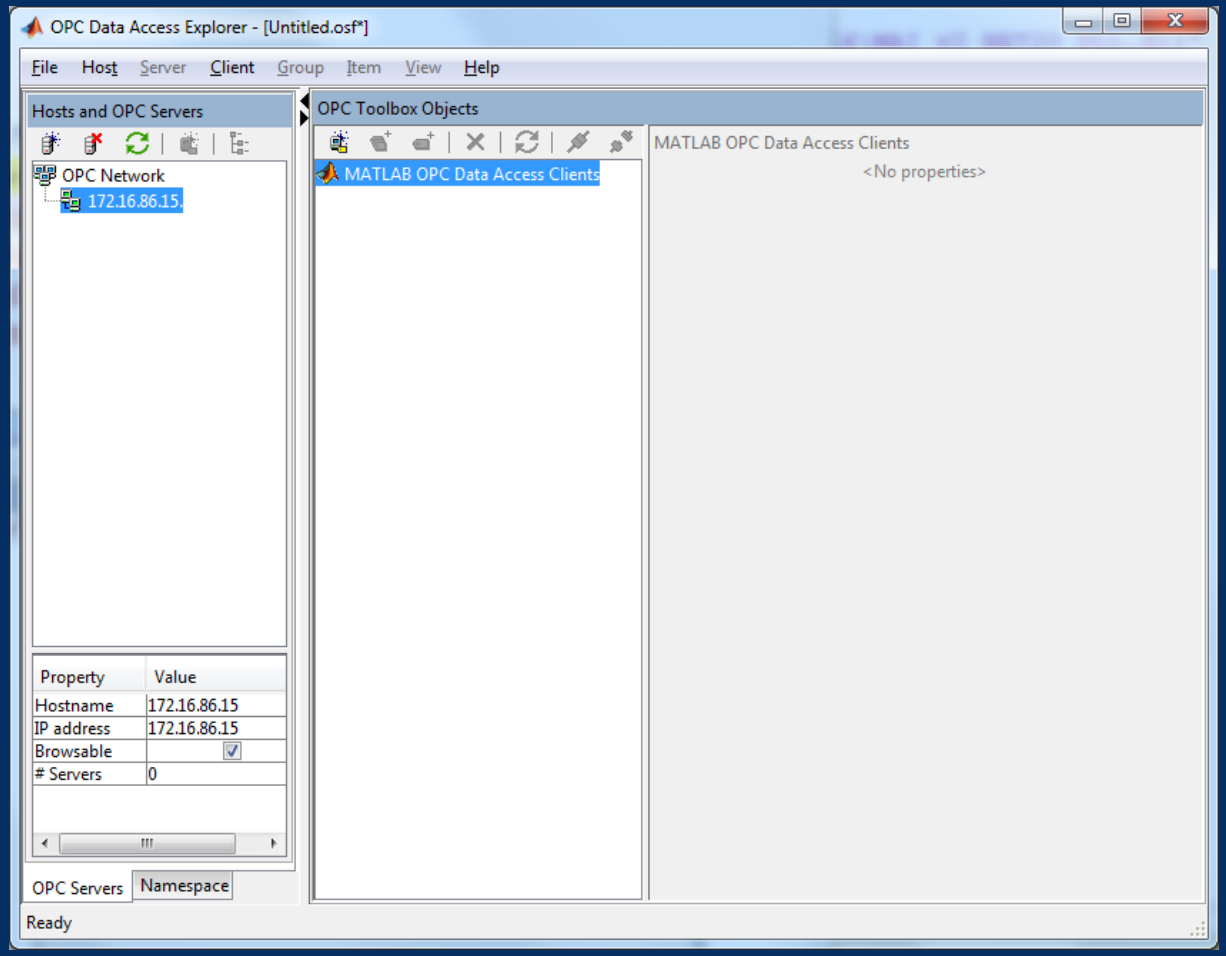
Access plant data securely from OPC UA servers

- Establish secure OPC UA connections
  - Authenticate with username and password or X509 user certificate credentials
  - Sign and encrypt messages



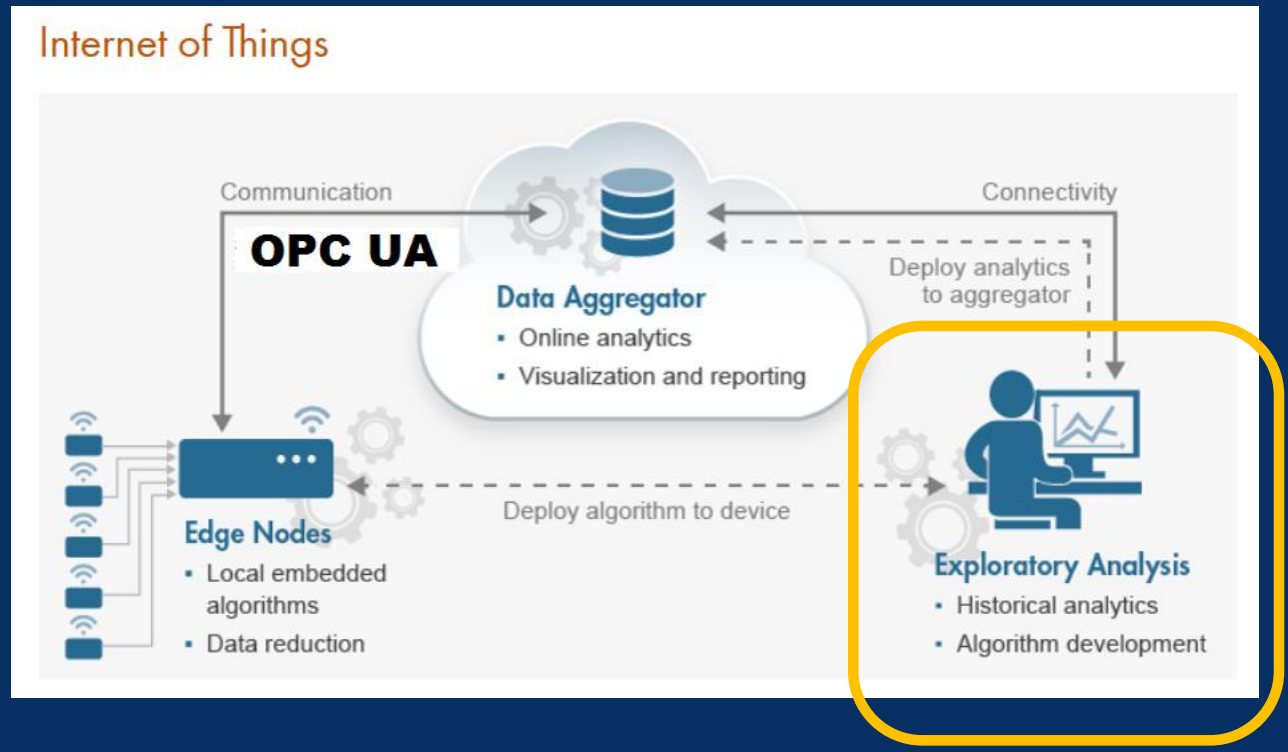
OPC Data Access Explorer App

- Rapidly connect
- Visually browse data
- Export data to the workspace



OPC UA drives IoT

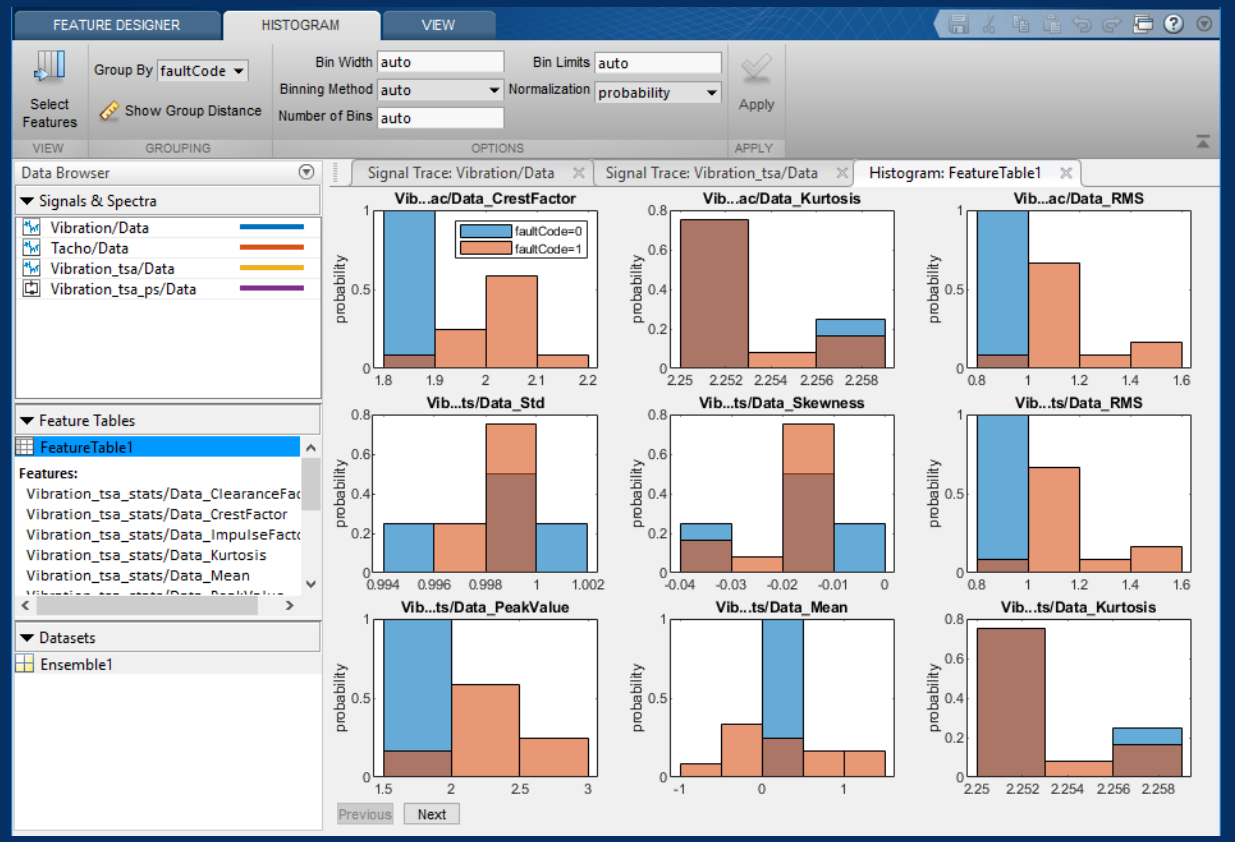
- OPC UA is vendor neutral
- Access PLCs or data aggregators directly from MATLAB and Simulink



Enables predictive maintenance workflows

Diagnostic Feature Designer

- Import multiple data sources
- Interactively visualise base features
- Generate new features, e.g. timeseries
- Prognostic ranking to estimate remaining useful life
- Automatically generate code



Predictive Maintenance Toolbox

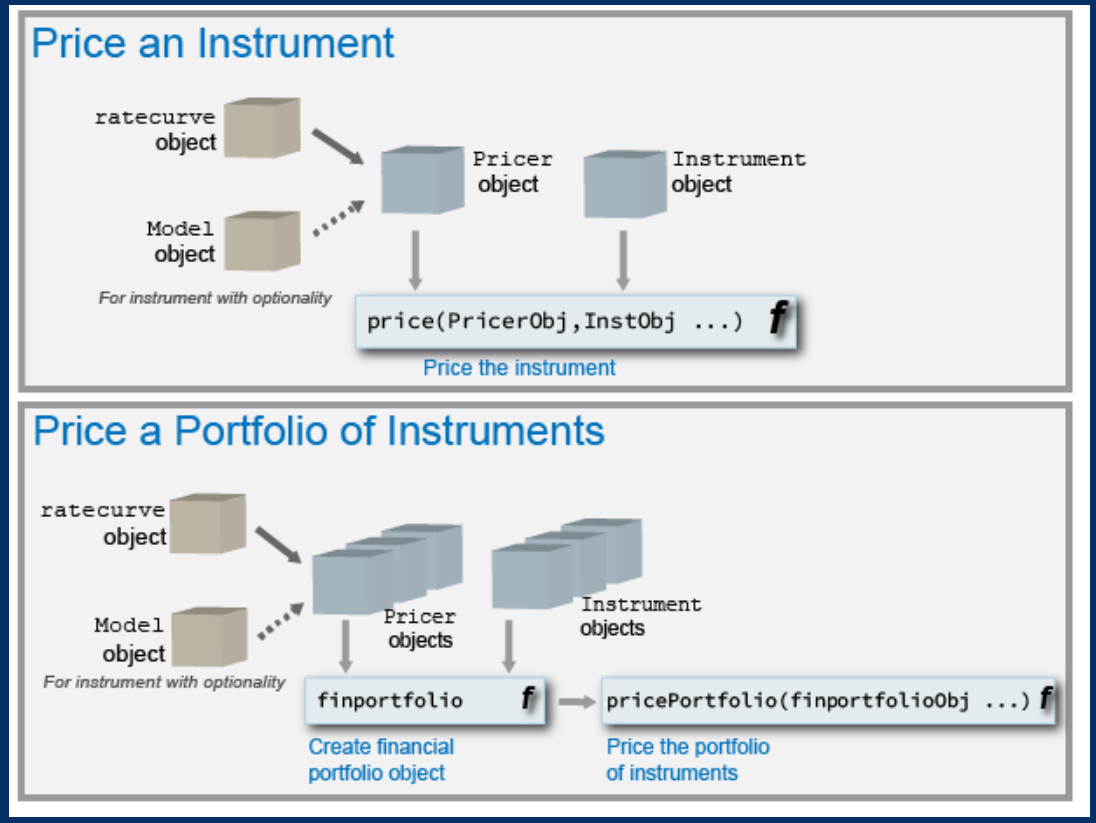
Financial Tools

1. Object Framework for Pricing
2. Econometrics Models

“Object Orientated framework encourages speed and code reuse”

Pricing and Valuation

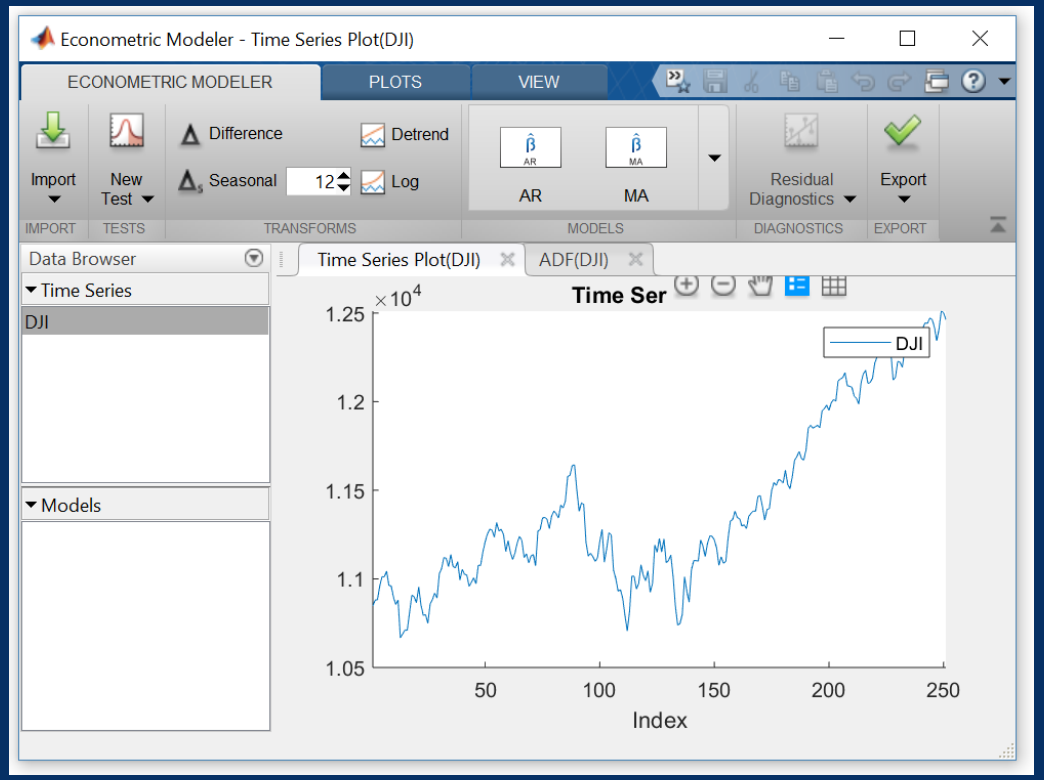
- Price various types of financial instruments individually or collectively as a portfolio using new **object-oriented framework**
- The object-based workflow is an alternative to pricing financial instruments using functions
- Modular objects can easily be reused to compare instrument prices for different models and pricing engines



Financial Instruments Toolbox

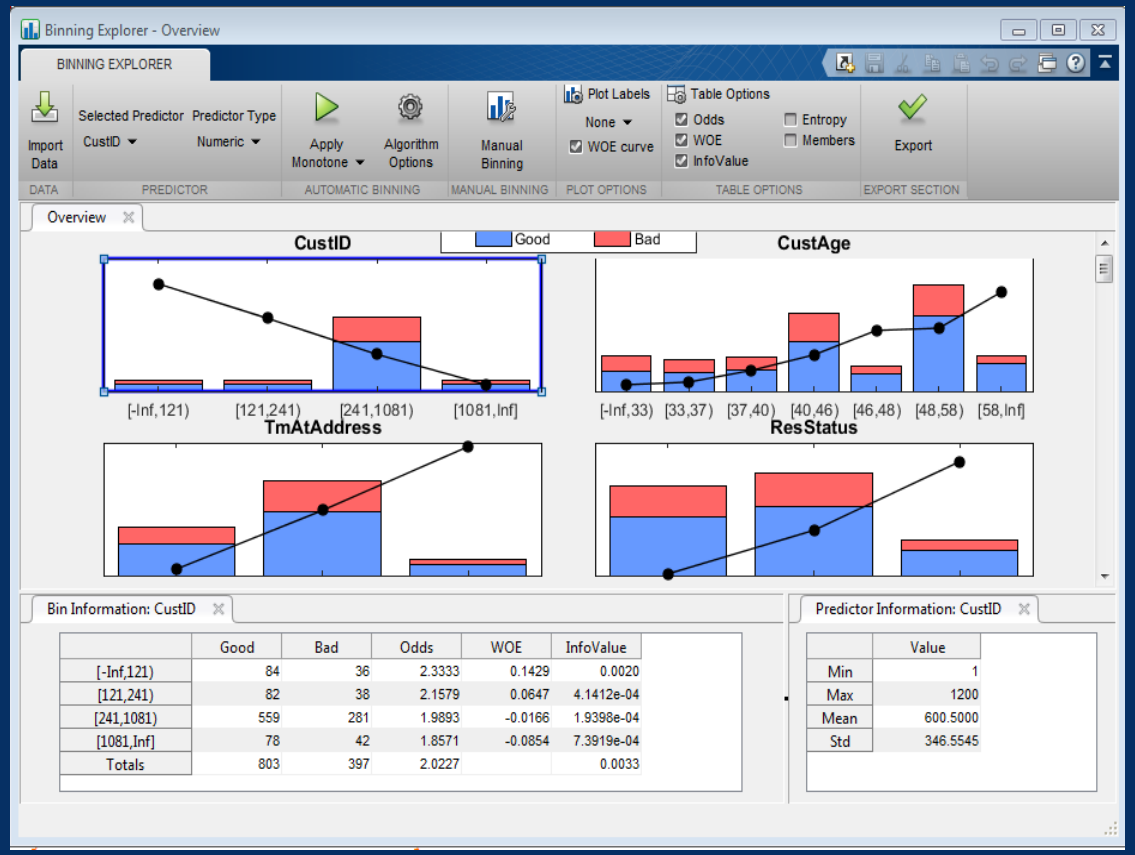
Econometrics Toolbox

- Bayesian vector autoregression models
- Markov-switching autoregression models
- Granger Causality Test



Risk Management Toolbox

- Support for constraints in credit scorecards
- Predictor screening for credit scorecards
  - Support for data that is too big to fit in memory (Big Data)



	Good	Bad	Odds	WOE	InfoValue
[-Inf,121)	84	36	2.3333	0.1429	0.0020
[121,241)	82	38	2.1579	0.0647	4.1412e-04
[241,1081)	559	281	1.9893	-0.0166	1.9398e-04
[1081,Inf]	78	42	1.8571	-0.0854	7.3919e-04
Totals	803	397	2.0227		0.0033

	Value
Min	1
Max	1200
Mean	600.5000
Std	346.5545

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Summary

1. Core MATLAB
    1. Live scripts; Stateflow; Projects
2. Server Suite
    1. Four core products; Web Apps Server; Reference architectures
3. AI Applications
    1. Deep Network Designer; Experiment; AutoML
4. Industrial Tools
    1. OPC UA, Diagnostic Feature Designer
5. Financial Models
    1. New object framework

