MATLAB EXPO

What's New in MATLAB and Simulink R2020a

山本　順久

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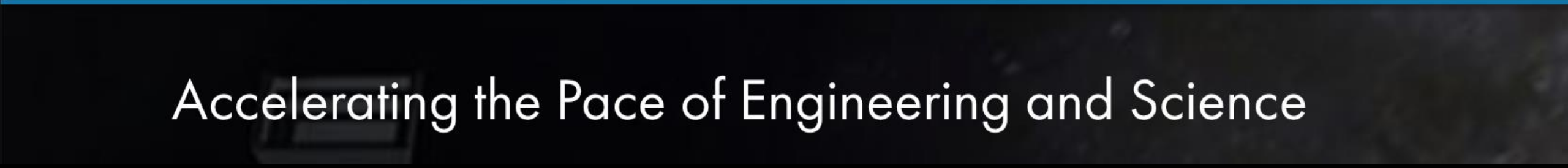
About MathWorks



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.

2,611

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&SIMULINK®

Test and Verify
Share and Deploy

Deep
Solutions

Test and Verify
Share and Deploy

Deep
Solutions

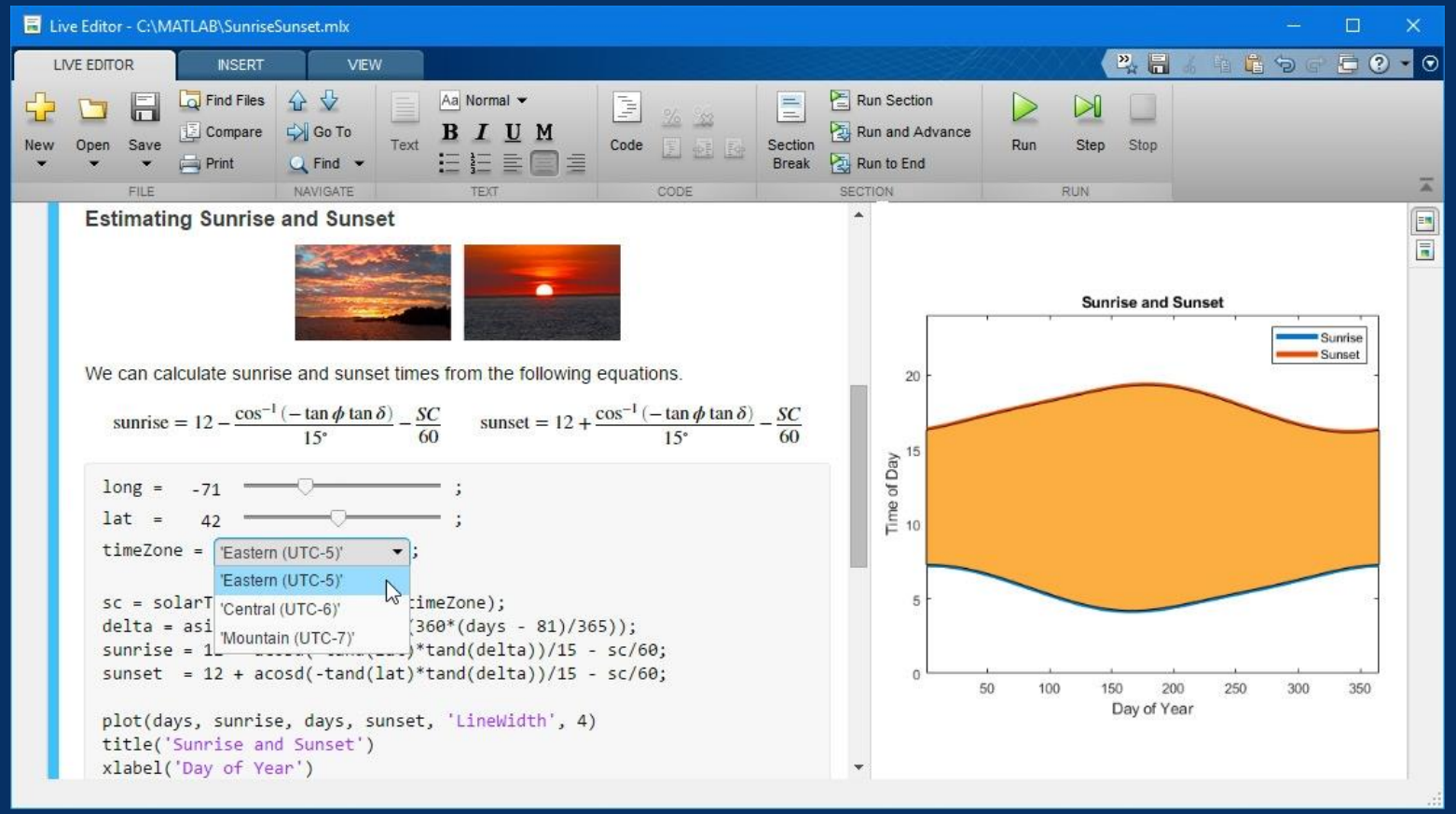
Create executable notebooks for sharing, presenting, teaching

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

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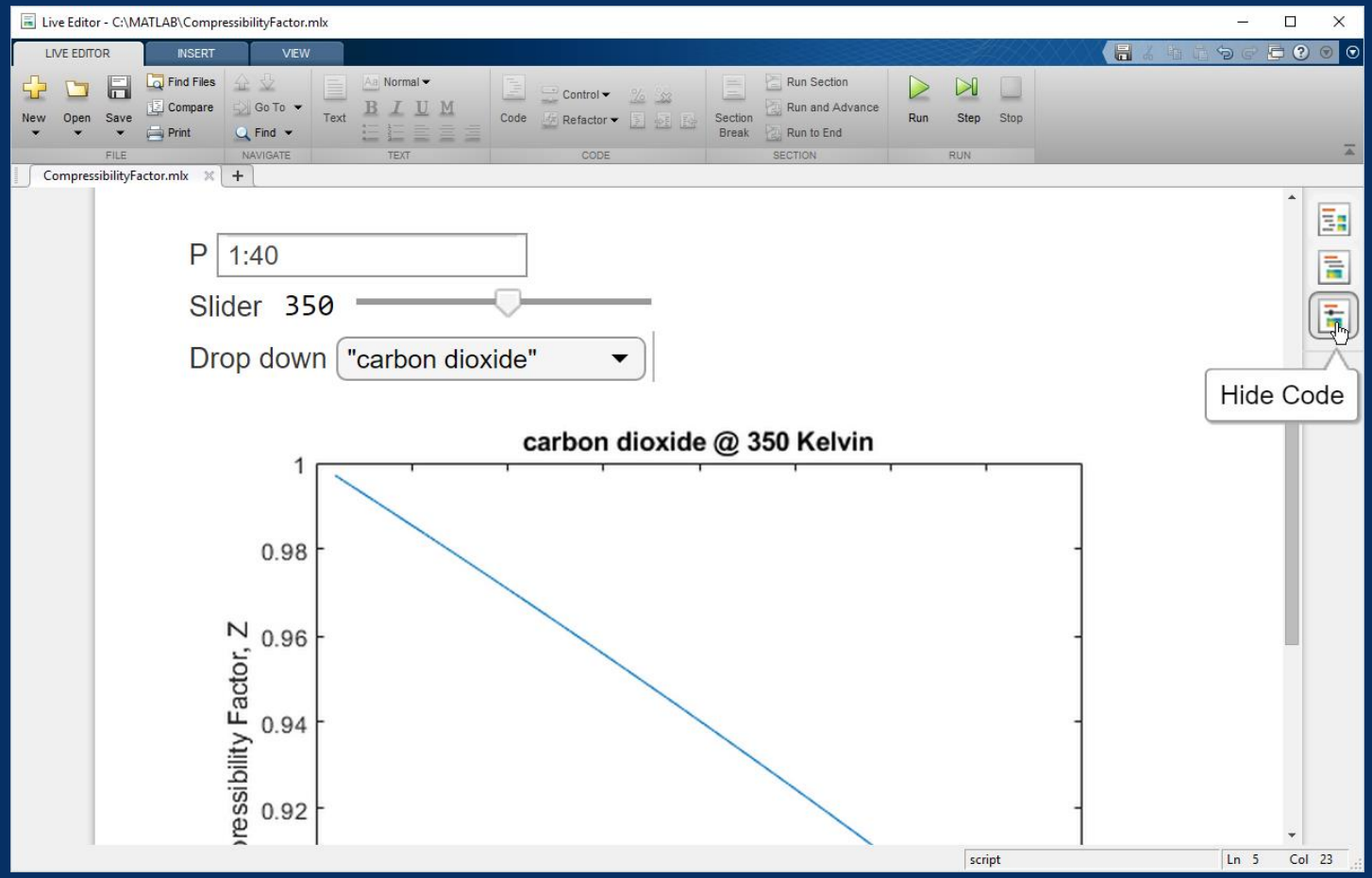
Turn a script into a simple app

Add **interactive controls** to modify script variables

- Numeric sliders
- Drop-down lists
- Edit fields

Hide the code to create simple applications and dashboards



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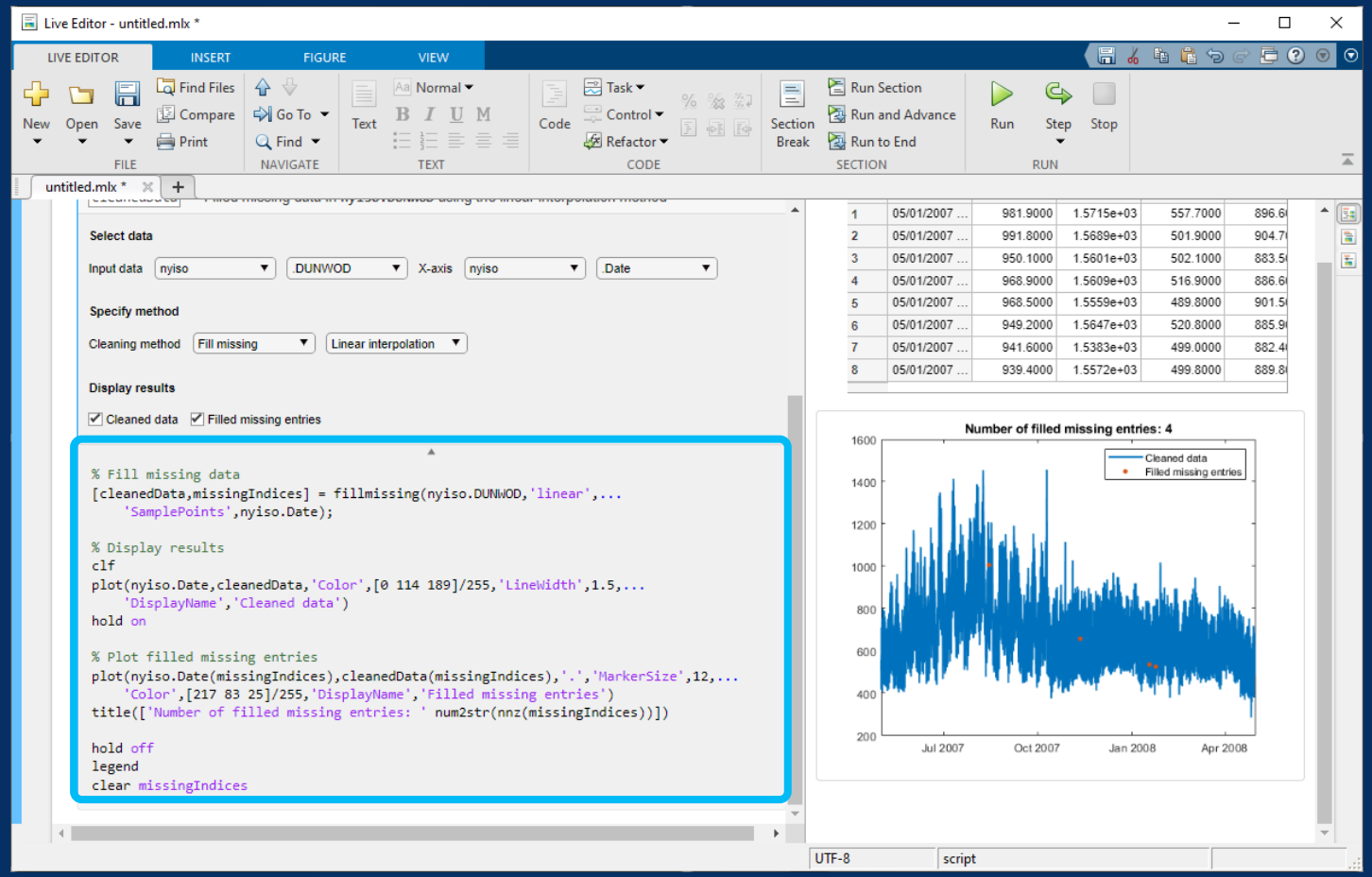
Complete steps interactively

Use **tasks** to explore parameters and options

Automatically generate MATLAB code for the completed task



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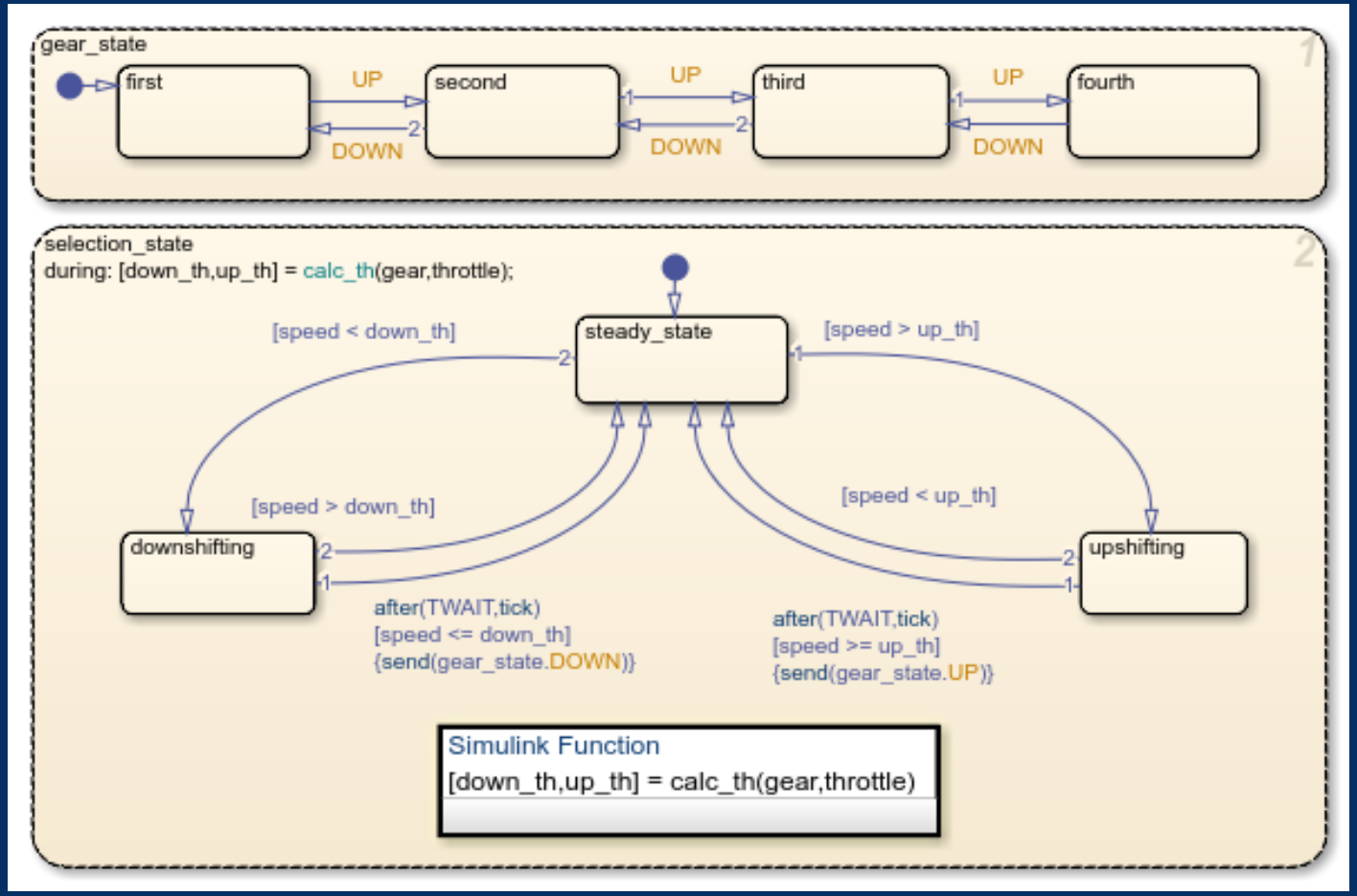
Design decision logic at a higher level of abstraction

Graphically program, debug and execute state machines



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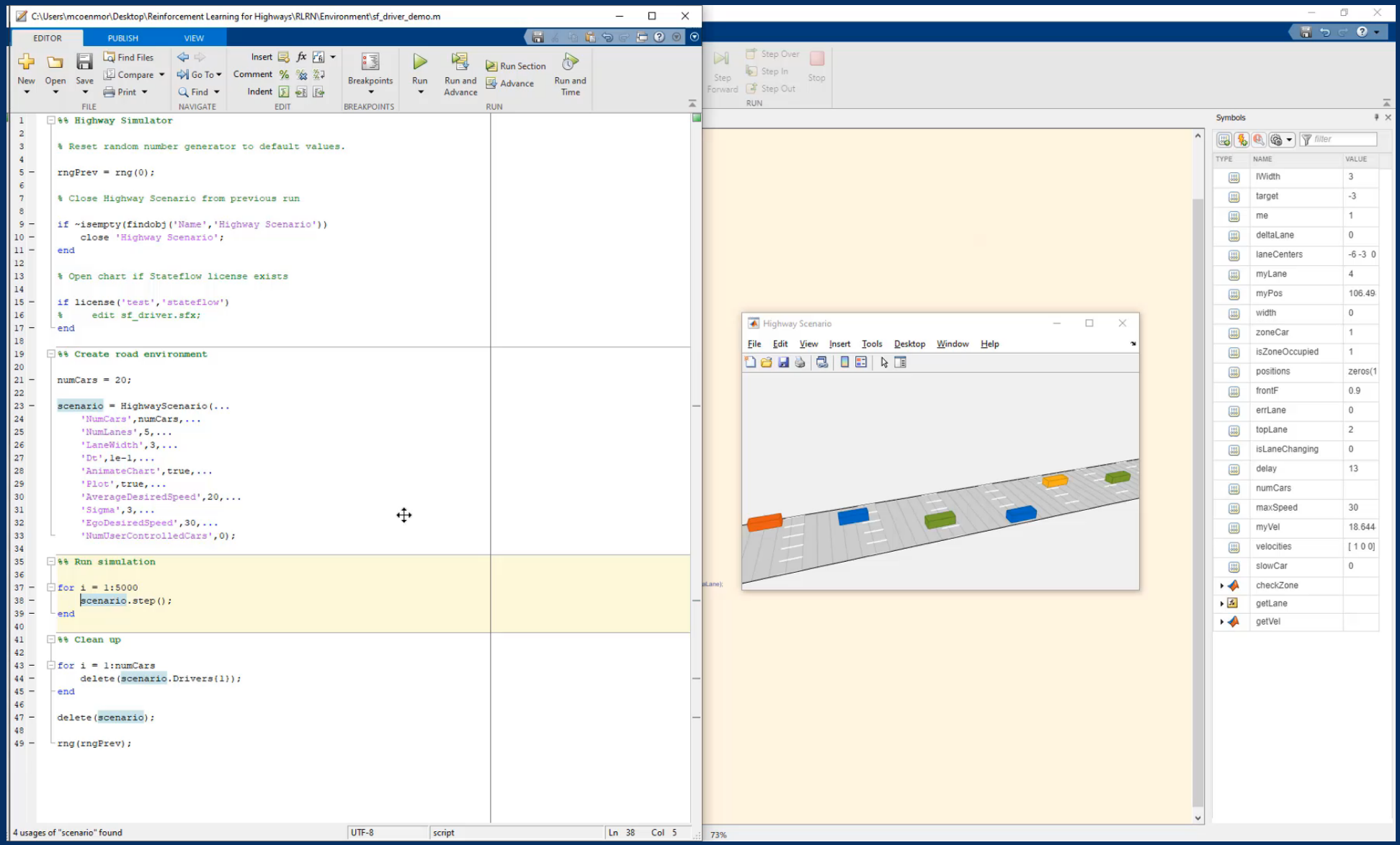
Design decision logic at a higher level of abstraction – in MATLAB



MATLAB
Stateflow

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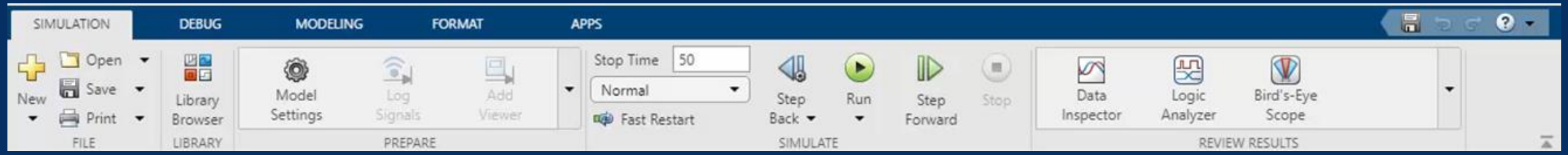
Enable any engineer at any level to model any system

User interfaces



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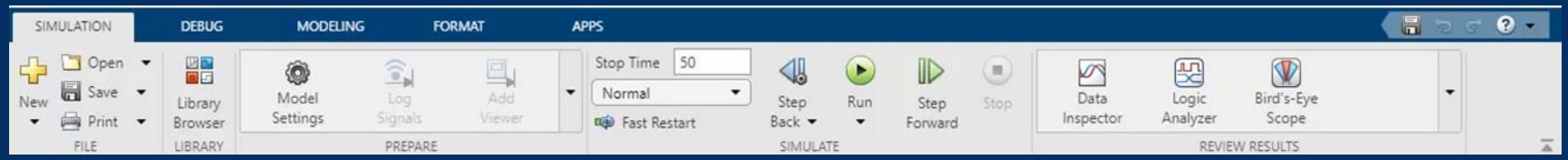
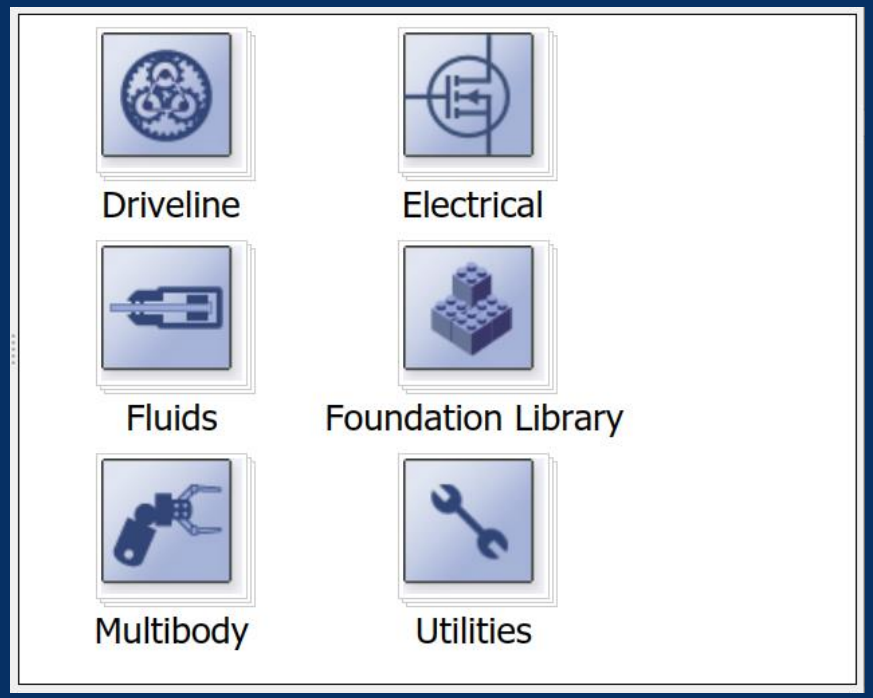
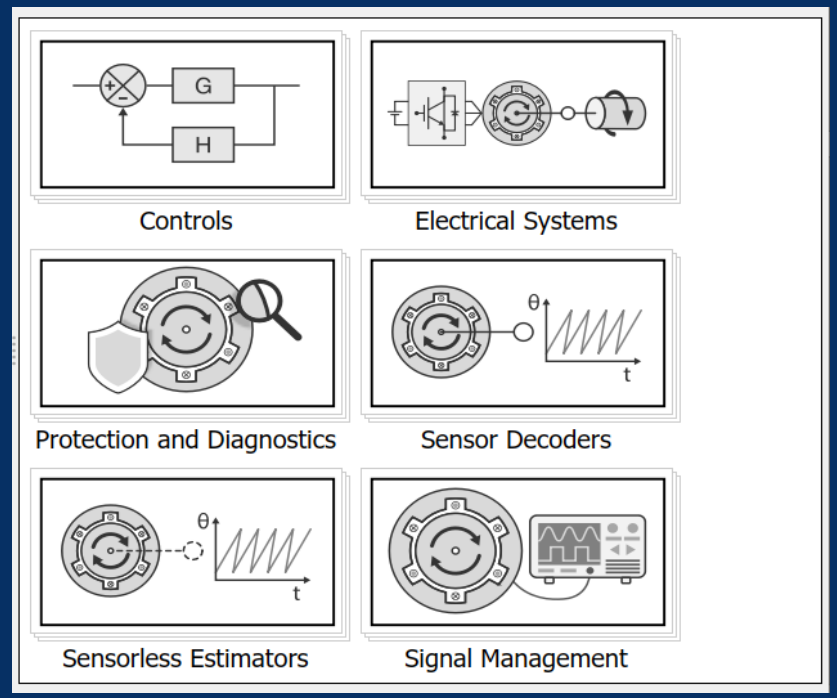
Enable any engineer at any level to model any system

User interfaces



Libraries





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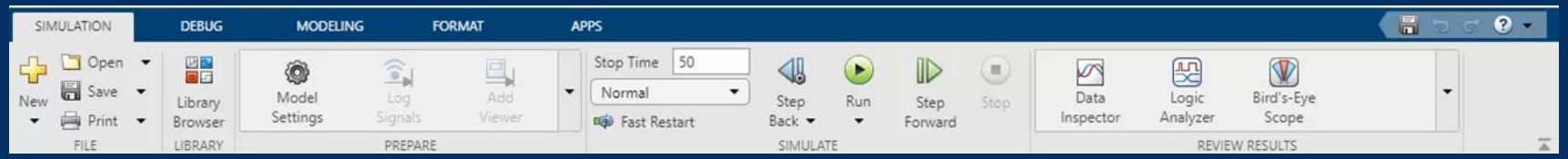
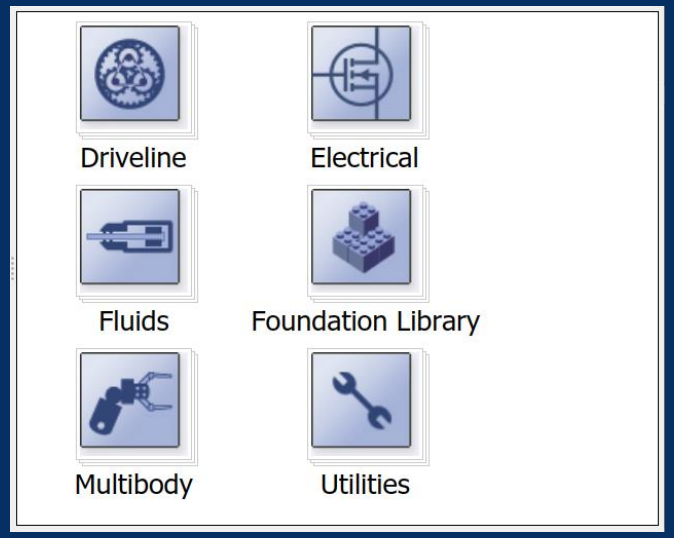
Enable any engineer at any level to model any system

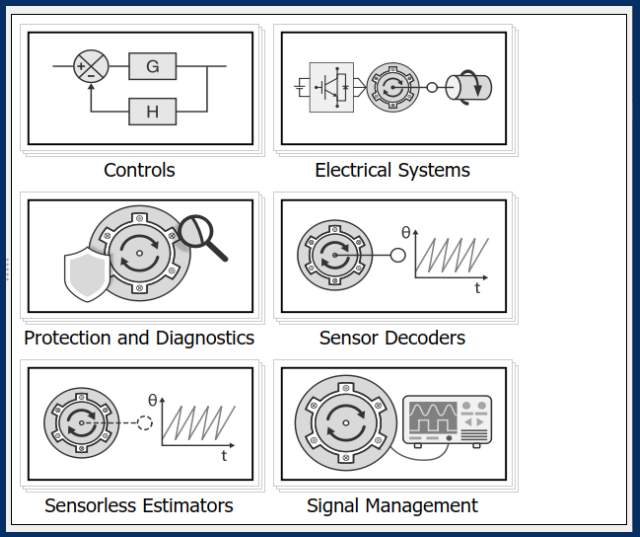
User interfaces

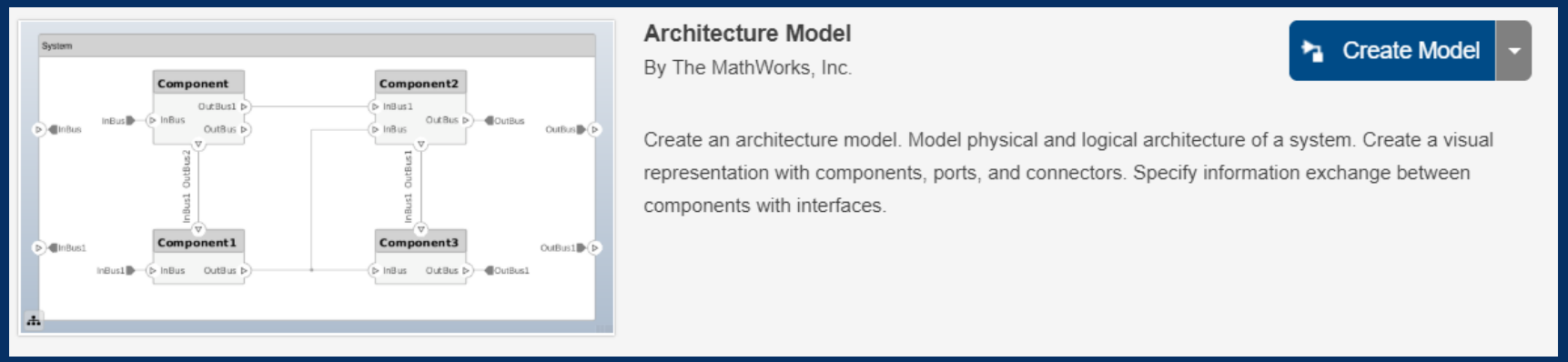
Libraries

Systems engineering









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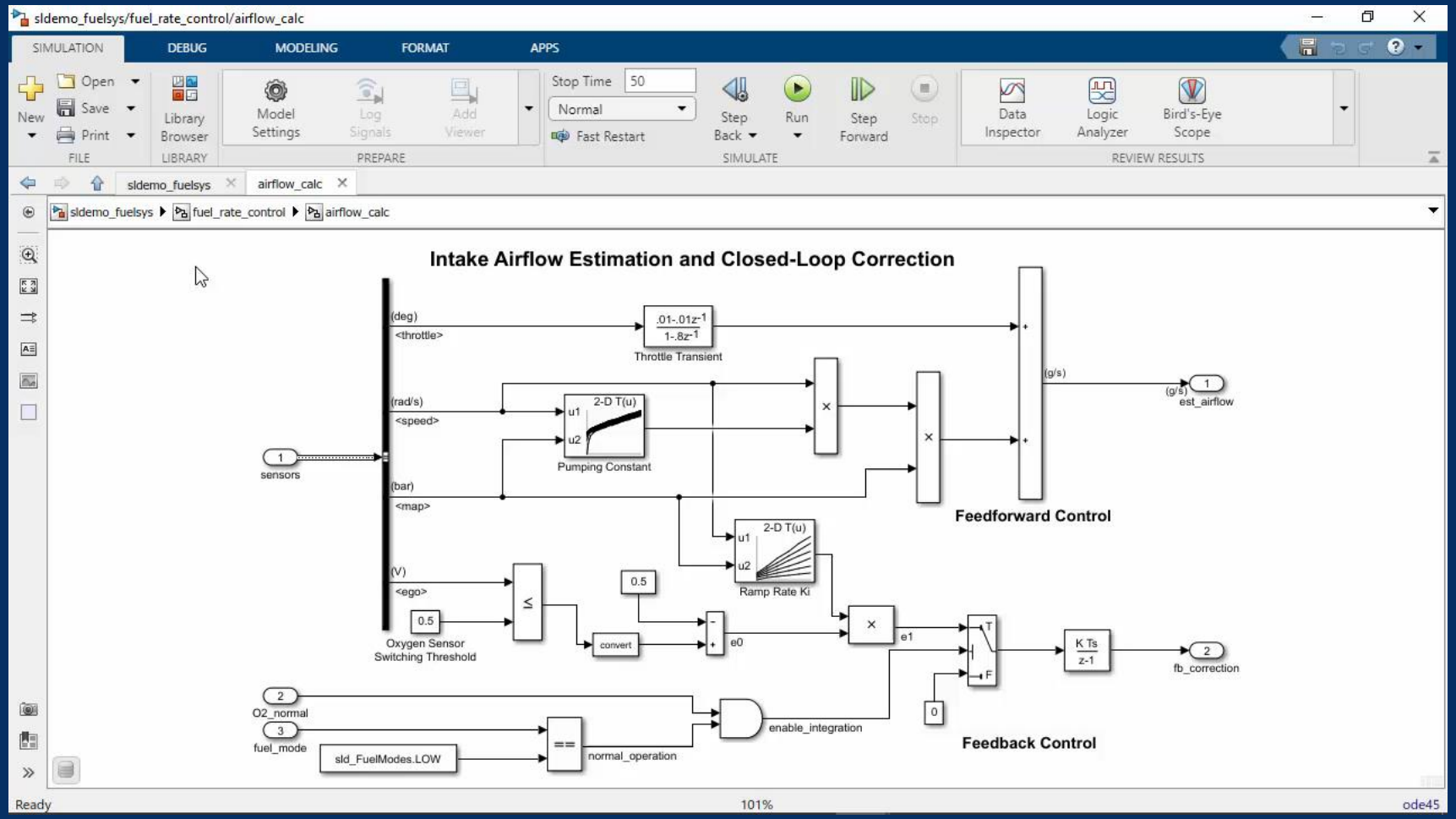
Access and discover Simulink capabilities when you need them

User interfaces

Libraries

Systems engineering



Simulink Toolstrip

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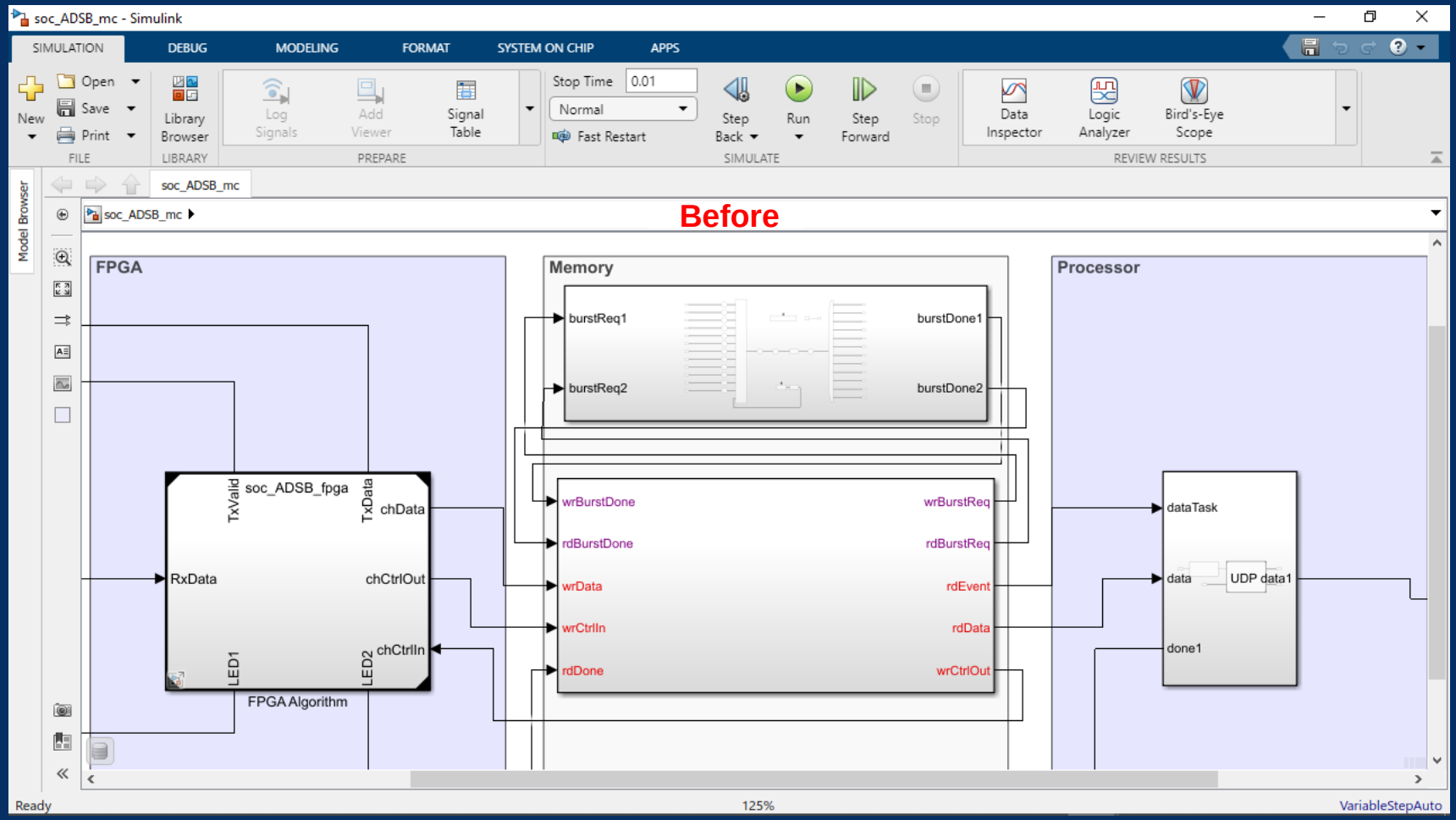
Edit at the speed of thought

User interfaces

Libraries

Systems engineering



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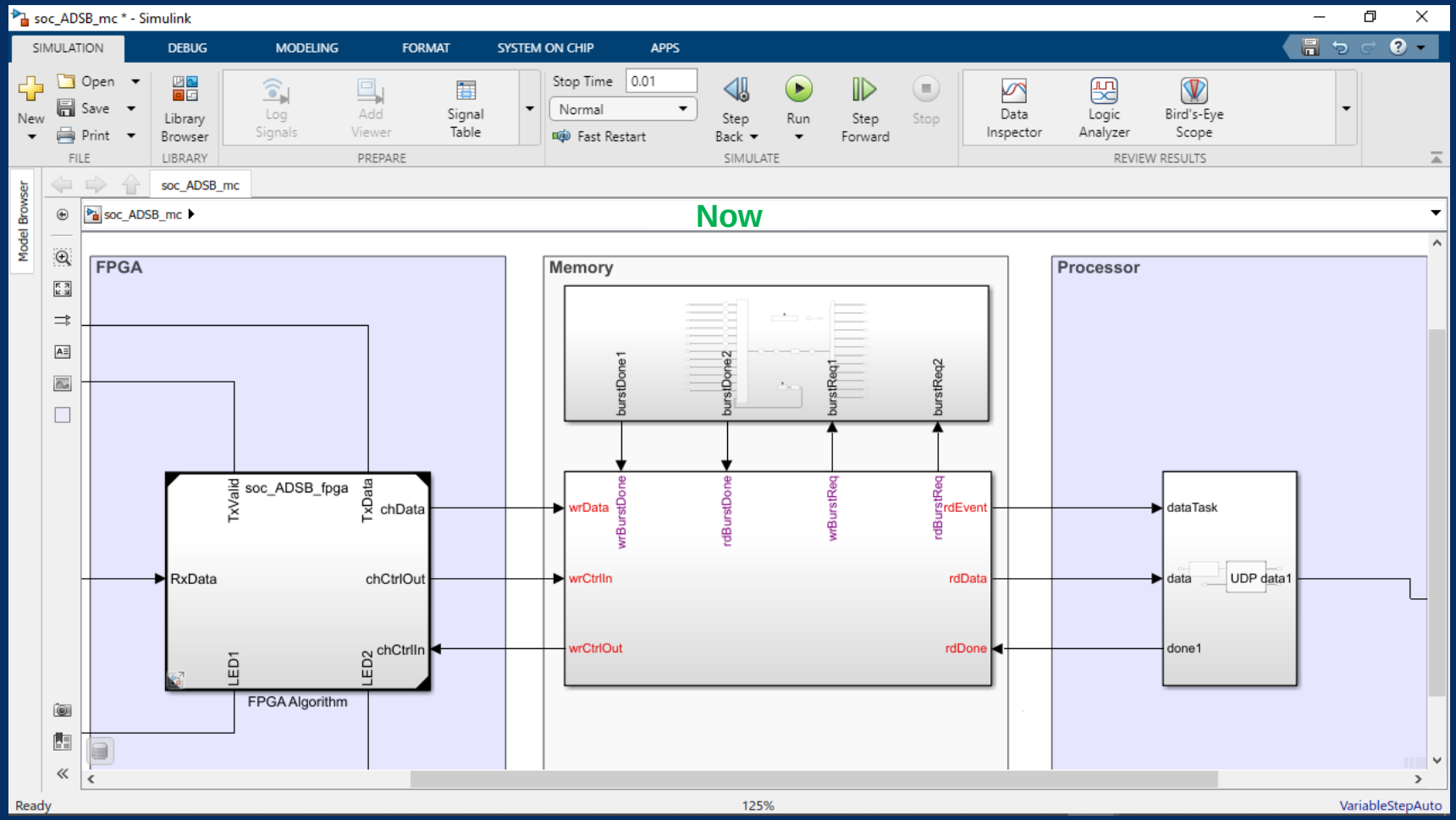
Edit at the speed of thought

User interfaces

Libraries

Systems engineering



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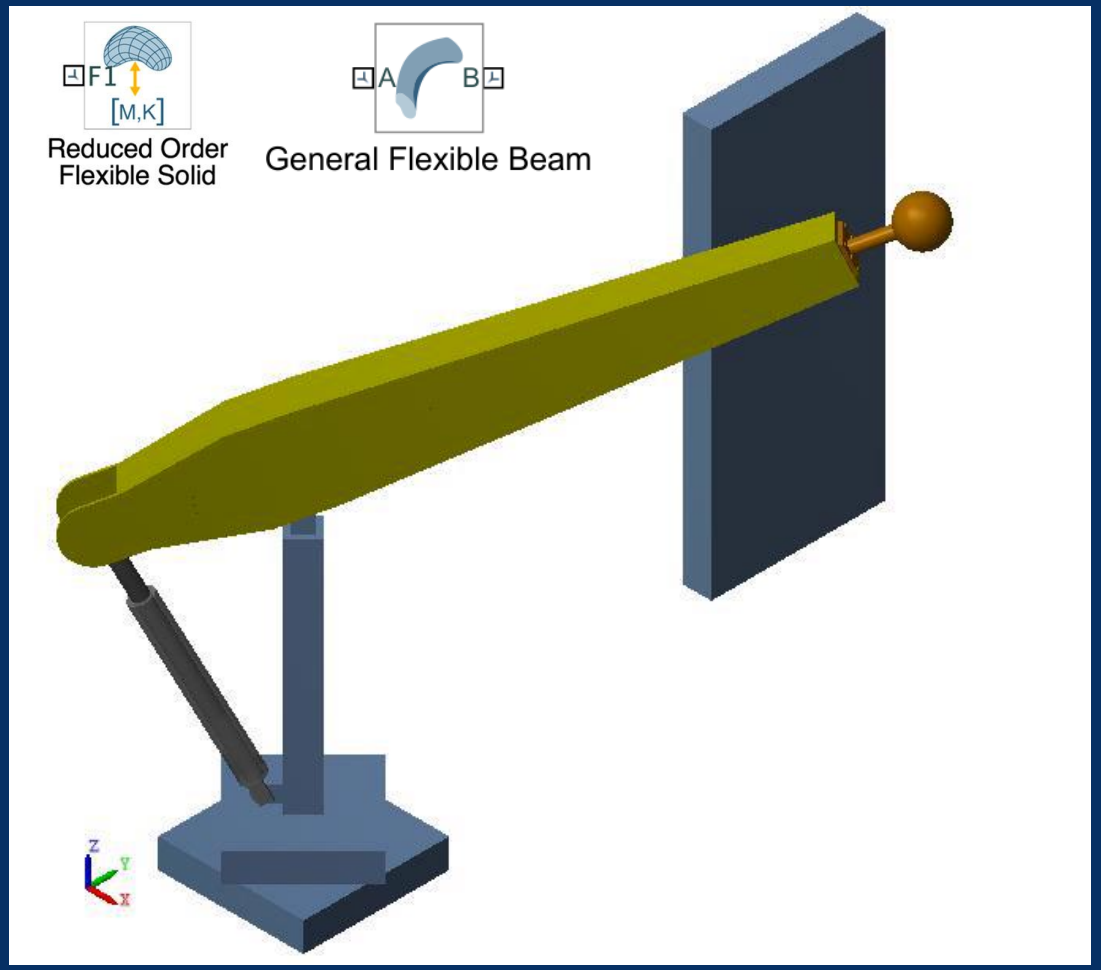
Model deformations and contact between bodies

User interfaces

Libraries – Physical modeling

Systems engineering



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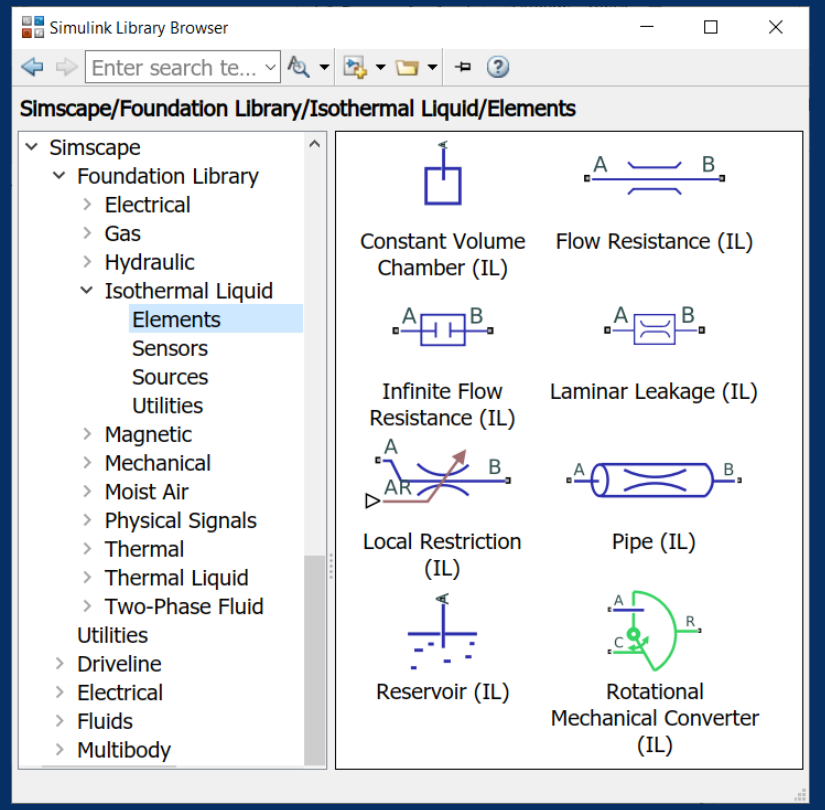
Model fluid power and transport applications

User interfaces

Libraries – Physical modeling

Systems engineering



Simscape

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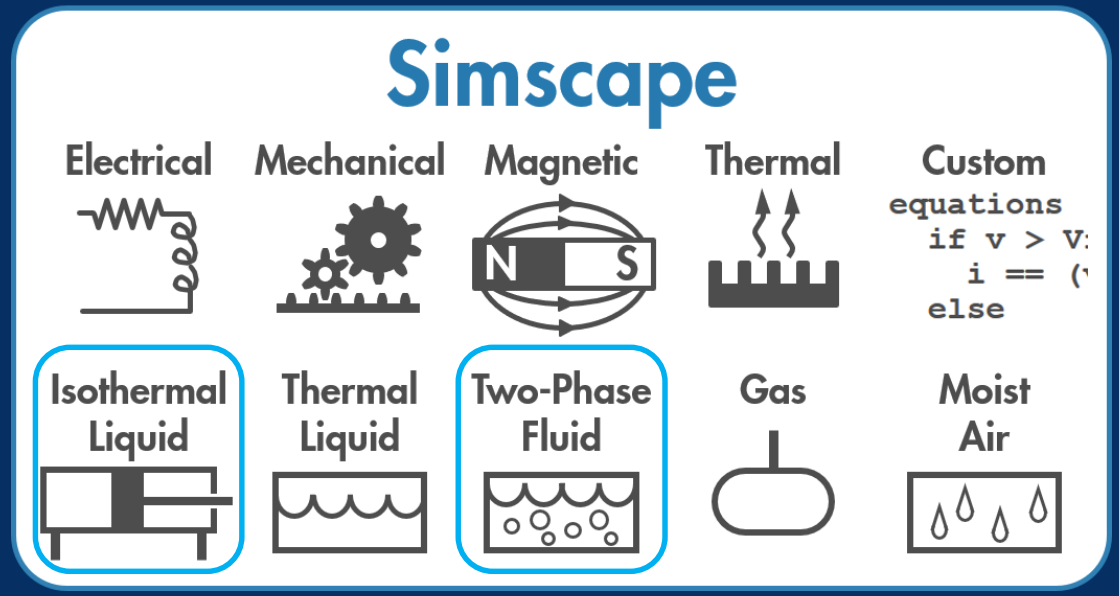
Model fluid power and transport applications

User interfaces

Libraries – Physical modeling

Systems engineering



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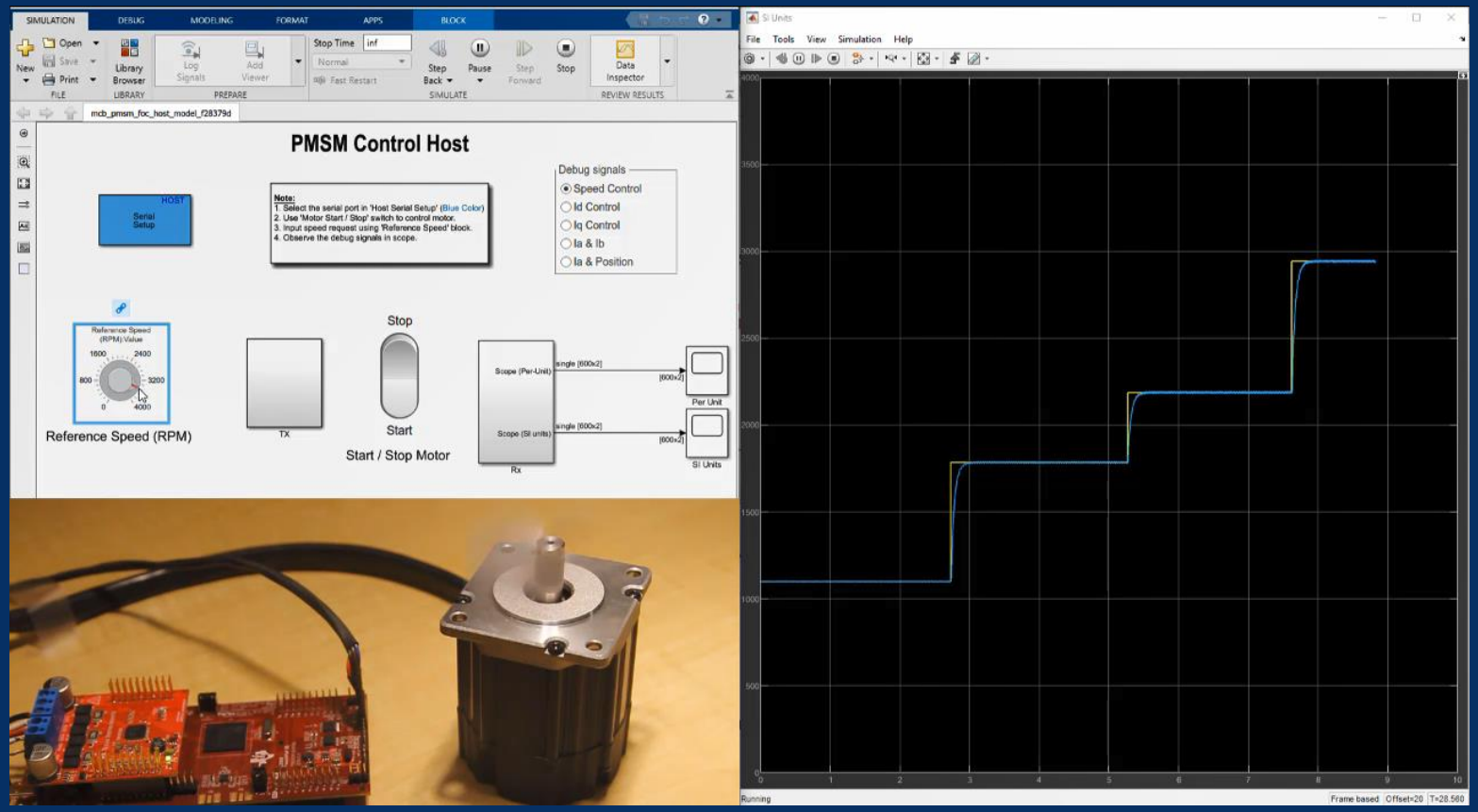
Generate motor control software with just a few clicks

User interfaces

Libraries – Motor control

Systems engineering



Motor Control Blockset **NEW PRODUCT**

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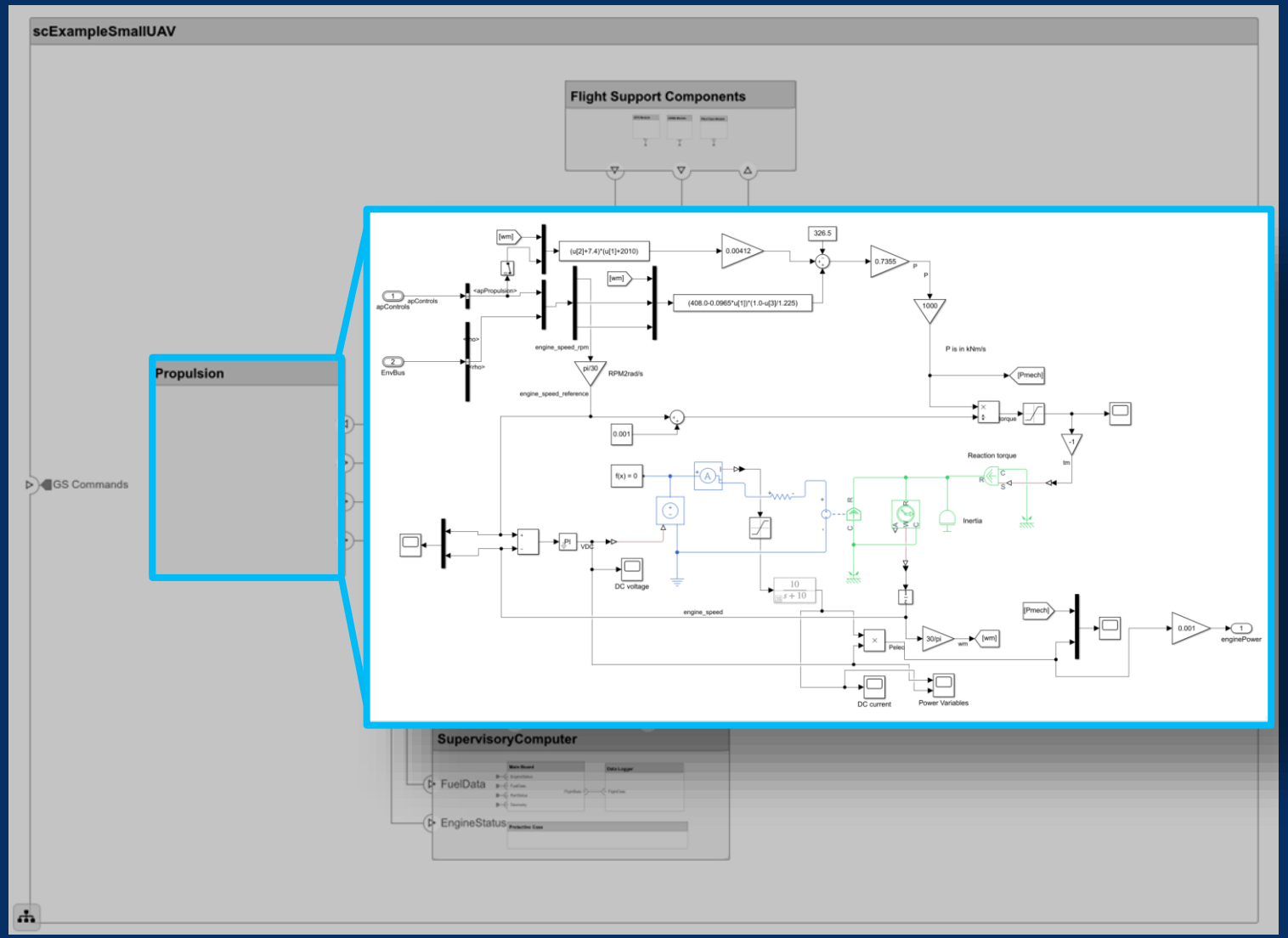
Design and analyze complex system and software architectures

User interfaces

Libraries

Systems engineering



System Composer

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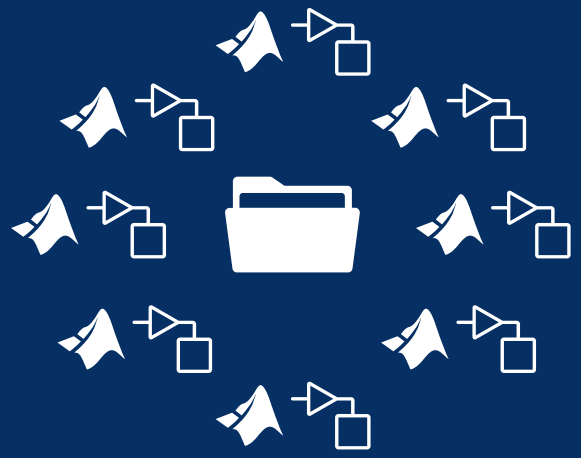
Manage system complexity



Numerous Files

Team Collaboration

Environment Configuration

Simulink
MATLAB

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Manage system complexity with projects

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

Simulink
MATLAB

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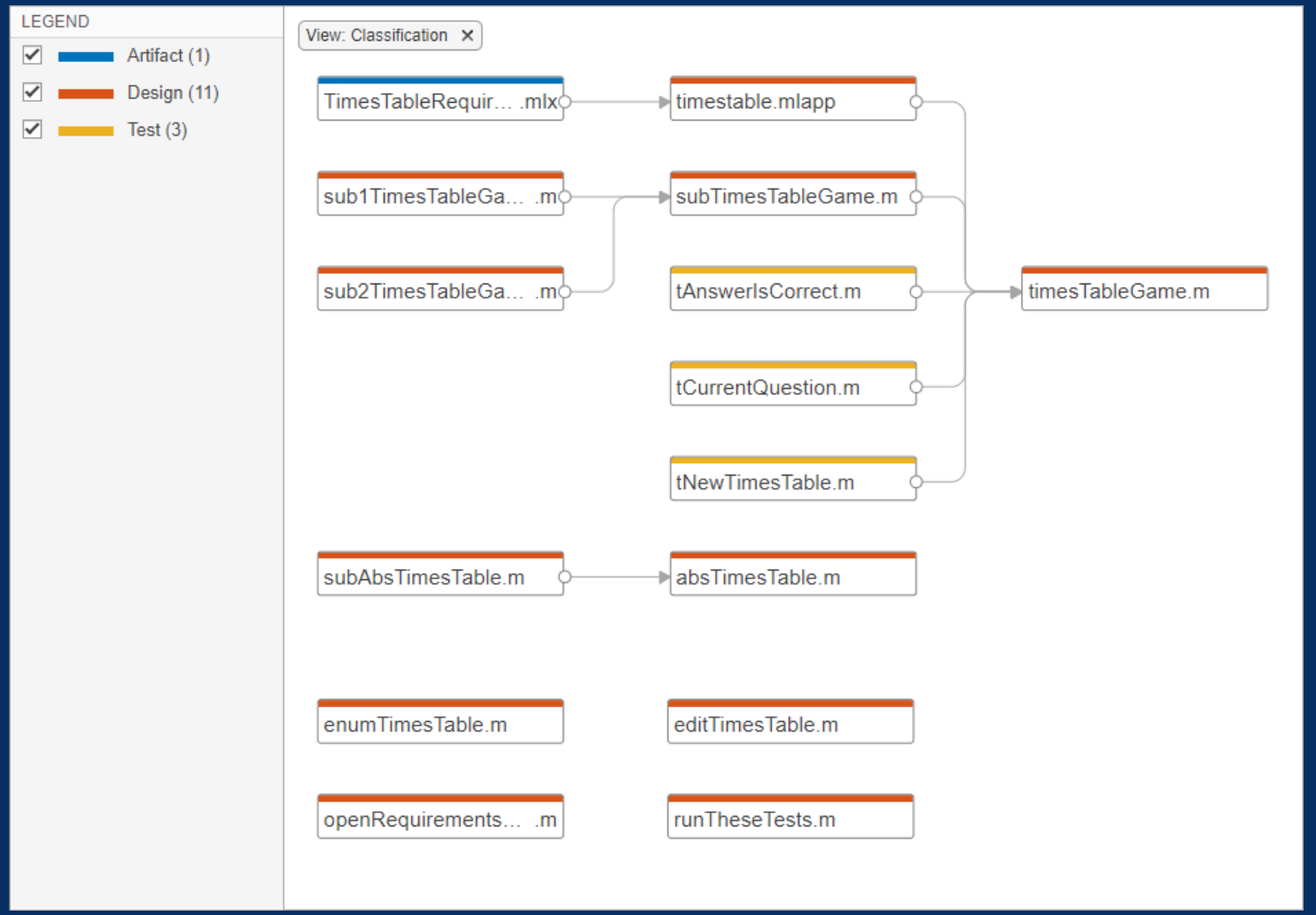
Explore file dependencies and impact analysis

Explore and visualize project structure



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MATLAB

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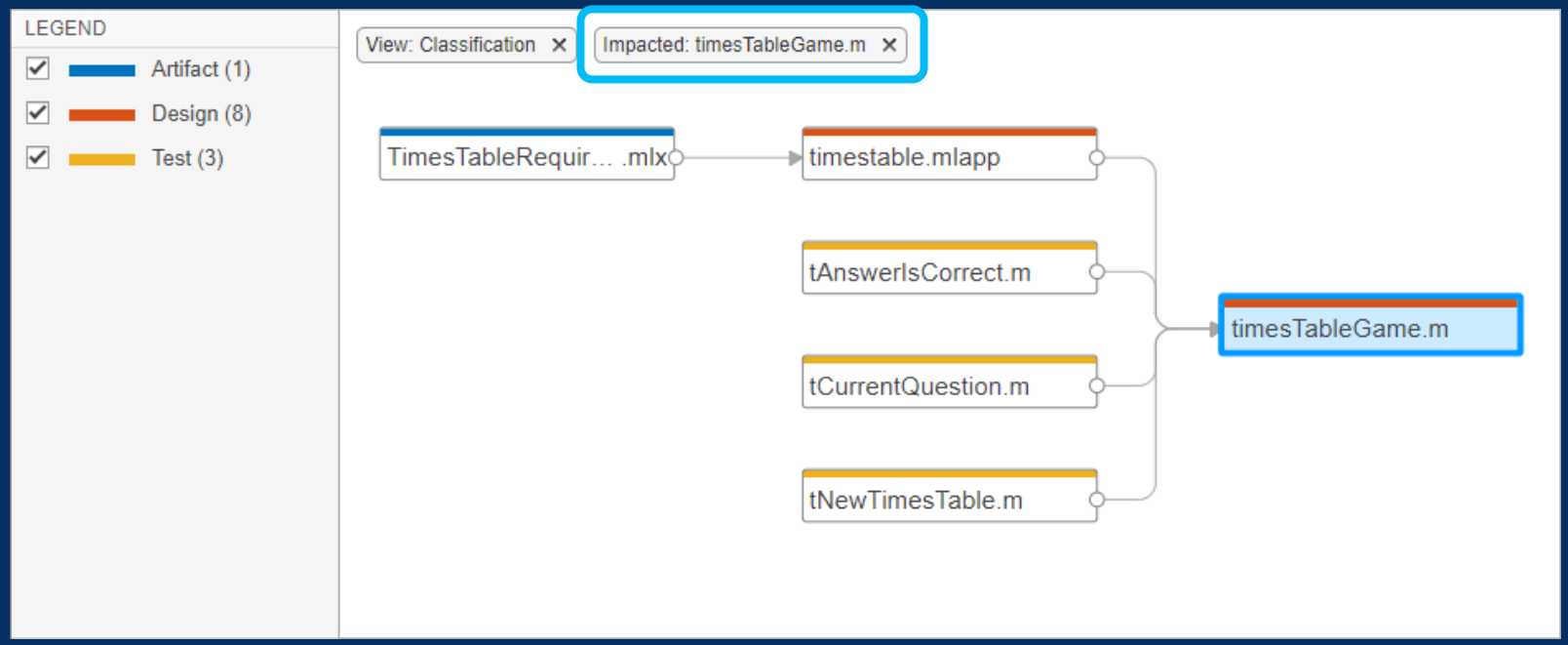
Explore file dependencies and impact analysis

Explore and visualize project structure

Assess how a change affects other files



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MATLAB

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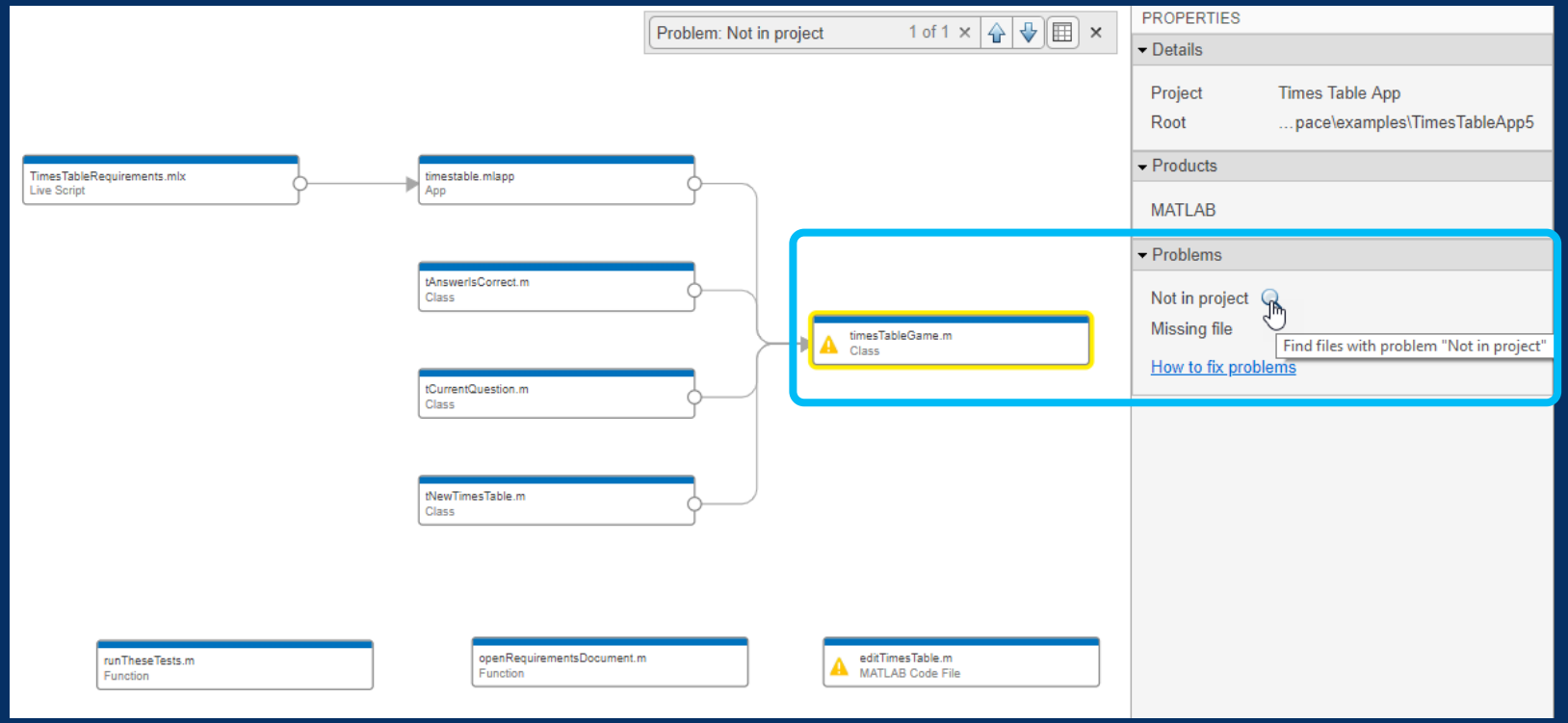
Explore file dependencies and impact analysis

Explore and visualize project structure

Assess how a change affects other files

Find and fix problems



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MATLAB

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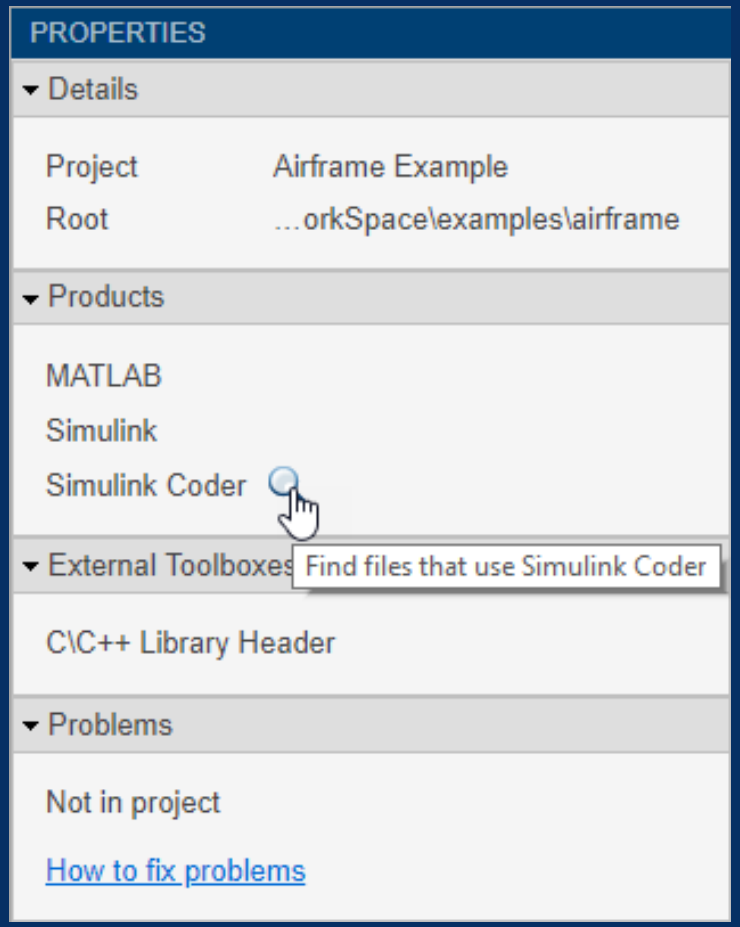
Explore file dependencies and impact analysis

Explore and visualize project structure

Assess how a change affects other files

Find and fix problems

Identify required products and toolboxes



Simulink
MATLAB

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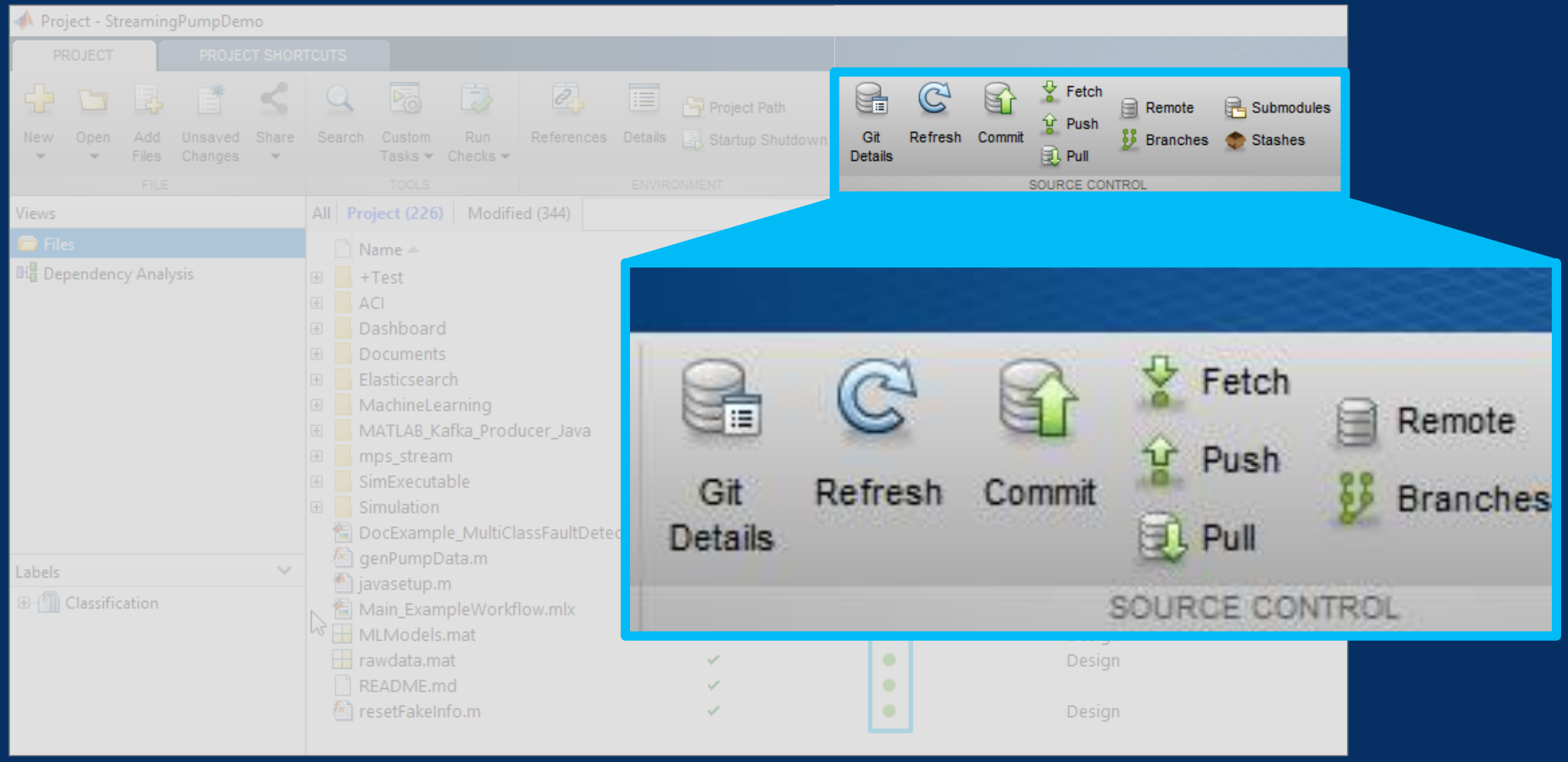
Use source control systems (Git, Subversion) with projects



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MATLAB

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Access other languages and systems directly from MATLAB

Python

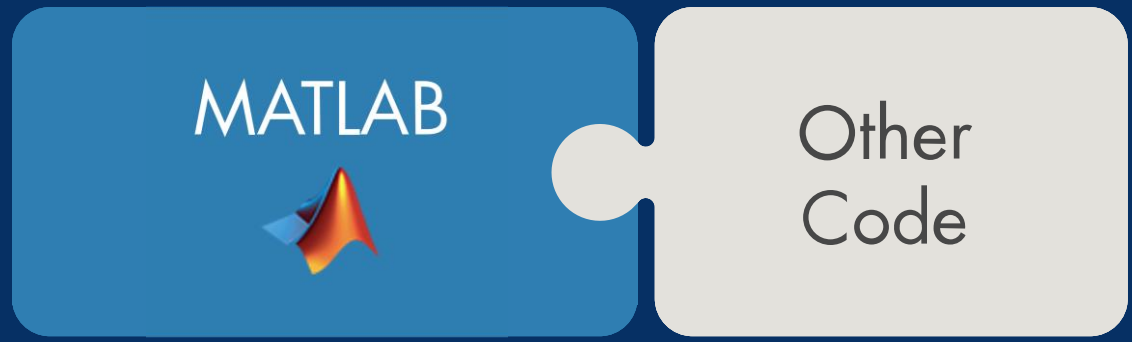
C/C++

Java

Fortran

COM components and ActiveX controls

RESTful, HTTP, and WSDL web services



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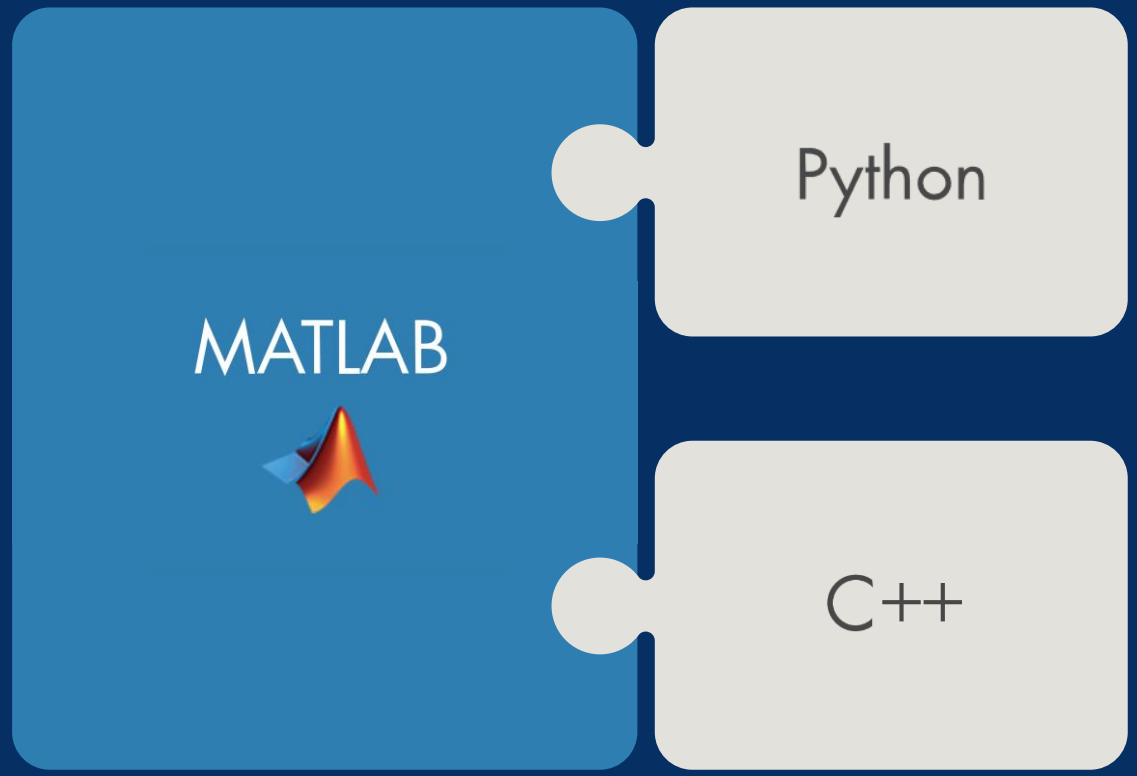
Access other languages and systems directly from MATLAB

Access Python functions out-of-process

```
pyenv("ExecutionMode","OutOfProcess")
wrapped = py.textwrap.wrap(T);
```

Call C++ libraries directly from MATLAB

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



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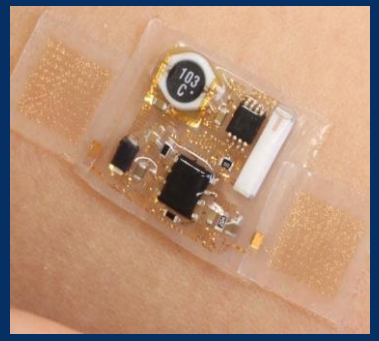
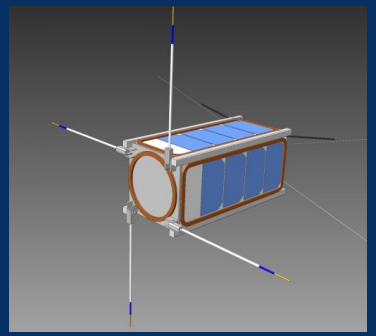

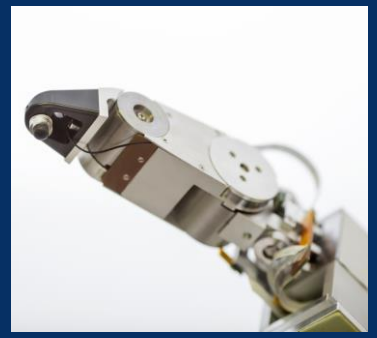

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Simulink is the simulation integration platform

Simulink

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Simulink is the simulation integration platform

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

Simulink

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& SIMULINK®

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Share and Deploy

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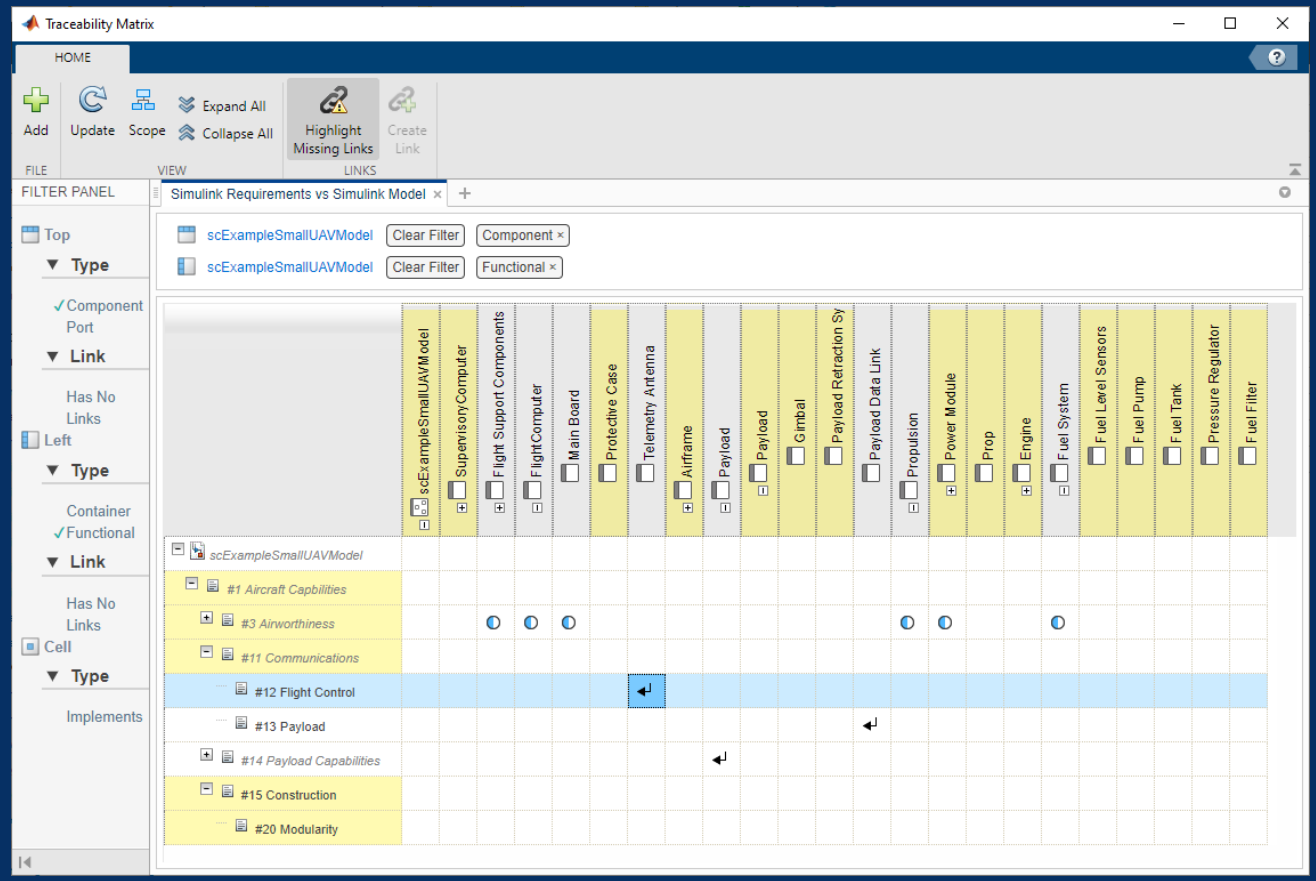
Solutions

Test and verify your design

Review and analyze traceability between artifacts in one interface



Traceability Matrix

Simulink Requirements

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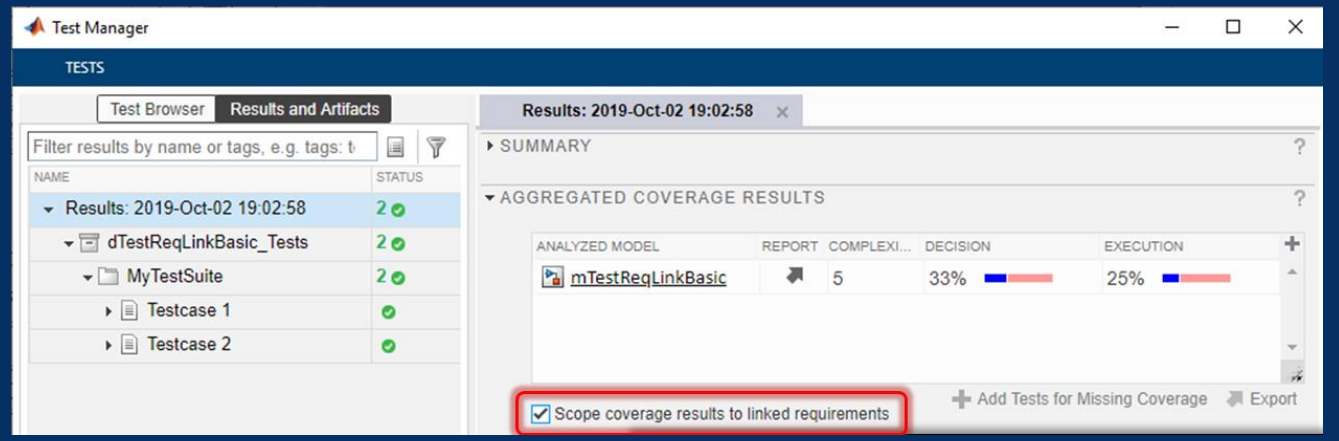
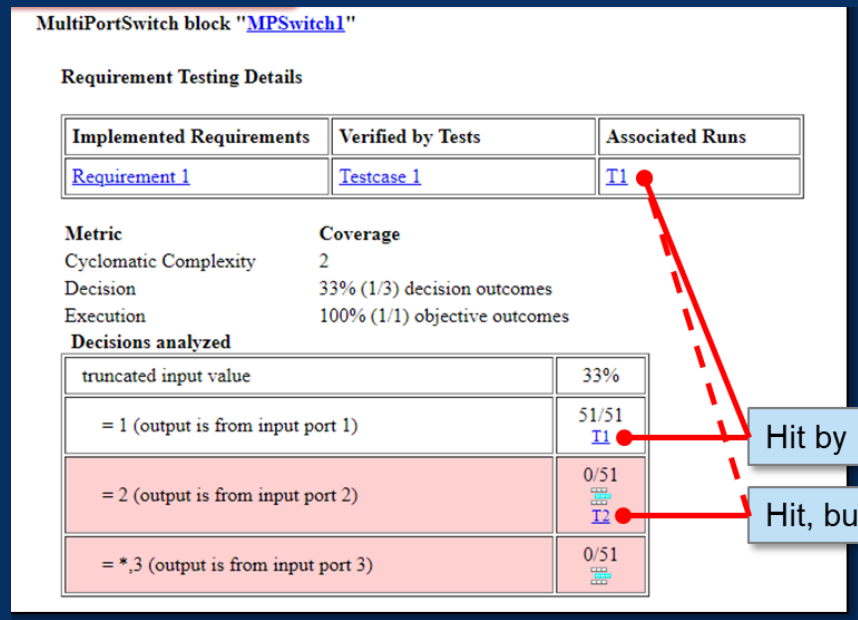
Test and verify your design

Review and analyze traceability between artifacts in one interface

Scope model coverage to requirements-based tests (RBT)





Simulink Coverage
Simulink Test

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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

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Code verification using Polyspace

Desktop

Polyspace Bug Finder
Polyspace Code Prover

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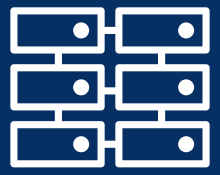
Automate code verification using Polyspace

Desktop



Server Computer

Polyspace Bug Finder Server
Polyspace Code Prover Server

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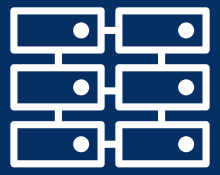
Automate code verification and share results using Polyspace

Desktop



Server Computer

Web Interface

Polyspace Bug Finder Access
Polyspace Code Prover Access

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Share and Deploy

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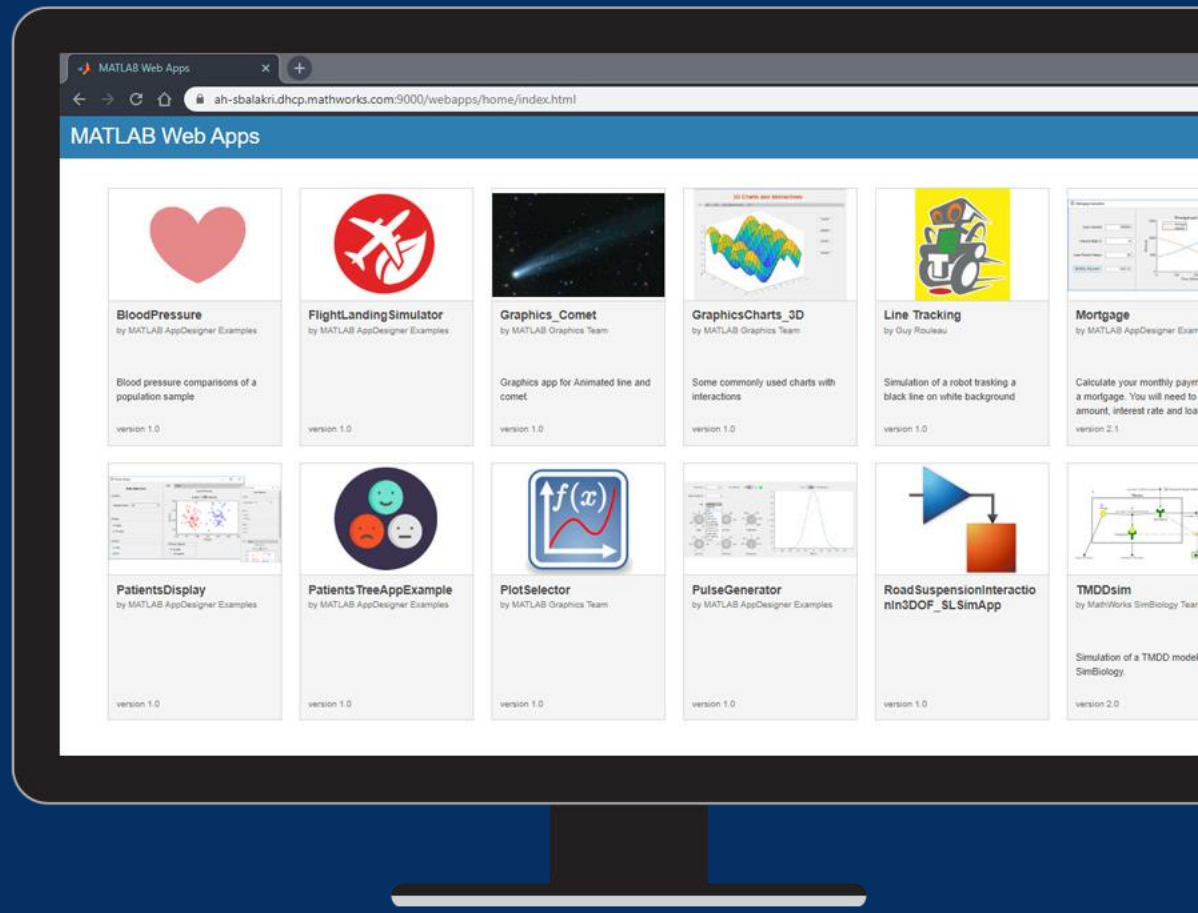
Solutions

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**

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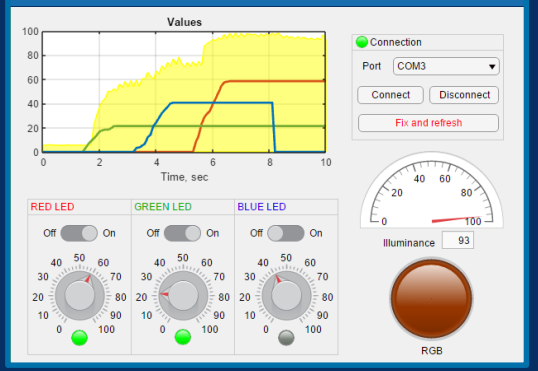
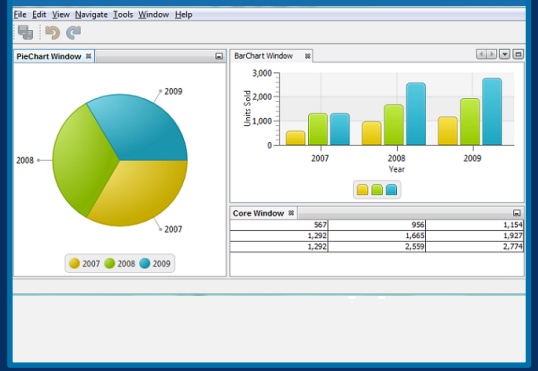
Share Simulink simulations – *where Simulink is not available*

Package a compiled Simulink model with MATLAB code

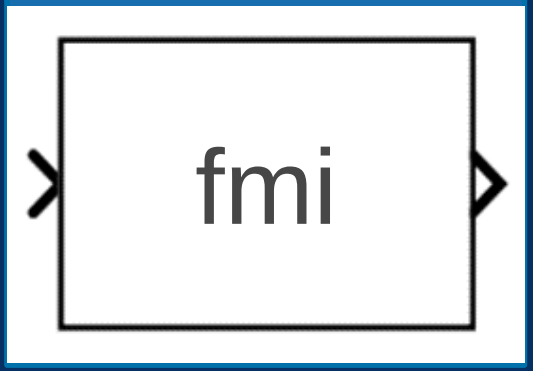
Standalone Apps



Web Apps



Standalone FMUs



Simulink Compiler

NEW PRODUCT

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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;
};
```

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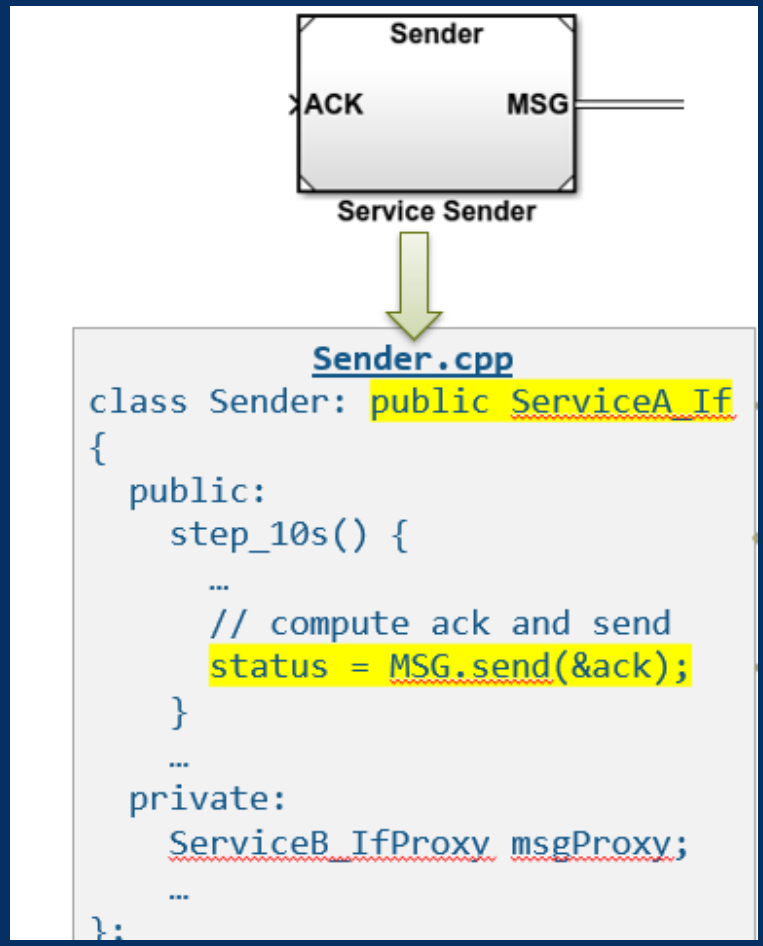
Deploy algorithms with automatically generated code

C++ classes from MATLAB classes

Code from software compositions
with message-based communication



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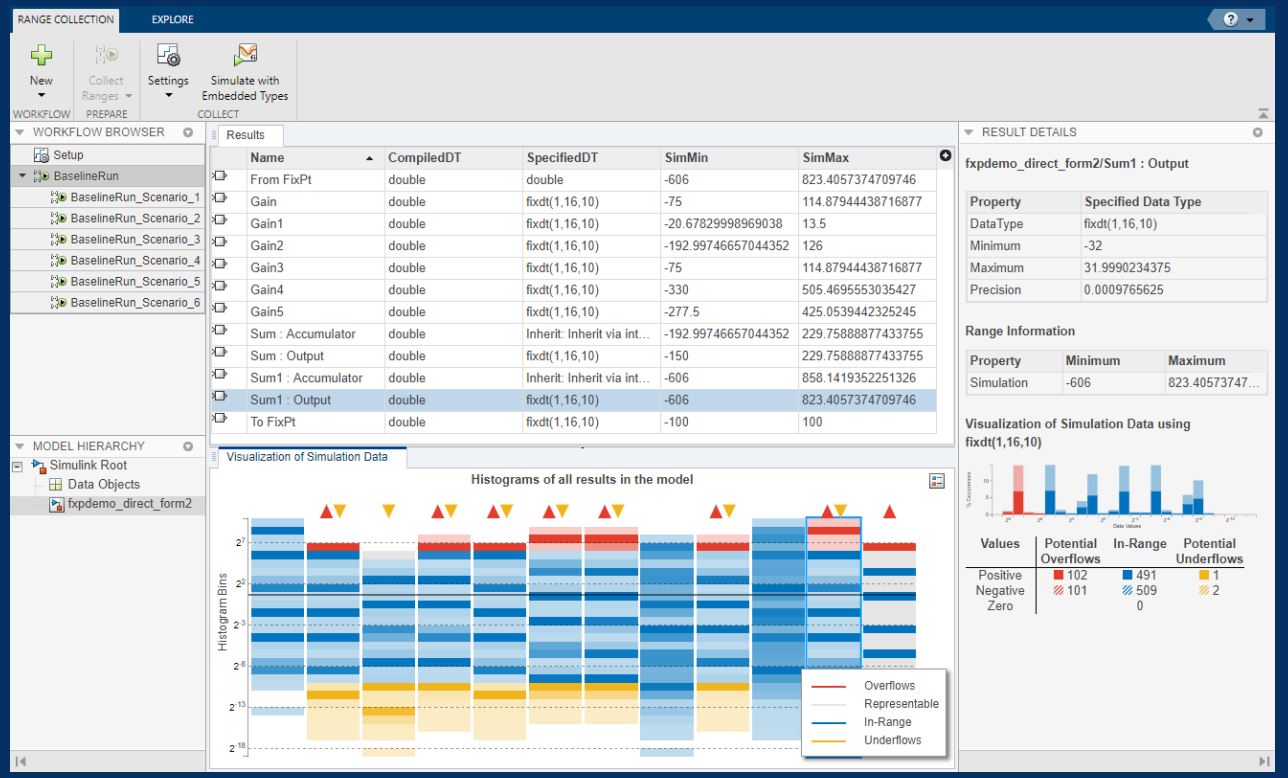
Deploy algorithms with automatically generated code

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

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& SIMULINK®

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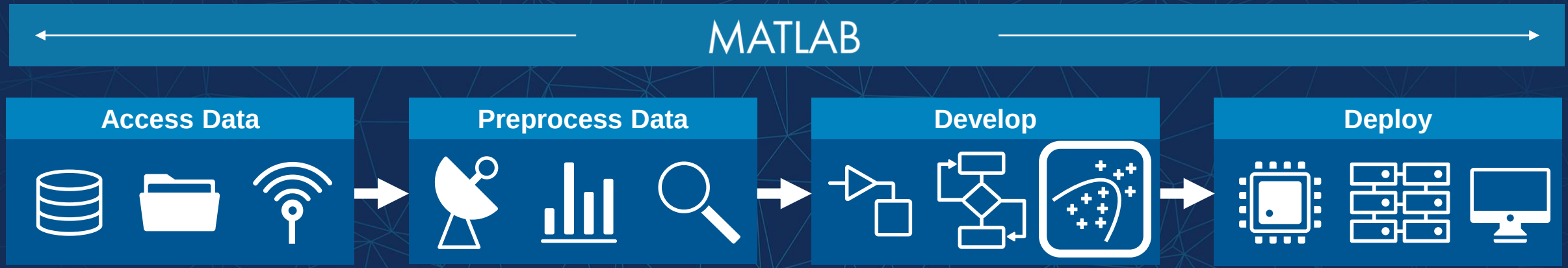
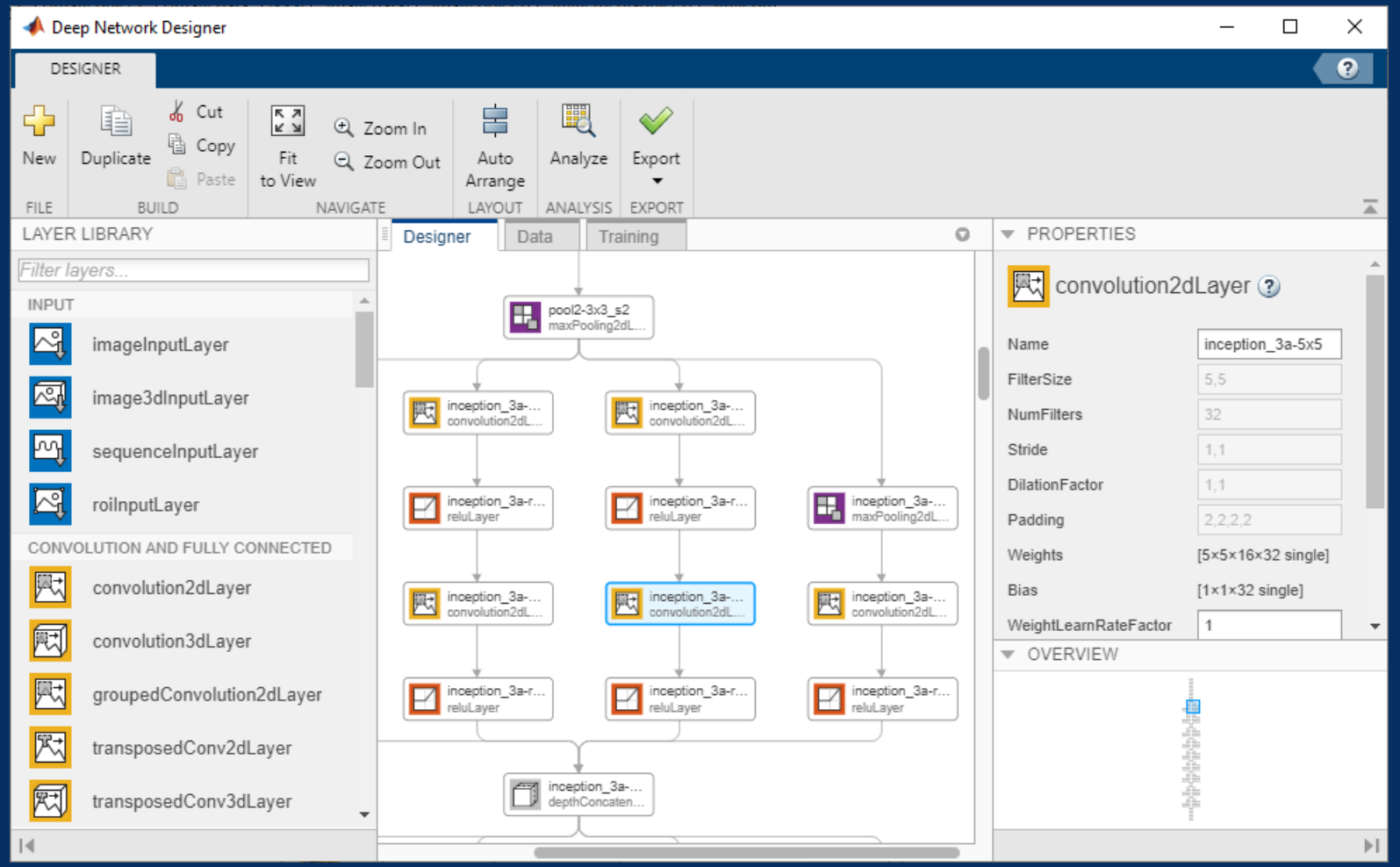
Share and Deploy

Deep
Solutions

Artificial Intelligence (AI)



Interactively access models, and develop and train networks



Deep Network Designer App

Deep Learning Toolbox

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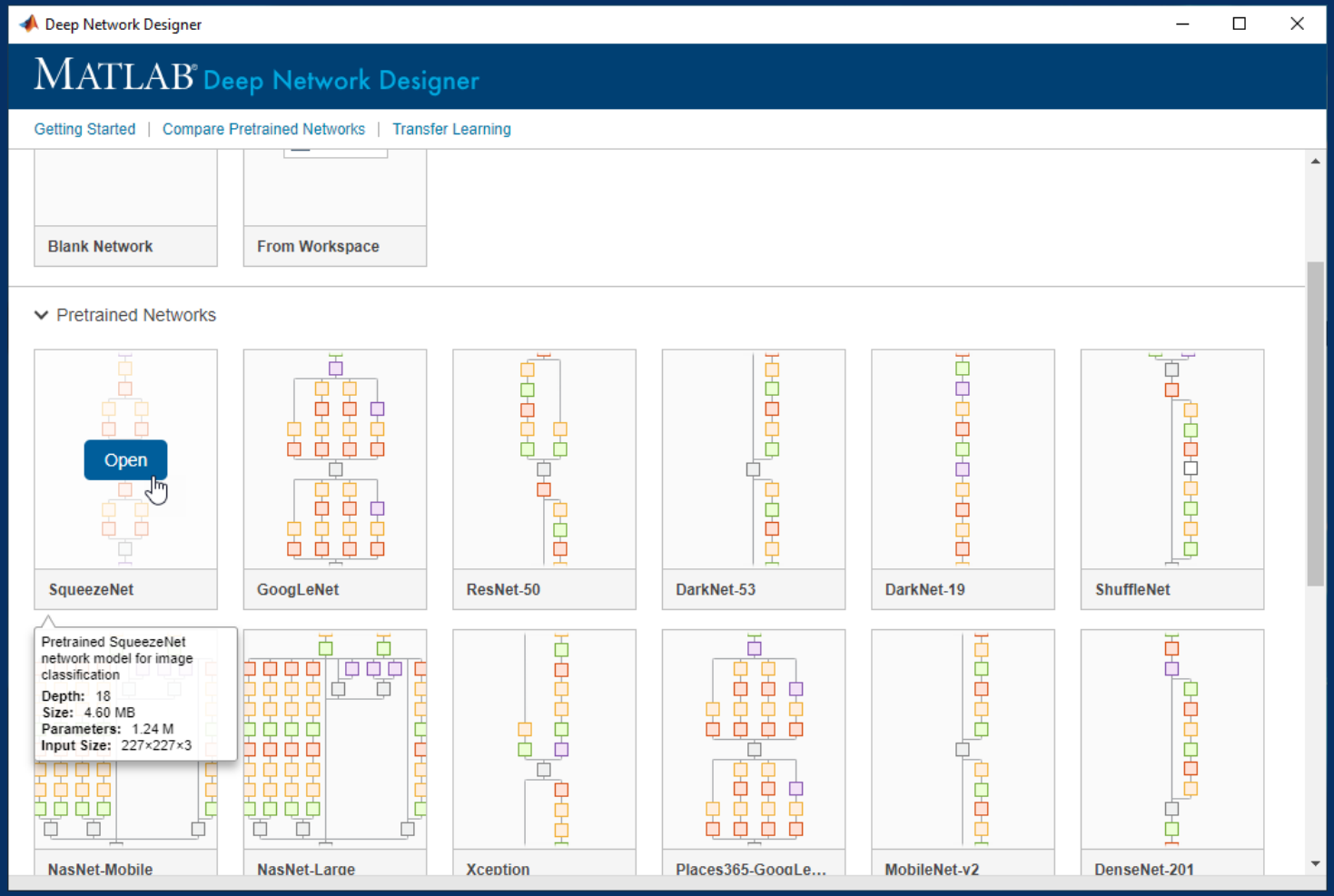
Interactively access models, and develop and train networks

Import pretrained networks for transfer learning



Deep Network Designer App

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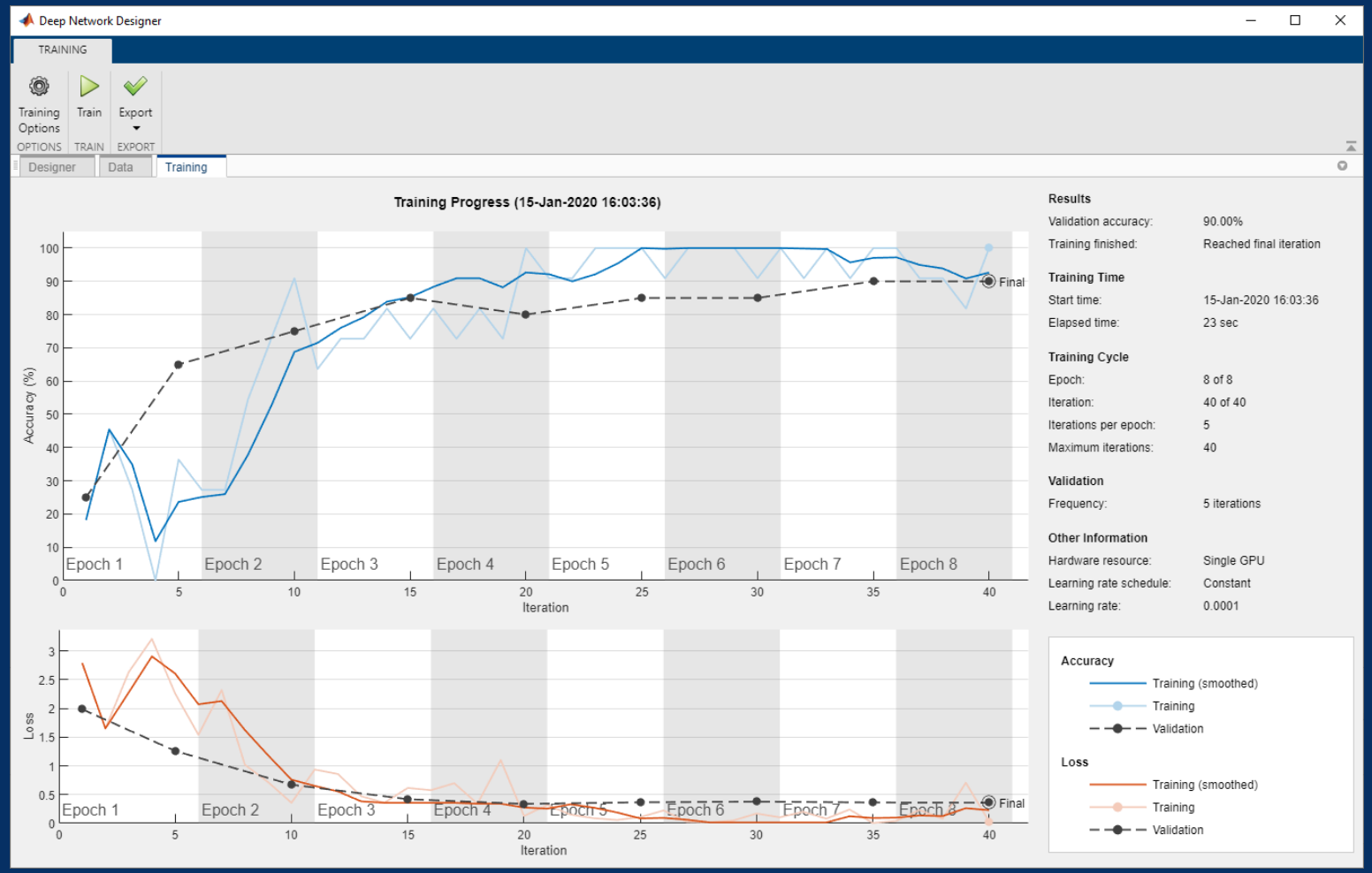
Interactively access models, and develop and train networks

Import pretrained networks for transfer learning

Train networks and generate MATLAB code



Deep Network Designer App

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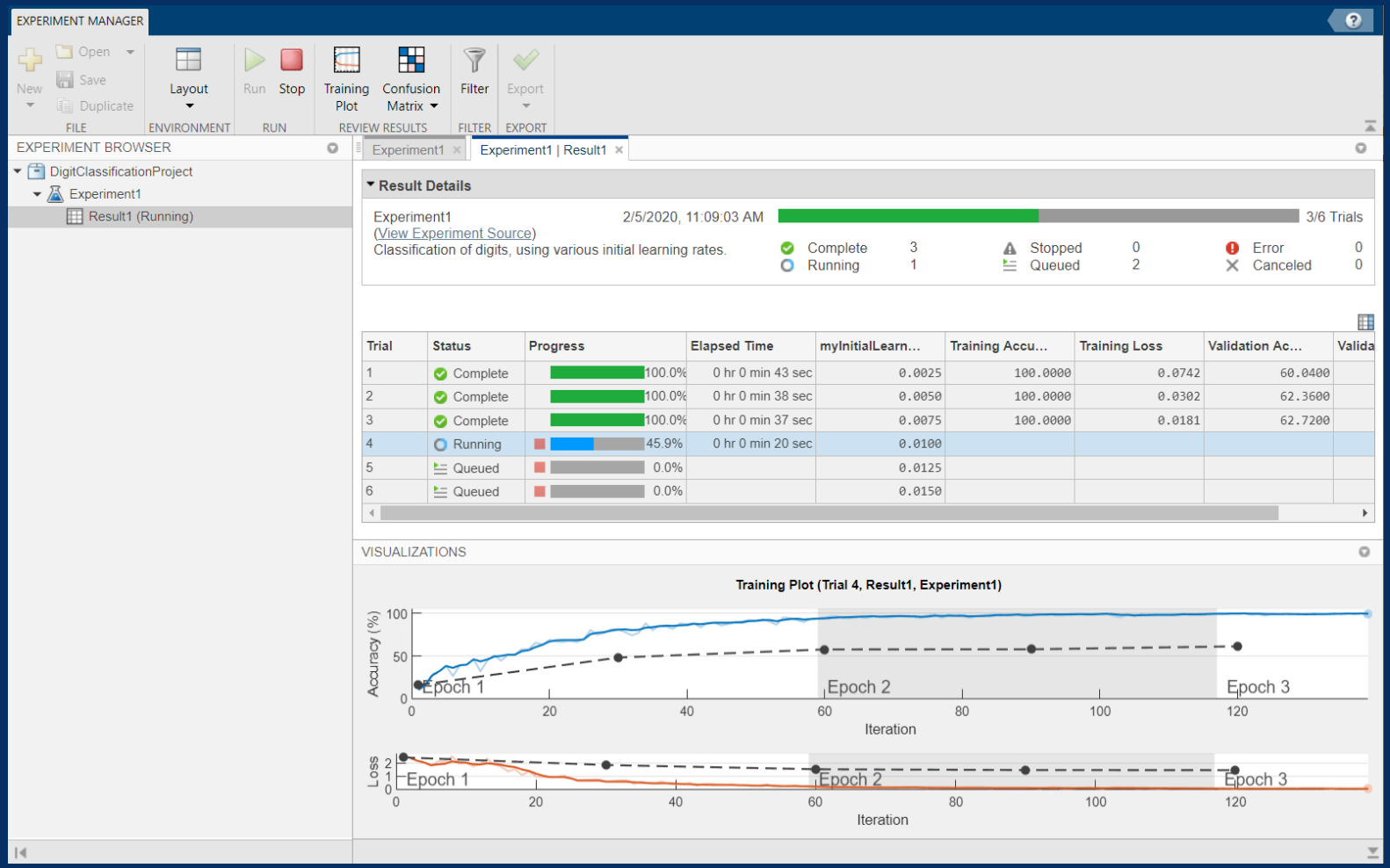
Manage multiple deep learning experiments

Keep track of training parameters

Reuse training data across multiple networks

Analyze and compare results



Experiment Manager App

Deep Learning Toolbox

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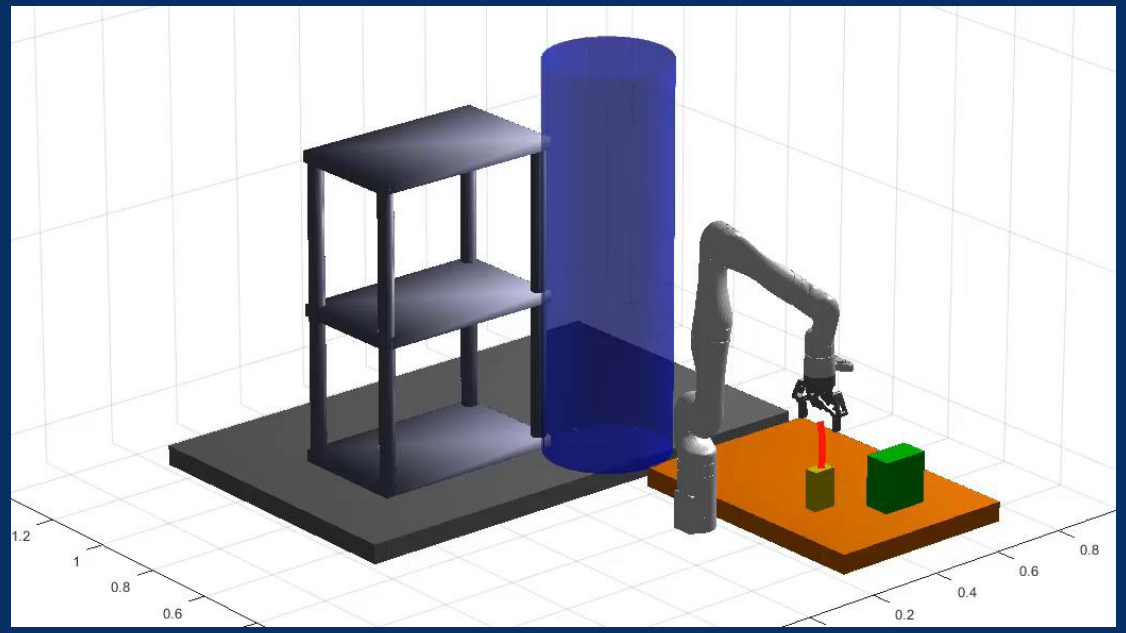
Robotics and Autonomous Systems

Simulate and visualize robot kinematics



Robotics System Toolbox

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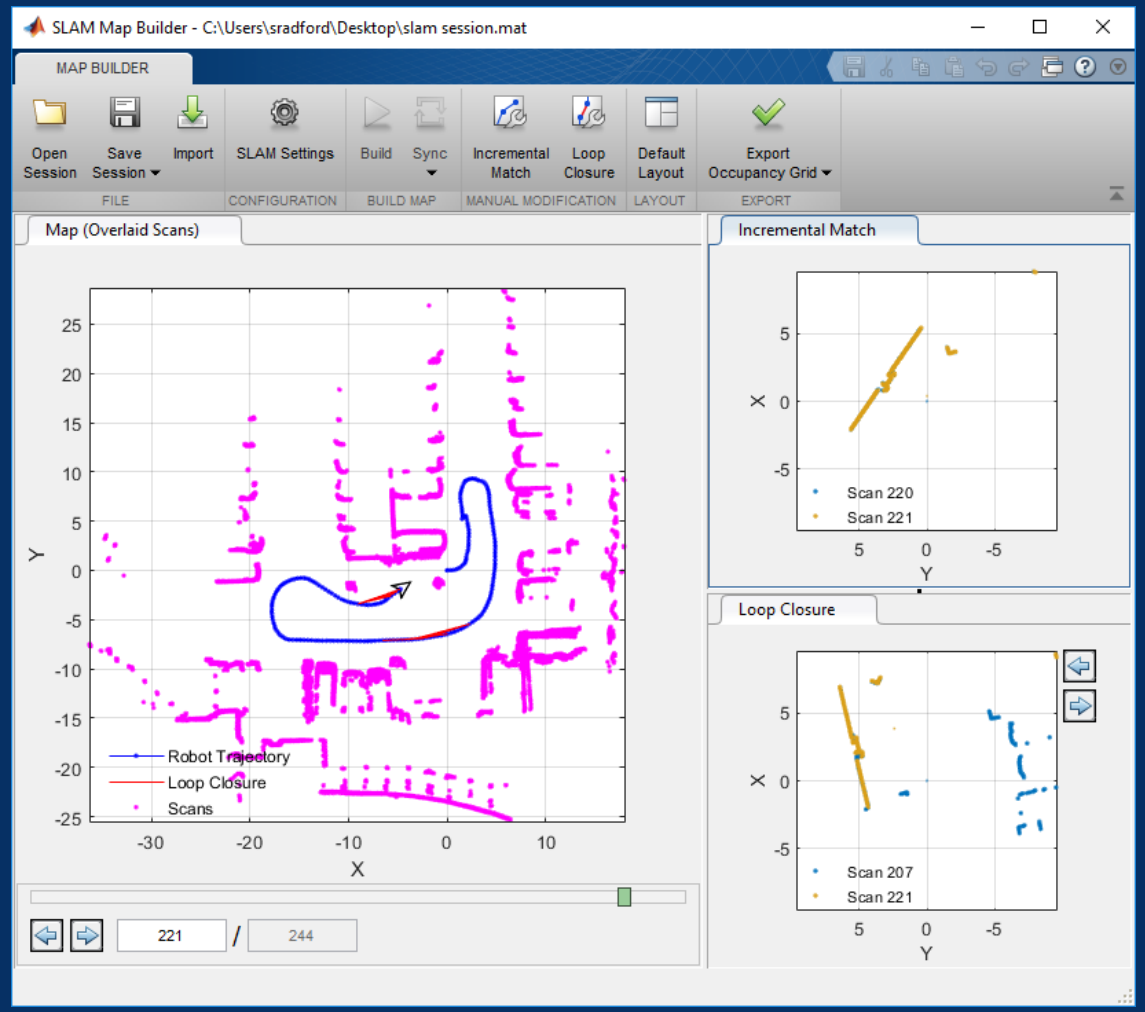
Design algorithms for planning and navigation

- Create a map of the environment



SLAM Map Builder

Navigation Toolbox

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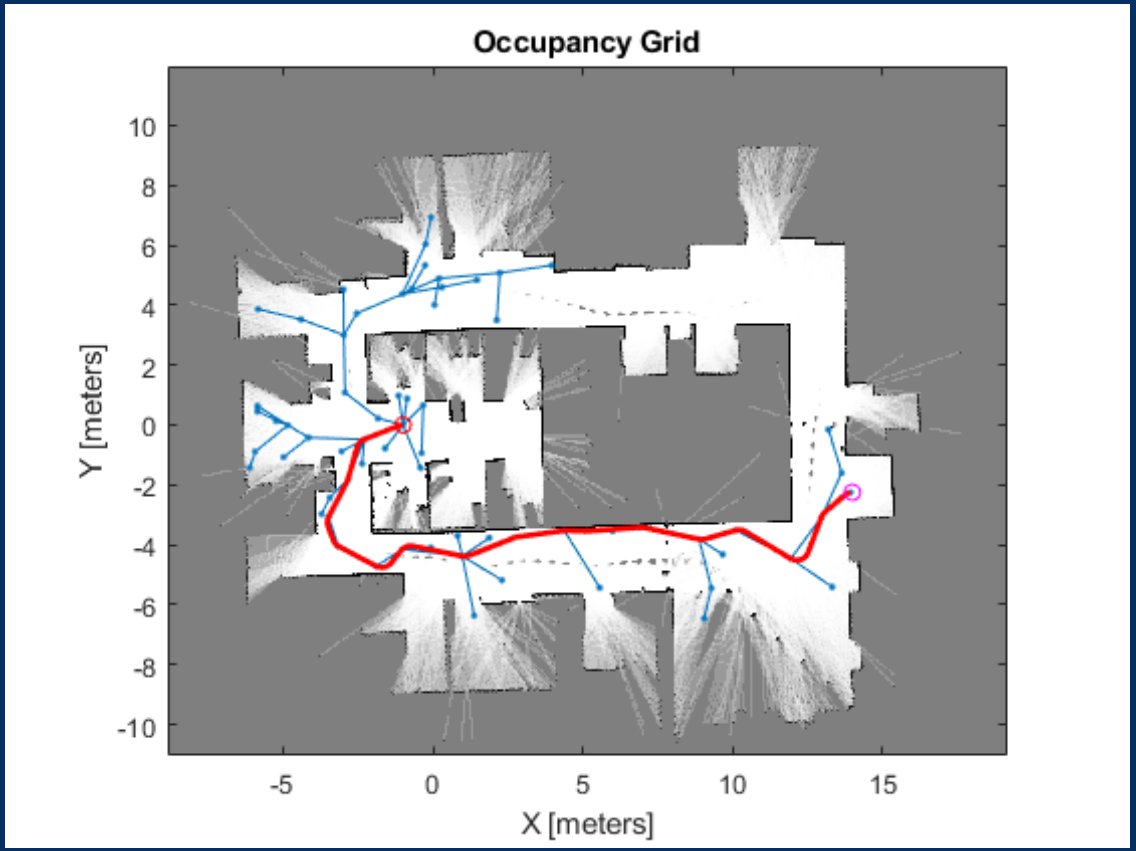
Design algorithms for planning and navigation

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



Navigation Toolbox

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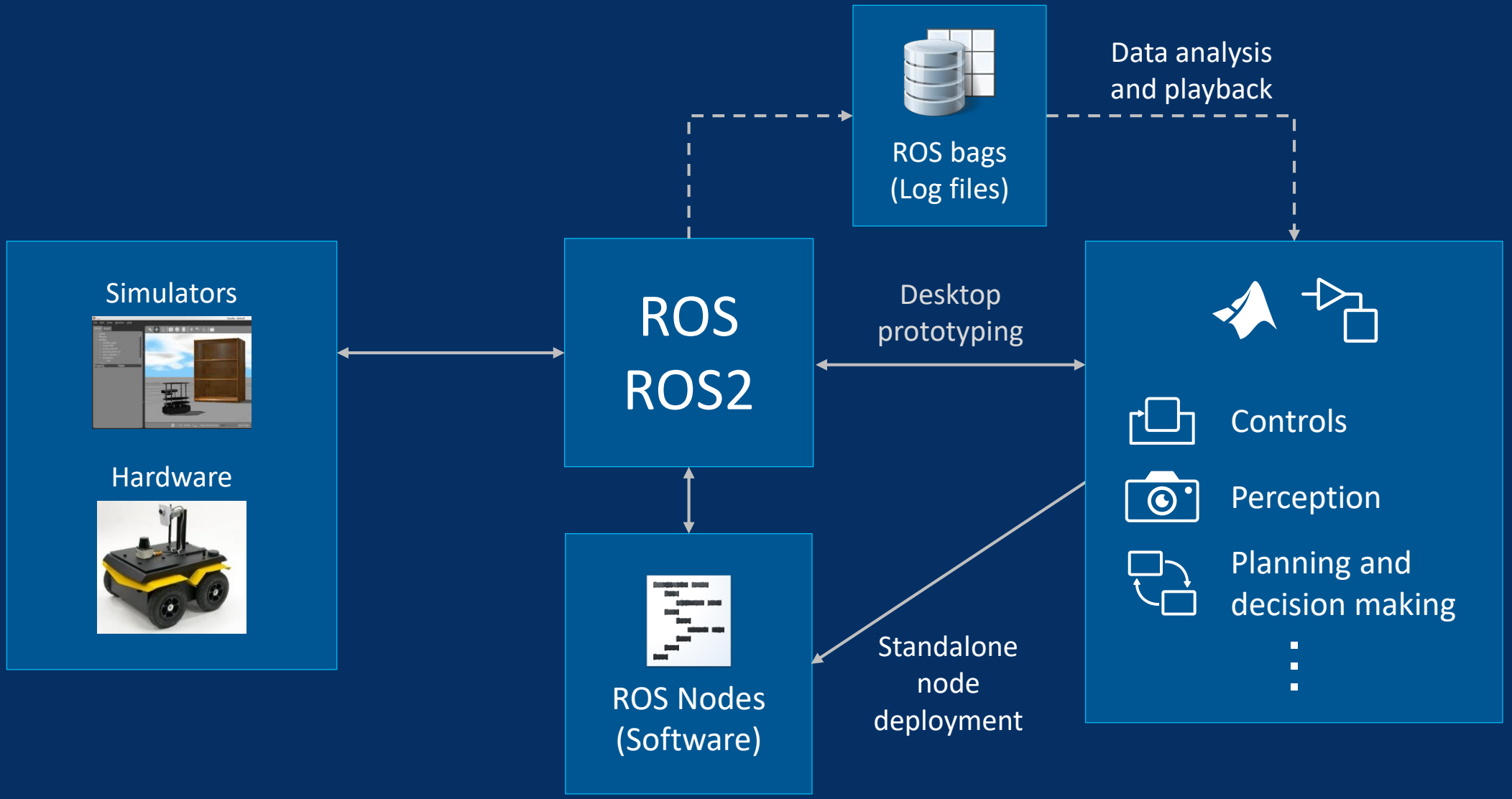
Design, simulate, and deploy ROS-based applications



ROS Toolbox

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Wireless Communications

RF & Antenna

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

Digital Baseband

- Communications Toolbox
- Wireless HDL Toolbox

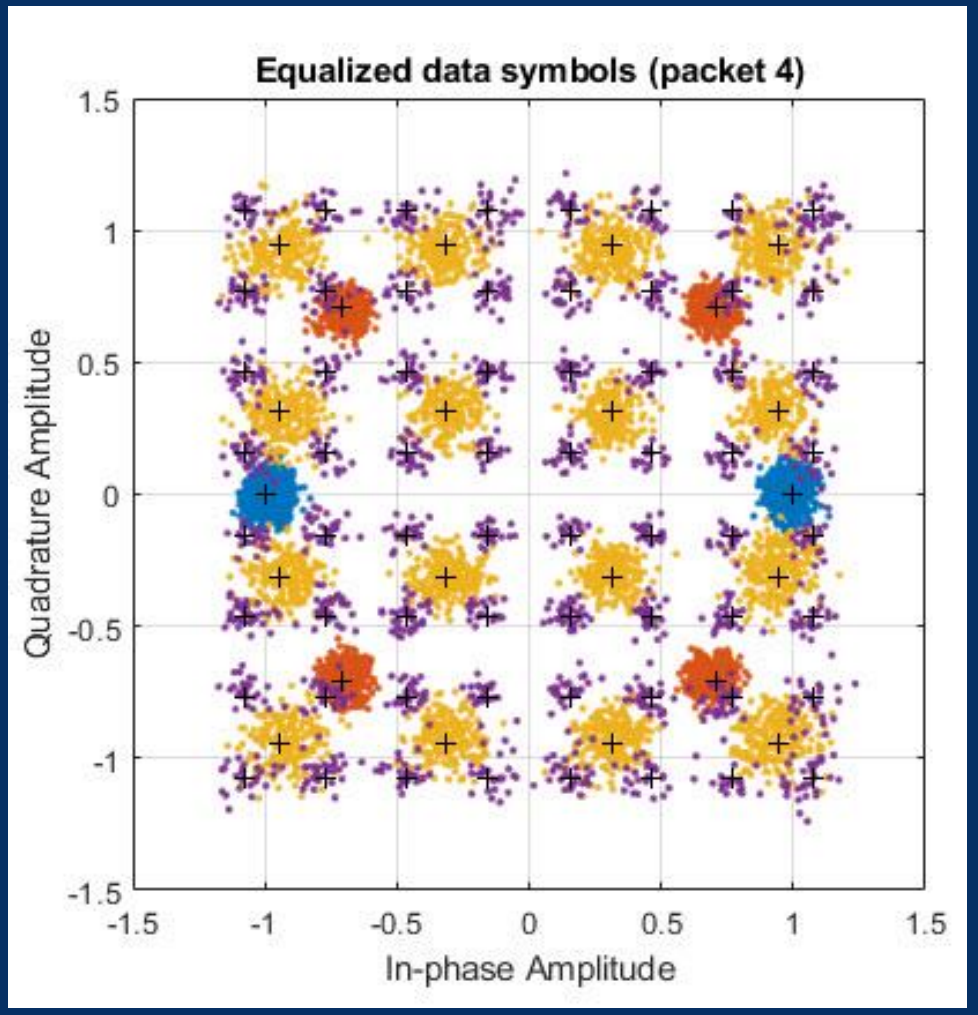
Standards

- 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

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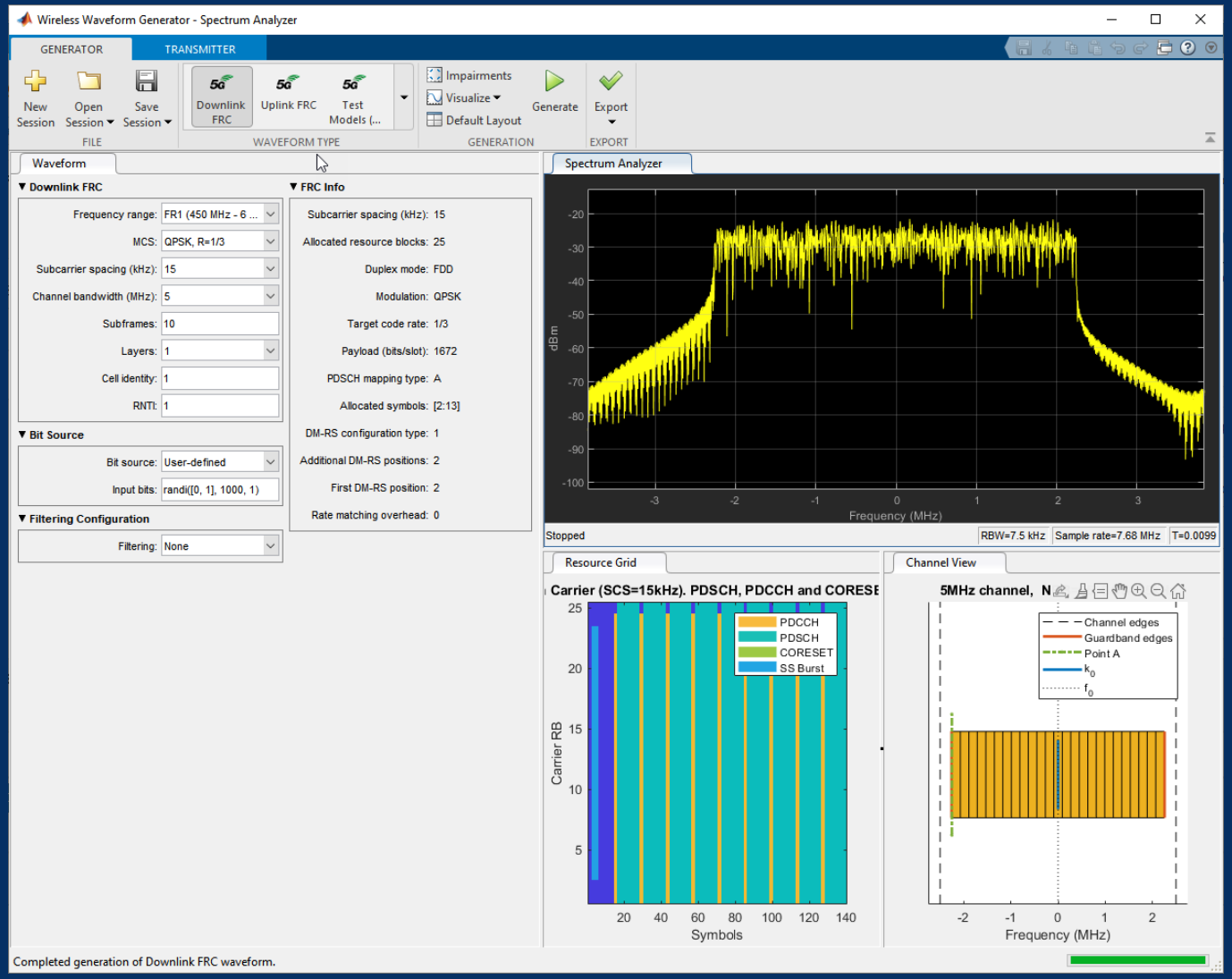
Interactively generate 5G waveforms for testing



Wireless Waveform Generator

5G Toolbox

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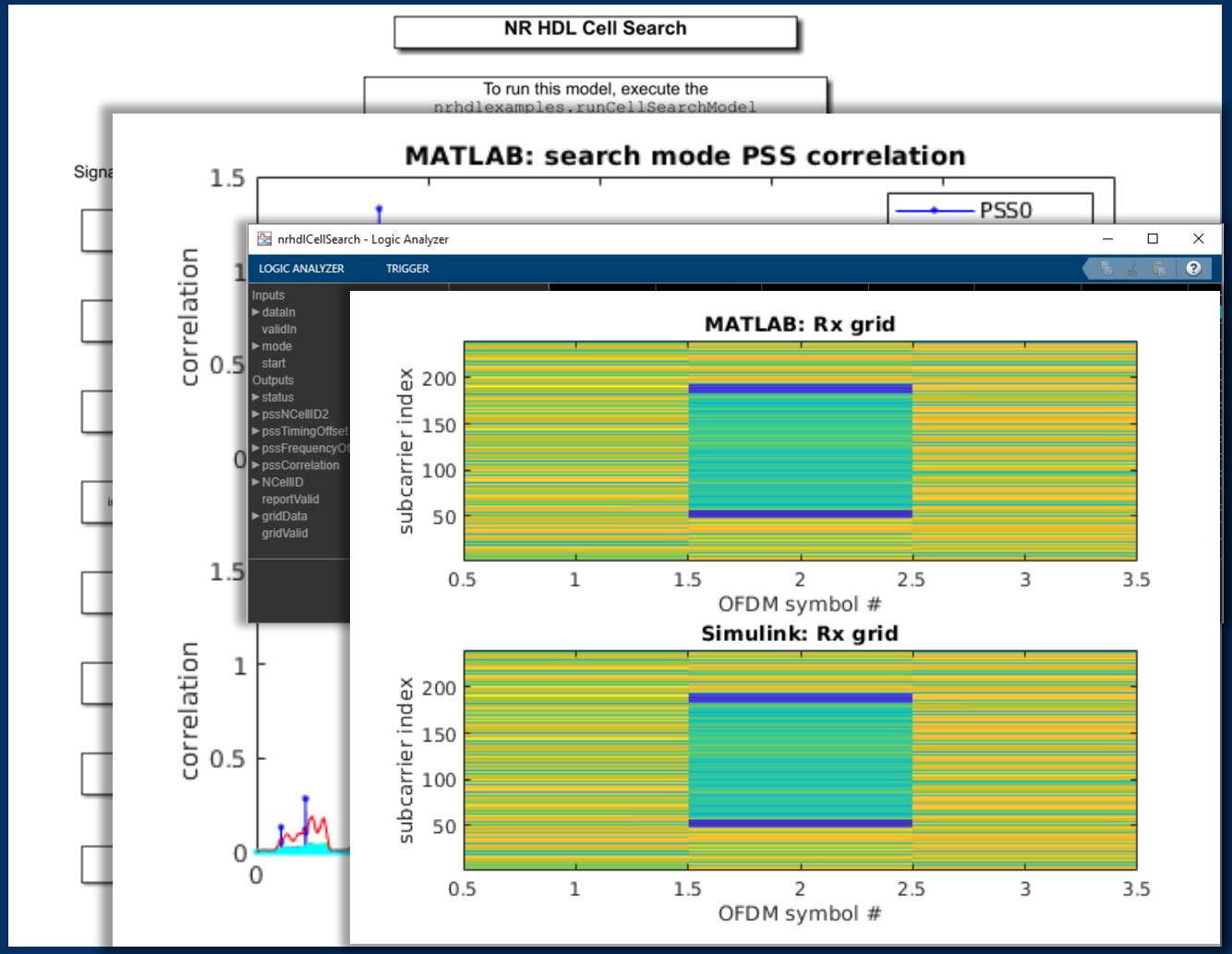
Start with reference examples to implement your design

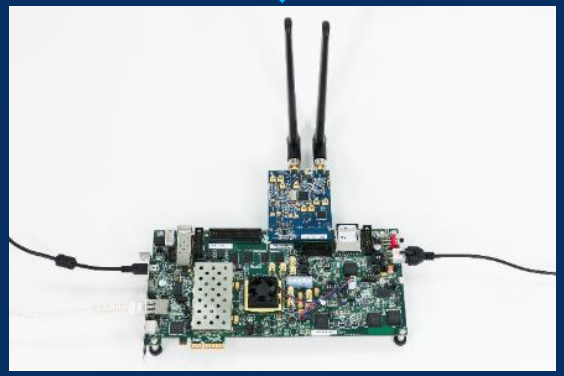


Standards-based IP + **Your expertise**

Wireless HDL Toolbox

Your unique application

HDL Coder



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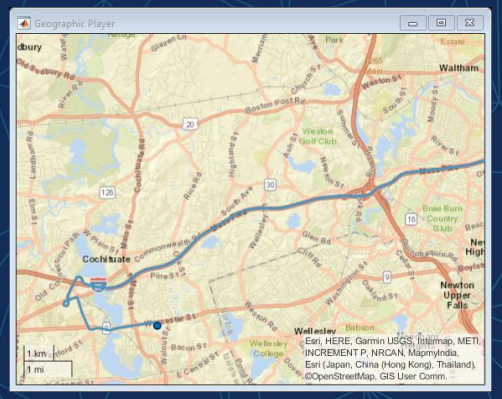
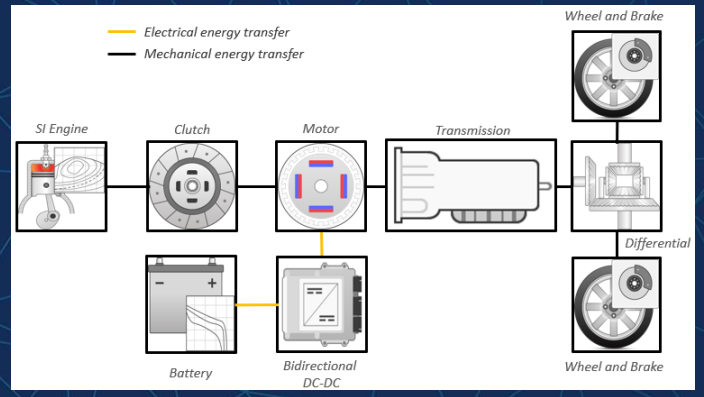
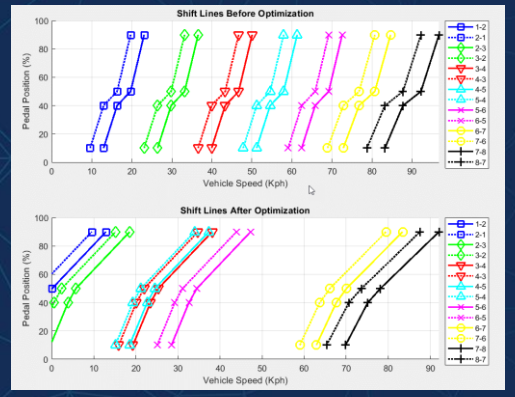
Automotive Systems







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

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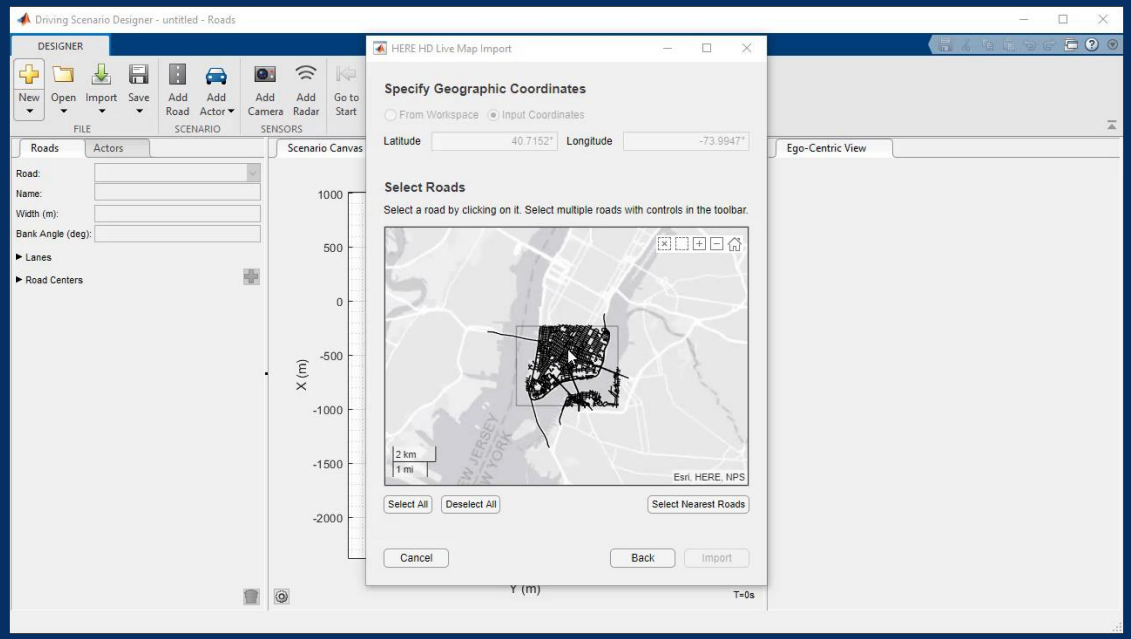
Accelerate development of automated driving systems

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

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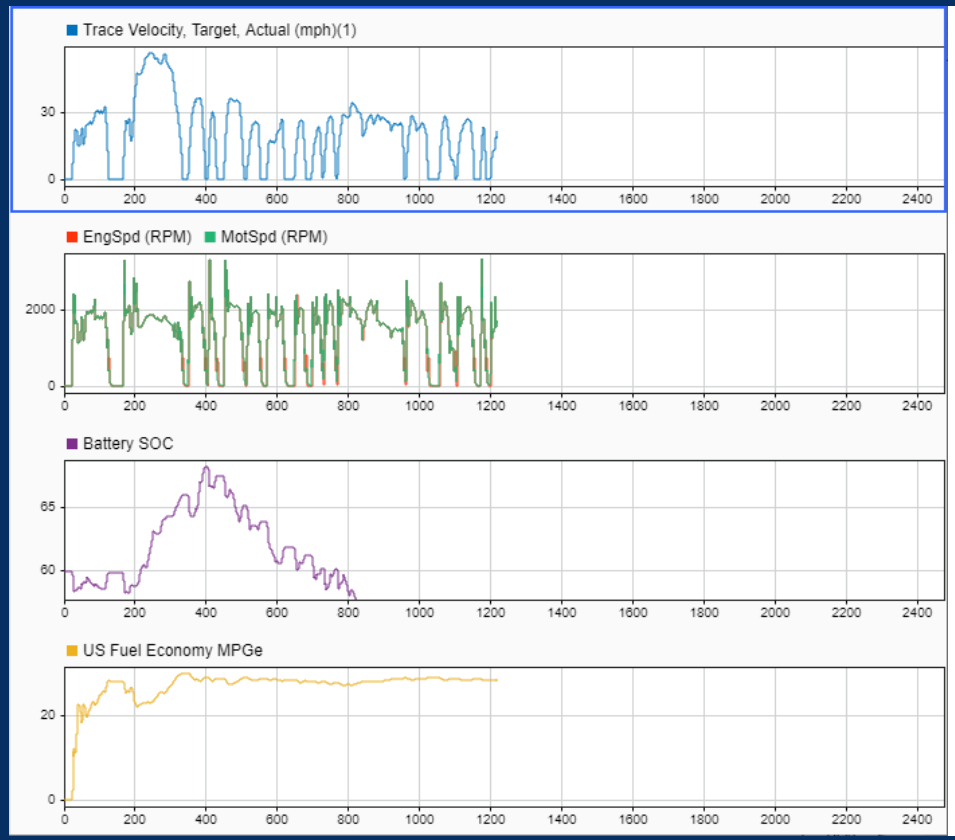
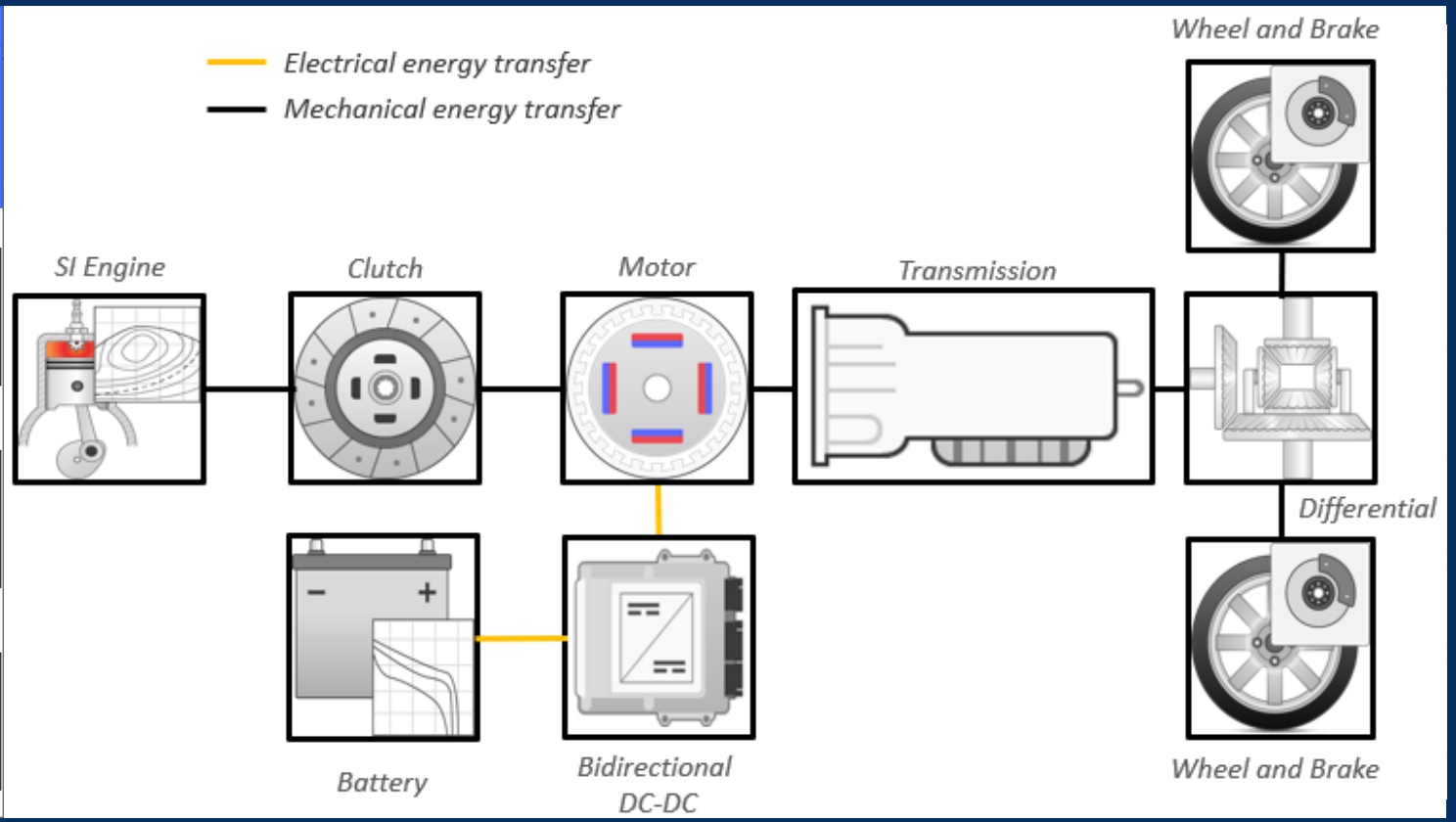
Analyze fuel economy and performance for various architectures





Powertrain Blockset

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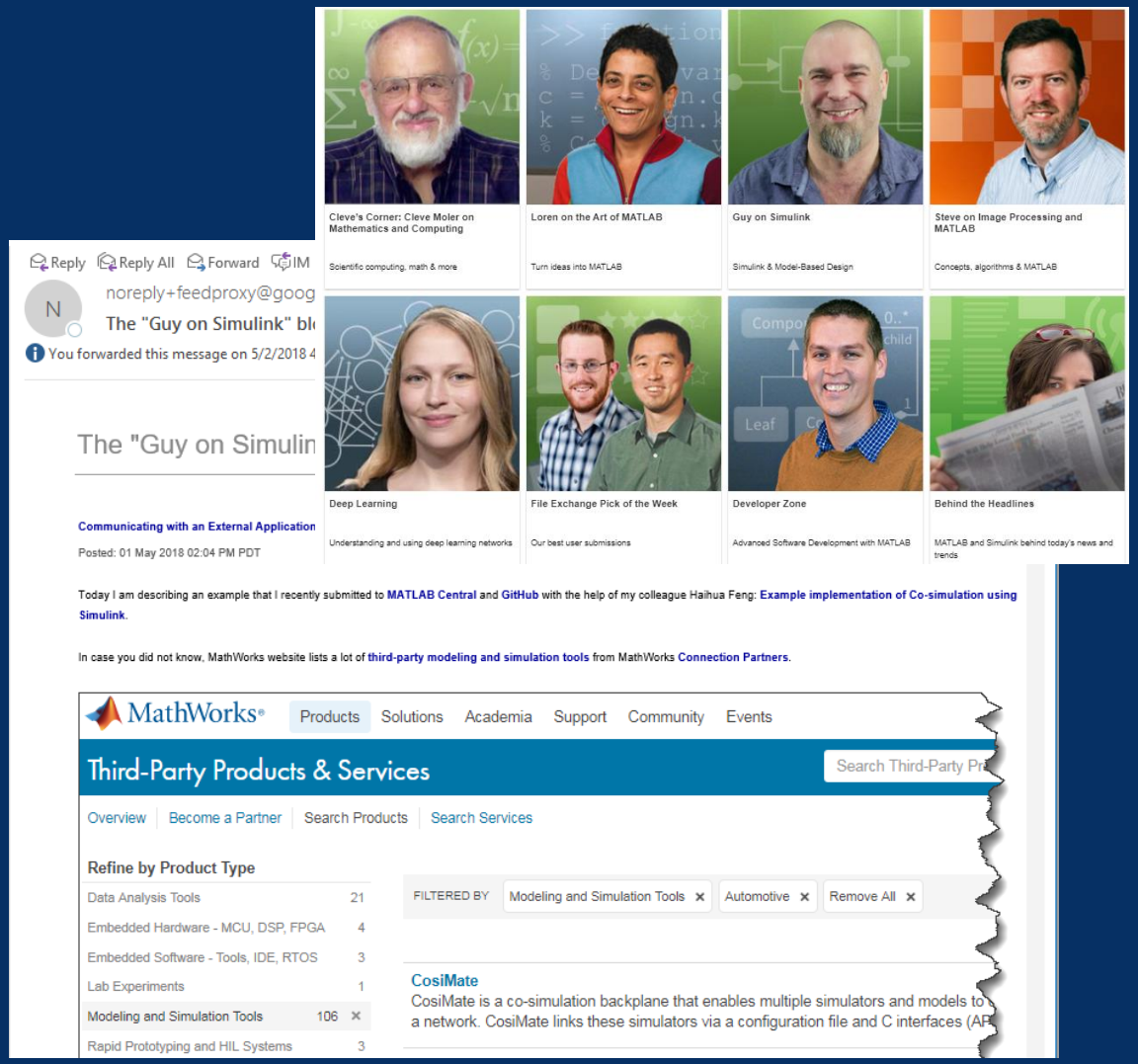

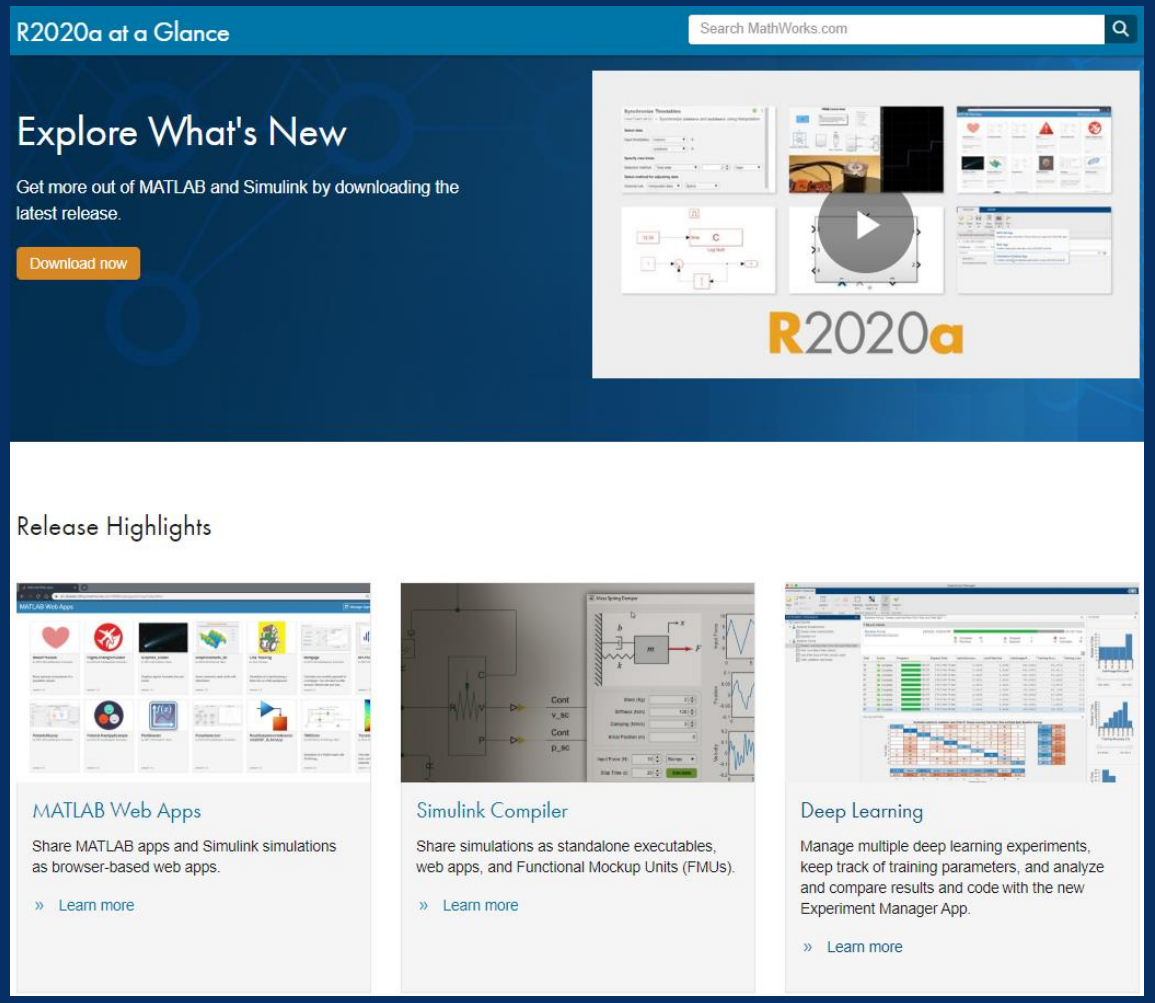

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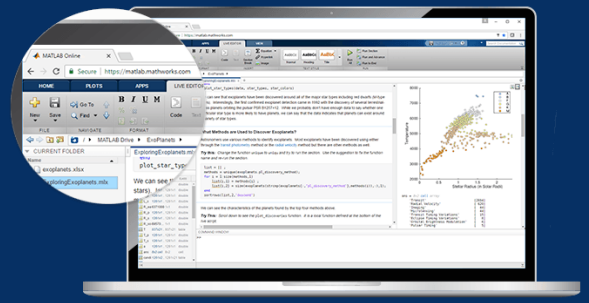
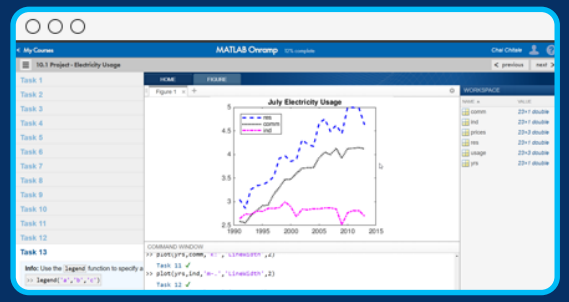
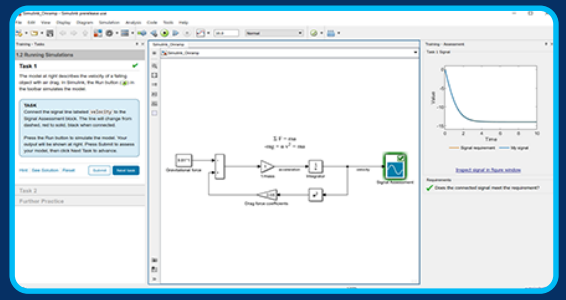


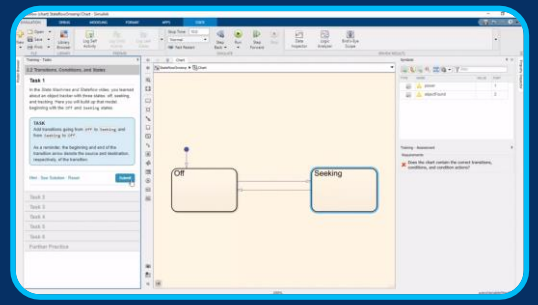
MATLAB Online



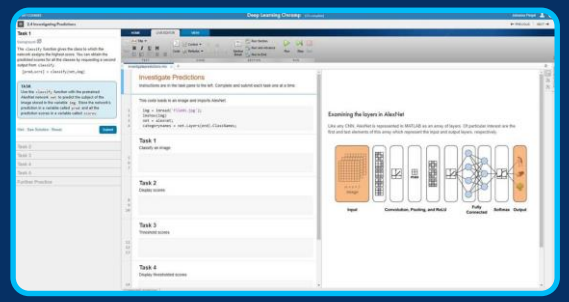
MATLAB Onramp



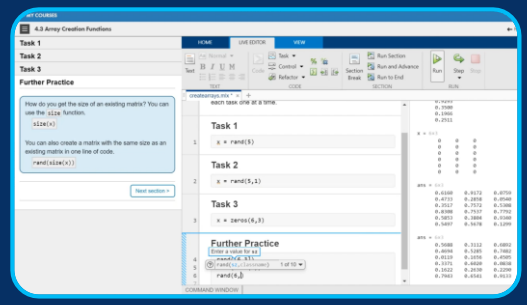
Simulink Onramp



Stateflow Onramp



Deep Learning Onramp



Machine Learning Onramp

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