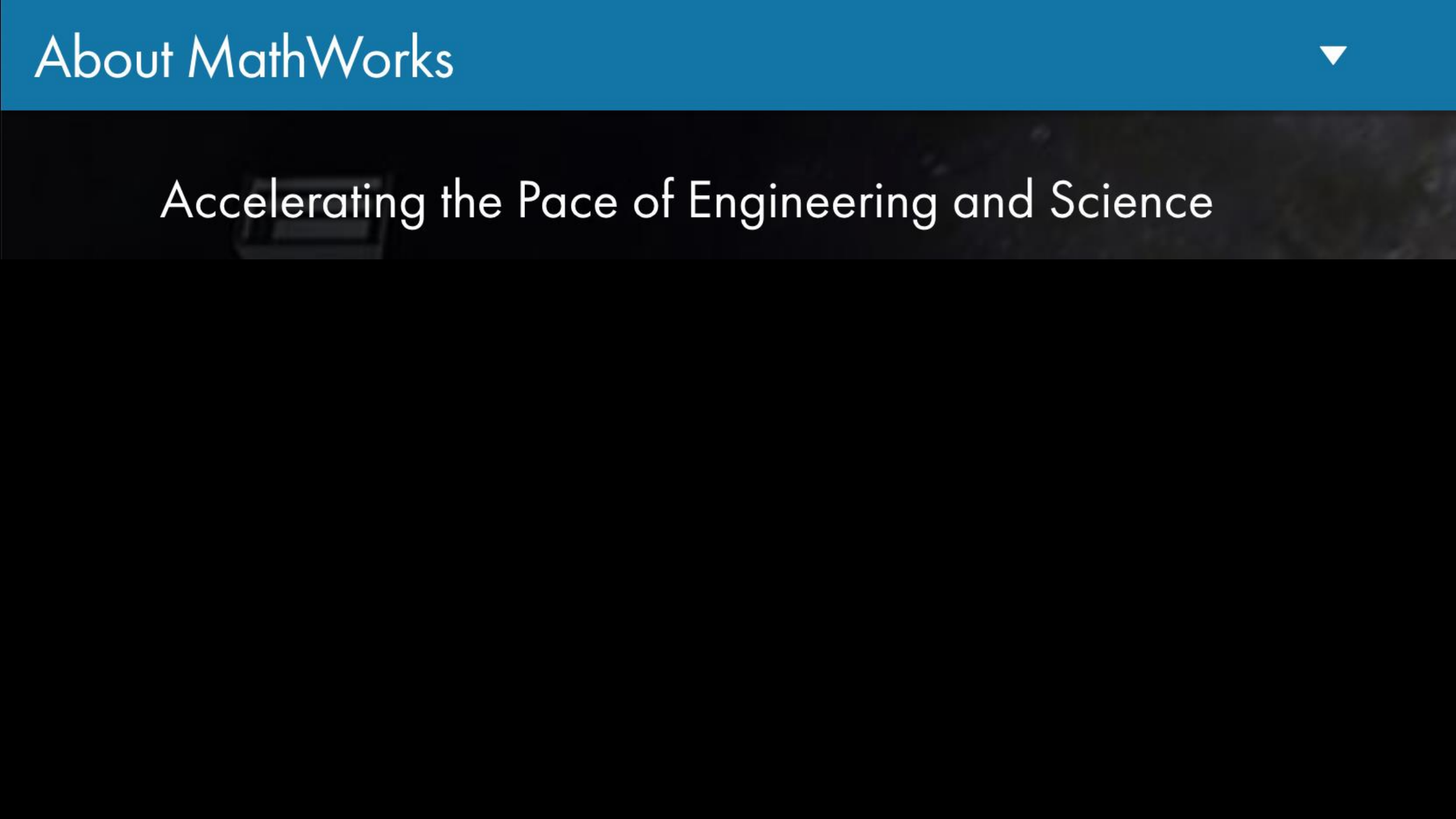

MathWorks®


About MathWorks
Accelerating the Pace of Engineering and Science

We at MathWorks believe in the importance of engineers and scientists. They increase human knowledge and profoundly improve our standard of living.


We created MATLAB and Simulink to help them do their best work.

MATLAB EXPO

What's New in MATLAB and Simulink R2020b

Kevin Cohan
Ed Marquez

MathWorks®

2,834

MATLAB®
&SIMULINK®

Test and Verify
Share and Deploy

Deep
Solutions

Test and Verify
Share and Deploy

Deep
Solutions

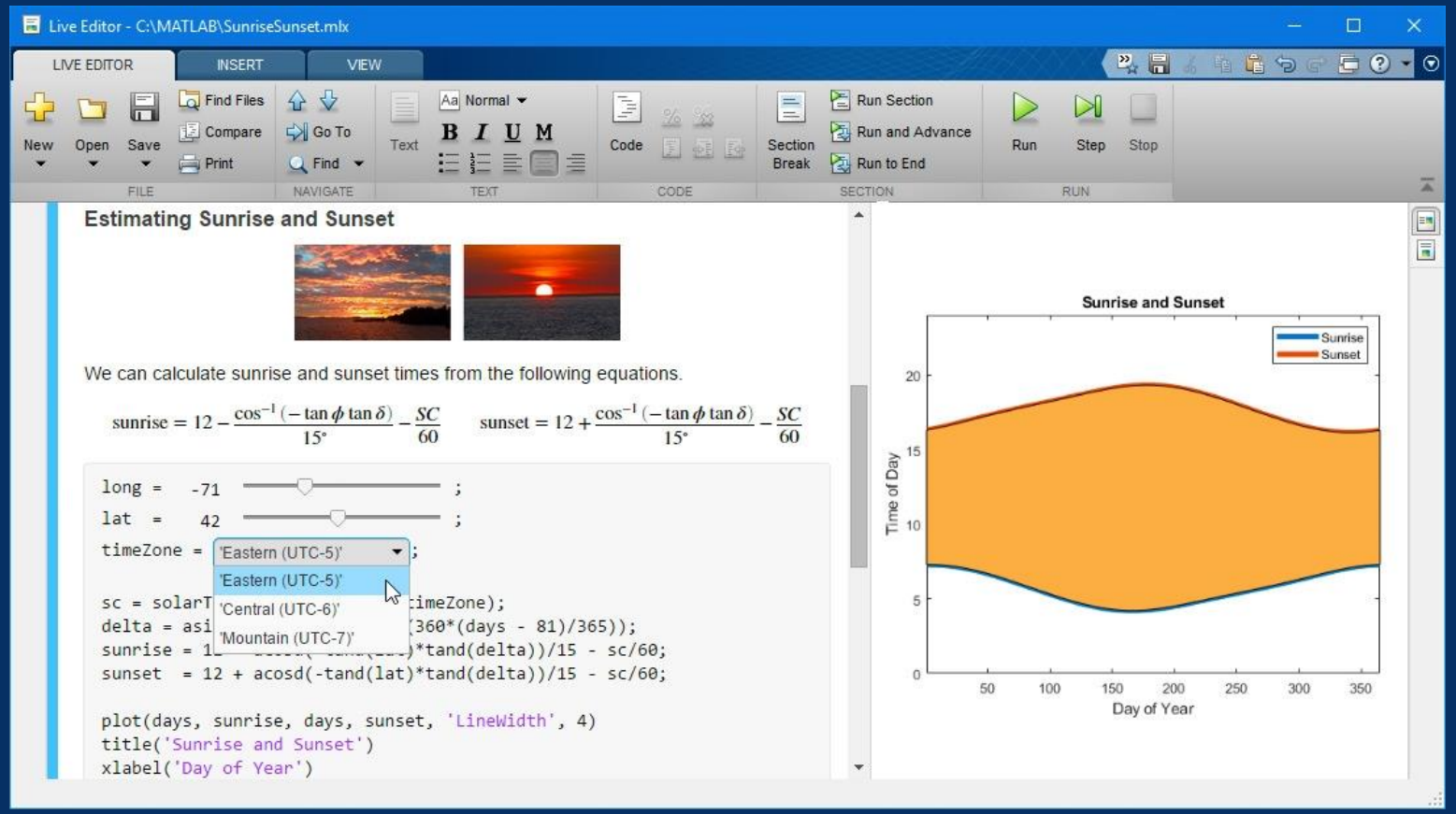
Create executable notebooks for sharing, presenting, teaching

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



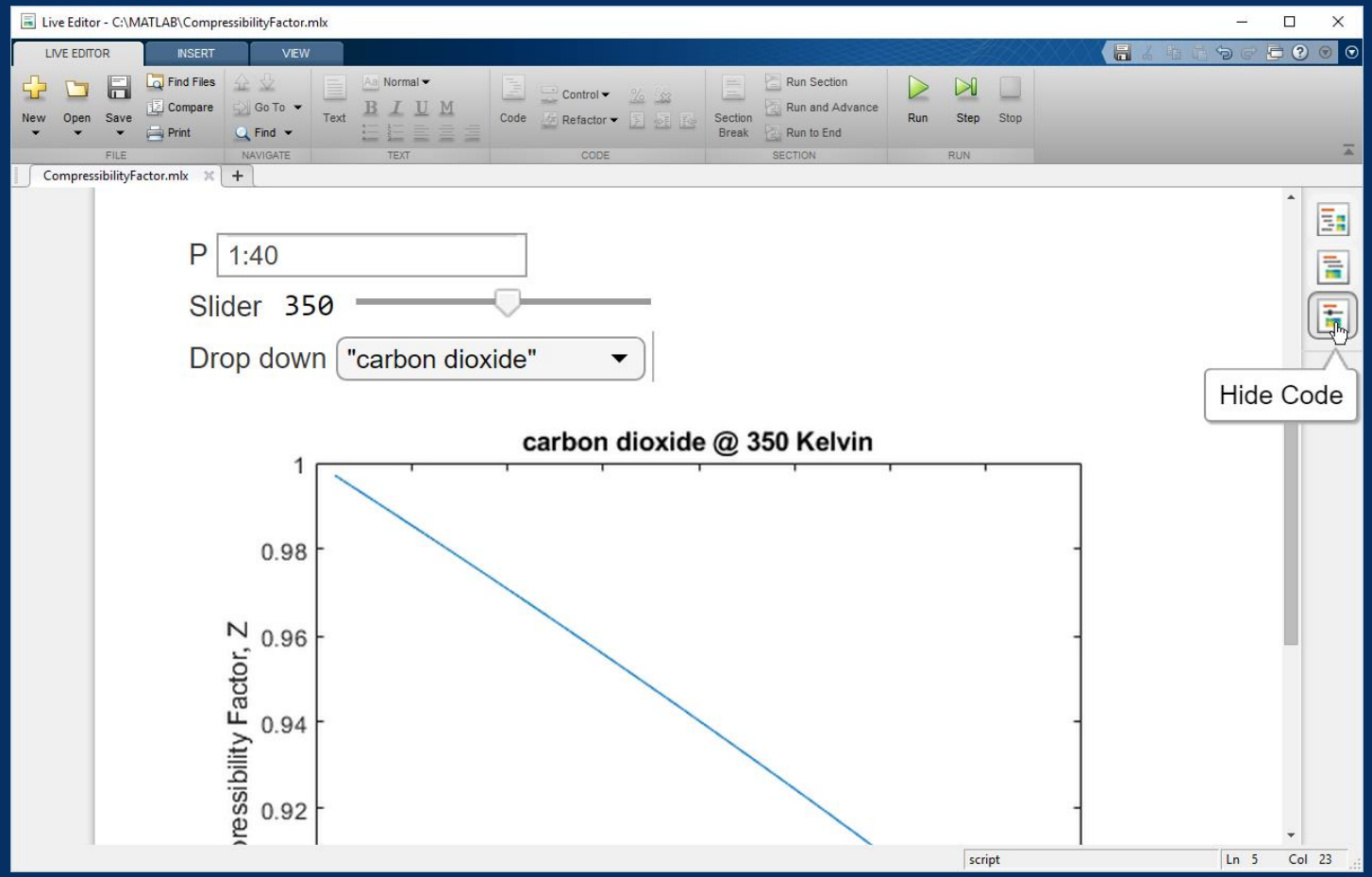
Live Editor

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

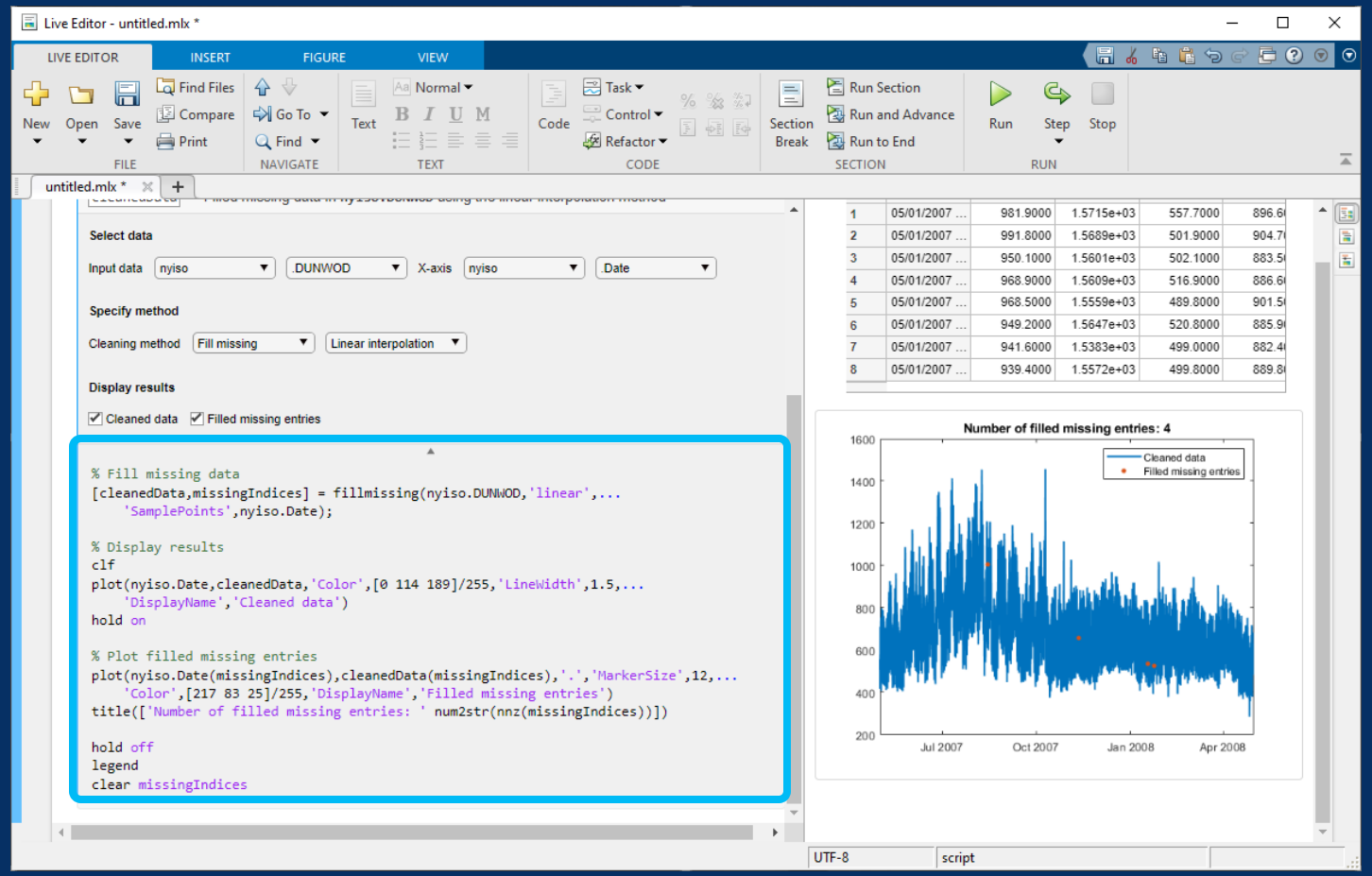


Live Editor

Complete steps interactively

Use **tasks** to explore parameters and options

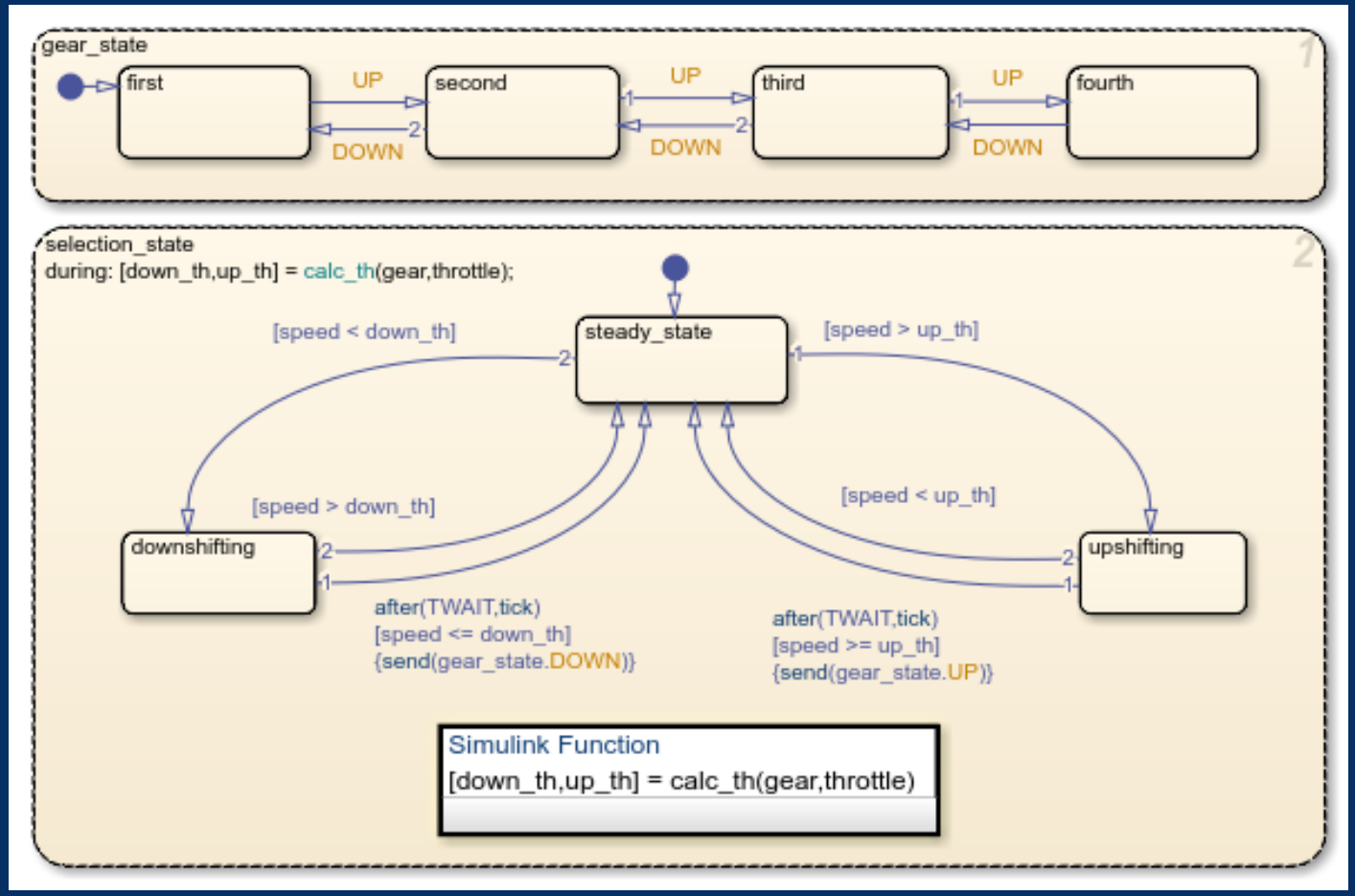
Automatically generate MATLAB code for the completed task



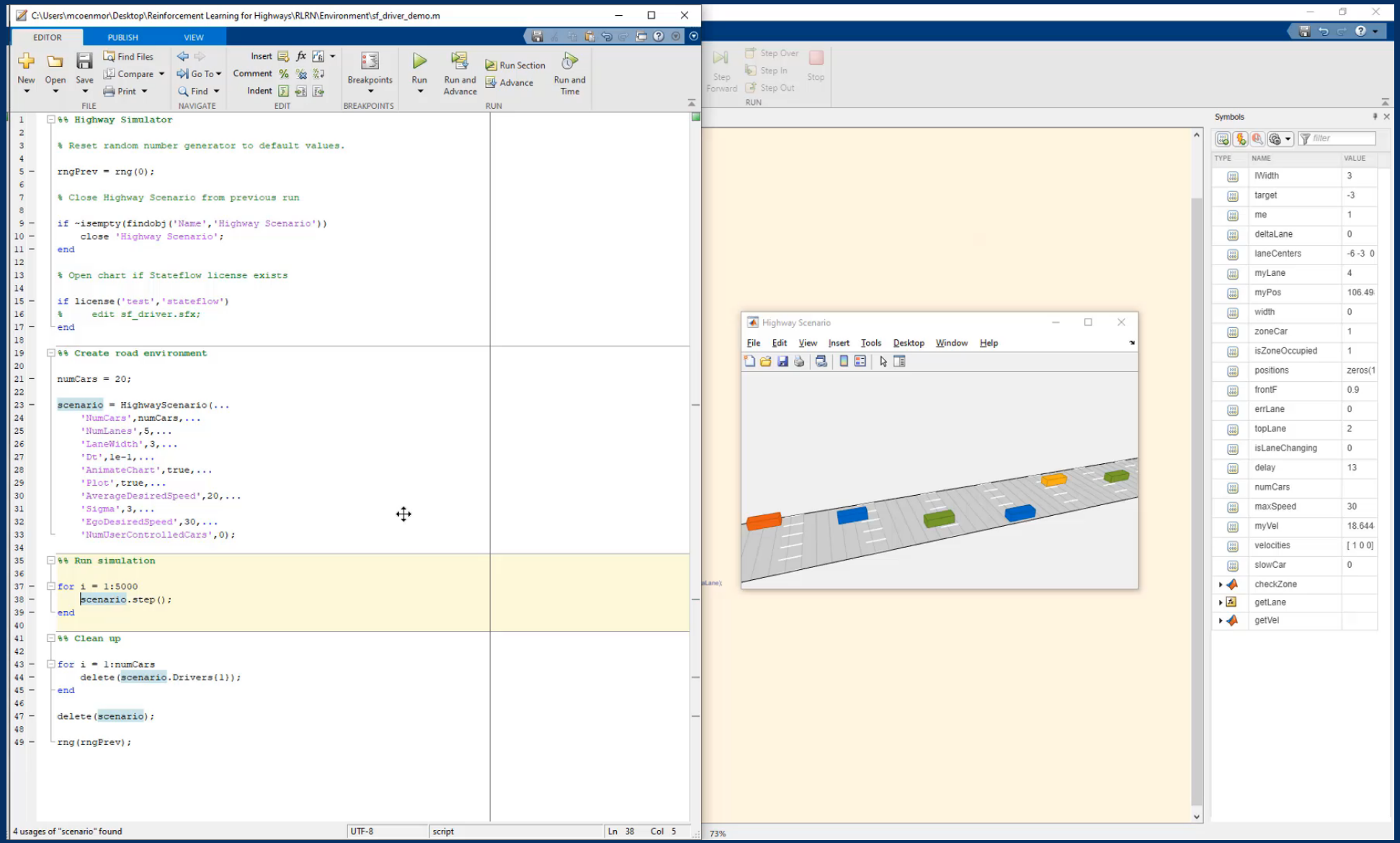
Live Editor

Design decision logic at a higher level of abstraction

Graphically program, debug and execute state machines



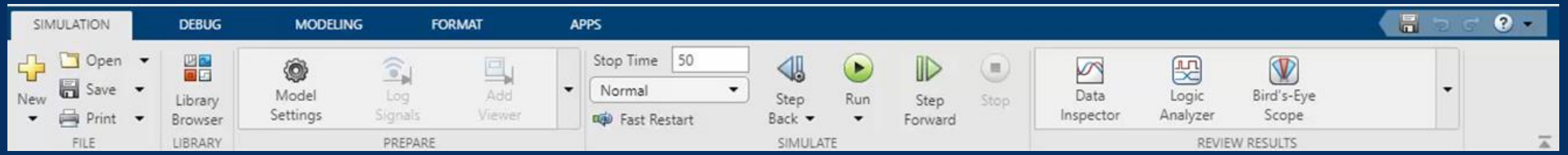
Design decision logic at a higher level of abstraction – in MATLAB



MATLAB
Stateflow

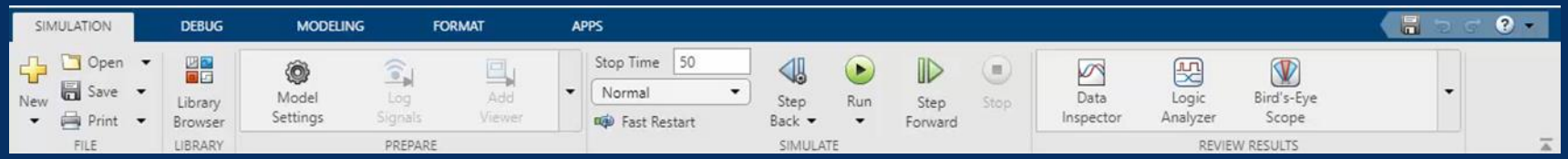
Enable any engineer at any level to model any system

User interfaces

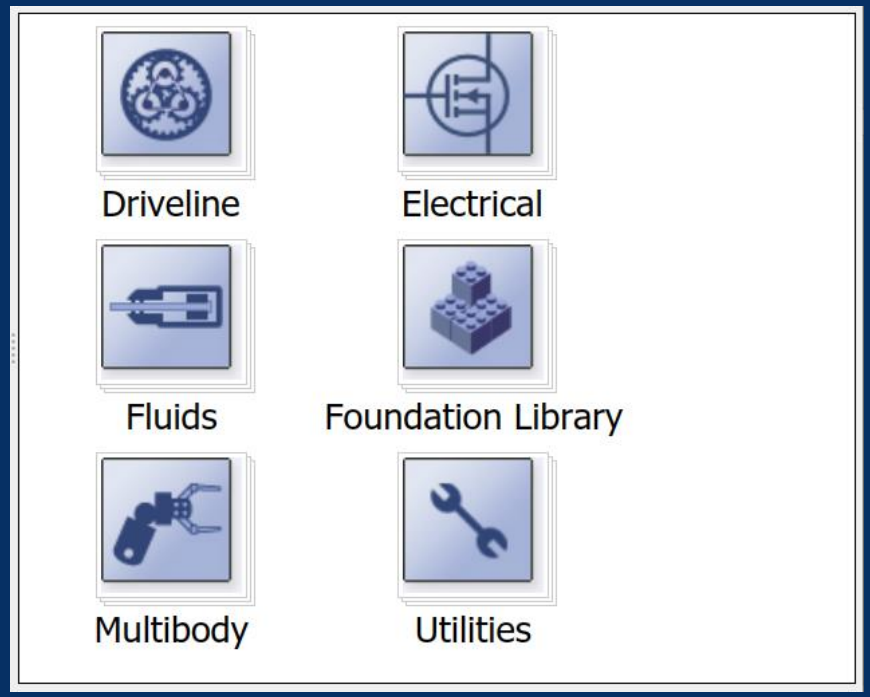


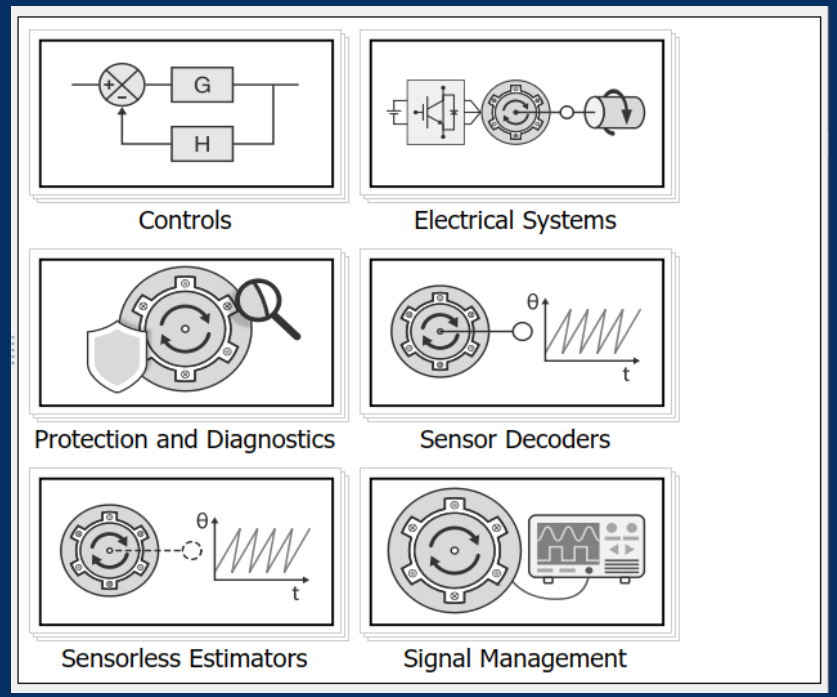
Enable any engineer at any level to model any system

User interfaces



Libraries



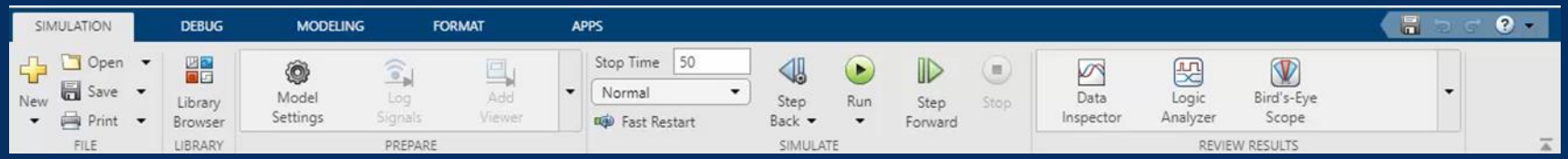


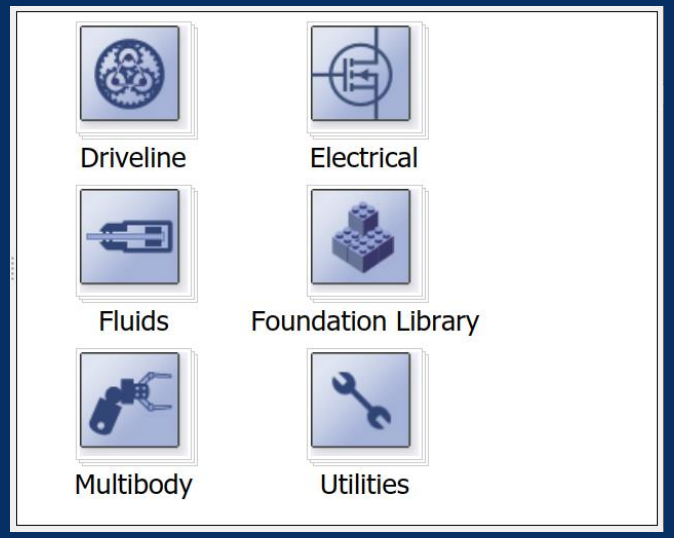
Enable any engineer at any level to model any system

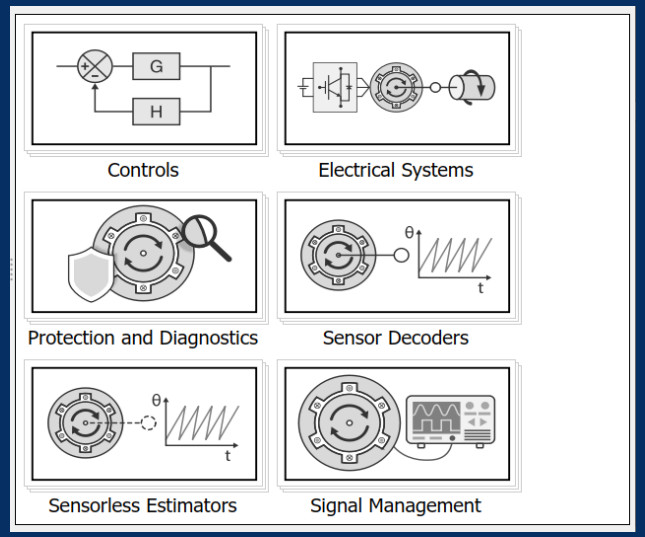
User interfaces

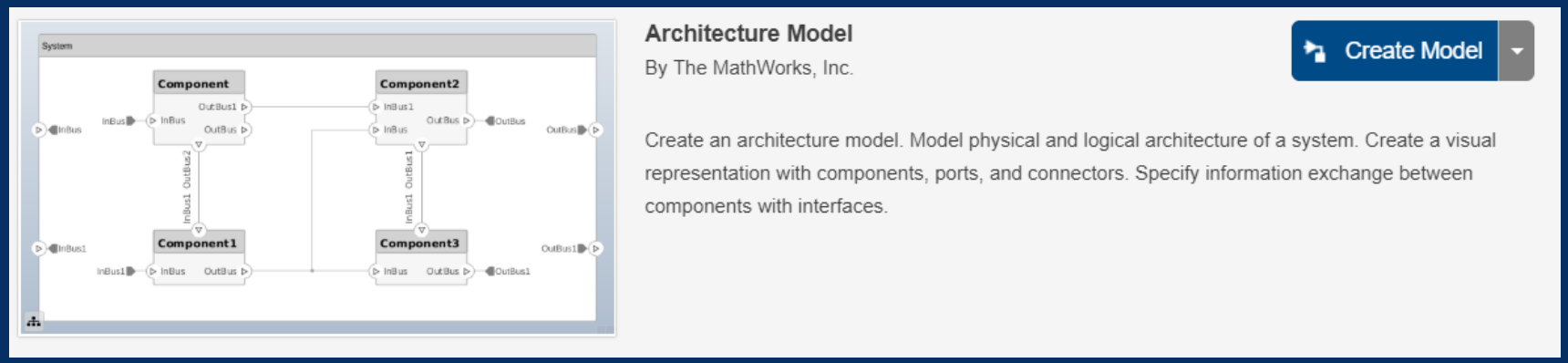
Libraries

Systems engineering







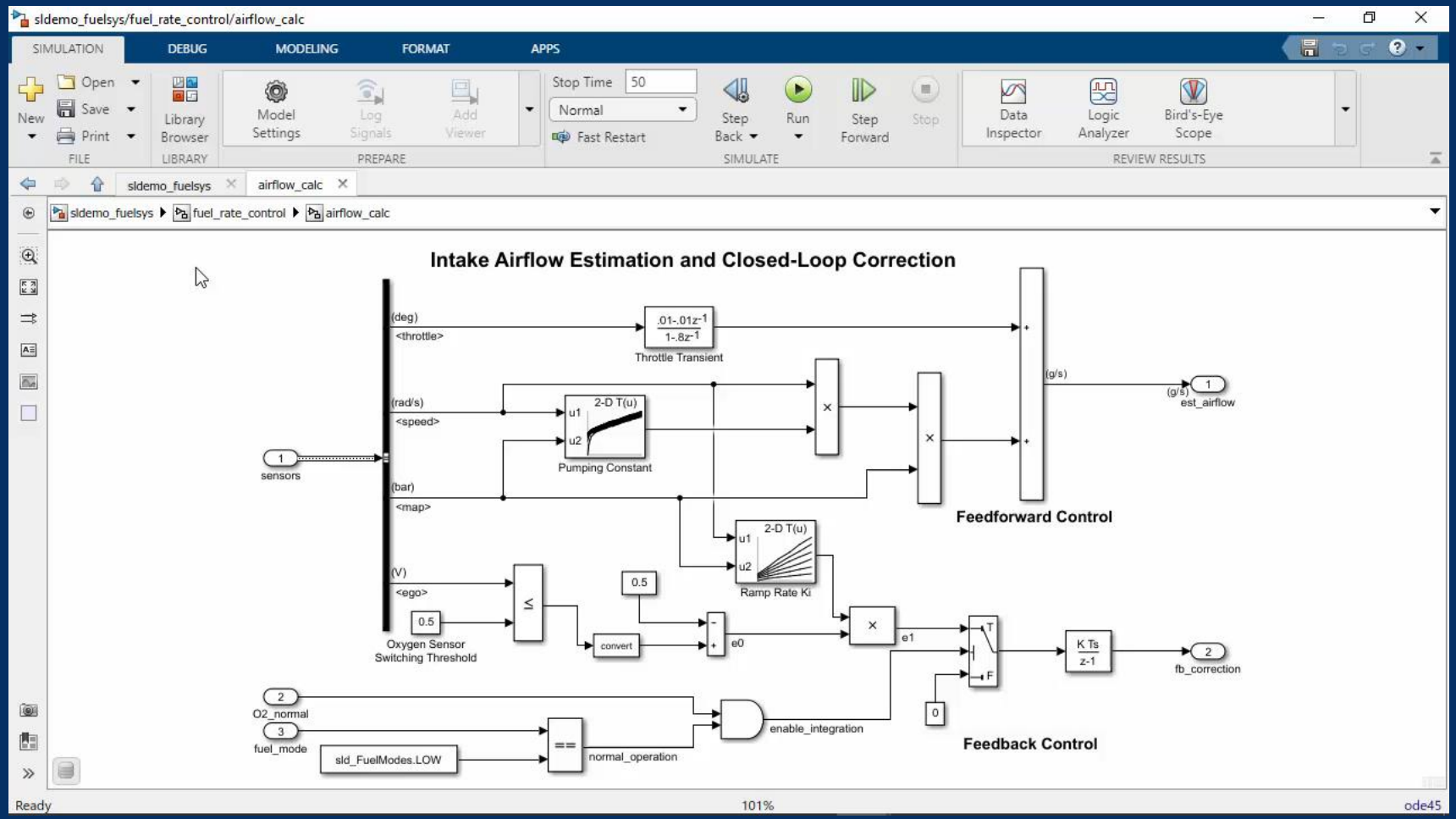


Access and discover Simulink capabilities when you need them

User interfaces

Libraries

Systems engineering



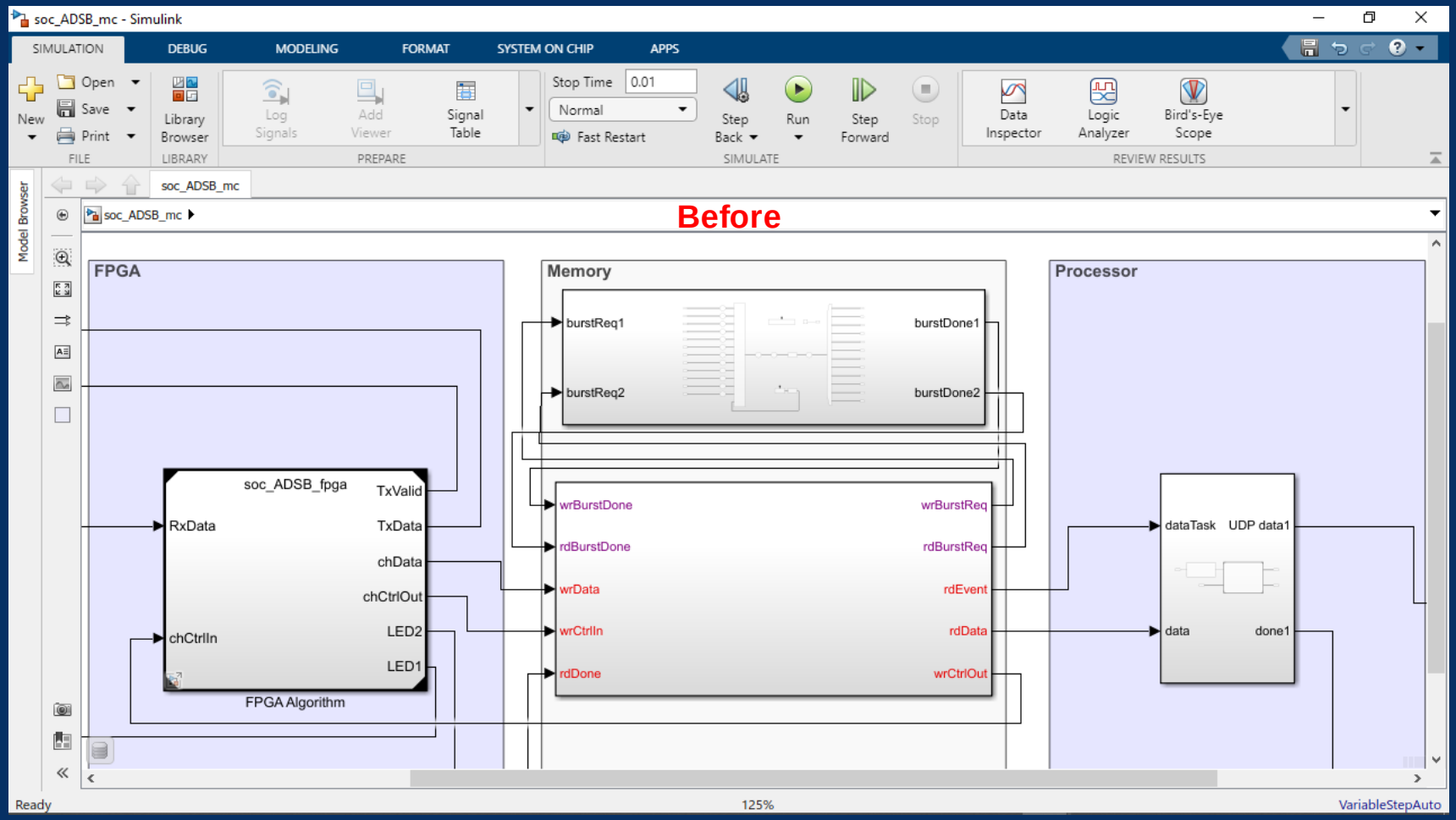
Simulink Toolstrip

Edit at the speed of thought

User interfaces

Libraries

Systems engineering

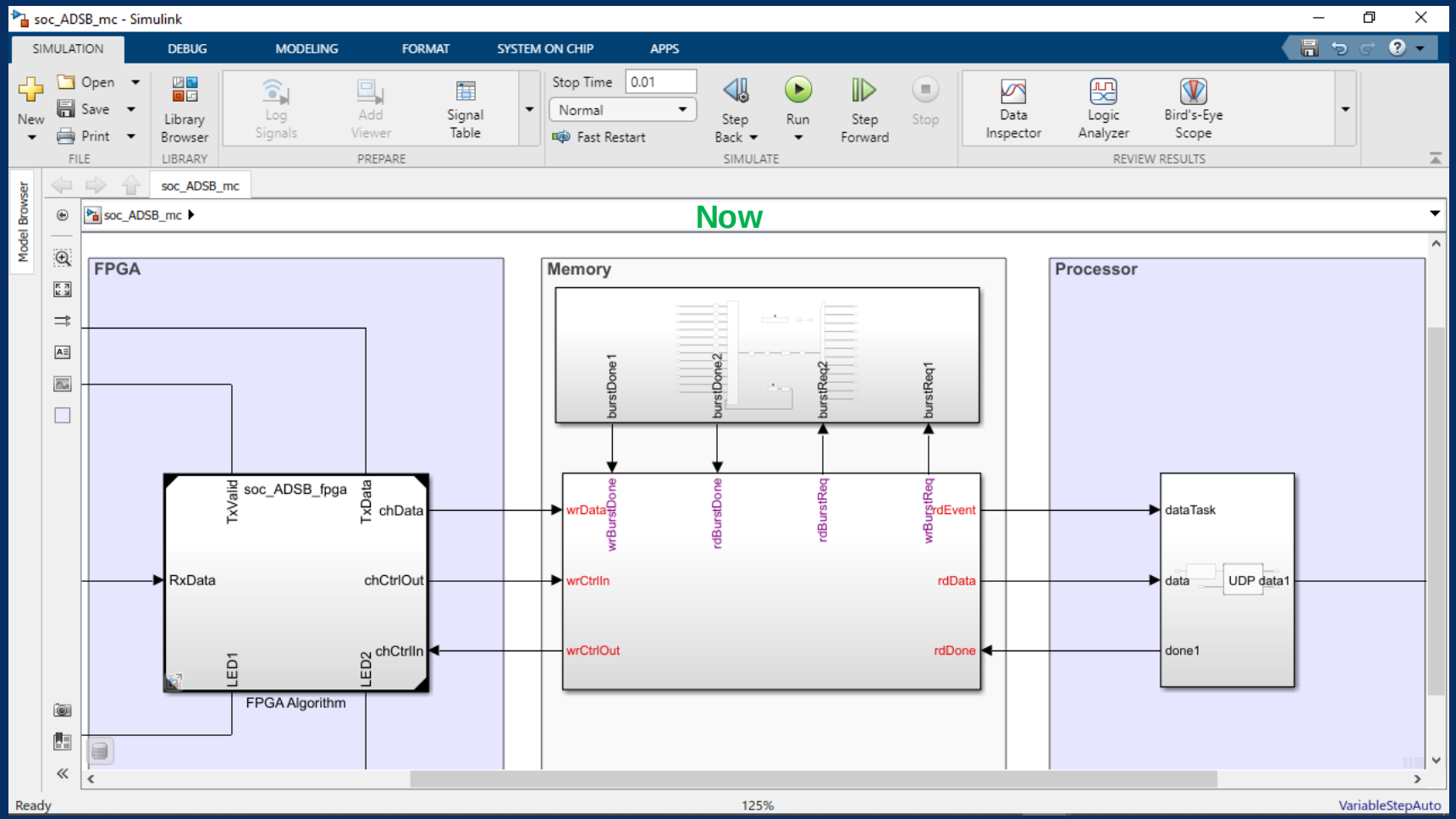


Edit at the speed of thought

User interfaces

Libraries

Systems engineering

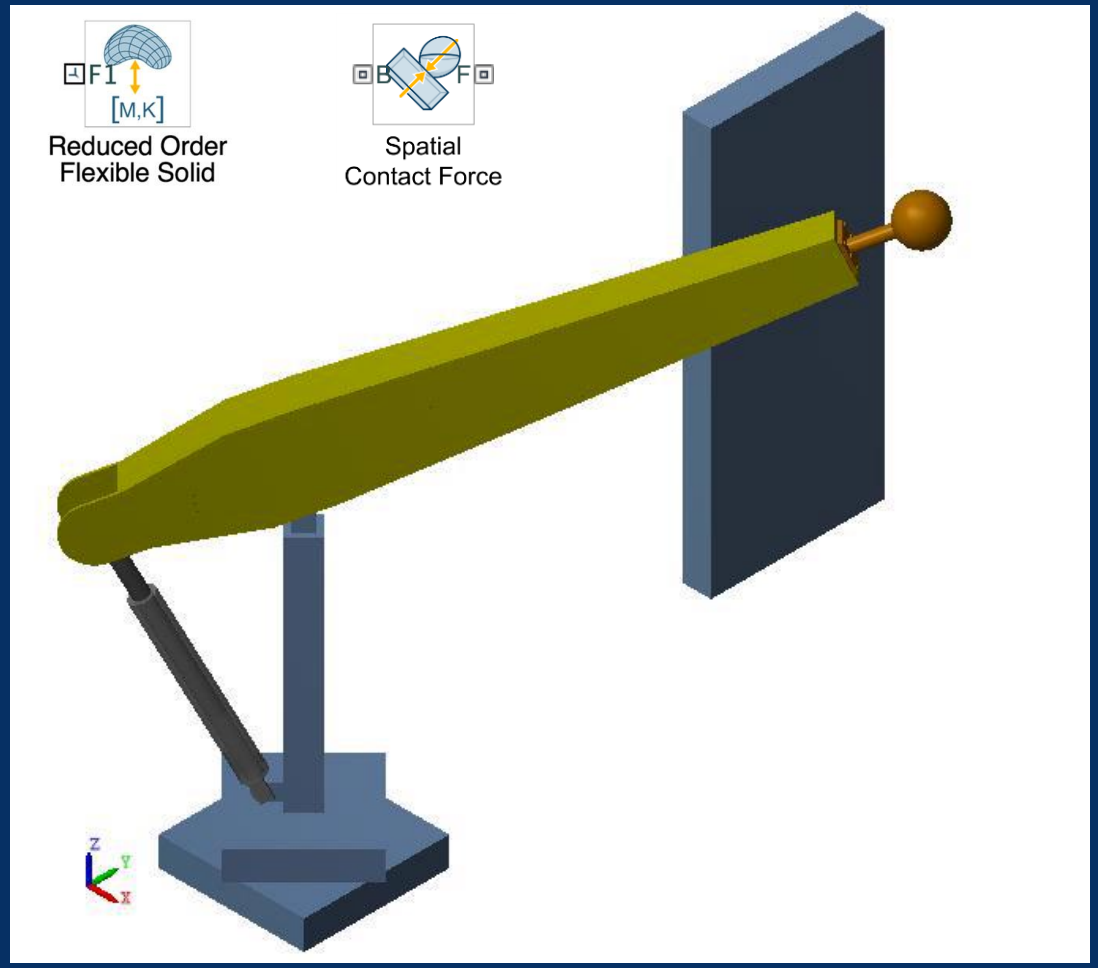


Model deformations and contact between bodies

User interfaces

Libraries – Physical modeling

Systems engineering

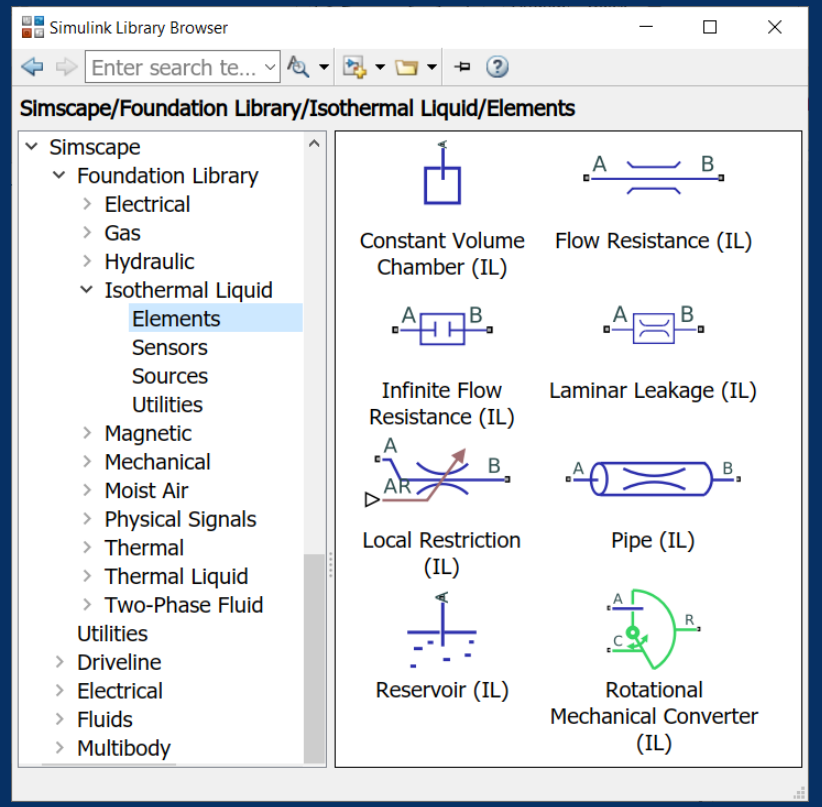


Model fluid power and transport applications

User interfaces

Libraries – Physical modeling

Systems engineering



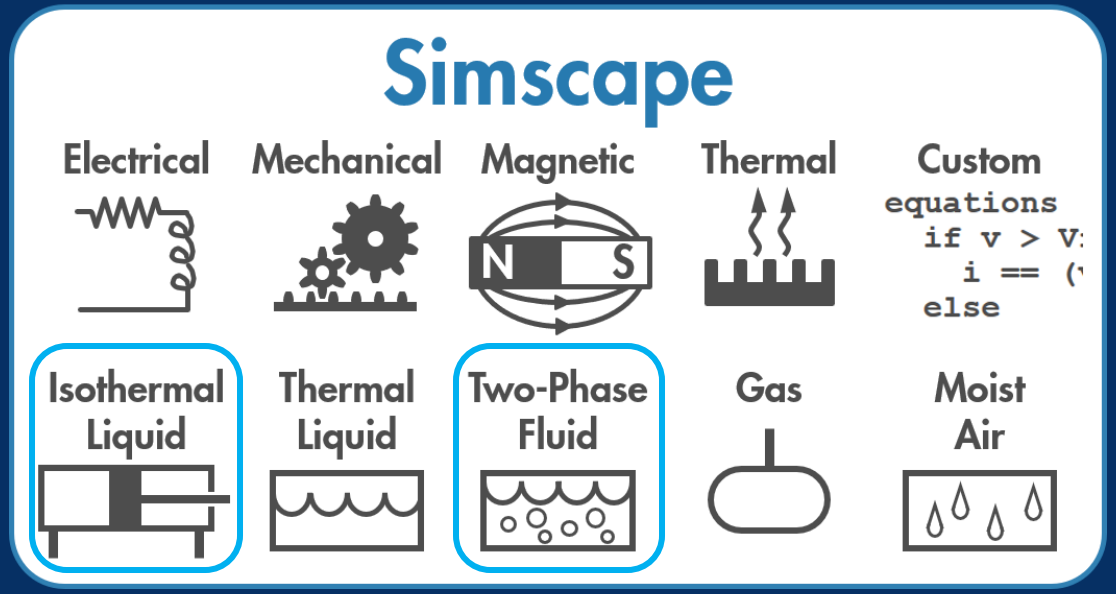
Simscape

Model fluid power and transport applications

User interfaces

Libraries – Physical modeling

Systems engineering



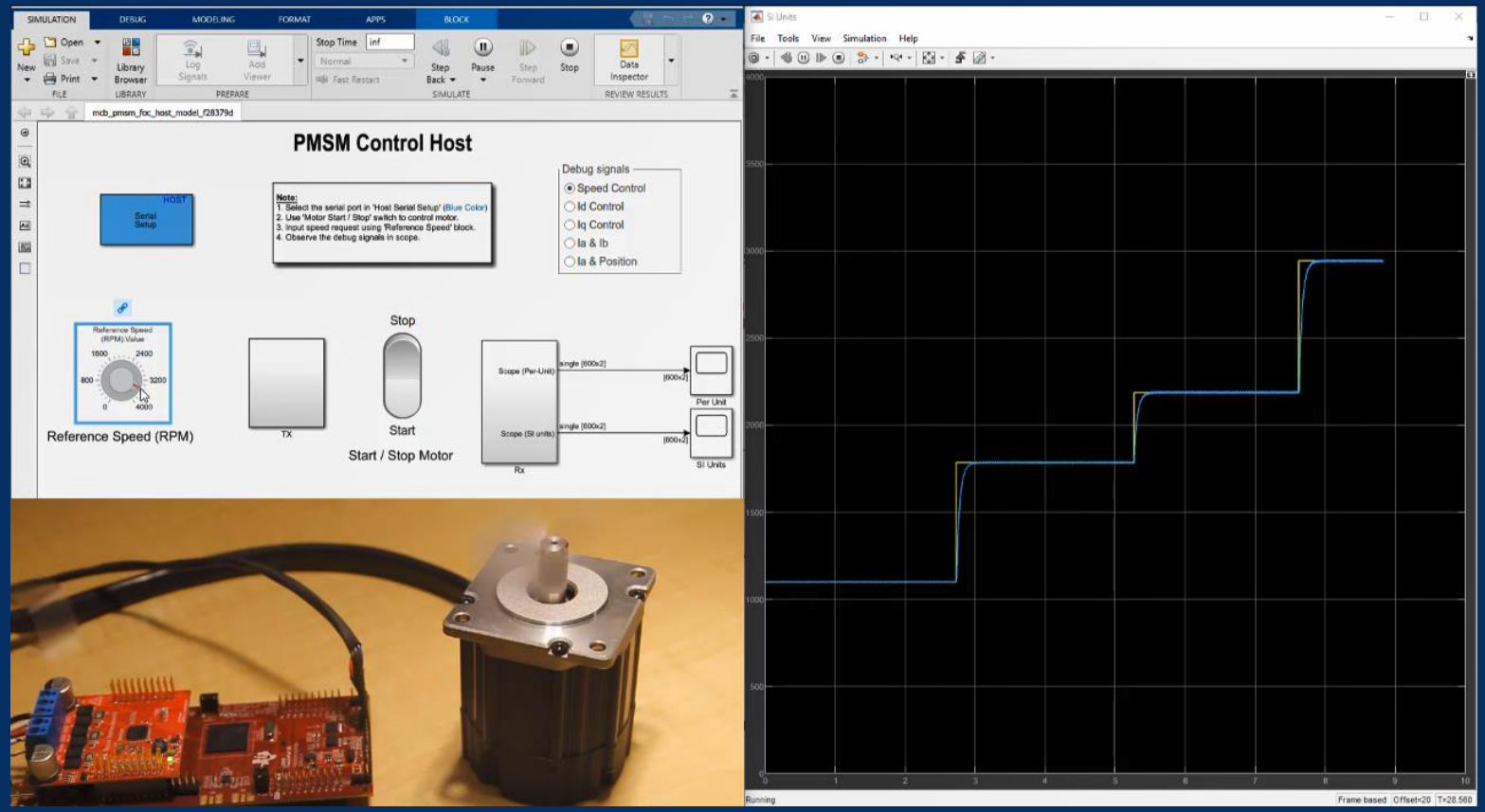
Simscape

Generate motor control software with just a few clicks

User interfaces

Libraries – Motor control

Systems engineering



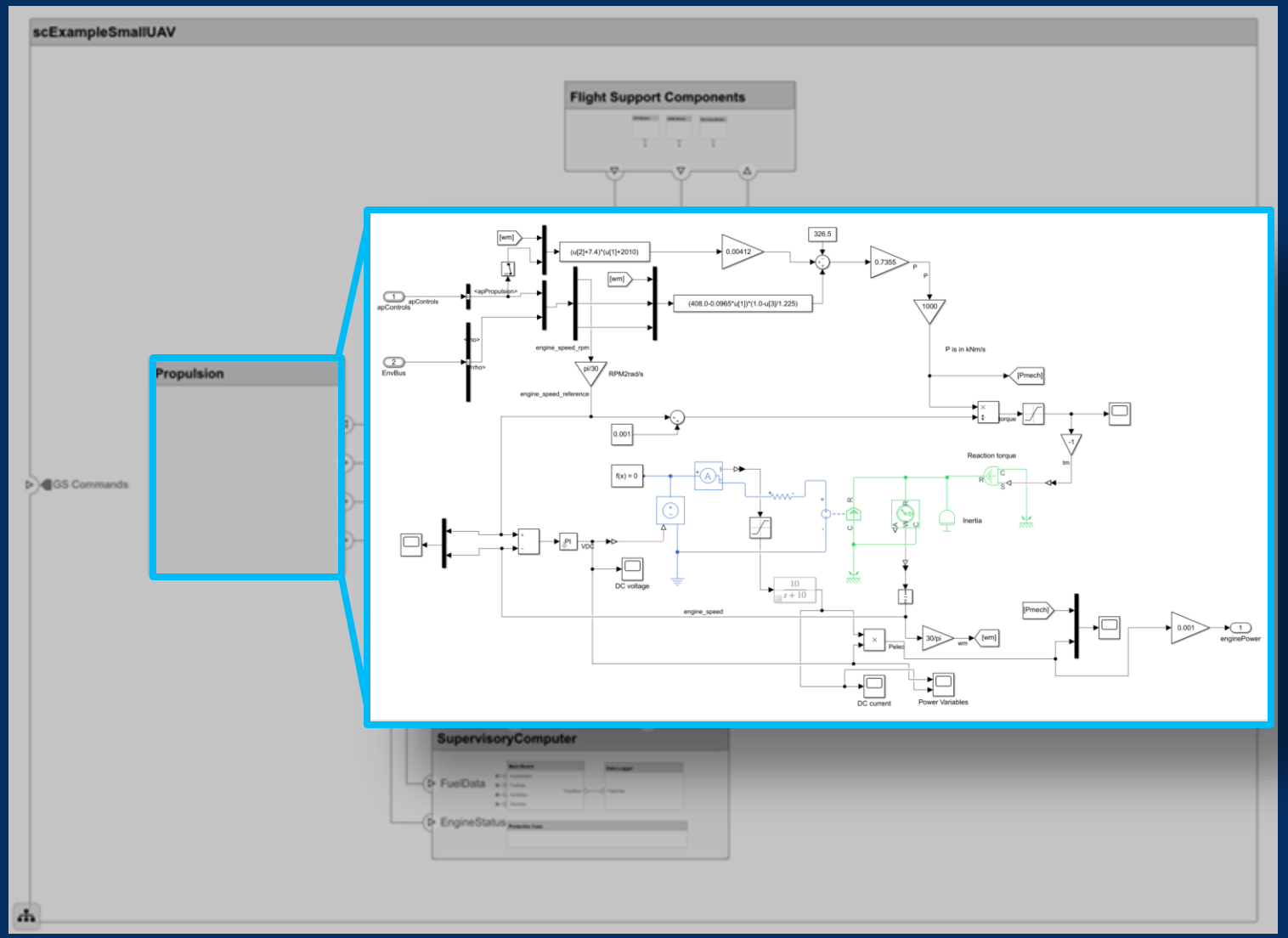
Motor Control Blockset **NEW PRODUCT**

Design and analyze complex system and software architectures

User interfaces

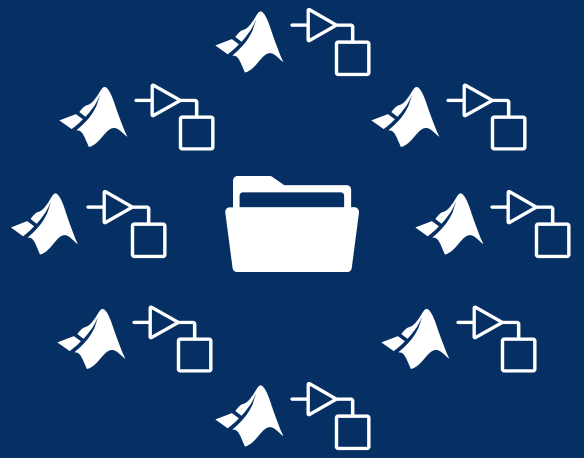
Libraries

Systems engineering



System Composer

Manage system complexity



Numerous Files

Team Collaboration

Environment Configuration

Simulink
MATLAB

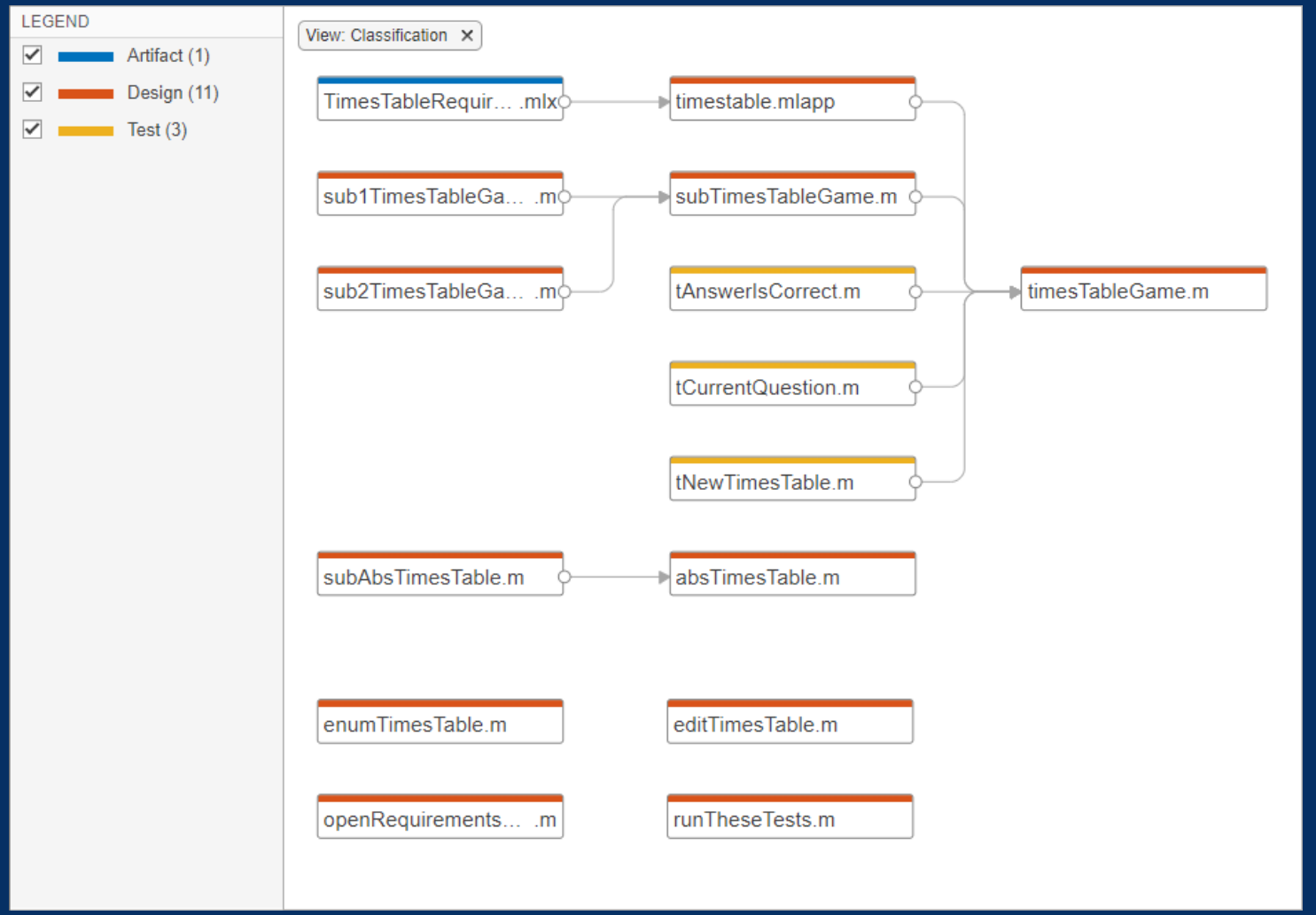
Manage system complexity with projects

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

Simulink
MATLAB

Explore file dependencies and impact analysis

Explore and visualize project structure

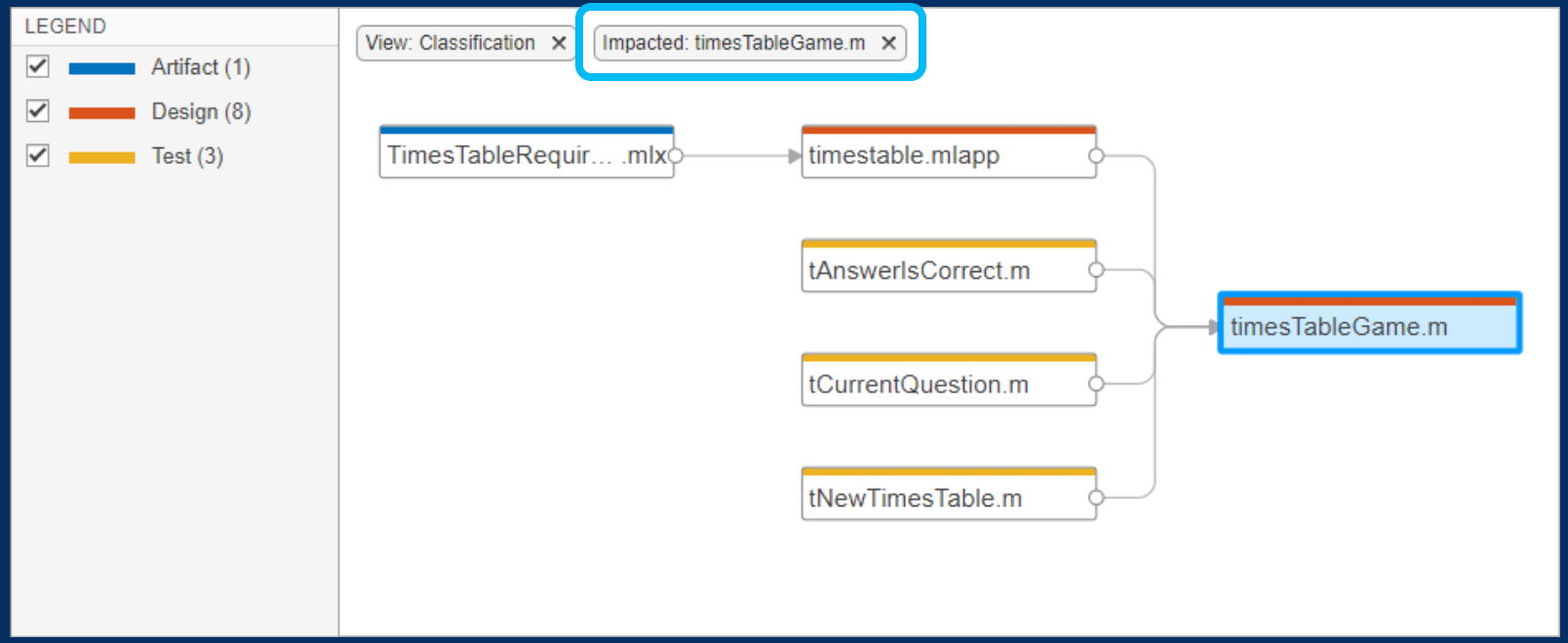


Simulink
MATLAB

Explore file dependencies and impact analysis

Explore and visualize project structure

Assess how a change affects other files



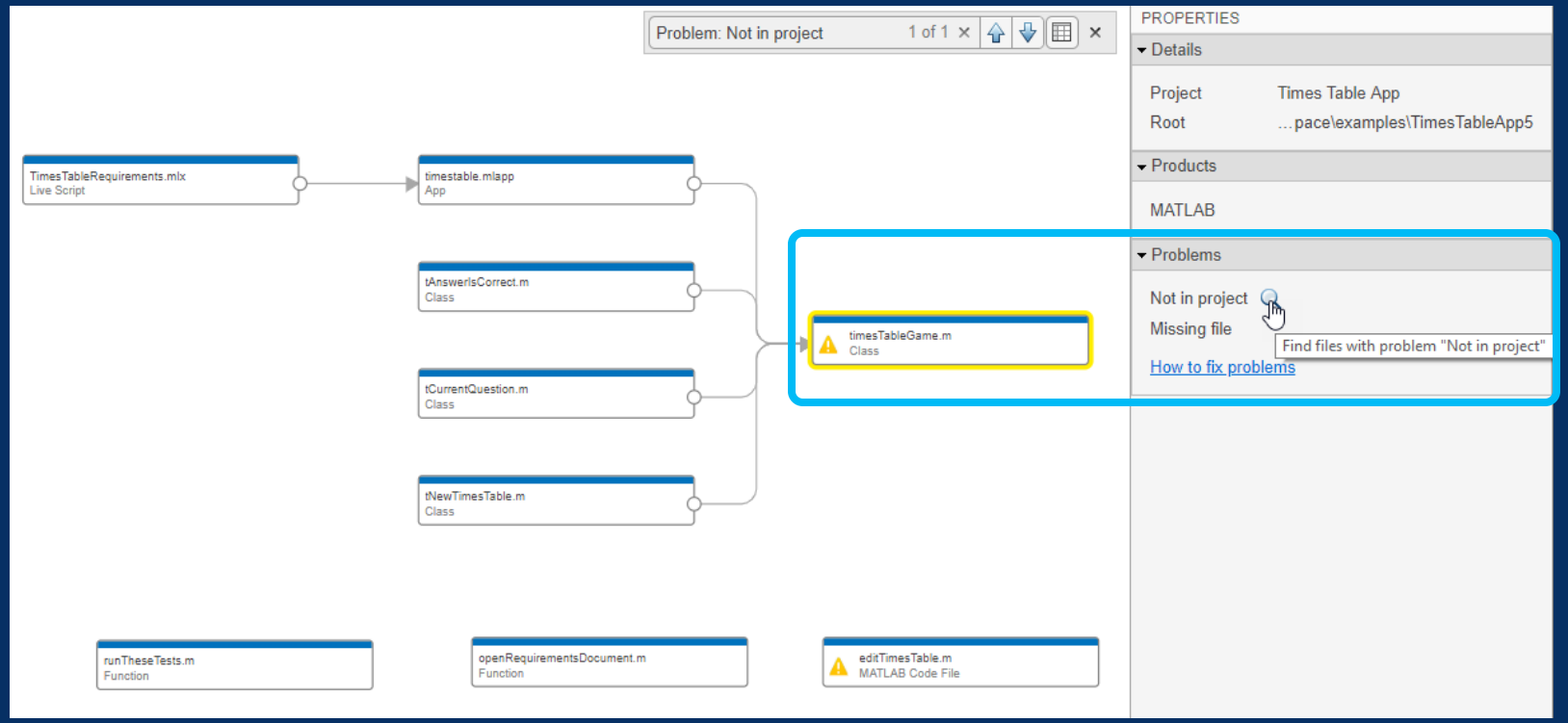
Simulink
MATLAB

Explore file dependencies and impact analysis

Explore and visualize project structure

Assess how a change affects other files

Find and fix problems



Simulink
MATLAB

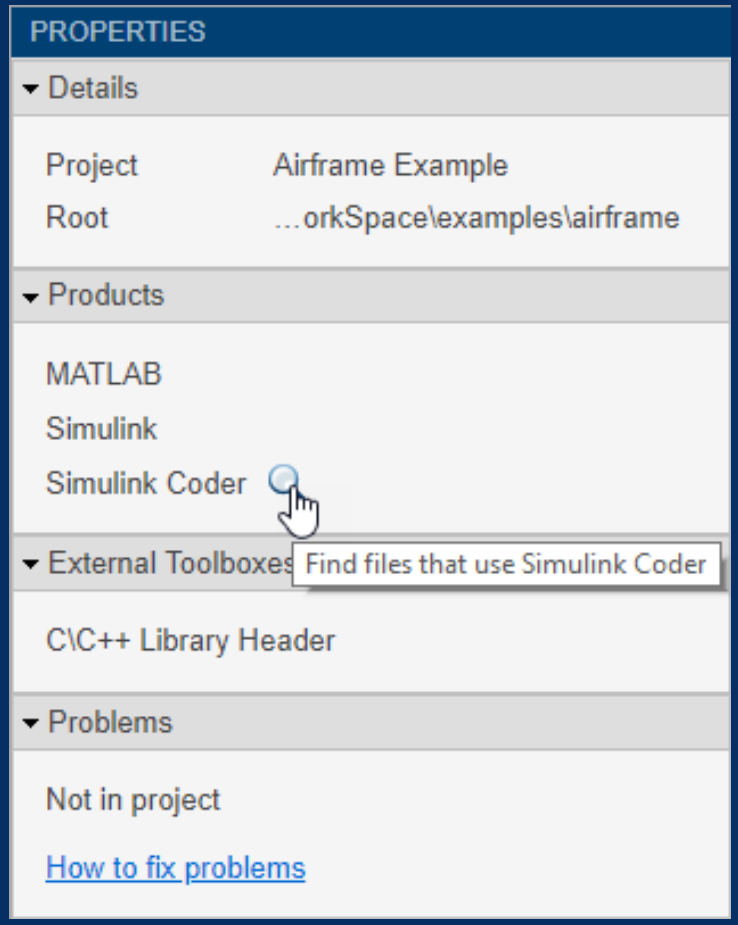
Explore file dependencies and impact analysis

Explore and visualize project structure

Assess how a change affects other files

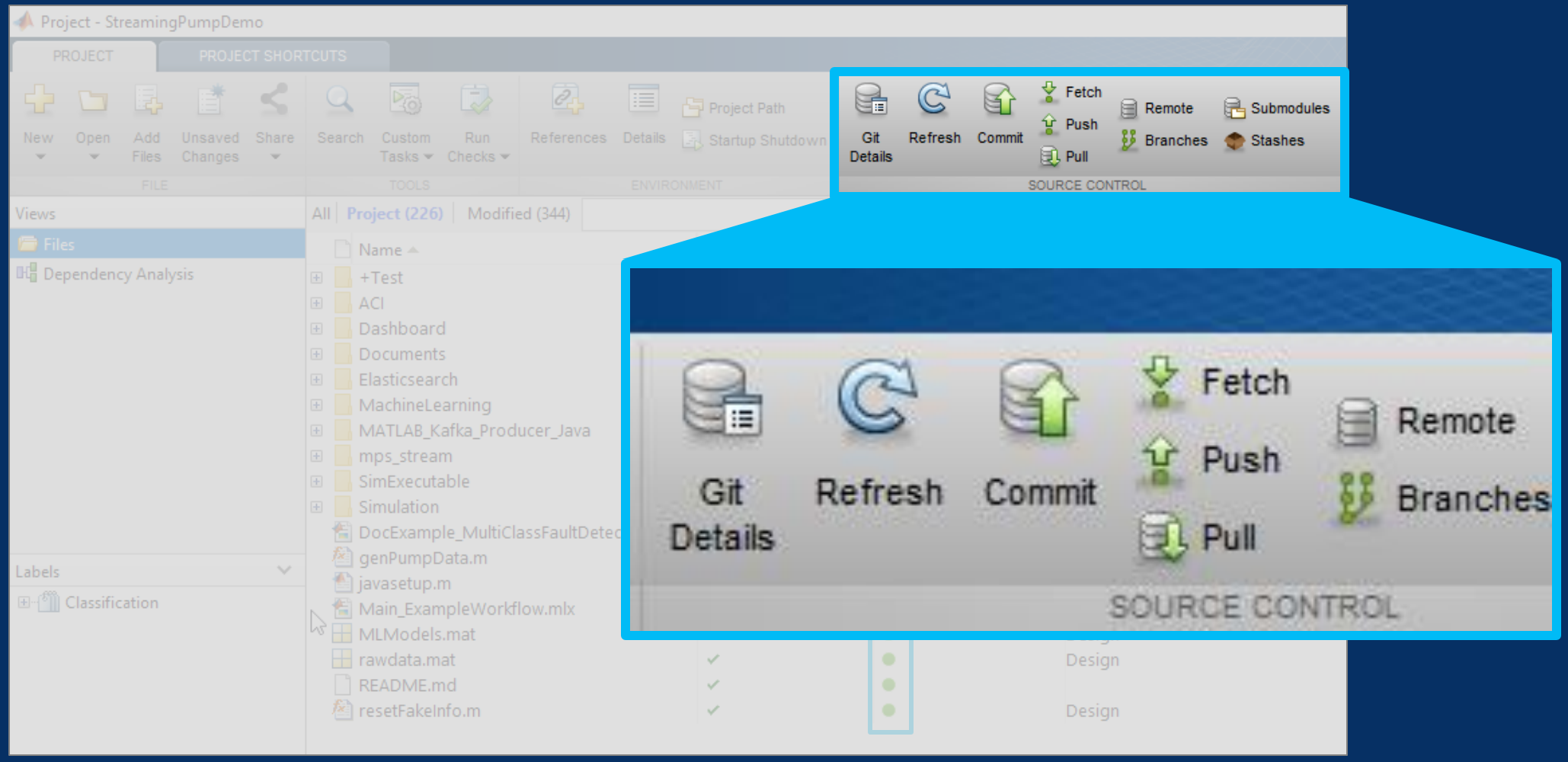
Find and fix problems

Identify required products and toolboxes



Simulink
MATLAB

Use source control systems (Git, Subversion) with projects



Simulink
MATLAB

Access other languages and systems directly from MATLAB

Python

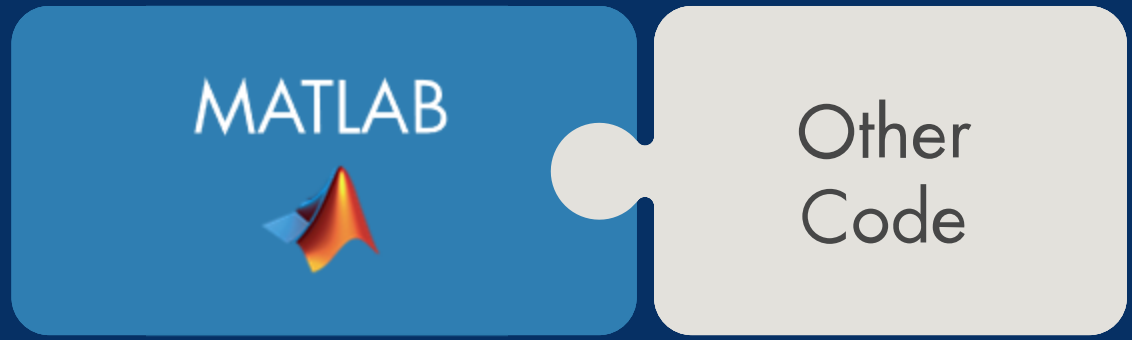
C/C++

Java

Fortran

COM components and ActiveX controls

RESTful, HTTP, and WSDL web services



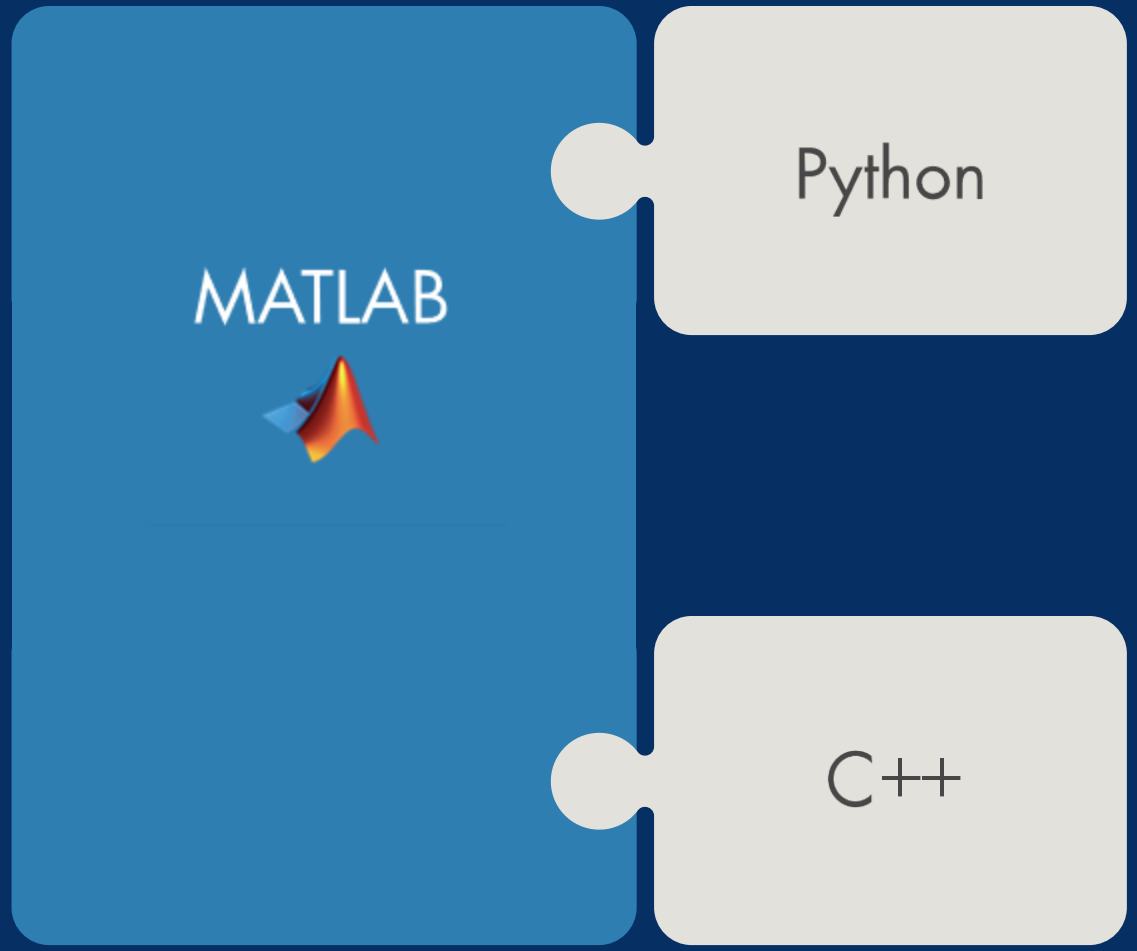
Access other languages and systems directly from MATLAB

Access Python functions out-of-process

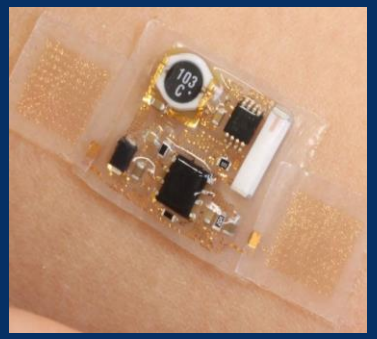
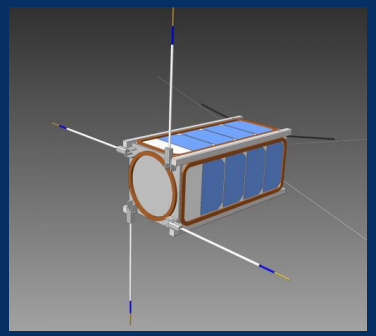
```
pyenv("ExecutionMode","OutOfProcess")
wrapped = py.textwrap.wrap(T);
terminate(pyenv)
pyenv("Version","2.7");
py.list; % Reload interpreter
```

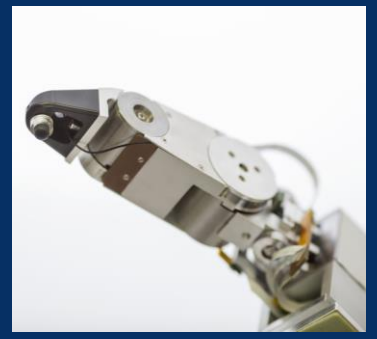
Call C++ libraries directly from MATLAB

```
retVal = clib.libname.funcname(arg1, arg2, ...)
```



Simulink

Simulink is the simulation integration platform

Simulink





Simulink is the simulation integration platform

C/C++ | OpenCV | FMI/FMU | IPG AUTOMOTIVE | GT

Simulink





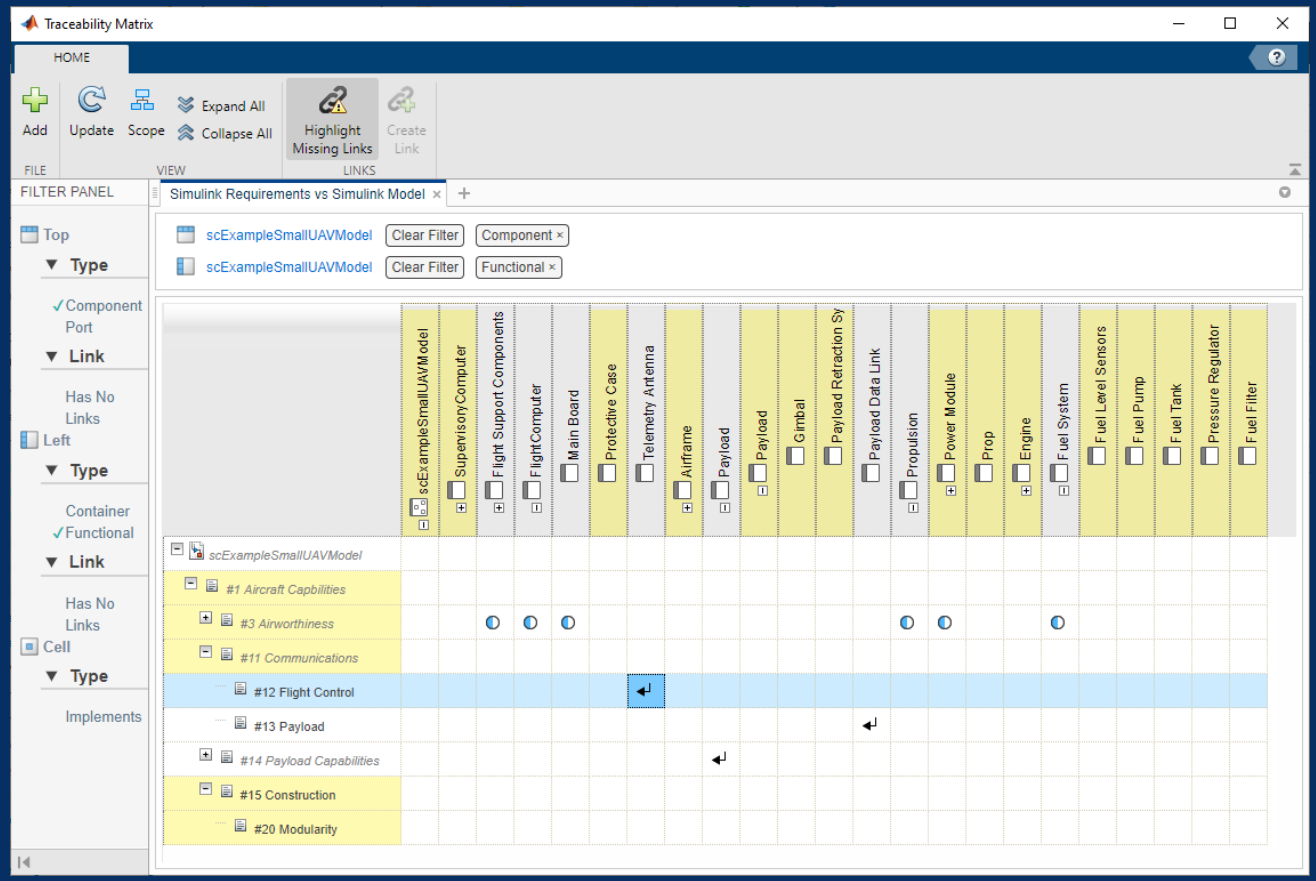
MATLAB®
&SIMULINK®

Test and Verify
Share and Deploy

Deep
Solutions

Test and verify your design

Review and analyze traceability between artifacts in one interface



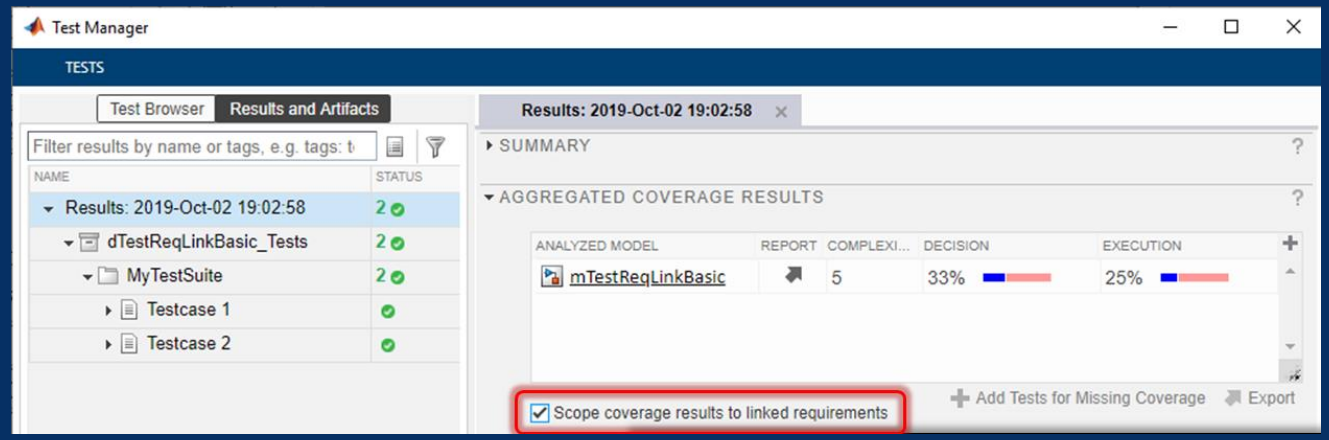
Traceability Matrix

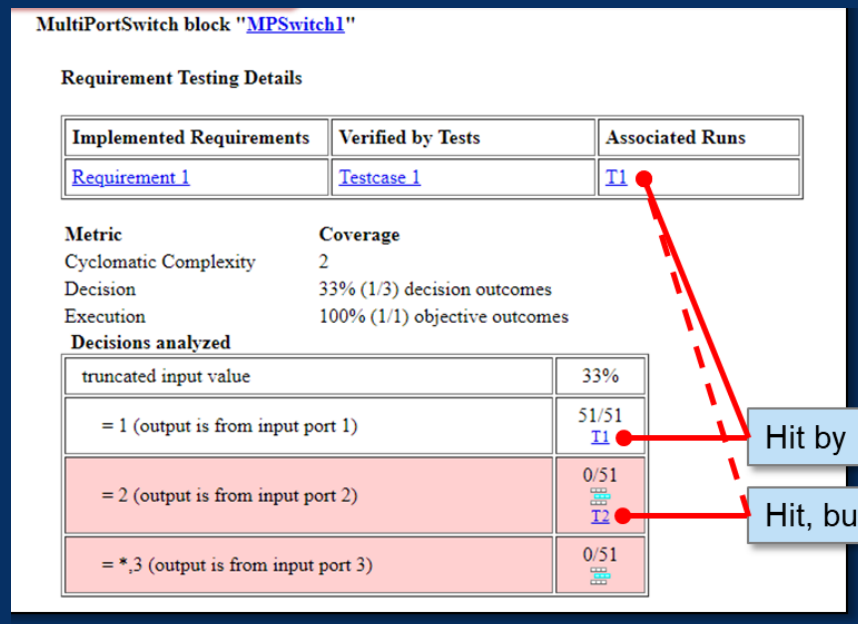
Simulink Requirements

Test and verify your design

Review and analyze traceability between artifacts in one interface

Scope model coverage to requirements-based tests (RBT)





Test and verify your design

Review and analyze traceability between artifacts in one interface

Scope model coverage to requirements-based tests (RBT)

Use full physical RAM in target computer with the 64-bit real-time operating system

Use Jenkins servers to automatically run and test your project

Install MATLAB Plugin for Jenkins directly from the Jenkins Plugin Manager

Simulink Test
Simulink
MATLAB

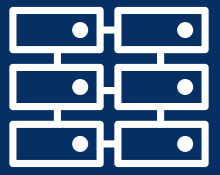
Code verification using Polyspace

Desktop

Polyspace Bug Finder
Polyspace Code Prover

Automate code verification using Polyspace

Desktop

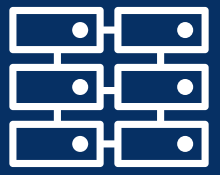


Server Computer

Polyspace Bug Finder Server
Polyspace Code Prover Server

Automate code verification and share results using Polyspace

Desktop



Server Computer

Web Interface

Polyspace Bug Finder Access
Polyspace Code Prover Access

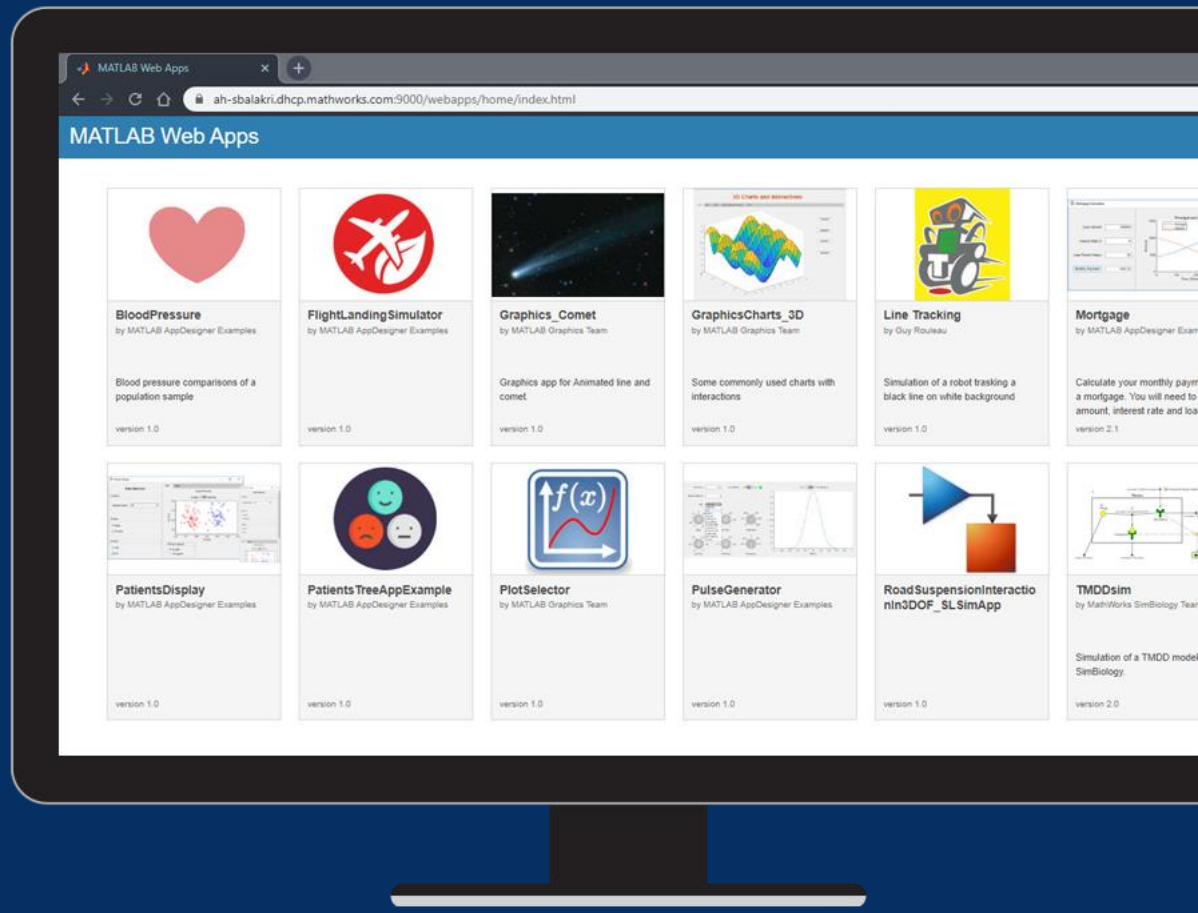
MATLAB®
&SIMULINK®

Test and Verify
Share and Deploy

Deep
Solutions

Share MATLAB apps as browser-based web apps

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

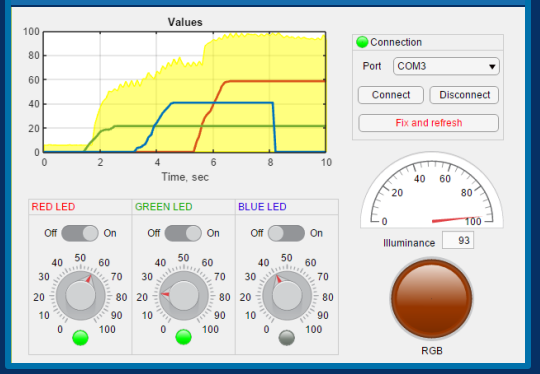


MATLAB Web App Server **NEW PRODUCT**

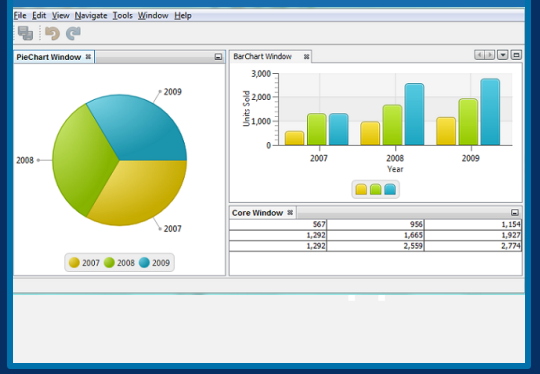
Share Simulink simulations – *where Simulink is not available*

Package a compiled Simulink model with MATLAB code

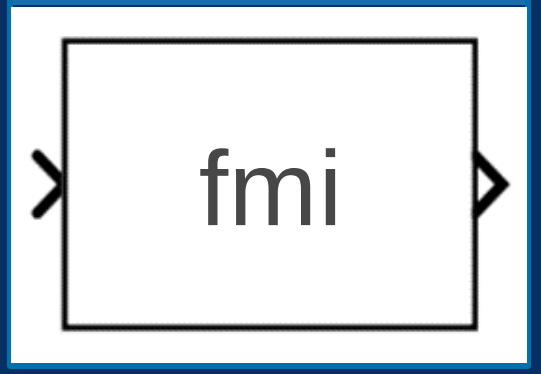
Standalone Apps



Web Apps



Standalone FMUs



Simulink Compiler

NEW PRODUCT

Deploy algorithms with automatically generated code

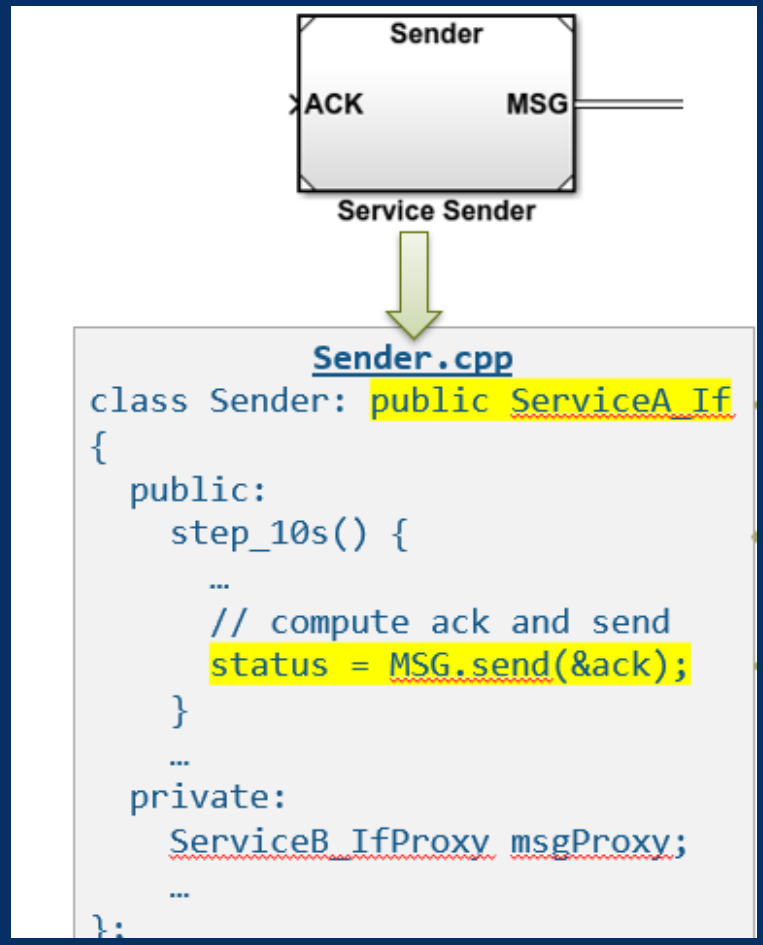
C++ classes from MATLAB classes

```
class MyClass
{
 public:
  MyClass *init();
  void publicMethod(double value);
  static double doubleThisValue(double val);
  double calculateSomeValue() const;
 private:
  MyClass *matlabCodegenHandle_init();
  MyClass *privateMethod(double value);
 public:
  double publicProp;
 private:
  double privateProp;
};
```

Deploy algorithms with automatically generated code

C++ classes from MATLAB classes

Code from software compositions with message-based communication



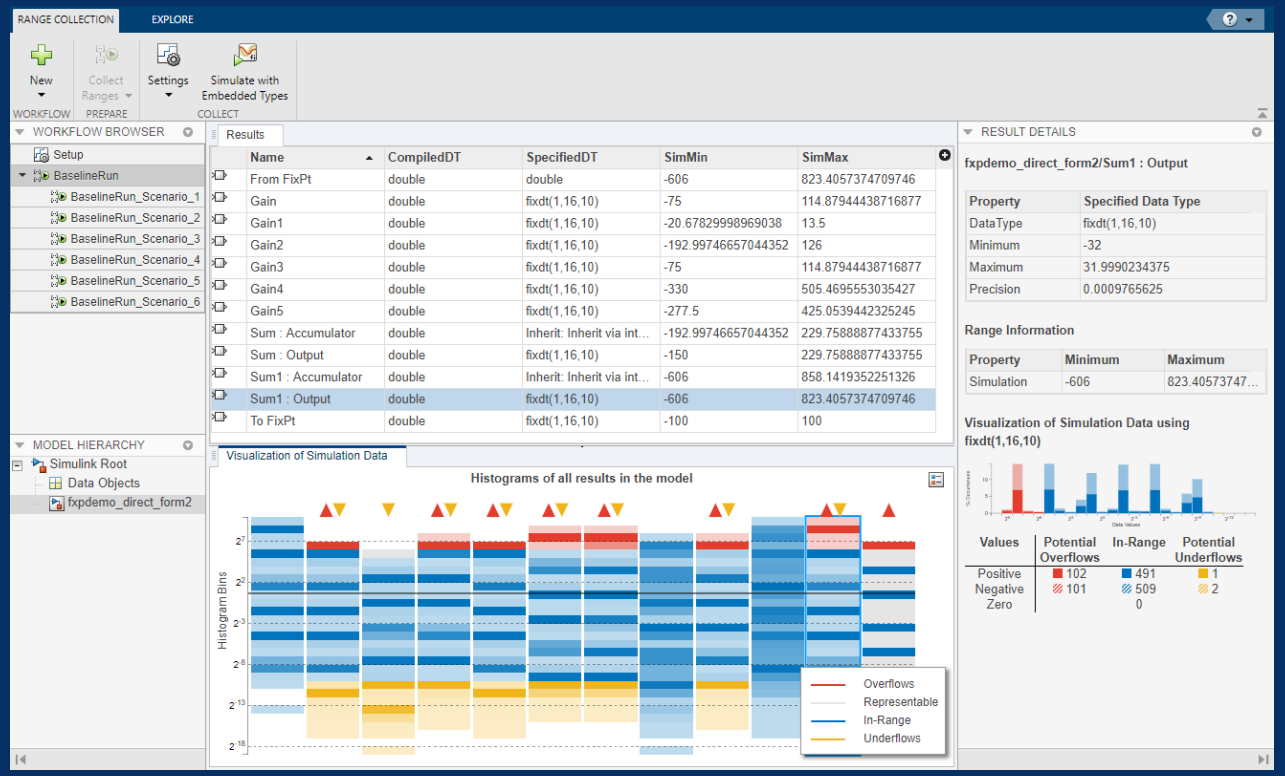
Embedded Coder

Deploy algorithms with automatically generated code

C++ classes from MATLAB classes

Code from software compositions with message-based communication

Explore signal ranges in designs, and data type optimization



Fixed-Point Tool

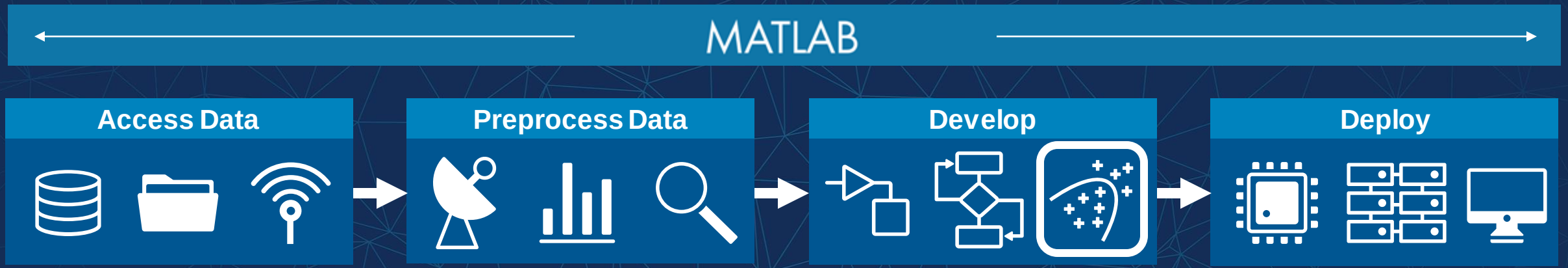
Fixed-Point Designer

MATLAB®
&SIMULINK®

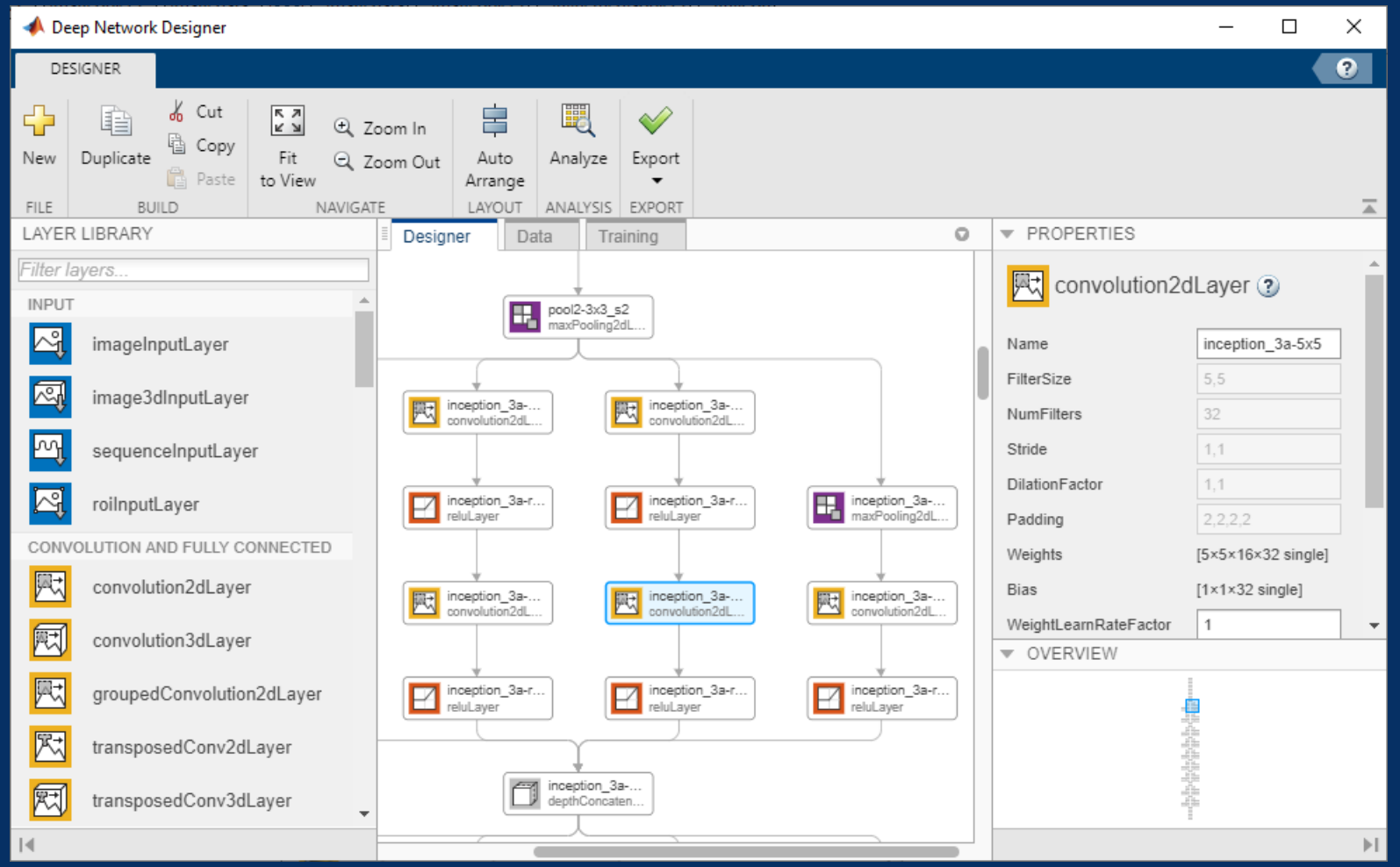
Test and Verify
Share and Deploy

Deep
Solutions

Artificial Intelligence (AI)



Interactively access models, and develop and train networks

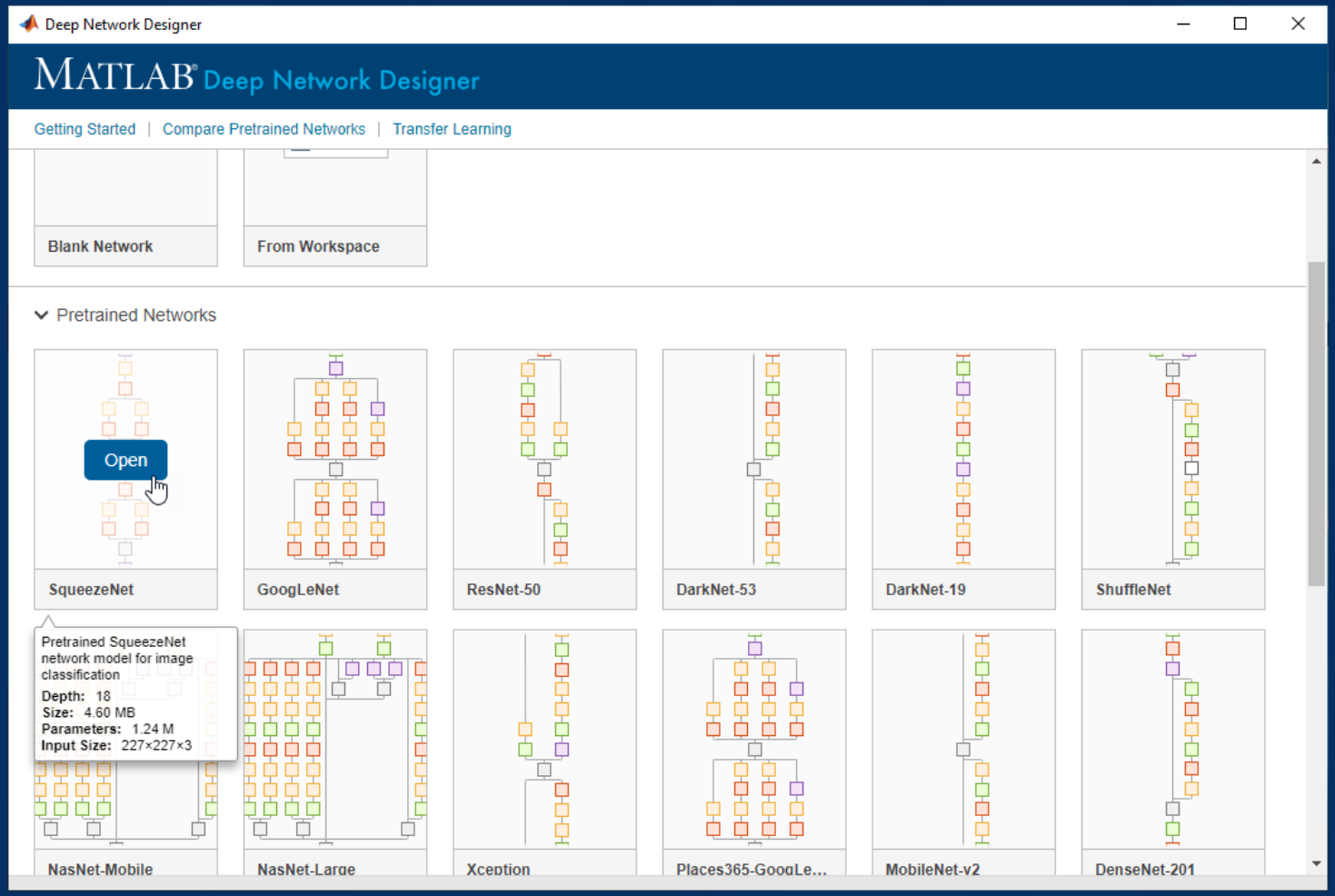


Deep Network Designer App

Deep Learning Toolbox

Interactively access models, and develop and train networks

Import pretrained networks for transfer learning



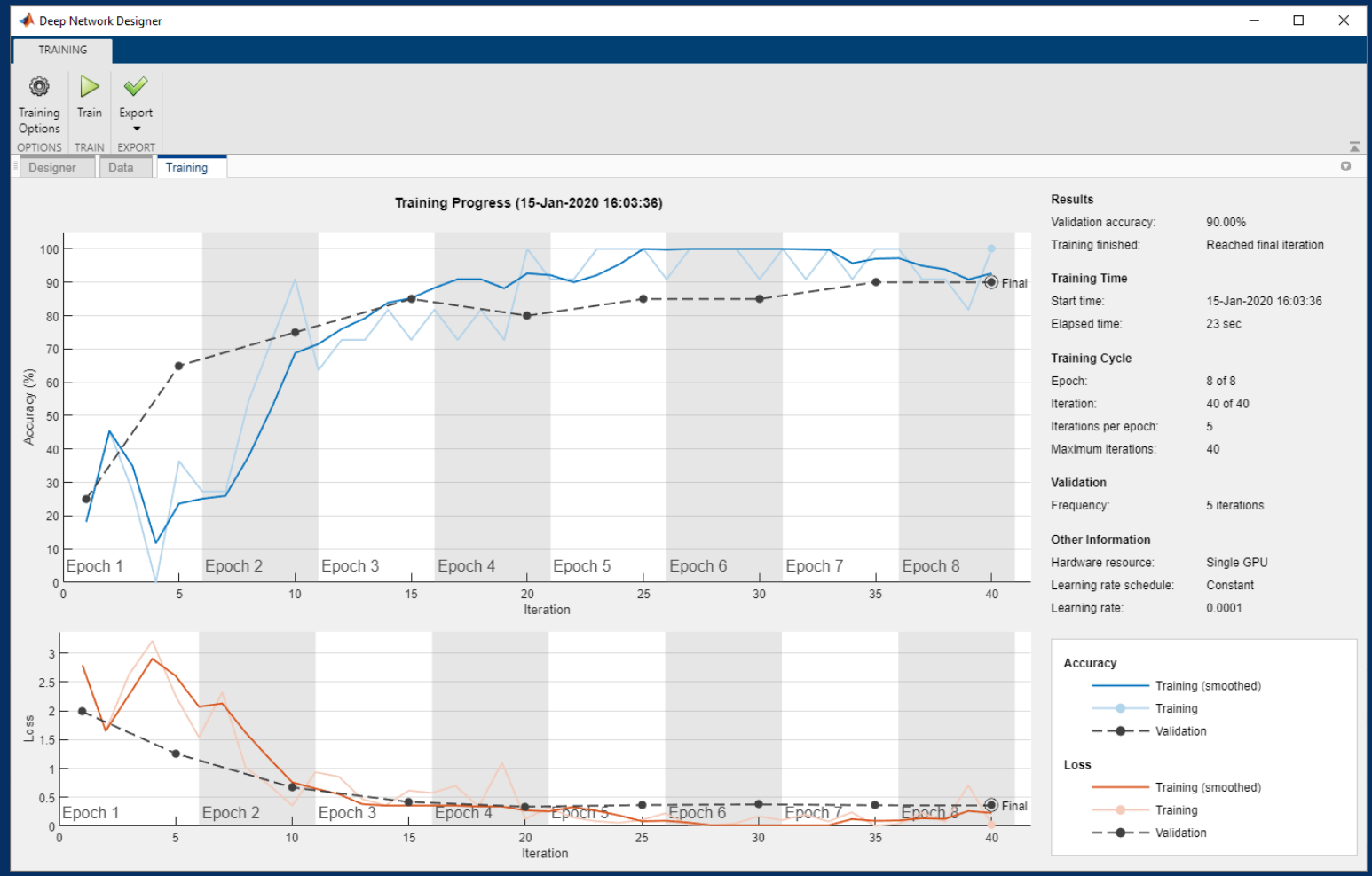
Deep Network Designer App

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

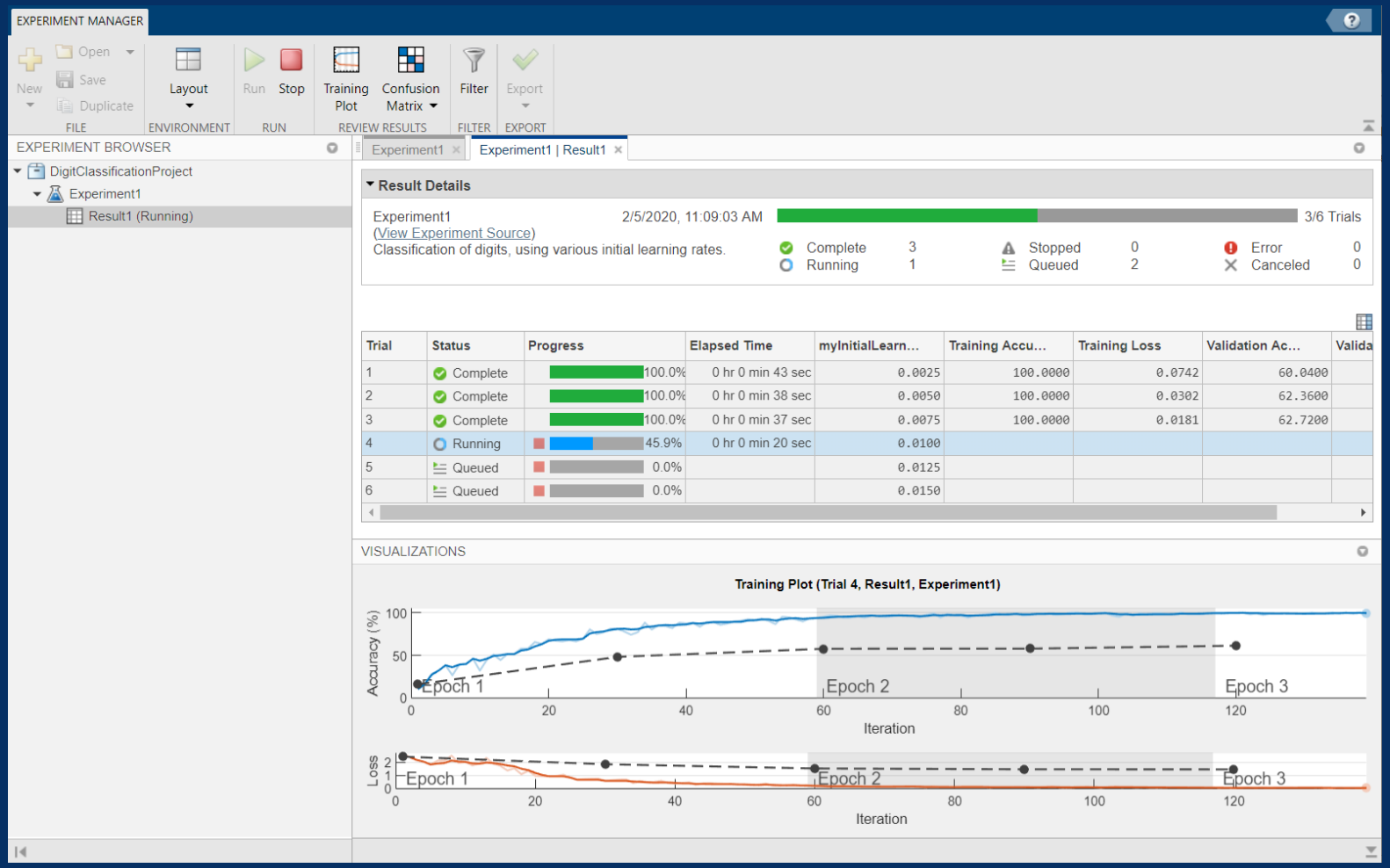
Deep Learning Toolbox

Manage multiple deep learning experiments

Keep track of training parameters

Reuse training data across multiple networks

Analyze and compare results

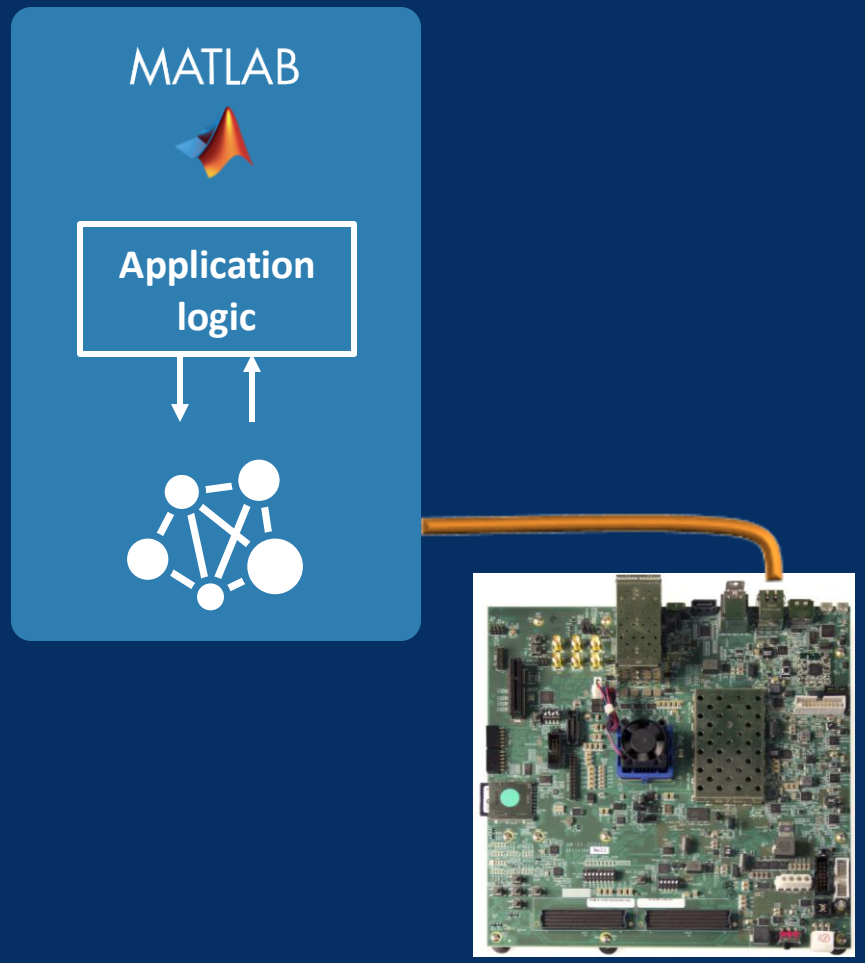


Experiment Manager App

Deep Learning Toolbox

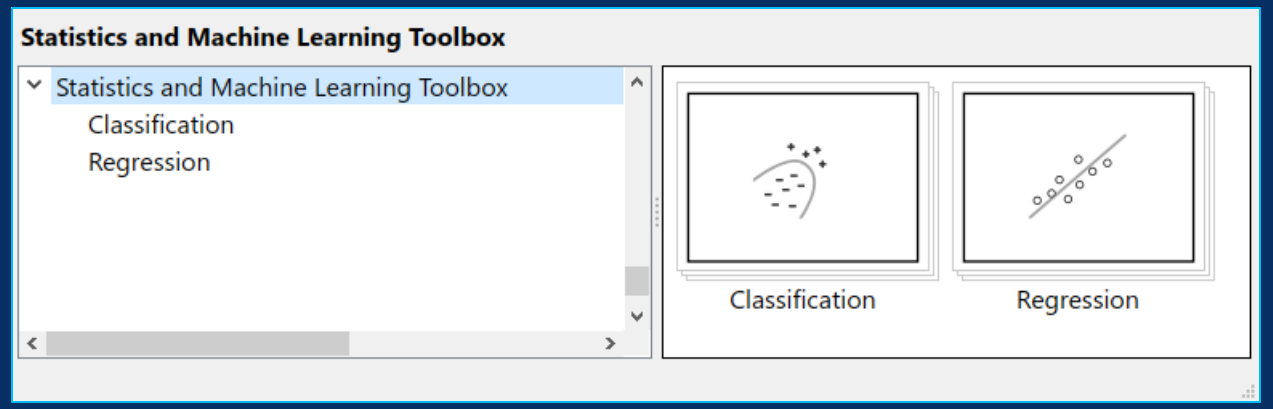
Prototype and deploy deep learning networks on FPGAs and SoCs

- Run deep learning inferencing on FPGAs directly from MATLAB
- Use pre-built bitstreams for running on supported Xilinx and Intel devices

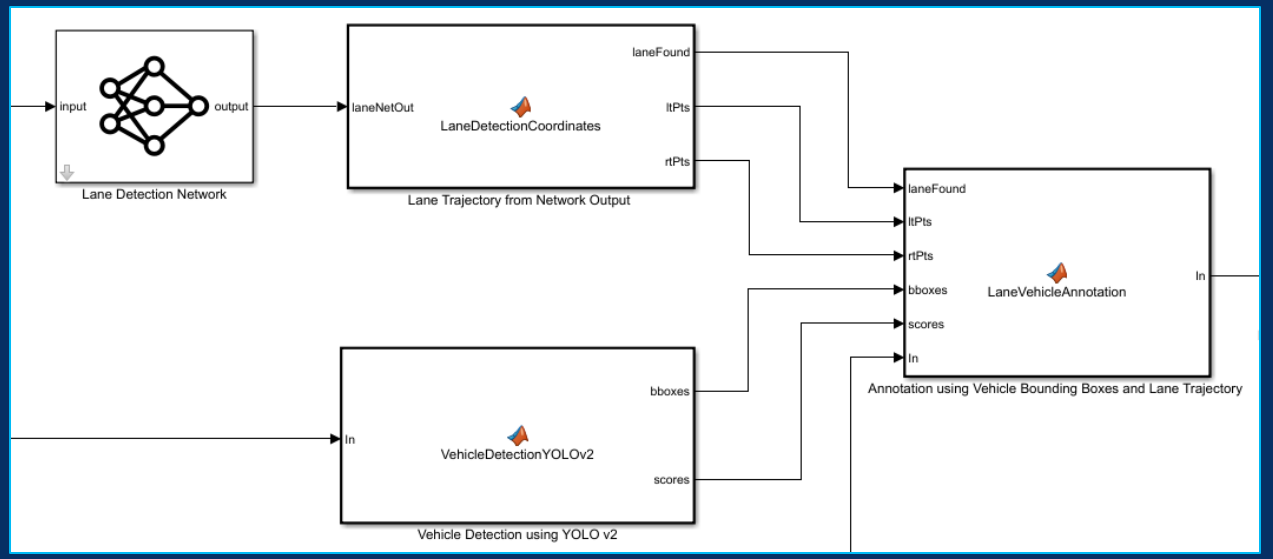


Deep Learning in Simulink

- Simulate and generate code using native blocks for support vector machine (SVM) models



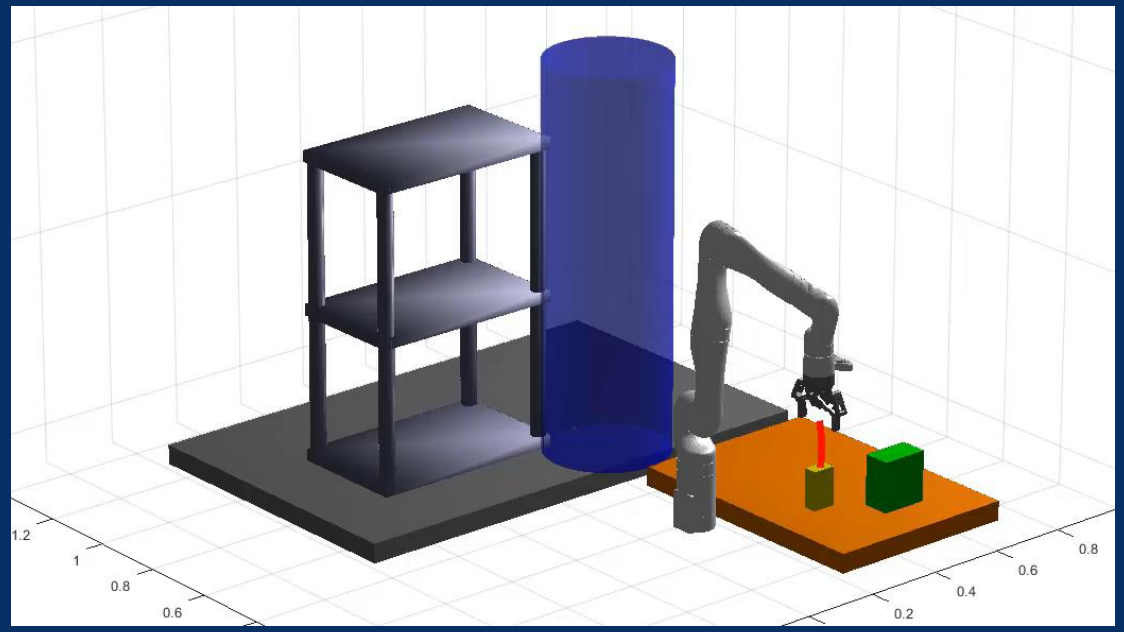
- Generate, build, and deploy deep learning networks in Simulink models to NVIDIA GPUs



Simulink
Statistics and Machine Learning Toolbox
MATLAB Coder
GPU Coder

Robotics and Autonomous Systems

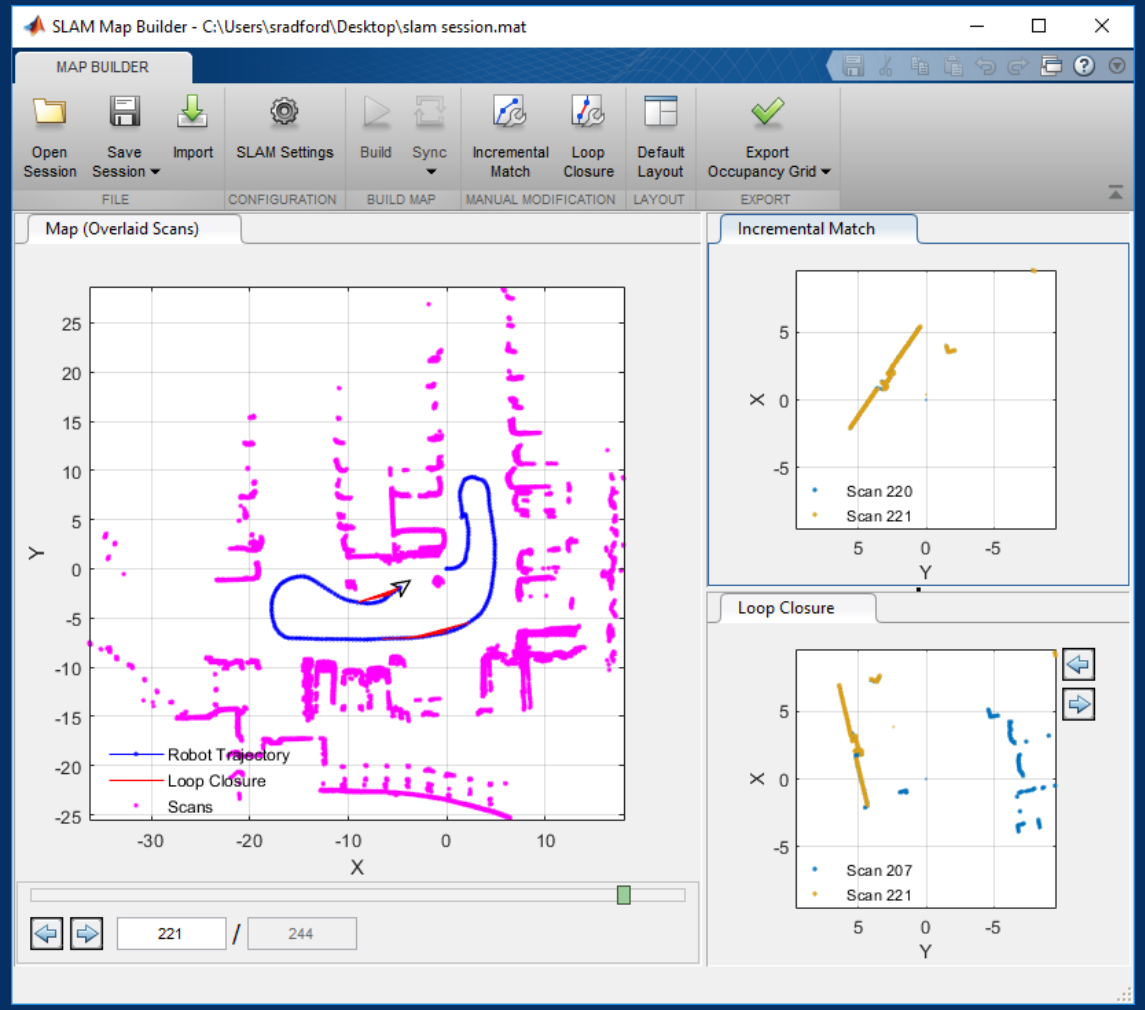
Simulate and visualize robot kinematics



Robotics System Toolbox

Design algorithms for planning and navigation

- Create a map of the environment

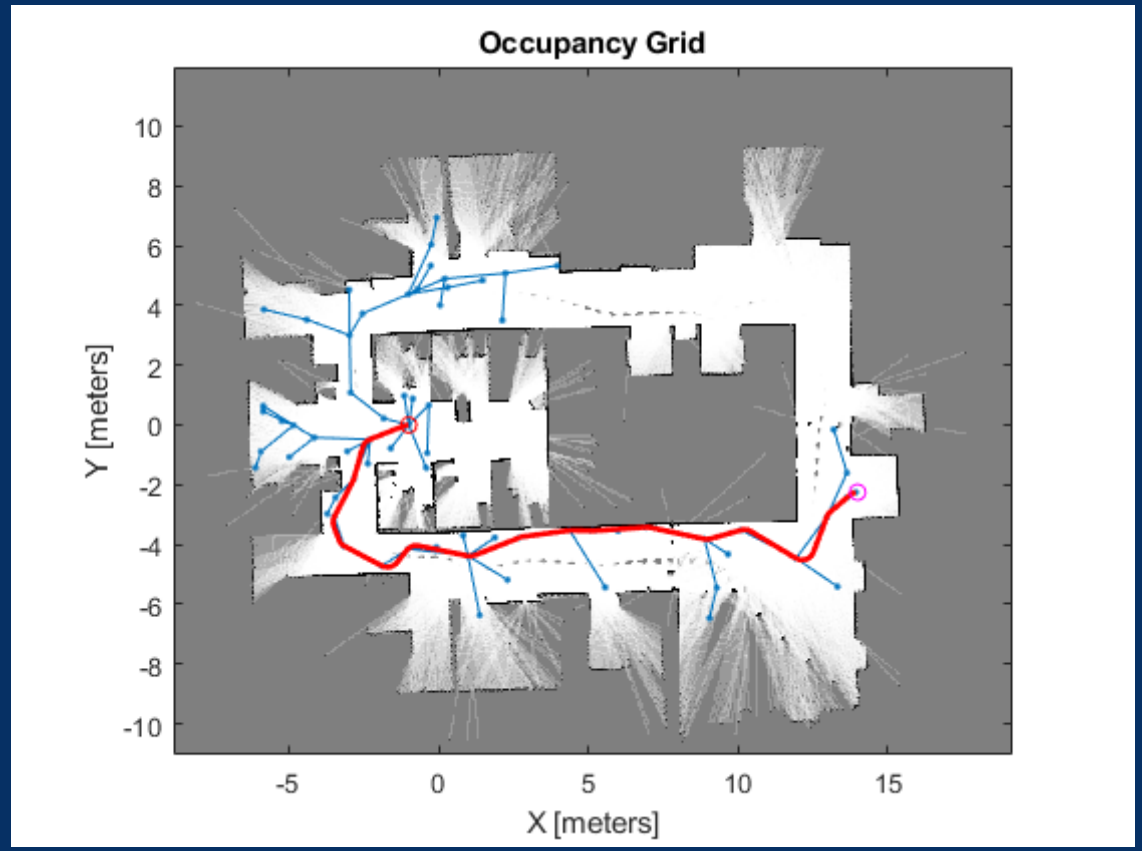


SLAM Map Builder

Navigation Toolbox

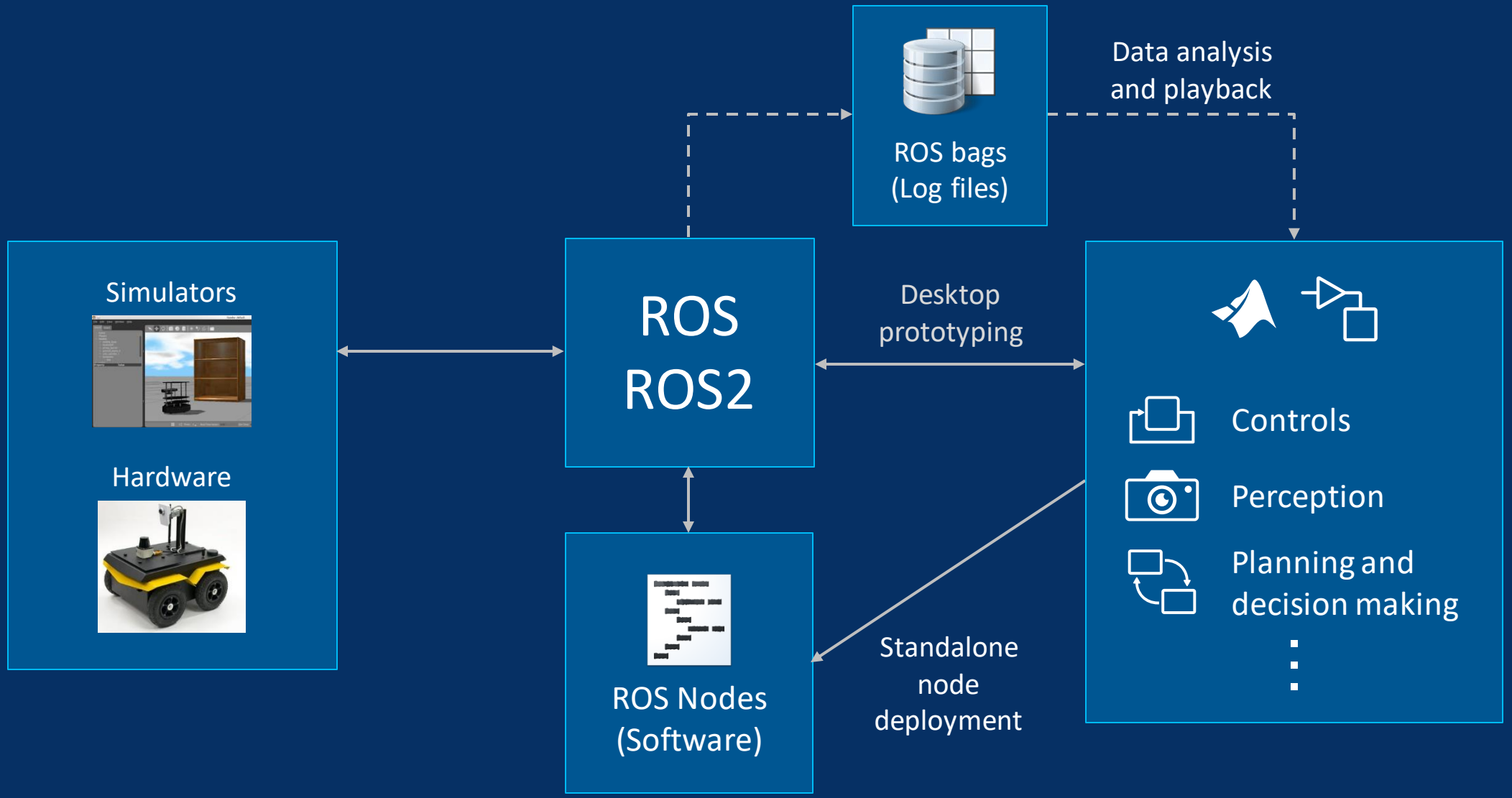
Design algorithms for planning and navigation

- Create a map of the environment
- Plan a path through a known map



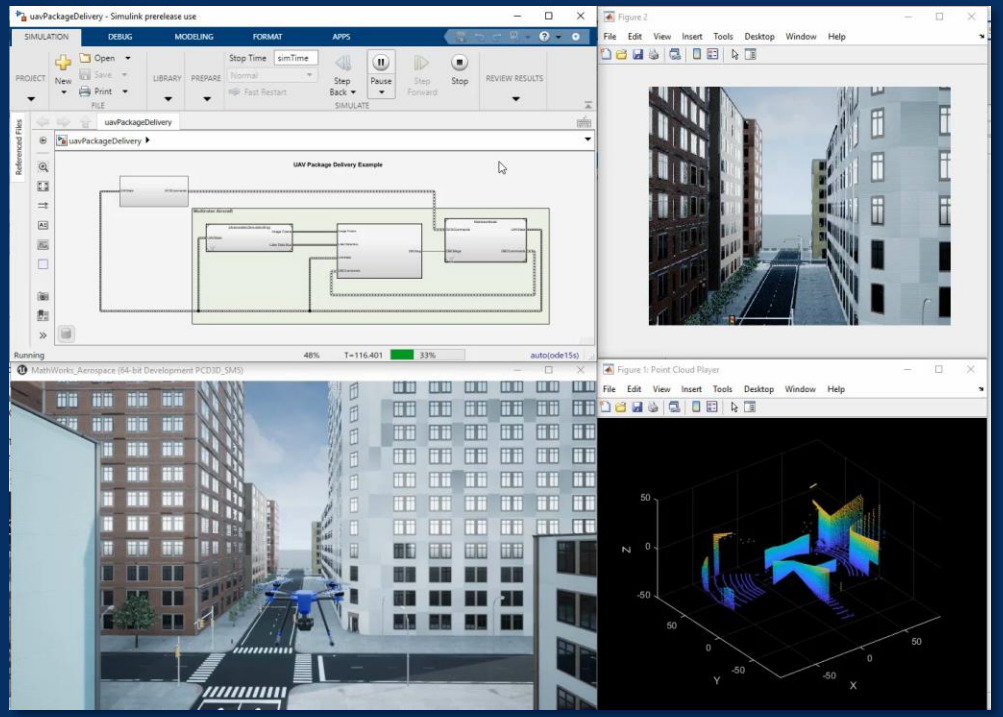
Navigation Toolbox

Design, simulate, and deploy ROS-based applications

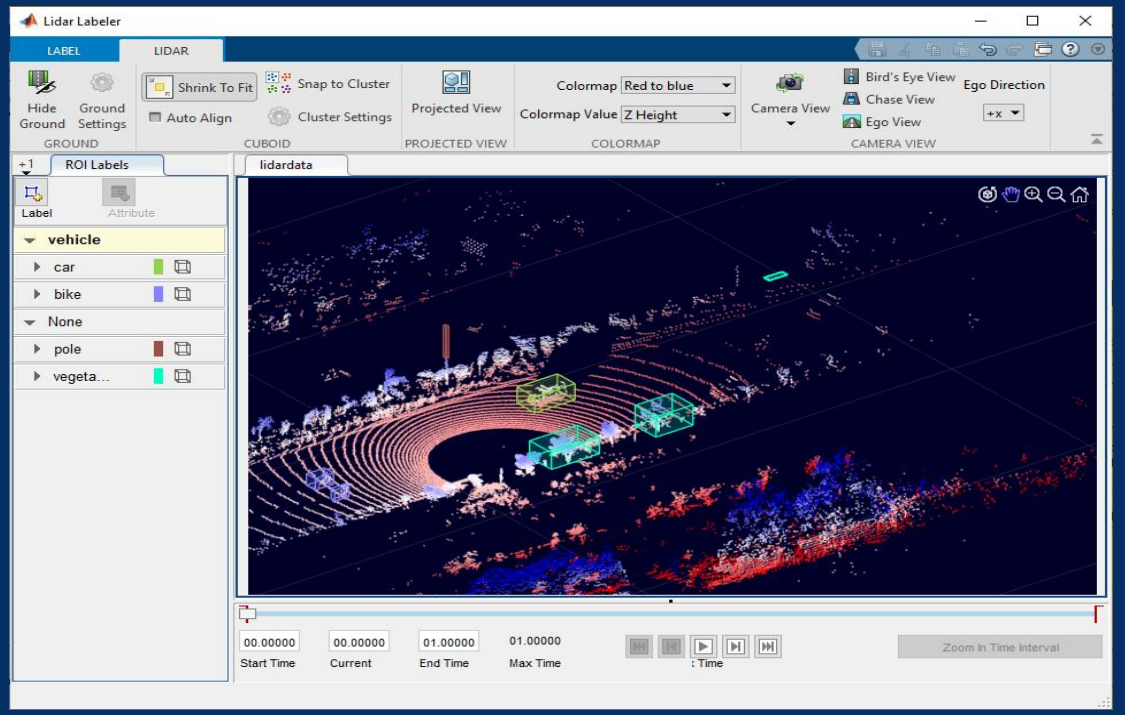


ROS Toolbox

Develop UAV applications and lidar processing systems



UAV Toolbox



Lidar Toolbox

Wireless Communications

RF & Antenna

- RF Toolbox
- RF Blockset
- Antenna Toolbox
- Phased Array Toolbox

Digital Baseband

- Communications Toolbox
- Wireless HDL Toolbox

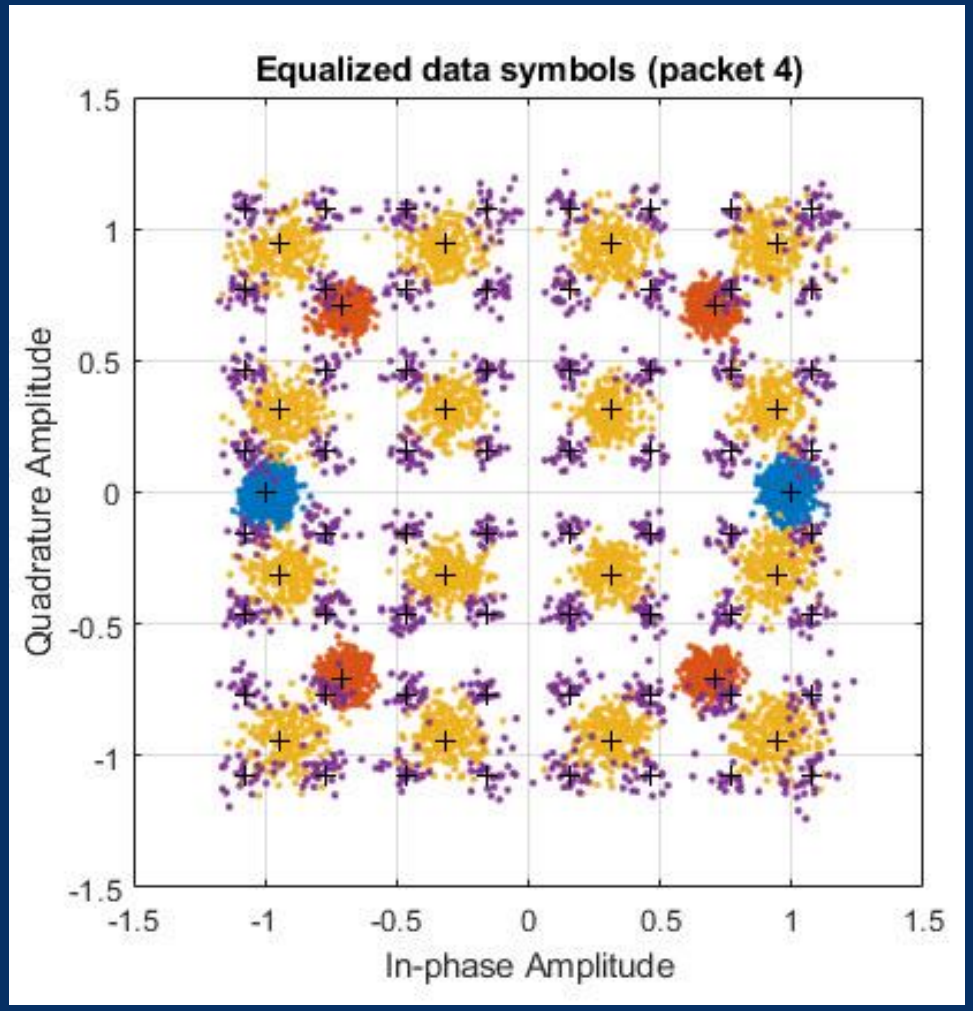
Standards

- 5G Toolbox
- LTE Toolbox
- WLAN Toolbox

Model, simulate, and test Wi-Fi 6 systems

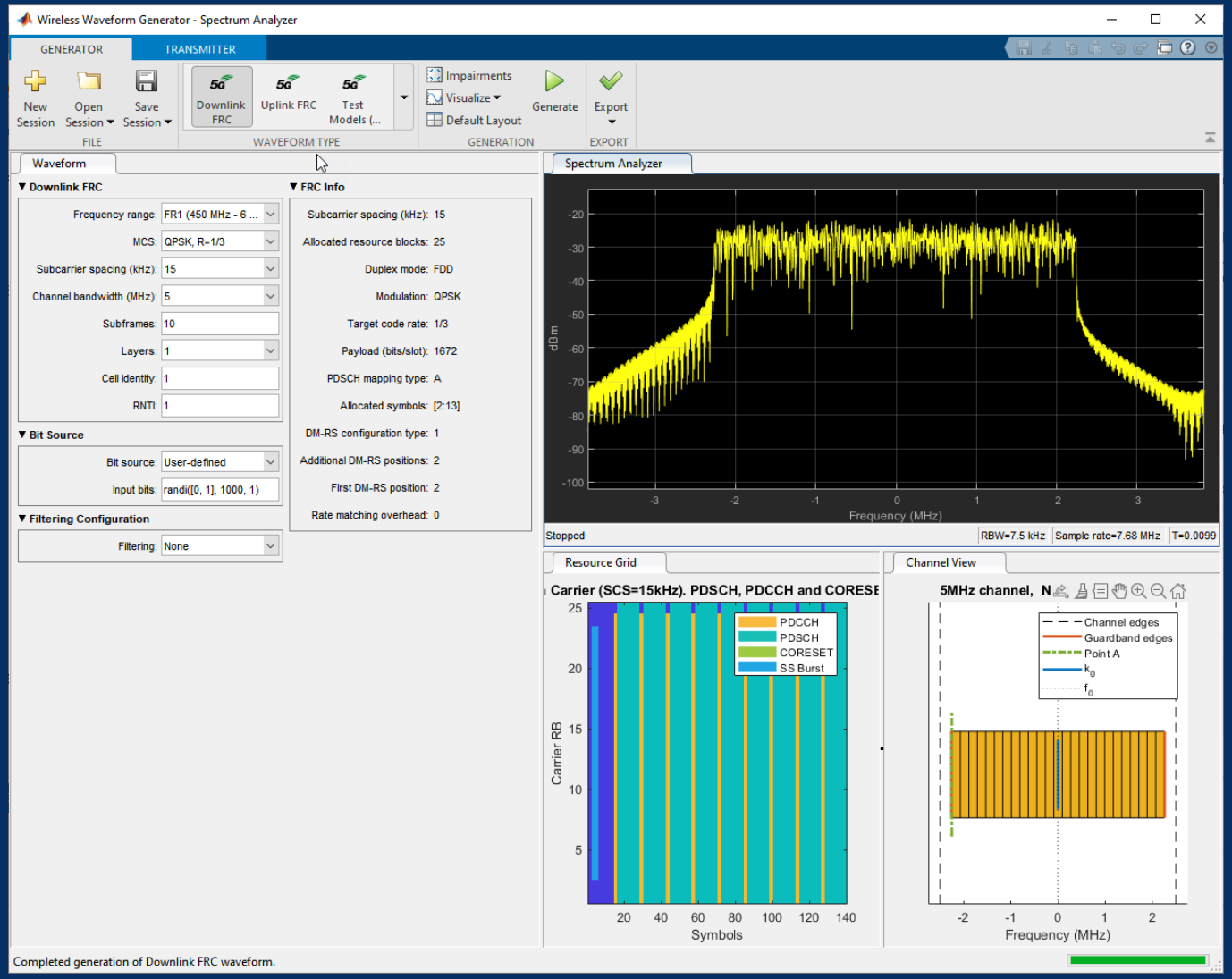
Generate P802.11ax™ Draft 4.1 waveforms

Link-level simulation of 802.11ax Trigger-Based Format



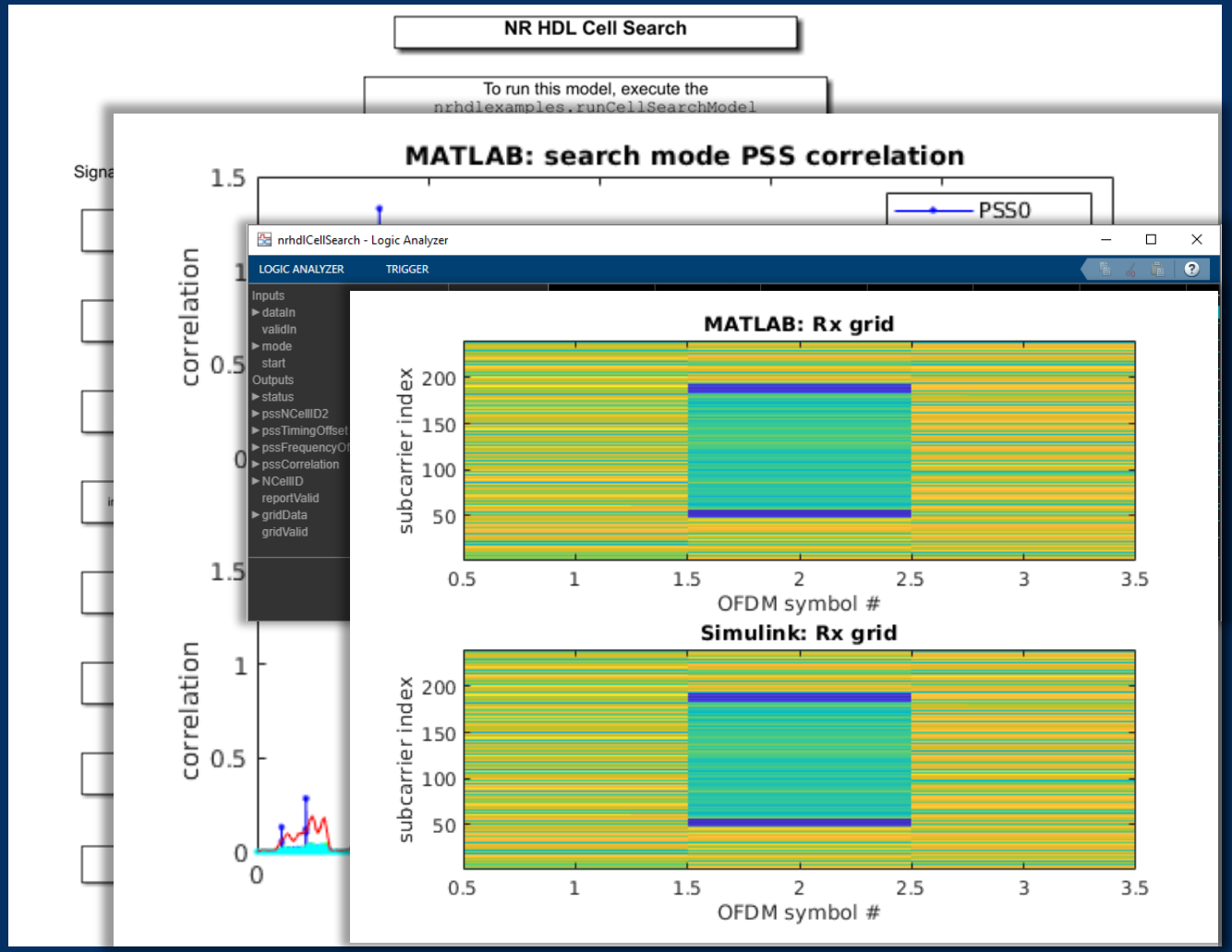
WLAN Toolbox

Interactively generate 5G waveforms for testing



Wireless Waveform Generator

Start with reference examples to implement your design

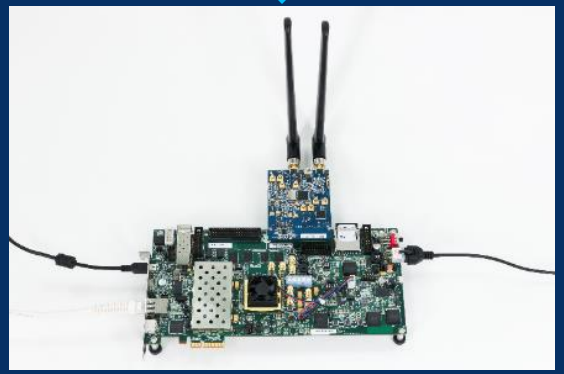


Standards-based IP + **Your expertise**

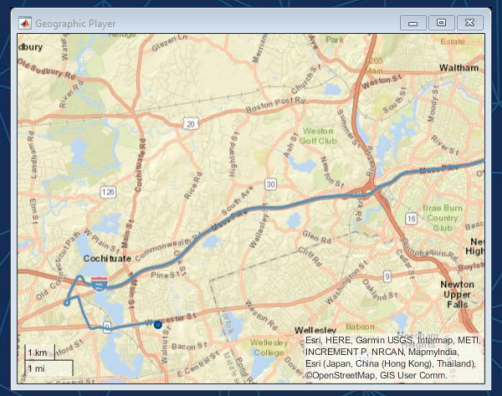
Wireless HDL Toolbox

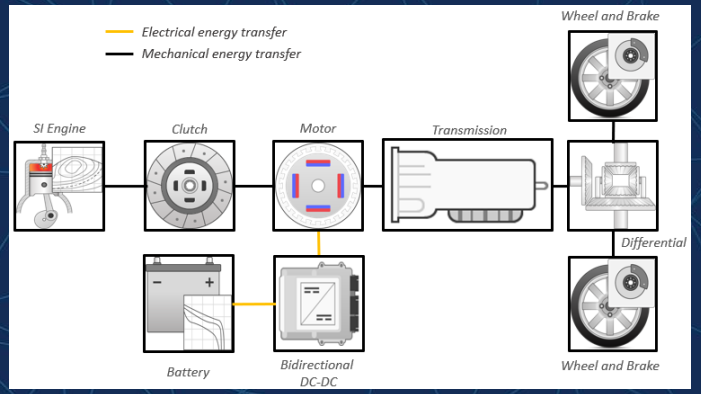
Your unique application

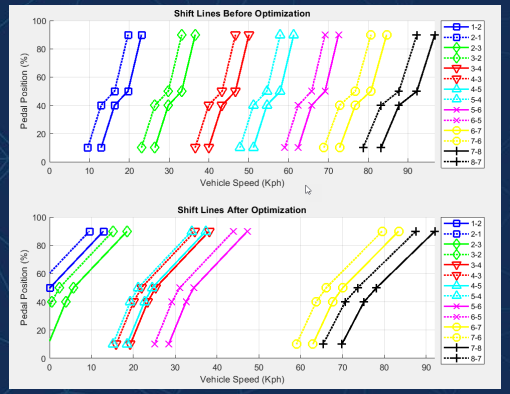
HDL Coder



Automotive Systems







Accelerate development of automated driving systems

Develop driving algorithms in a 3D simulation environment

Test algorithms with prebuilt scenarios

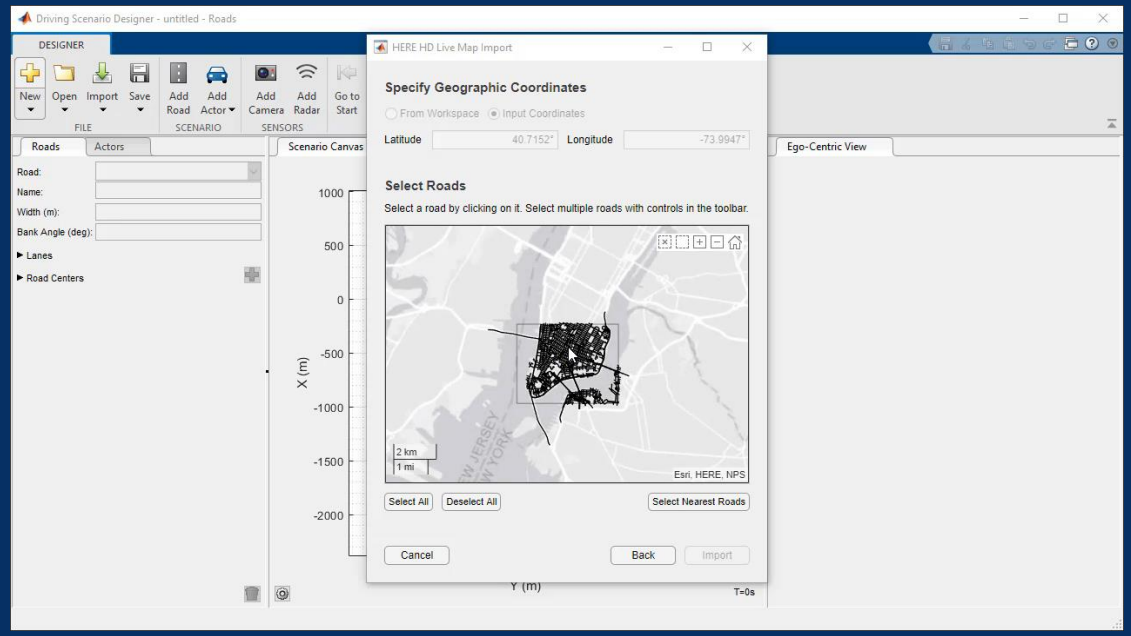
Automated Driving Toolbox
Vehicle Dynamics Blockset

Accelerate development of automated driving systems

Develop driving algorithms in a 3D simulation environment

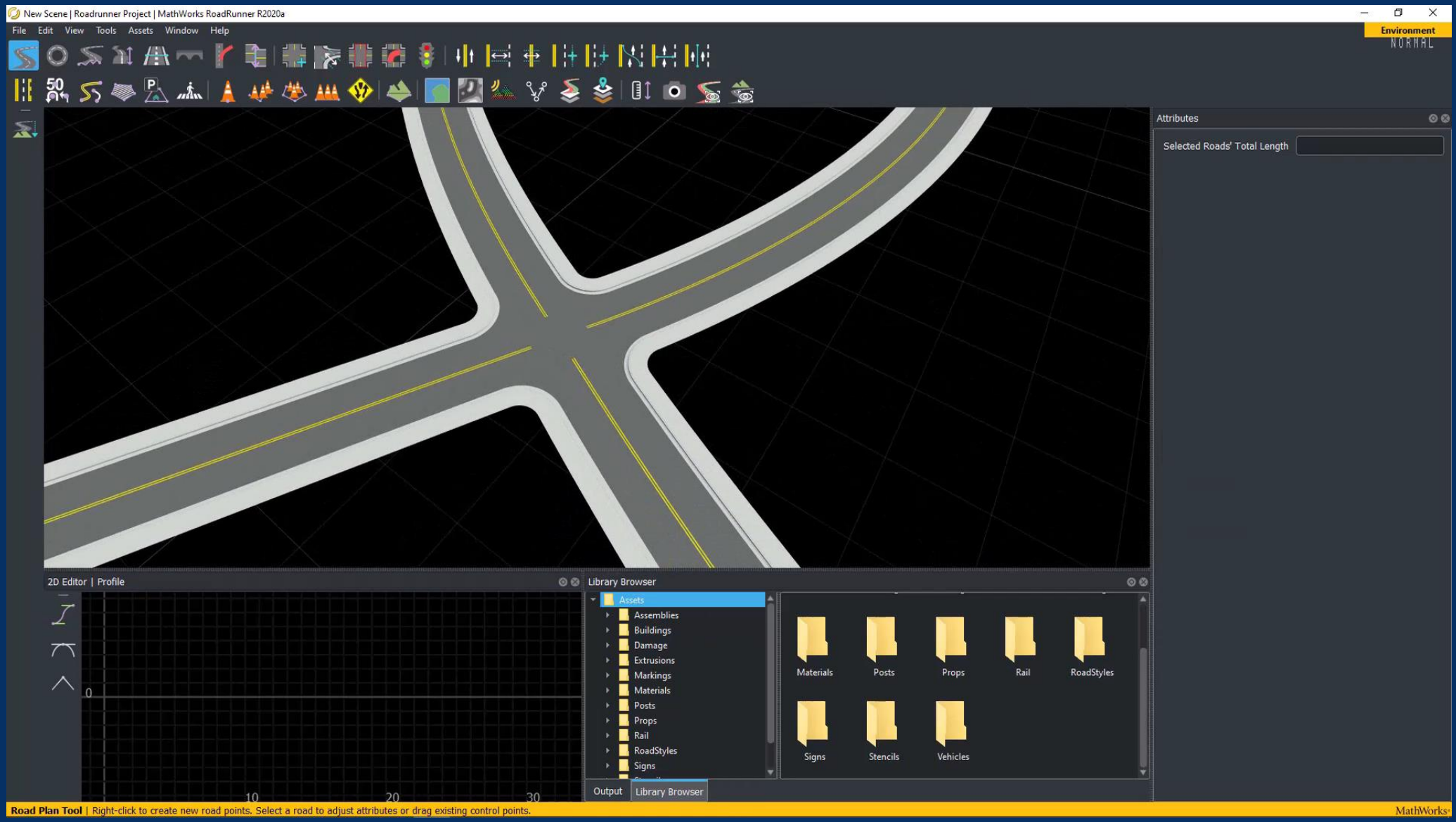
Test algorithms with prebuilt scenarios

Create driving scenarios using road data from high-definition maps



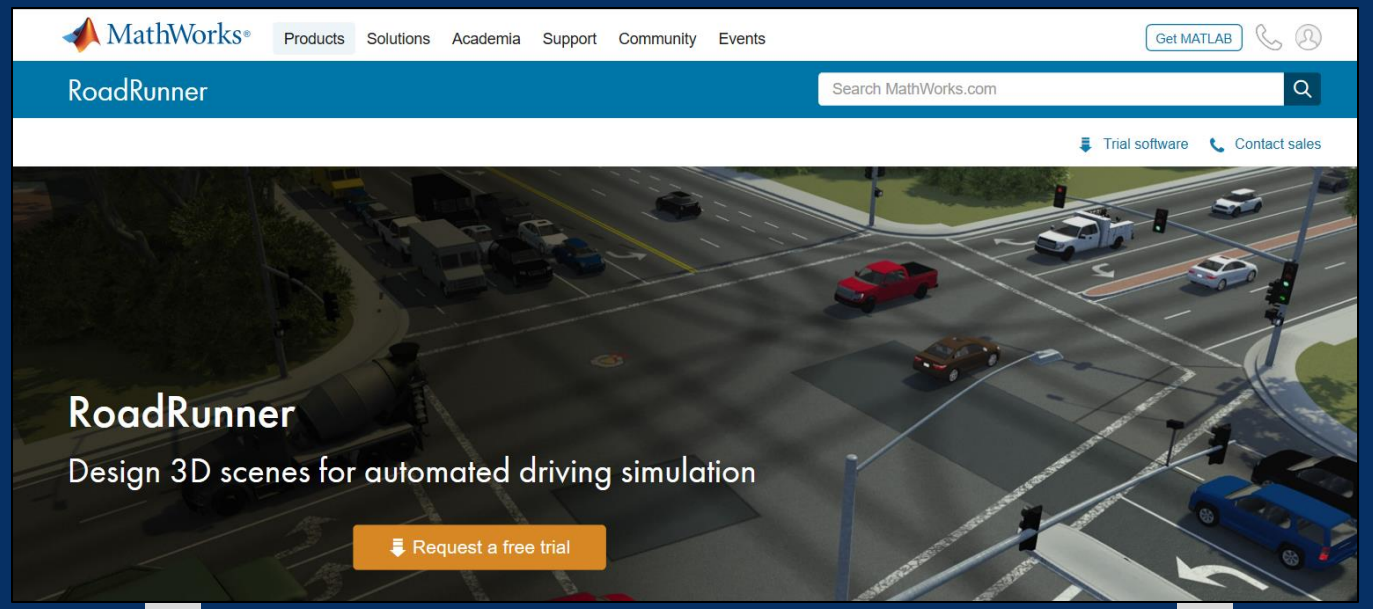
Automated Driving Toolbox
Vehicle Dynamics Blockset

Accelerate development of automated driving systems

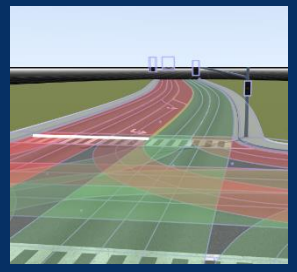


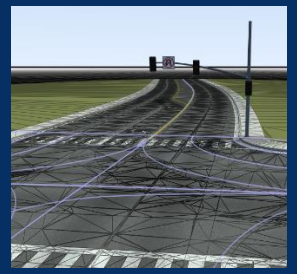
RoadRunner

Accelerate development of automated driving systems

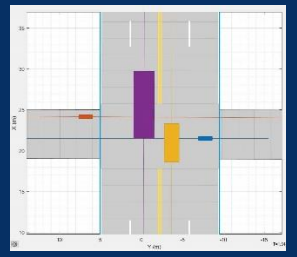


External Simulators



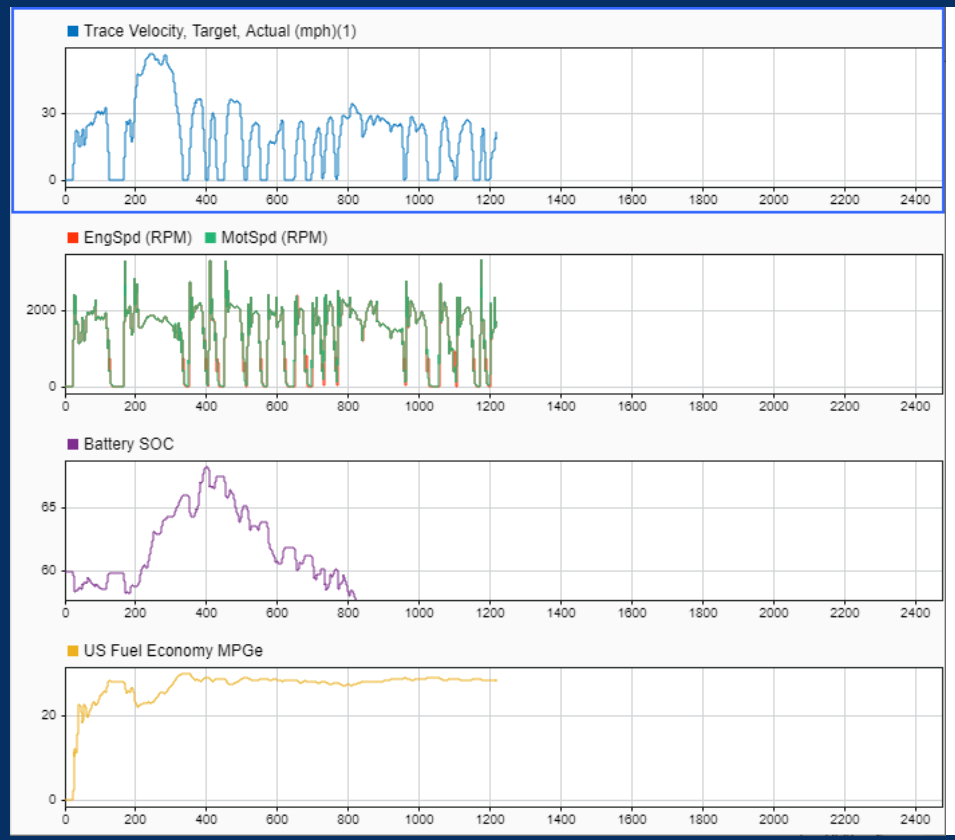


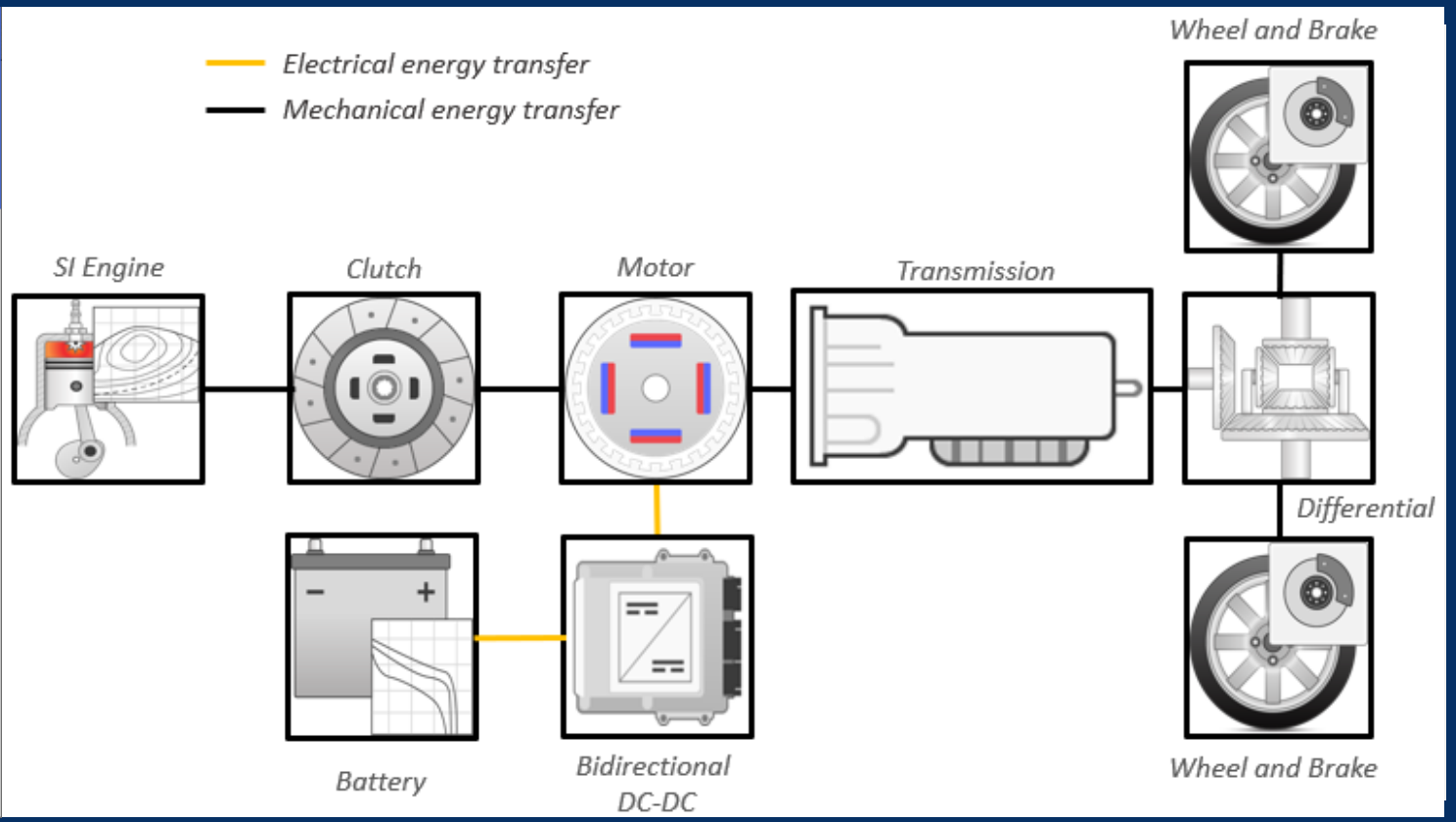
MATLAB & Simulink



RoadRunner

Analyze fuel economy and performance for various architectures





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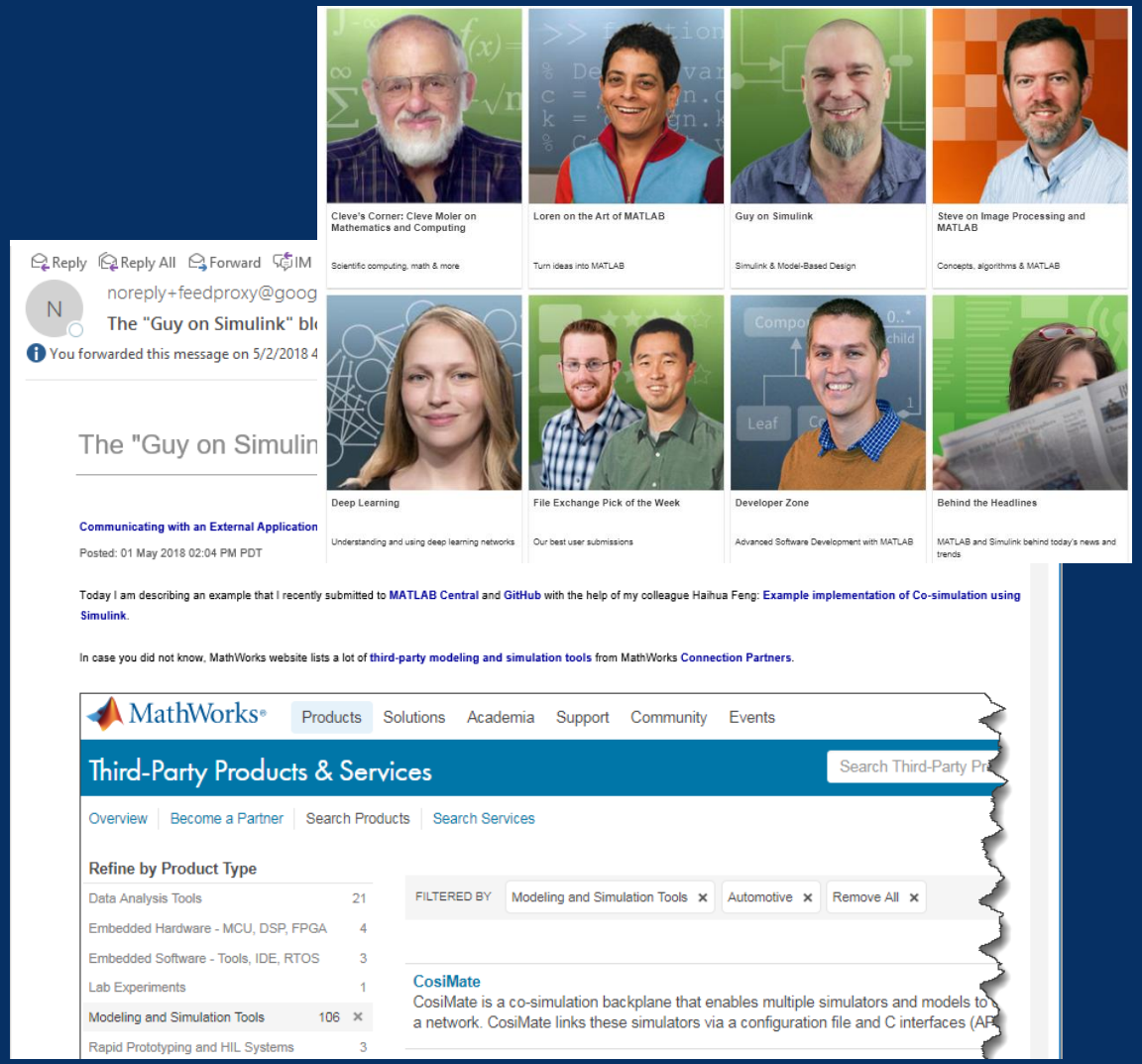

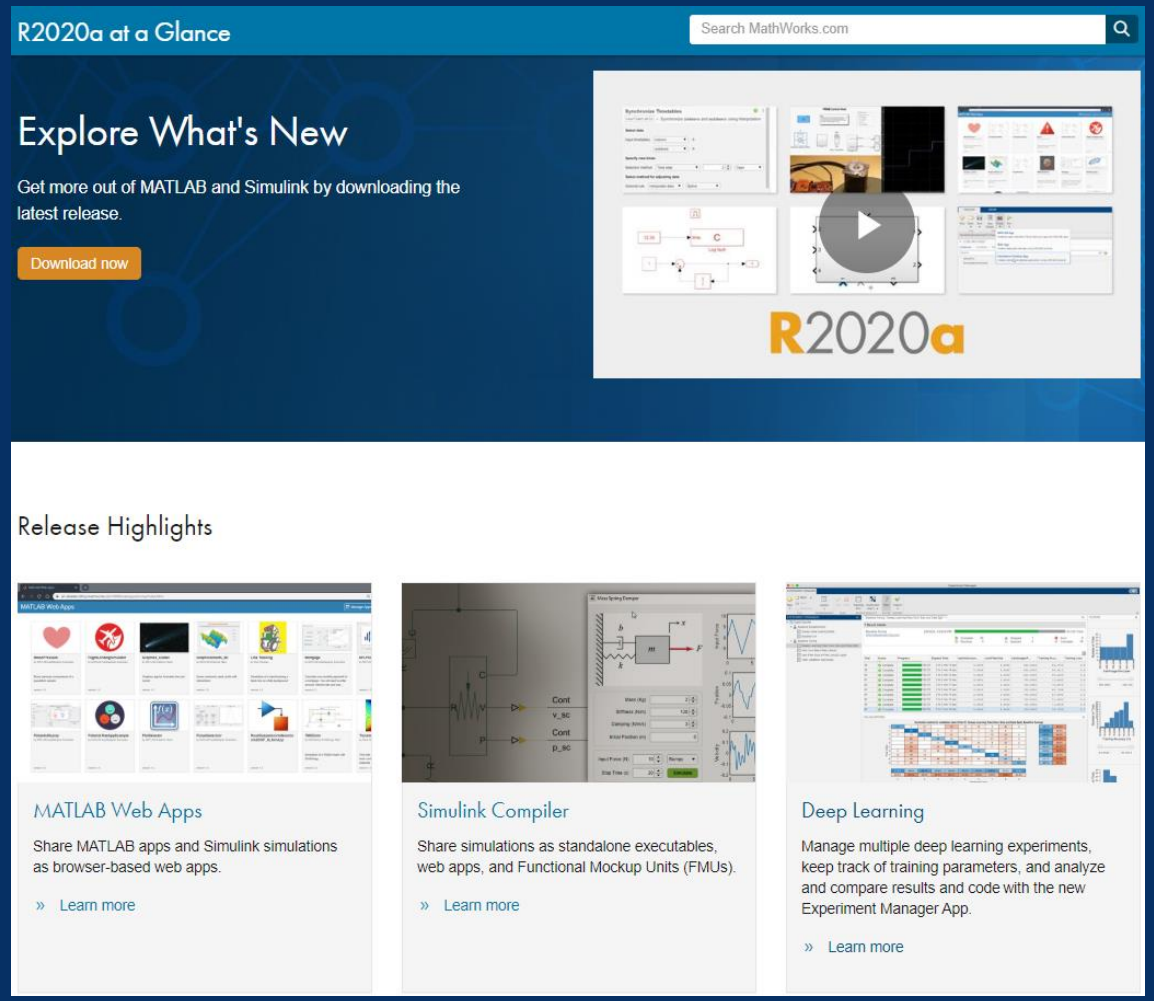

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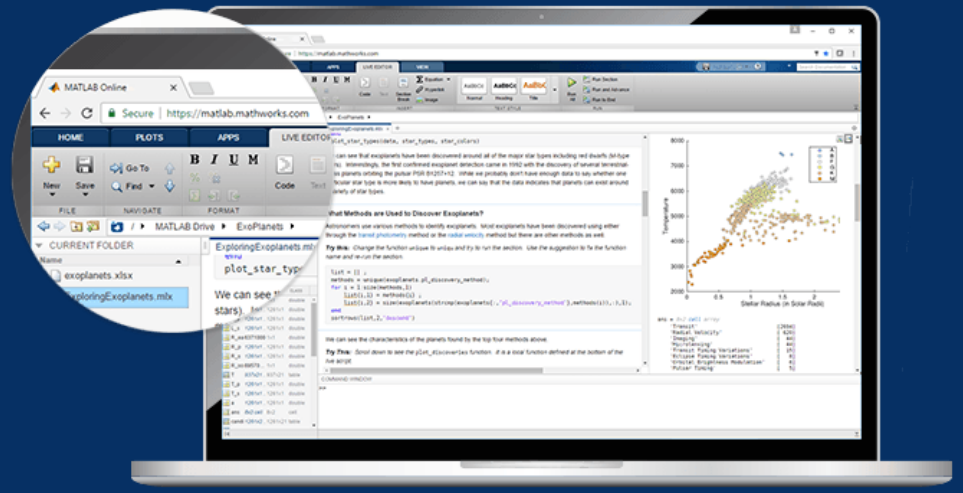

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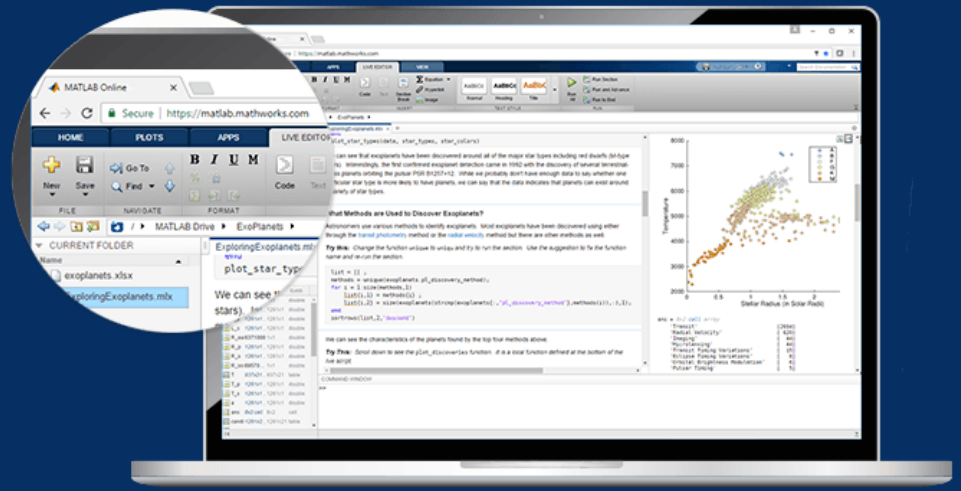
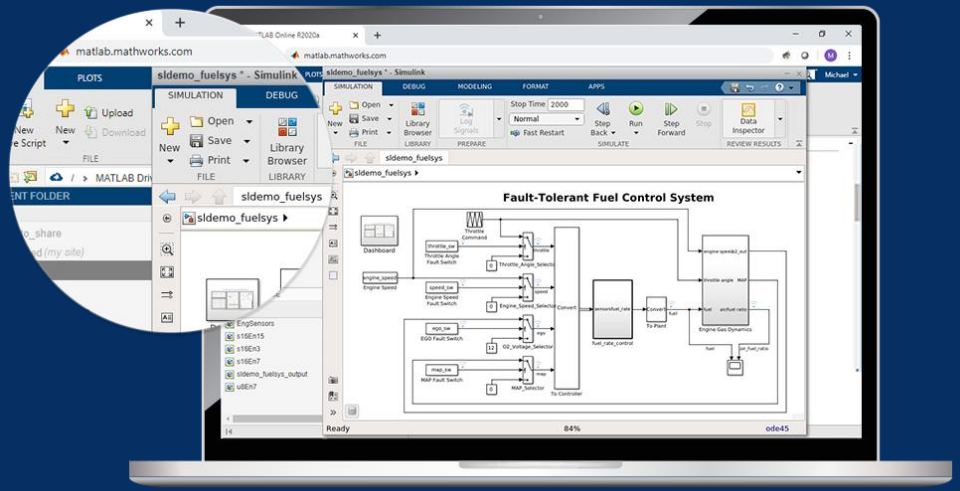


MATLAB Online



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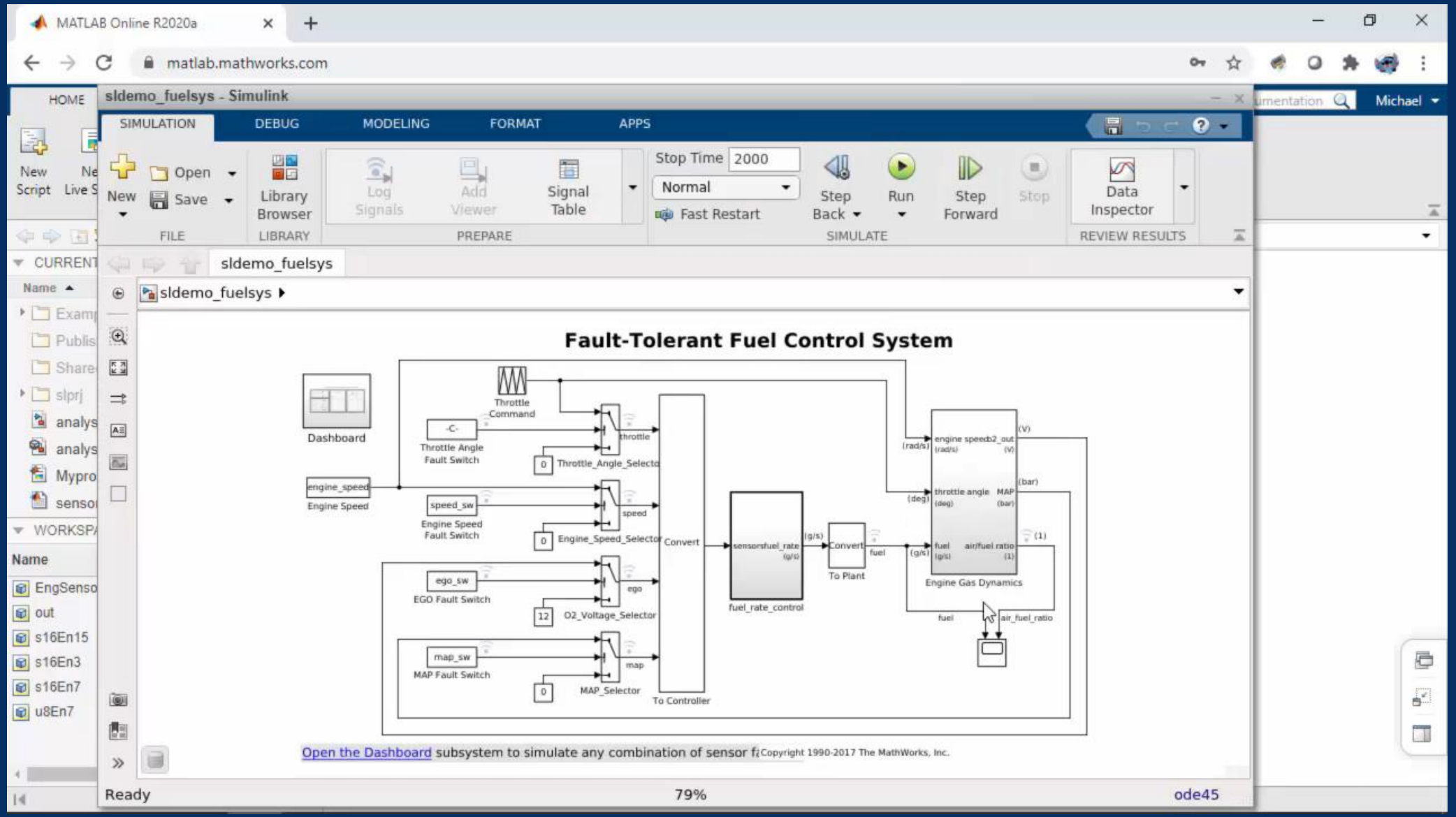

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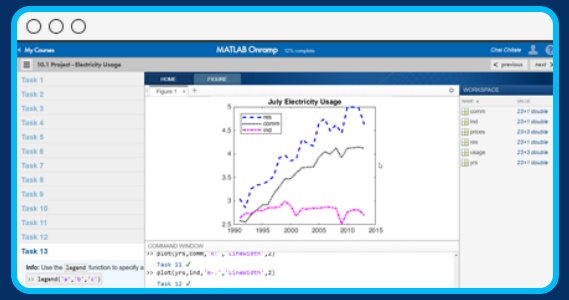
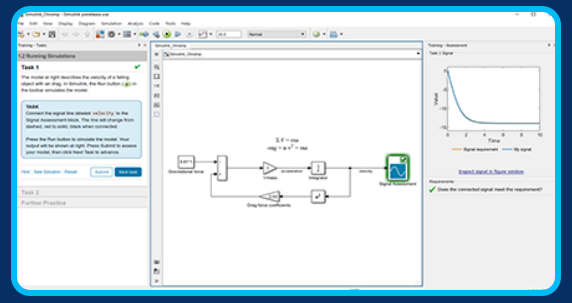
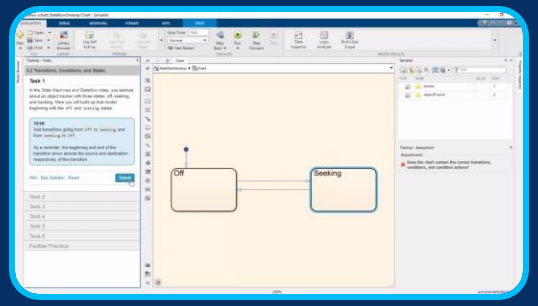


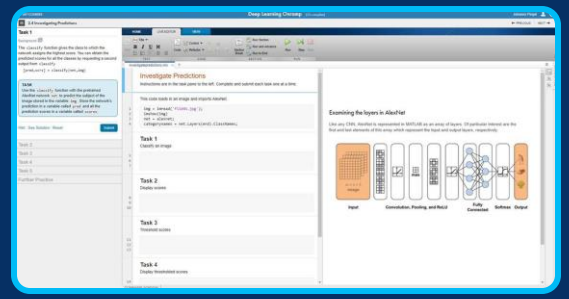
MATLAB Onramp



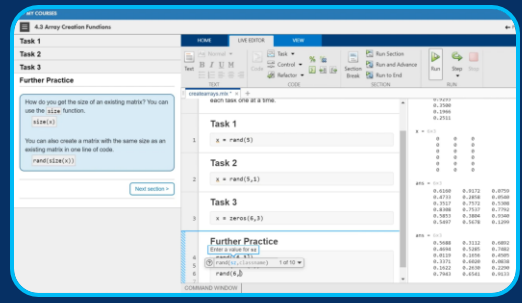
Simulink Onramp



Stateflow Onramp



Deep Learning Onramp



Machine Learning Onramp

MATLAB EXPO