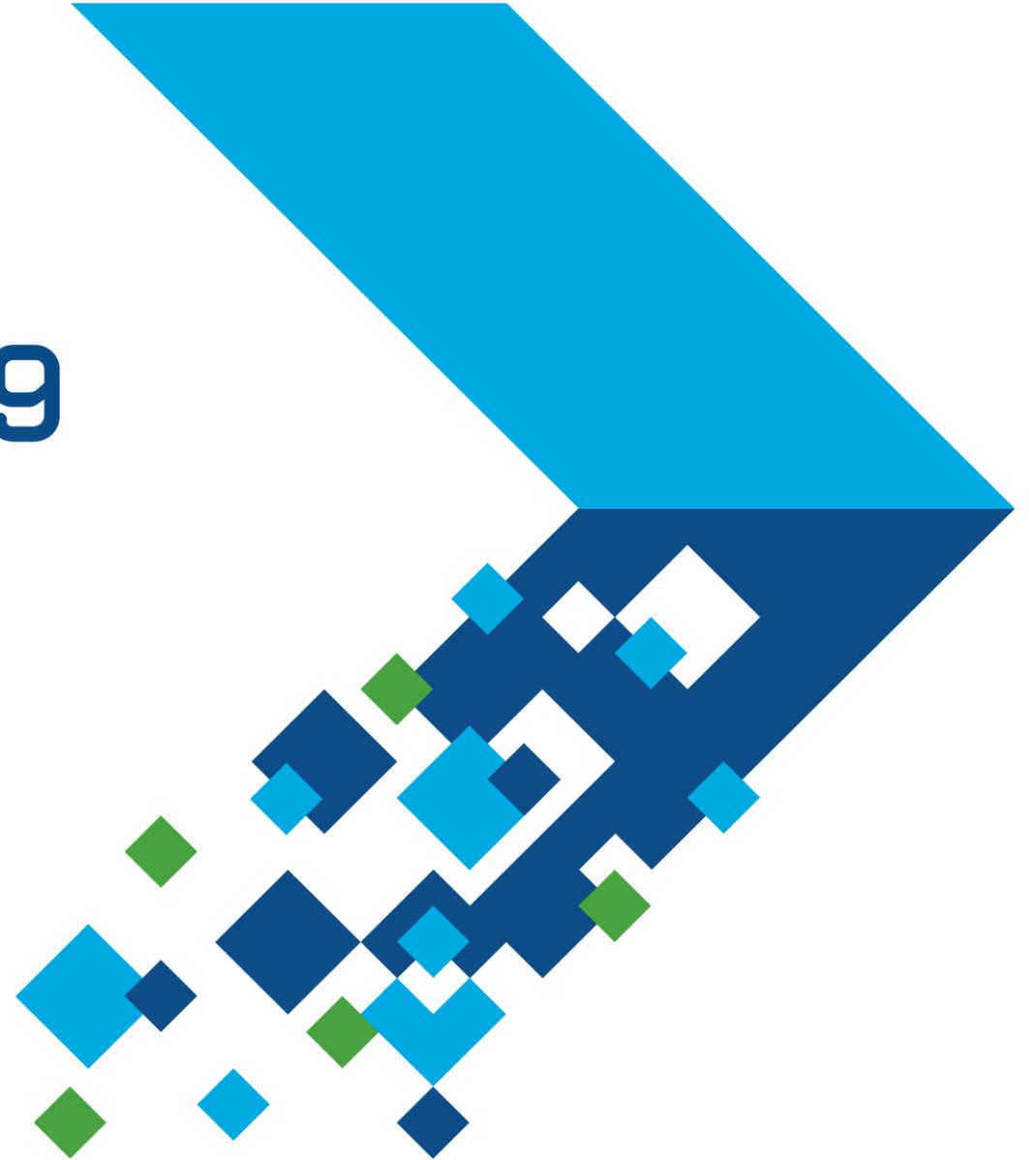
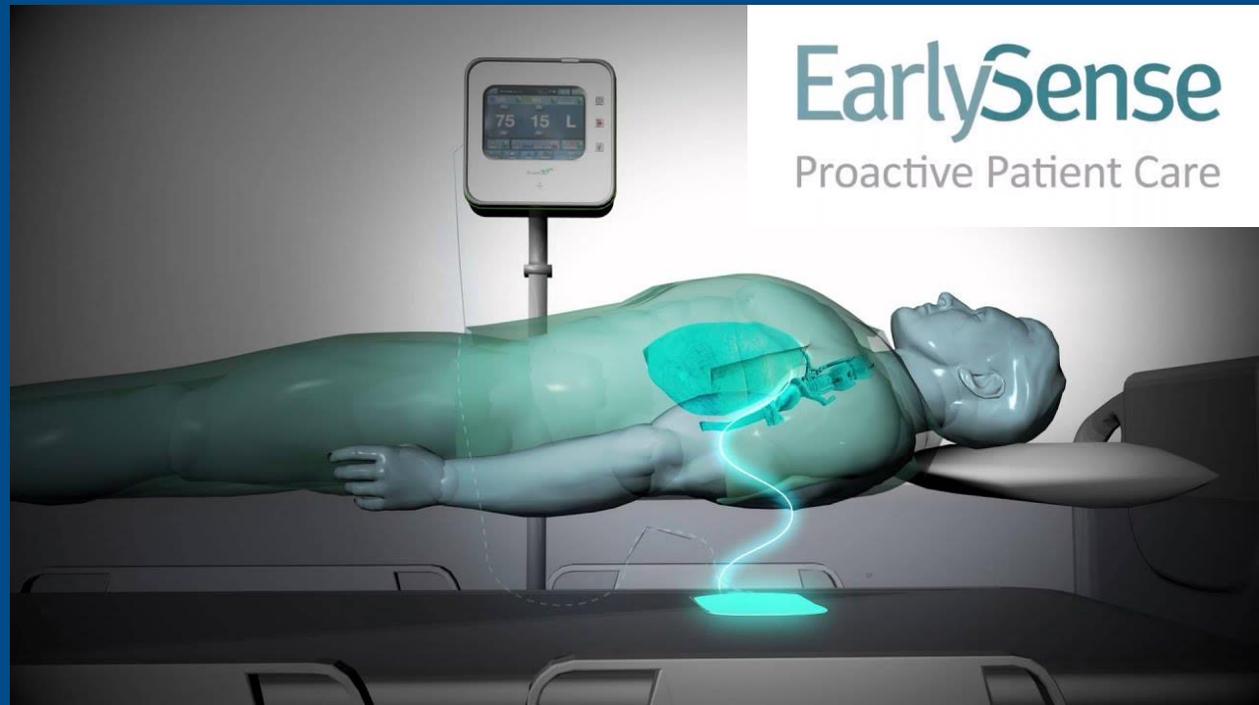


MATLAB EXPO 2019

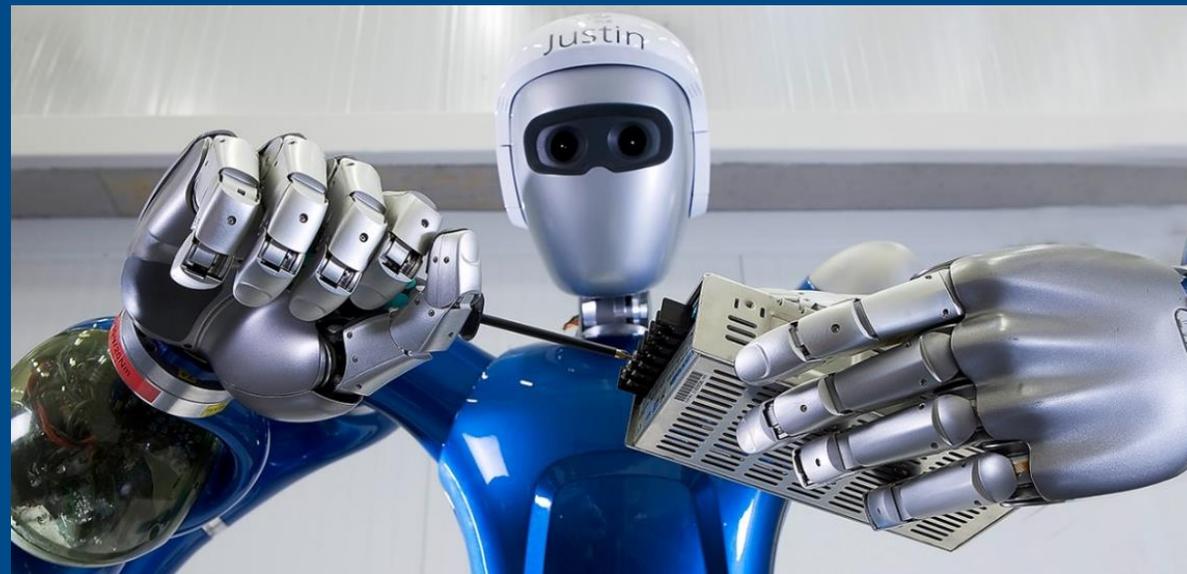
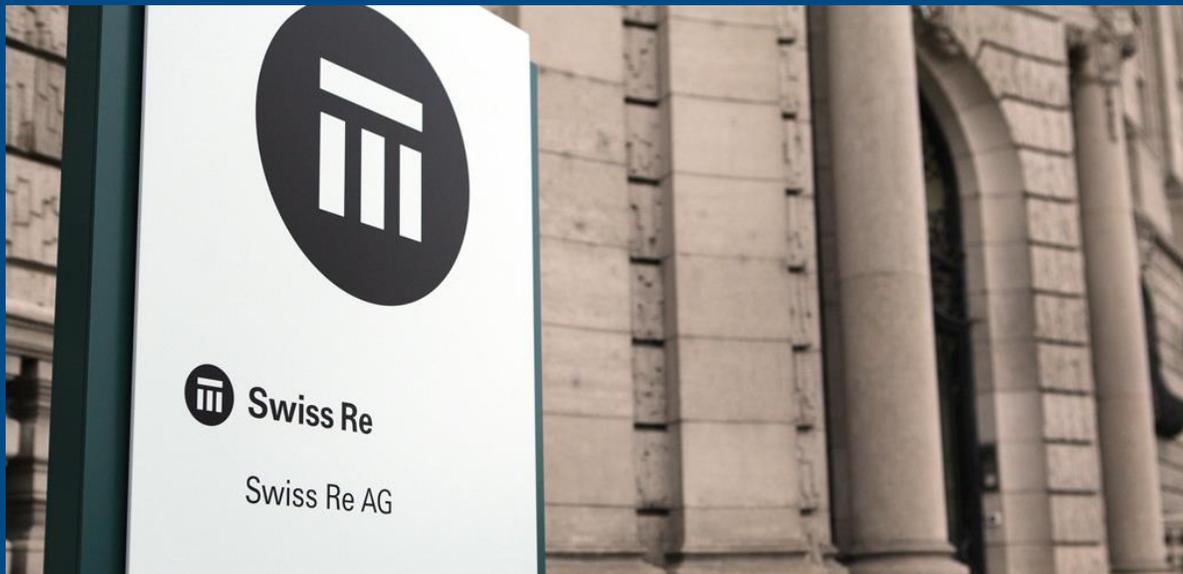
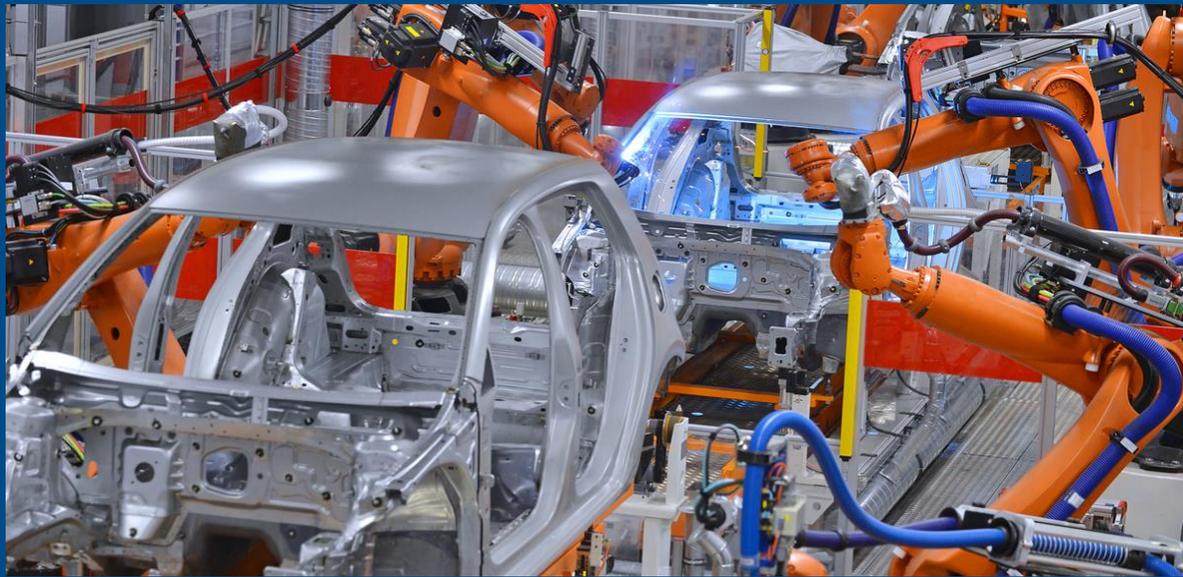
Novedades de las
últimas versiones de
MATLAB y Simulink

Paz Tárrega y David Pérez





Algorithms in Everything



Using MATLAB & Simulink to Build Algorithms in Everything

Simplifying your work...

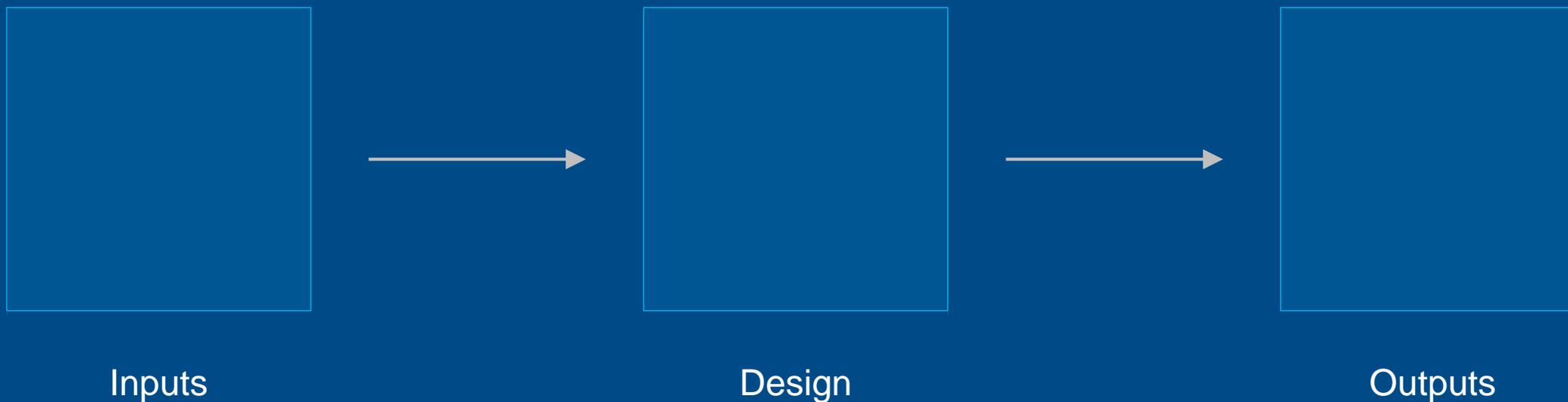
...often at higher levels of abstraction.



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Using MATLAB & Simulink to Build Algorithms in Everything



MATLAB® & SIMULINK®



Artificial Intelligence

*The capability of a machine to
match or exceed intelligent human behavior by
training a machine
to learn the desired behavior*

There are two ways to get a computer to do what you want

Traditional Programming

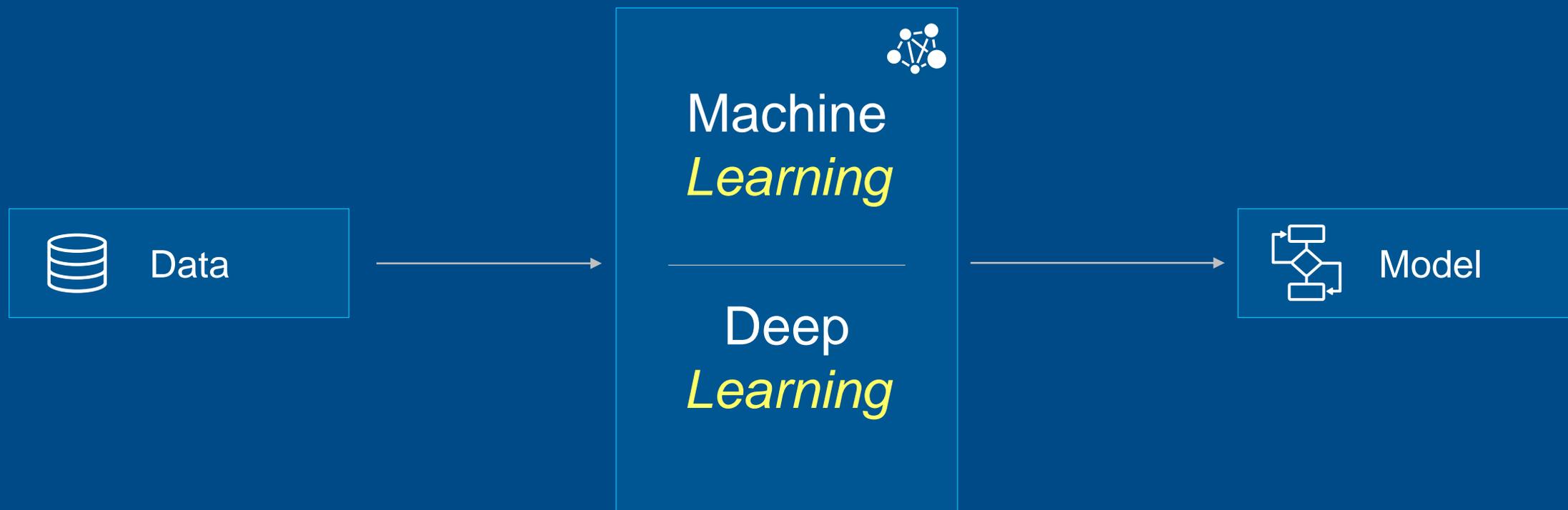


There are two ways to get a computer to do what you want

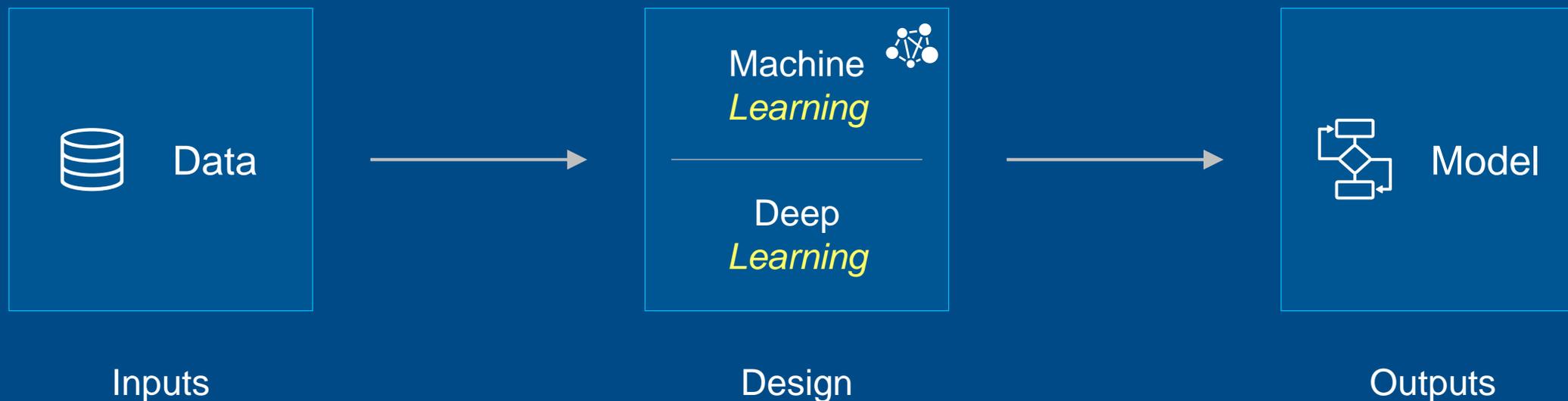
Machine Learning



Artificial Intelligence



Using MATLAB and Simulink to Build **Deep Learning Models**

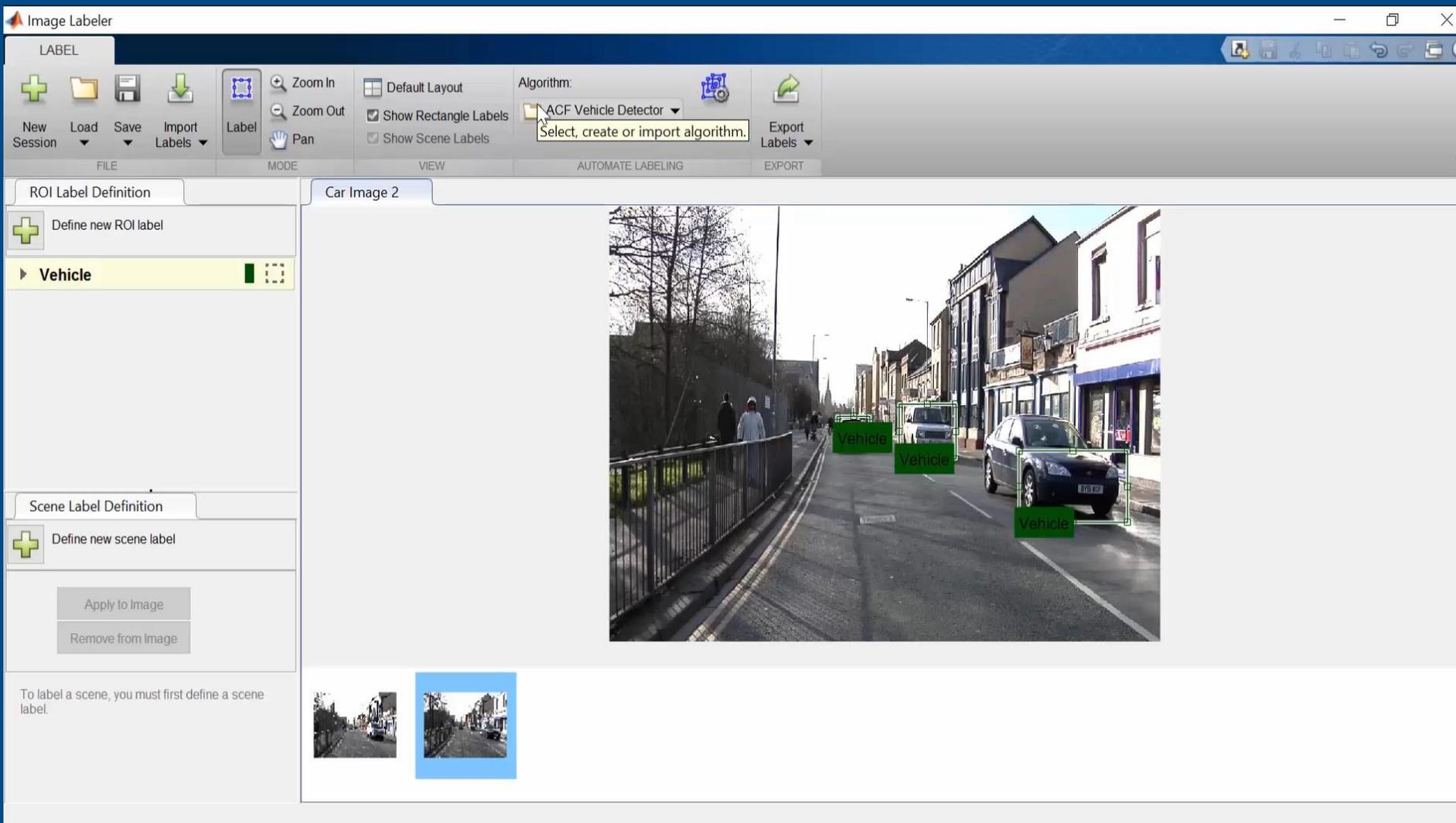


MATLAB® & SIMULINK®





Using Apps for Ground Truth Labeling Image and Video Data





Using Apps for Ground Truth Labeling

Signal Data

LABEL **DISPLAY** **TIME**

Point **Description** **Value**

Name: TrillPeaks Trill peaks 3

Parent Name: TrillRegions

LABEL DEFINITION SELECTED DEFINITION SET VALUE CLOSE

Label Definitions

- WhaleType
- MoanRegions
- TrillRegions
 - TrillPeaks

Labeled Signal Set

Name	Plot	Value	Location (Min)	Location (Max)
whale1	<input checked="" type="checkbox"/>	blue		
WhaleType		blue		
MoanRegions				
	<input checked="" type="checkbox"/>	true	6.13604115...	7.763
	<input type="checkbox"/>	true	16.37525	18.153984...
	<input type="checkbox"/>	true	11.4020000...	13.120148...
TrillRegions				
	<input type="checkbox"/>	true	1.4357724...	3.275
TrillPeaks				
	<input type="checkbox"/>	1	1.77425	
	<input type="checkbox"/>	2	2.44375	
	<input checked="" type="checkbox"/>	3	2.74225	
whale2	<input checked="" type="checkbox"/>	blue		
WhaleType		blue		
MoanRegions				
	<input checked="" type="checkbox"/>	true	2.44511966...	3.5605
	<input type="checkbox"/>	true	5.7136928...	8.113
	<input type="checkbox"/>	true	15.3215	16.712880...
TrillRegions				
	<input type="checkbox"/>	true	10.91475	13.152470...
TrillPeaks				
	<input type="checkbox"/>	1	11.50975	
	<input type="checkbox"/>	2	11.88	
	<input checked="" type="checkbox"/>	3	12.32975	

Time (s)

MoanRegions

TrillRegions

TrillPeaks

Time (s)

WhaleType

- blue
- blue



Using Apps for Ground Truth Labeling Audio Data

The screenshot displays the 'Audio Labeler' application window for the file 'Rainbow-16-8-mono-114secs.wav'. The interface is divided into several sections:

- Top Panel:** Includes 'LABEL' and 'RECORD' tabs, a toolbar with 'Load', 'Save', 'Import', 'Settings', 'Legend', and 'Export' buttons, and a menu bar with 'FILE', 'DEVICE', 'VIEW', and 'EXPORT' options.
- Data Browser:** A list of audio files with 'Rainbow-16-8-mono-114secs.wav' selected.
- File Labels:** A table with columns 'Label Name' and 'Value'. The 'Content' label has a value of 'speech'.
- Audio Waveform:** A visualization of the audio signal with a blue waveform and a yellow vertical bar indicating a segment. Time markers are shown at 0.5, 1, 1.5, 1.9984, 2, 2.445, 3, 3.5, 4, 4.5, and 5 seconds.
- ROI Labels:** A table with columns 'Label Name' and 'Value'. The 'SpeechActivity' label has a value of 'true' for three segments.
- Audio File Info:** Metadata for the selected file: Channels: 1, Sample Rate: 8000 Hz, Duration: 114.144 s, Compression: Uncompressed, Bits per Sample: 16, Location: E:\jobarchive.

Ready Samples Underrun = 0

Using Apps for Designing Deep Learning Networks



The screenshot displays the Deep Network Designer application window. The interface includes a toolbar with icons for New, Import, Duplicate, Cut, Copy, Paste, Fit to View, Zoom In, Zoom Out, Auto Arrange, Analyze, and Export. Below the toolbar are tabs for FILE, BUILD, NAVIGATE, LAYOUT, ANALYSIS, and EXPORT.

The main workspace shows a vertical flowchart of a neural network architecture with the following layers:

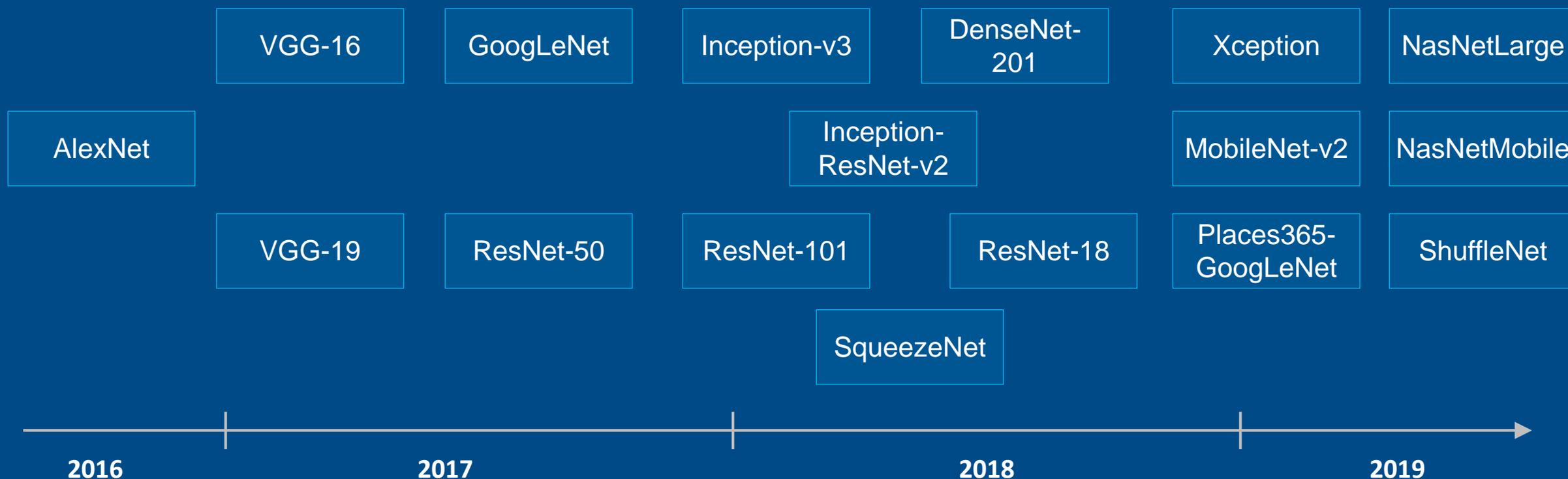
- imageinput (ImageInputLayer)
- conv (Convolution2DLayer)
- relu (ReLU Layer)
- maxpool (MaxPooling2D Layer)
- fc (FullyConnected Layer)
- softmax (Softmax Layer)
- classoutput (Classification Output Layer)

On the left, the LAYERS panel is visible, categorized into INPUT, LEARNABLE, ACTIVATION, and NORMALIZATION AND DROPOUT. The INPUT category includes ImageInputLayer and SequenceInputLayer. The LEARNABLE category includes Convolution2DLayer, TransposedConvolution2DLayer, FullyConnectedLayer, LSTM Layer, and BiLSTM Layer. The ACTIVATION category includes ReLU Layer, LeakyReLU Layer, and ClippedReLU Layer.

On the right, the PROPERTIES panel shows the following details for the selected layer:

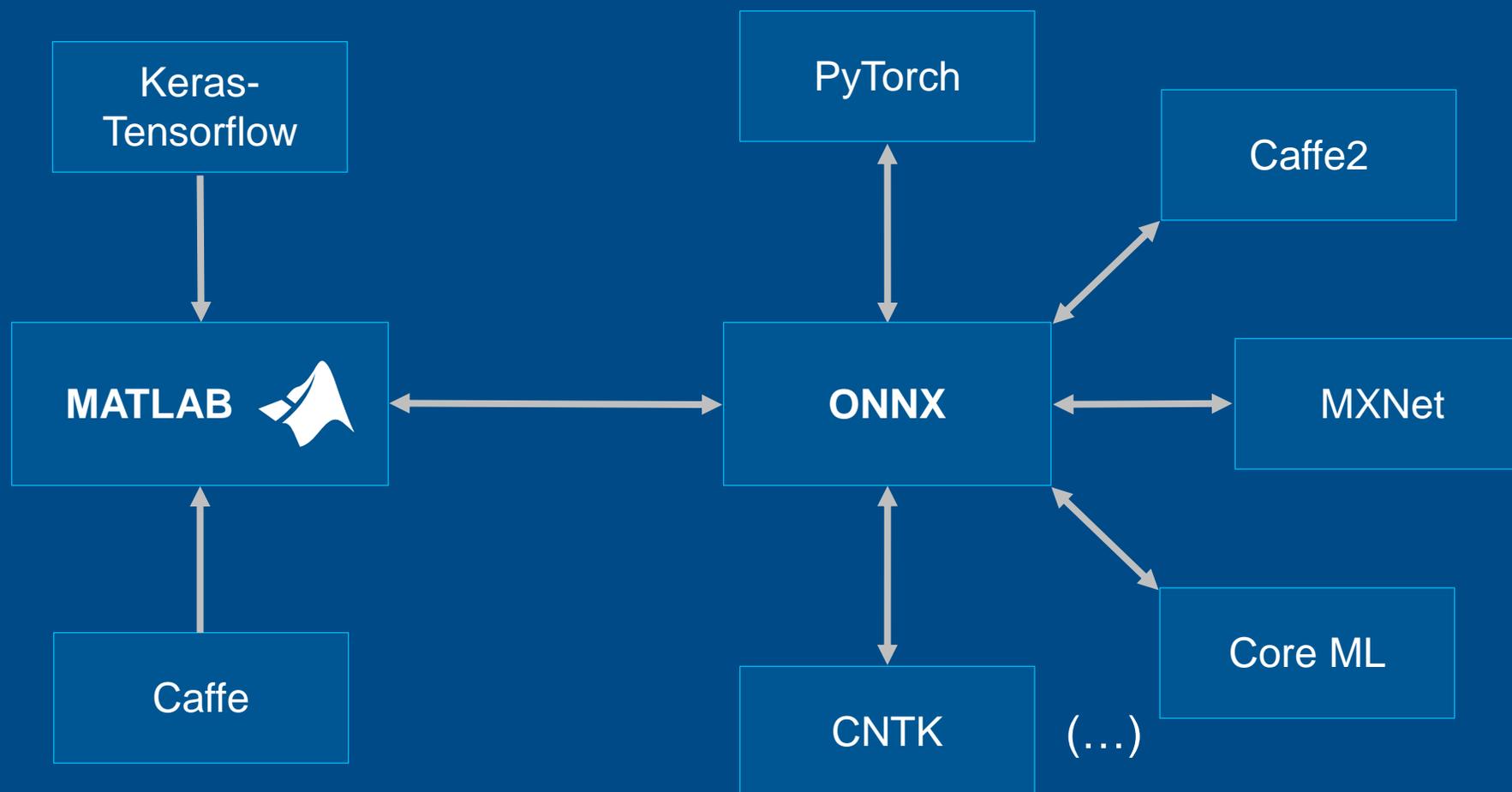
Property	Value
Number of layers	7
Number of connections	6
Input type	Image
Output type	Classification

Using Transfer Learning with Pre-trained Models

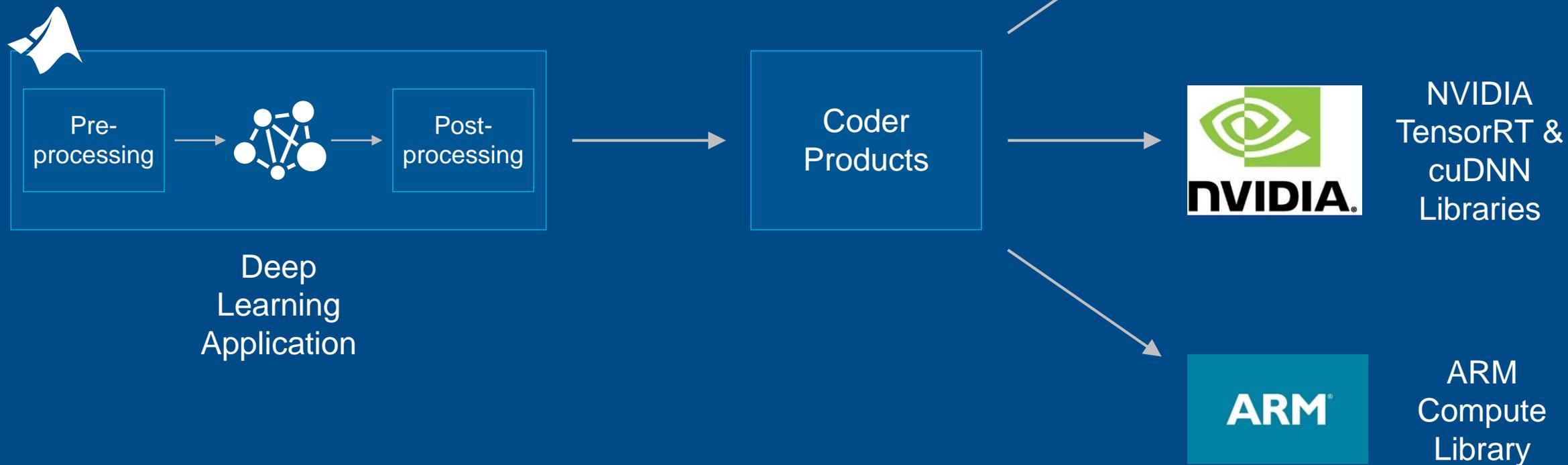




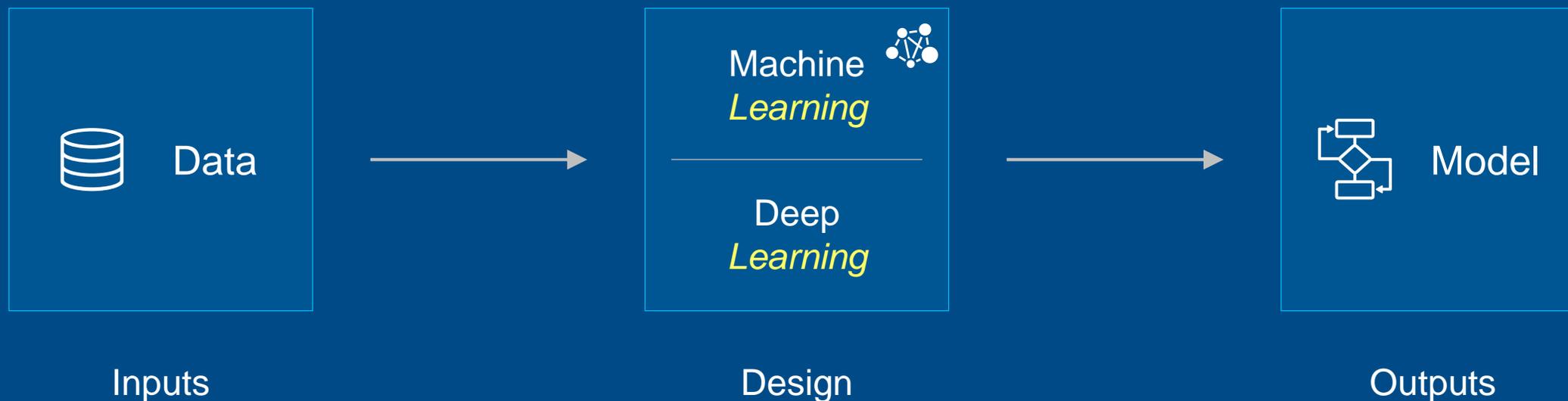
Using Models from Other Frameworks



Deploying Deep Learning Applications



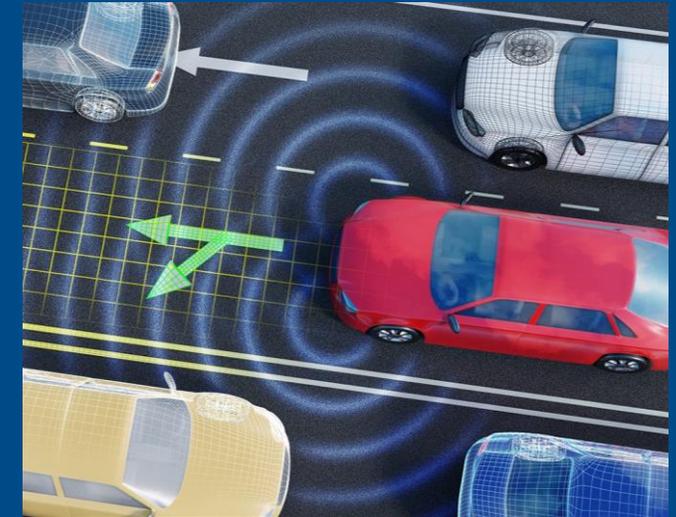
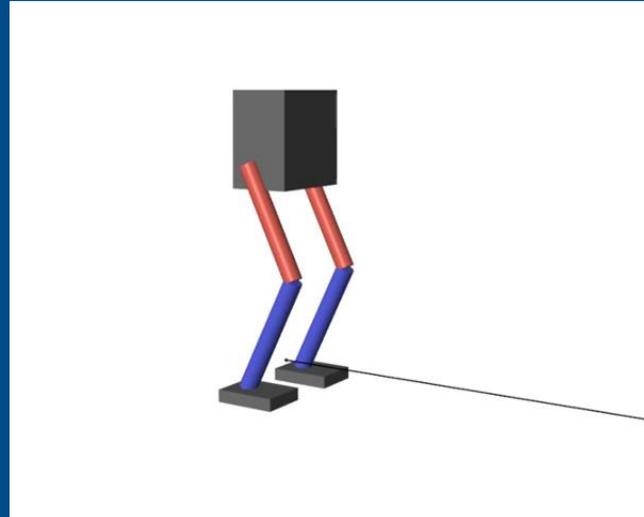
Using MATLAB and Simulink for Reinforcement Learning



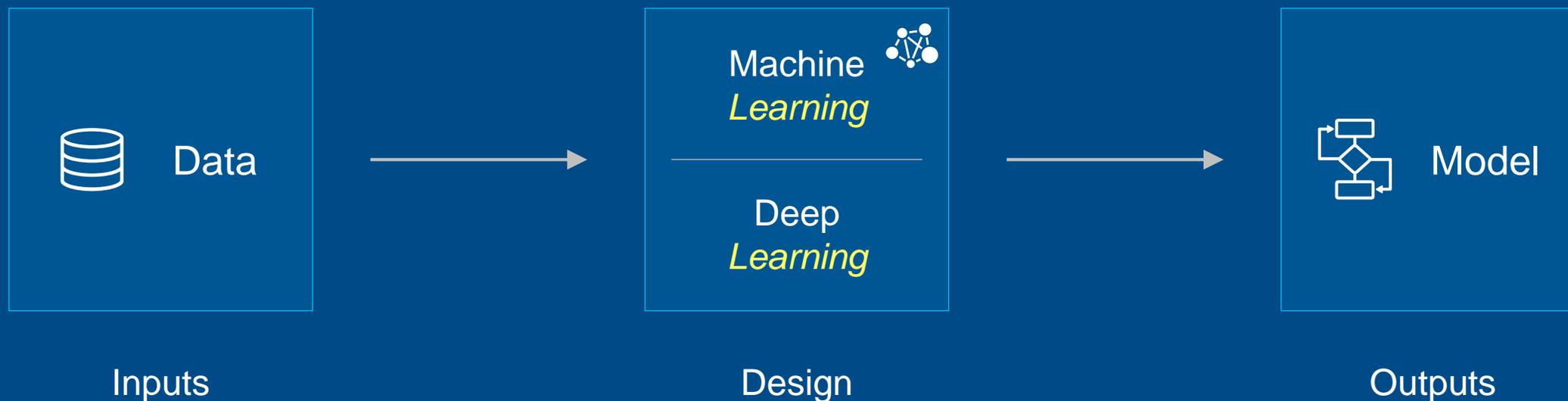
MATLAB® & SIMULINK®



Using MATLAB and Simulink for Reinforcement Learning



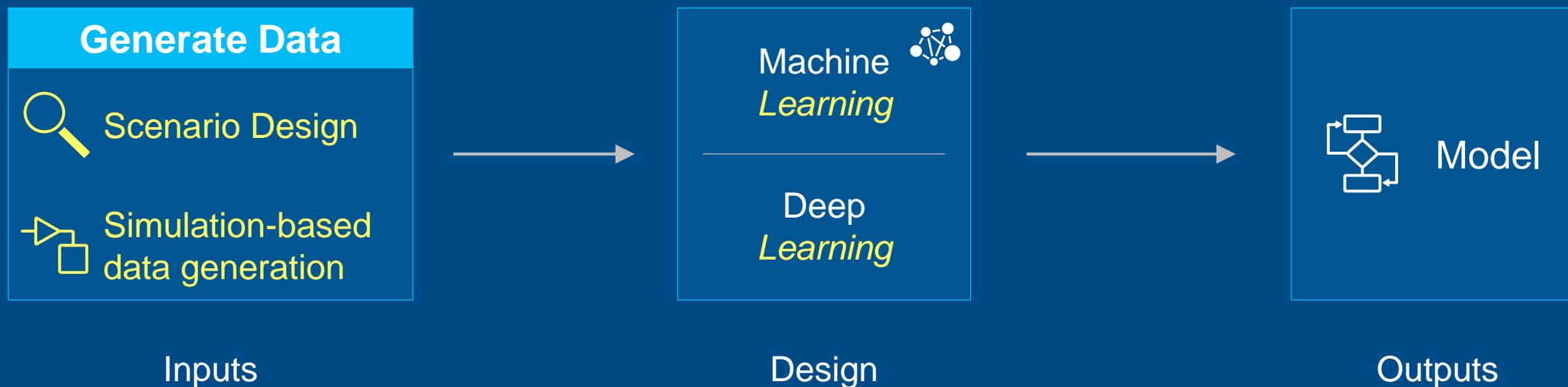
Using MATLAB and Simulink for Reinforcement Learning



MATLAB® & SIMULINK®



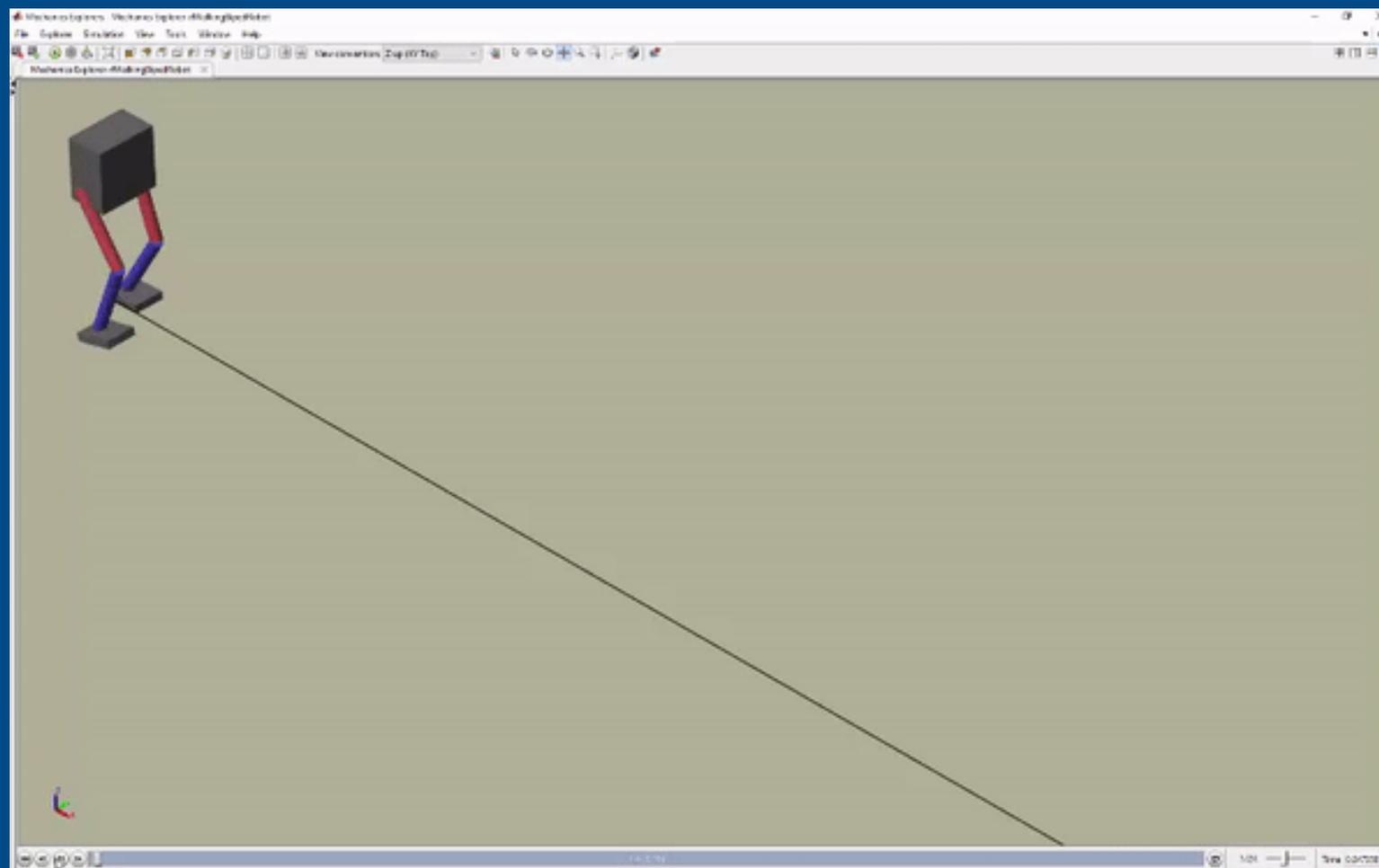
Using MATLAB and Simulink for Reinforcement Learning



MATLAB® & SIMULINK®



Using MATLAB and Simulink for Reinforcement Learning



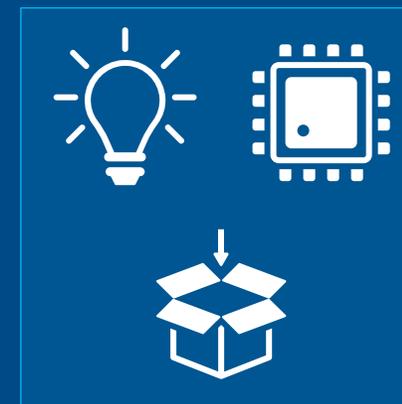
Using MATLAB & Simulink to Build Algorithms in Everything



Inputs



Design



Outputs



MATLAB® & SIMULINK®



Working with Text Data



```

Vehicle_Repairs.csv x +
Dept,JobDate,jobno,Vehicleid,UnitNo,Reason,Notes,CostParts,CostLabor,CostTotal
1020,01/06/2015 12:00:00 AM,14073,118743,14,04 DRIVER'S REPORT,"PM SERVICE, CHECK TURN SIGNAL, CLUNKING NOISE WHEN DRIVING",493.85,0,493.85
1020,01/14/2015 12:00:00 AM,14232,230973,13,08 PM SERVICE ***,"SERVICEROB,EXT,5604",38.869999999999997,0,38.869999999999997
2111,01/02/2015 12:00:00 AM,14006,1243,116,04 DRIVER'S REPORT,NEED 4 PLOW PINS,45,0,45
2111,01/02/2015 12:00:00 AM,14140,B39109 ,178,04 DRIVER'S REPORT,INSTALL SPINNER ASSY,0,0,0
2111,01/03/2015 12:00:00 AM,14163,574950,215,13 SNOW BREAKDOWN,DONT START,0,0,0
2111,01/05/2015 12:00:00 AM,14169,A00413 ,283,04 DRIVER'S REPORT,DOG BONE PIN BROKEN,20,0,20
2111,01/06/2015 12:00:00 AM,14000,766153,248,08 PM SERVICE ***,"NEED SERVICE, CHECK BRAKES",387.17,0,387.17
2111,01/06/2015 12:00:00 AM,14155,525670,232,04 DRIVER'S REPORT,HYD CAP CHECK ENGINE LIGHT ON,12.95,0,12.95
2111,01/06/2015 12:00:00 AM,14157,621909,213,40 NEGLIGENCE,TARP VALVE STICKINGRIGHT SIDE MIRROR BRACKET BROKEN,50.02,0,50.02
2111,01/06/2015 12:00:00 AM,14164,1226,117,13 SNOW BREAKDOWN,HANDLES IN CAB LOOSE,0,0,0
2111,01/06/2015 12:00:00 AM,14165,525999,114,04 DRIVER'S REPORT,NO PLOW LIGHTS,0,0,0
2111,01/06/2015 12:00:00 AM,14172,B34632 ,276,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14174,1469,122,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14175,68932,147,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14176,68933,148,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14177,621907,208,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14181,337657,218,04 DRIVER'S REPORT,CONVEORY NOT WORKING,0,0,0
2111,01/06/2015 12:00:00 AM,14182,D-1920 ,164,10 ROADCALL,DONT START,0,0,0
2111,01/06/2015 12:00:00 AM,14183,525998,217,10 ROADCALL,DONT START,0,0,0
2111,01/06/2015 12:00:00 AM,14184,526000,225,10 ROADCALL,DONT START,0,0,0
2111,01/06/2015 12:00:00 AM,14185,621921,214,04 DRIVER'S REPORT,CONVORY NOT WORKING,0,0,0
2111,01/07/2015 12:00:00 AM,14188,001469 ,201,04 DRIVER'S REPORT,needs def/jim f,0,0,0
2111,01/07/2015 12:00:00 AM,14190,337656,219,04 DRIVER'S REPORT,NEEDS FLOOR MATTS,65.069999999999993,0,65.069999999999993
2111,01/07/2015 12:00:00 AM,14191,B34632 ,276,10 ROADCALL,DONT START,0,0,0
2111,01/07/2015 12:00:00 AM,14196,1222,118,04 DRIVER'S REPORT,HARDWARE FOR REAR SPRINGS,14.32,0,14.32
2111,01/07/2015 12:00:00 AM,14199,52565,626,04 DRIVER'S REPORT,WASHER FLUIDDEF,28.88,0,28.88
2111,01/09/2015 12:00:00 AM,14107,1467,121,08 PM SERVICE ***,"REMOVE & REPLACE REAR SPRINGS, CHECK COOLANT TUBESPM SERVICE",4697.55,0,

```

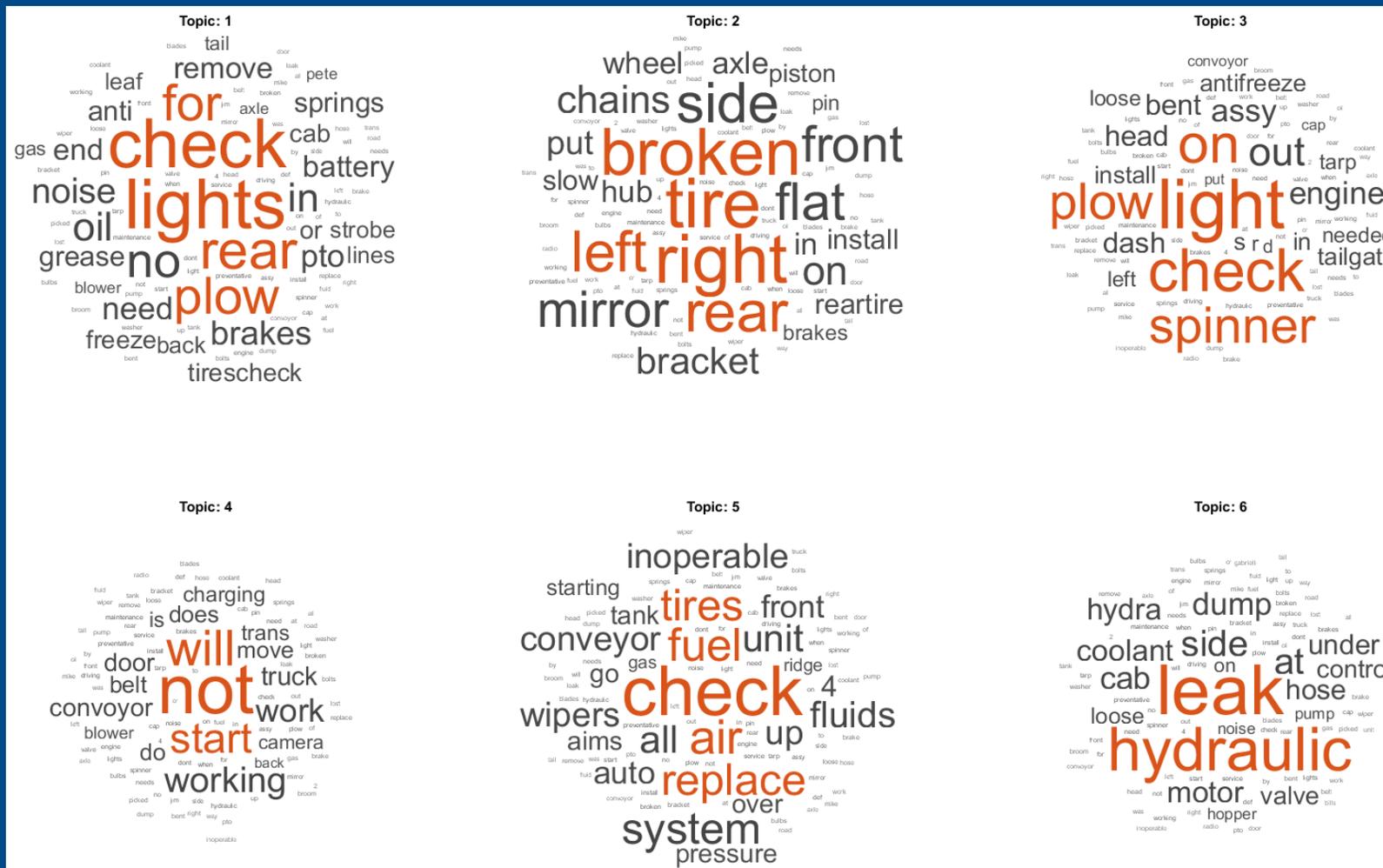
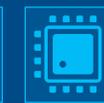
Working with Text Data



```
t = readtable(filename, 'TextType', 'string');
disp(t(1:20,6:7))
```

	Reason		Notes
"04	DRIVER'S REPORT"		"PM SERVICE, CHECK TURN SIGNAL, CLUNKING NOISE WHEN DRIVING"
"08	PM SERVICE	***"	"SERVICEROB,EXT,5604"
"04	DRIVER'S REPORT"		"NEED 4 PLOW PINS"
"04	DRIVER'S REPORT"		"INSTALL SPINNER ASSY"
"13	SNOW BREAKDOWN"		"DONT START"
"04	DRIVER'S REPORT"		"DOG BONE PIN BROKEN"
"08	PM SERVICE	***"	"NEED SERVICE, CHECK BRAKES"
"04	DRIVER'S REPORT"		"HYD CAP CHECK ENGINE LIGHT ON"
"40	NEGLIGENCE"		"TARP VALVE STICKINGRIGHT SIDE MIRROR BRACKET BROKEN"
"13	SNOW BREAKDOWN"		"HANDLES IN CAB LOOSE"
"04	DRIVER'S REPORT"		"NO PLOW LIGHTS"
"10	ROADCALL"		"WILL NOT START"
"10	ROADCALL"		"WILL NOT START"
"10	ROADCALL"		"WILL NOT START"
"10	ROADCALL"		"WILL NOT START"
"10	ROADCALL"		"WILL NOT START"
"04	DRIVER'S REPORT"		"CONVEORY NOT WORKING"
"10	ROADCALL"		"DONT START"
"10	ROADCALL"		"DONT START"
"10	ROADCALL"		"DONT START"

Working with Text Data



Deep Learning Toolbox
 Statistics and Machine Learning Toolbox
 Text Analytics Toolbox
 MATLAB

Creating Your Own Data

Input



The screenshot shows the Signal Editor interface. The main plot area is titled "Signal" and displays a grid with the x-axis labeled "TIME" ranging from 0 to 10 and the y-axis ranging from -4 to 4. The plot area is currently empty. To the right of the plot is the "Signal Properties" panel, which includes the following settings:

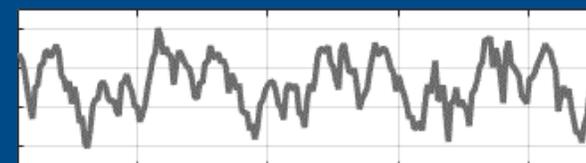
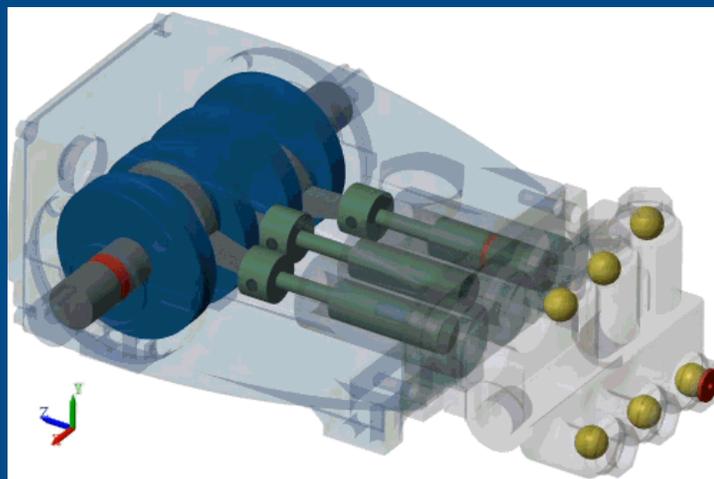
- Name: Signal
- Units: Enter signal units
- Data type: double
- Interpolate: linear
- Show result of cast to data type

Below the Signal Properties panel is the "Axes" section, which includes the following settings:

- XMin: 0
- XMax: 10
- YMin: -5
- YMax: 5

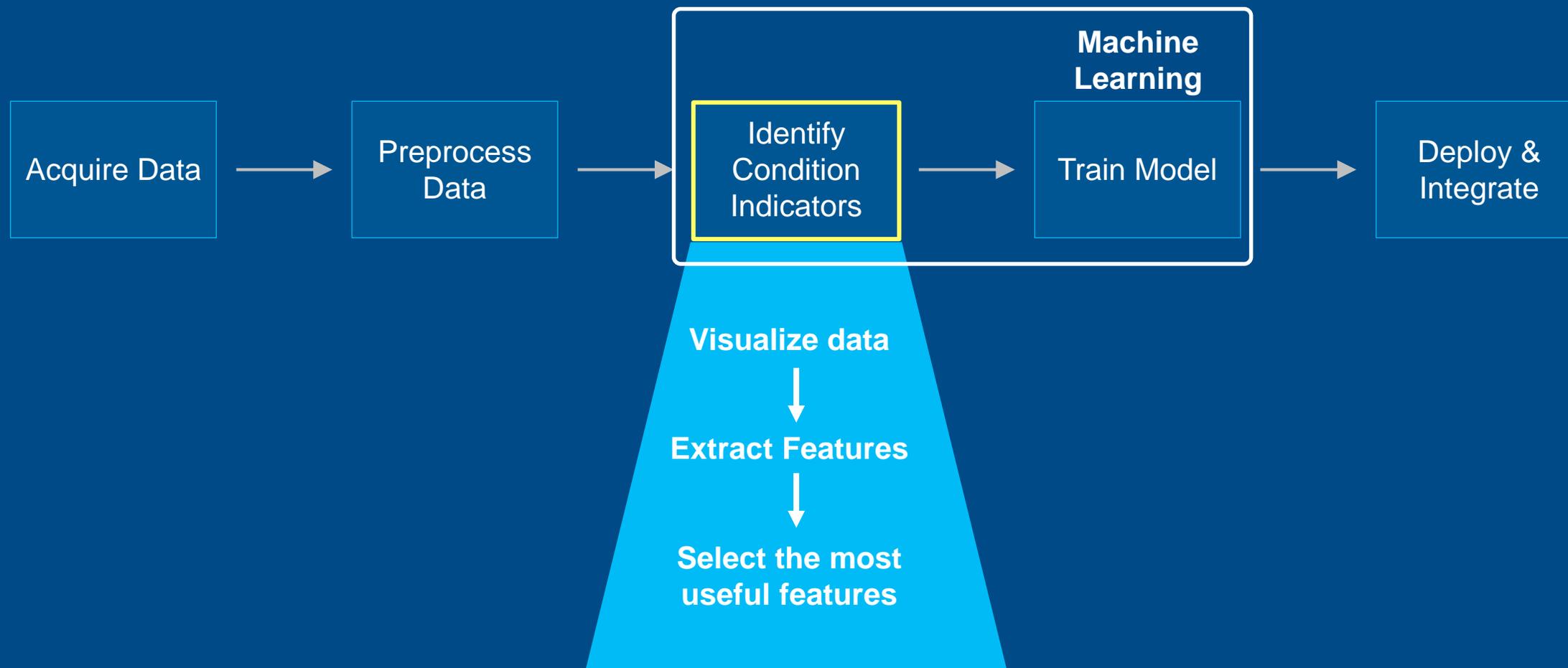
The toolbar at the top contains several tool groups: DRAW (Select, Move, Delete, Edit Point, Erase, Clear), TOOLS (Insert Point, f(x) Expression, Insert Line, Draw), ALIGN (Snap X to Grid, Snap X to Tick, Snap Y to Grid, Snap Y to Tick), SHOW (Markers, Grid), ZOOM & PAN (Zoom In, Zoom Out, Pan, Zoom Reset), CAPTURE (Screenshot), INSERT (Green Checkmark), and CLOSE (Blue X).

Input

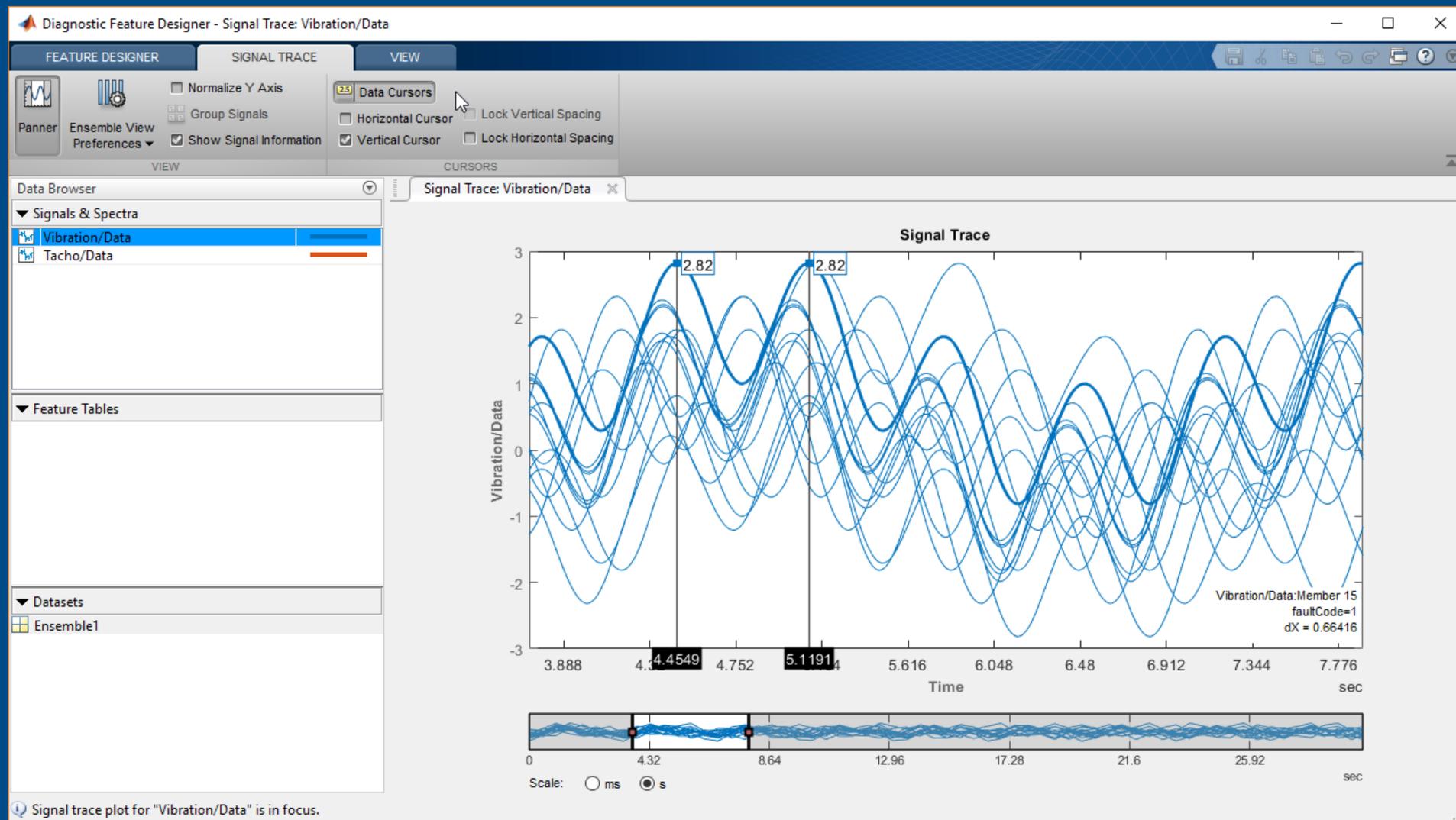




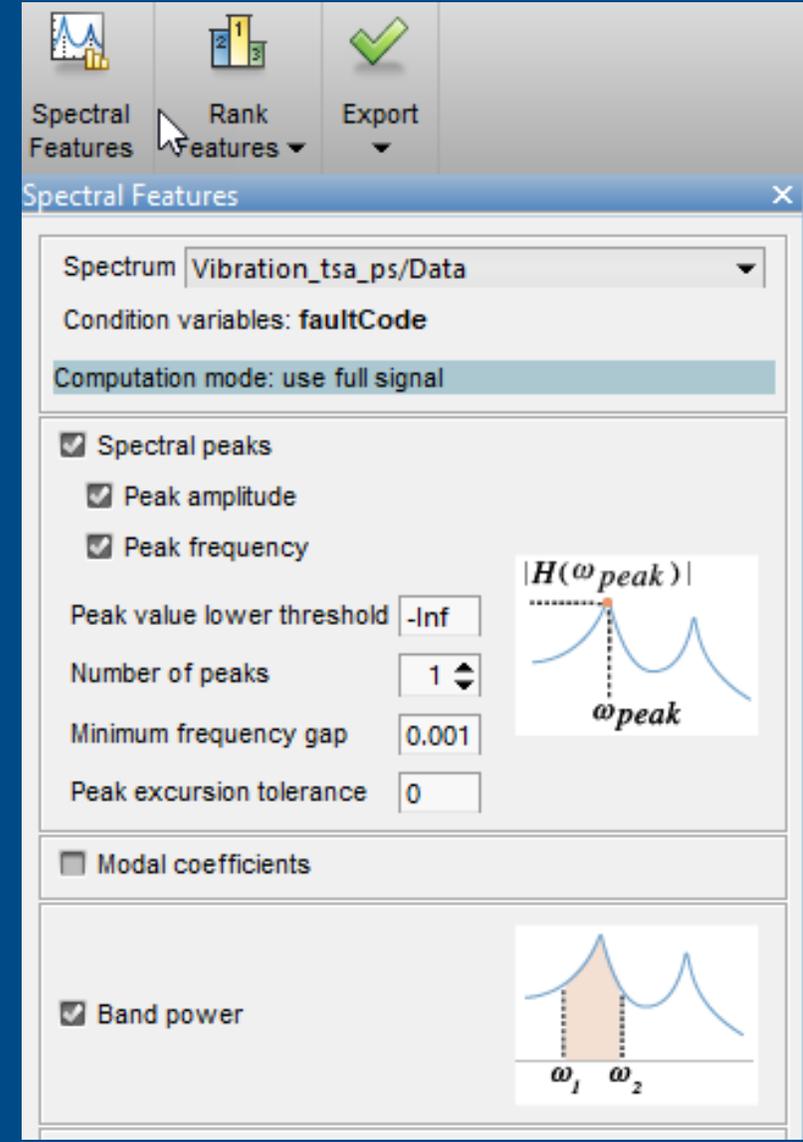
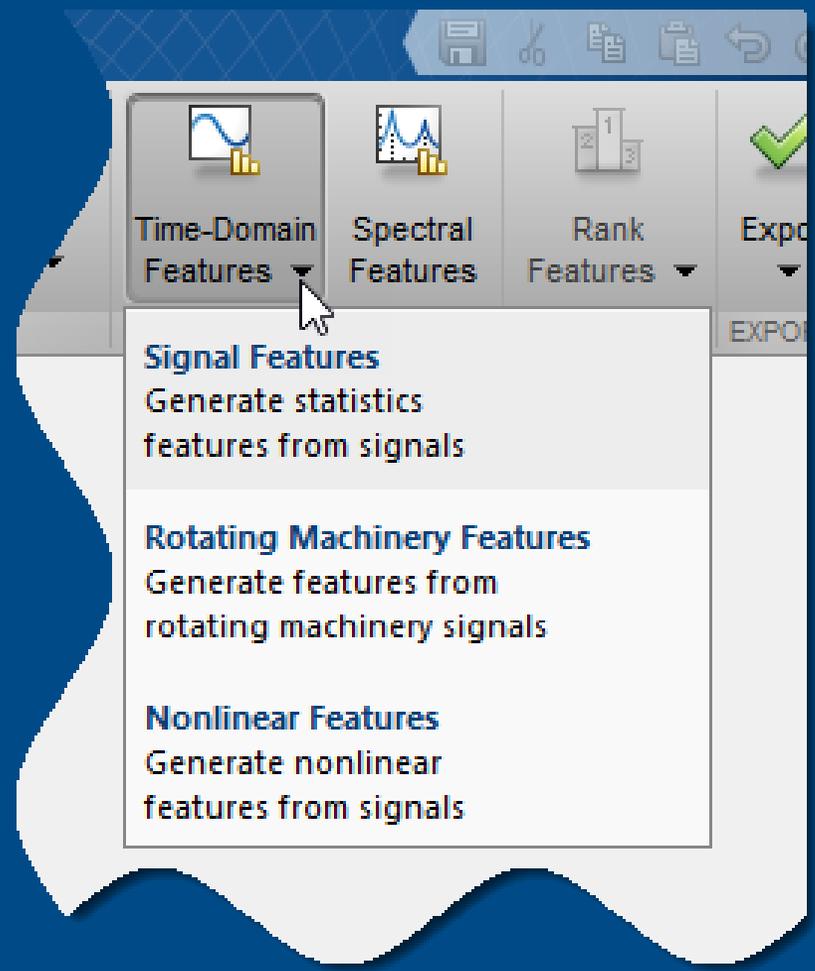
Identifying the Useful Data



Identifying the Useful Data

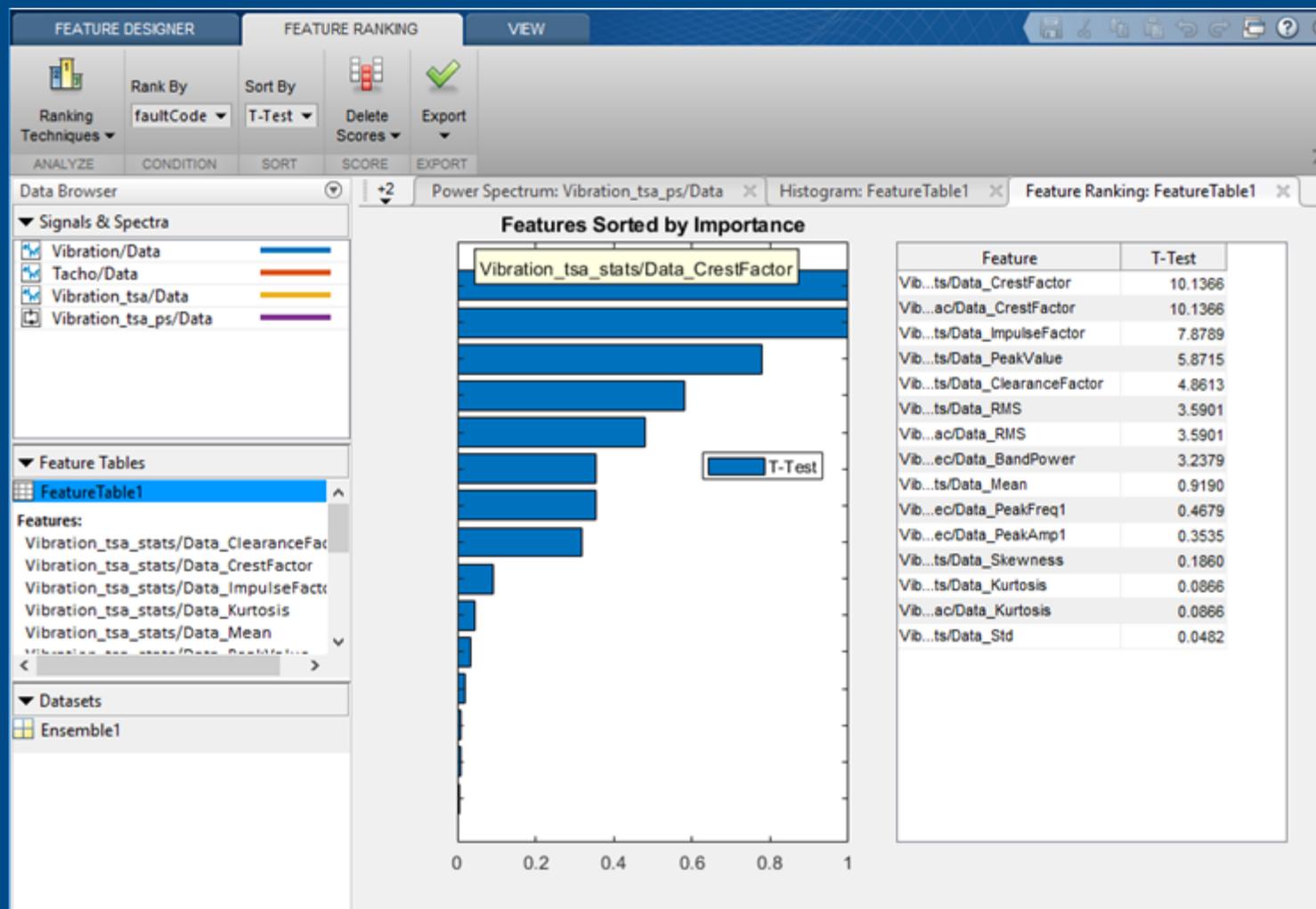


Identifying the Useful Data





Identifying the Useful Data



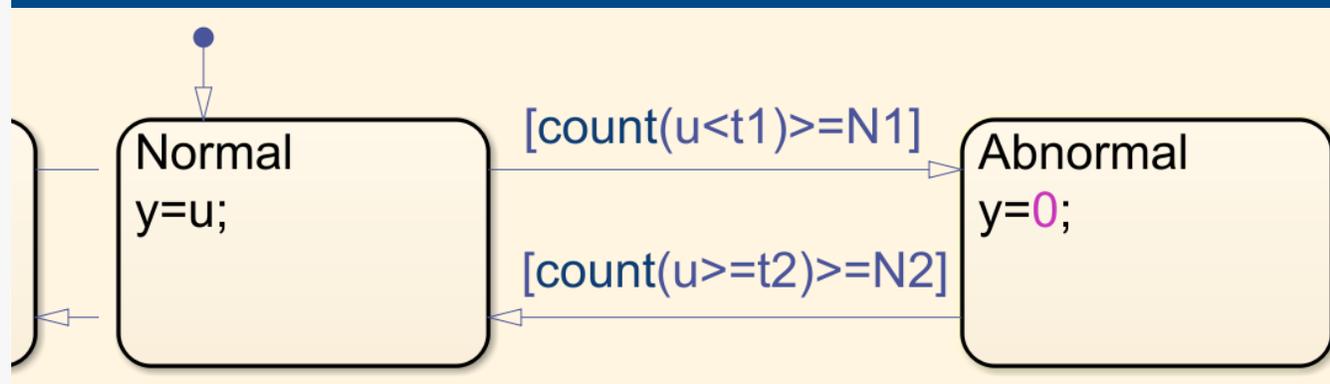


Designing Decision Logic with Stateflow

```

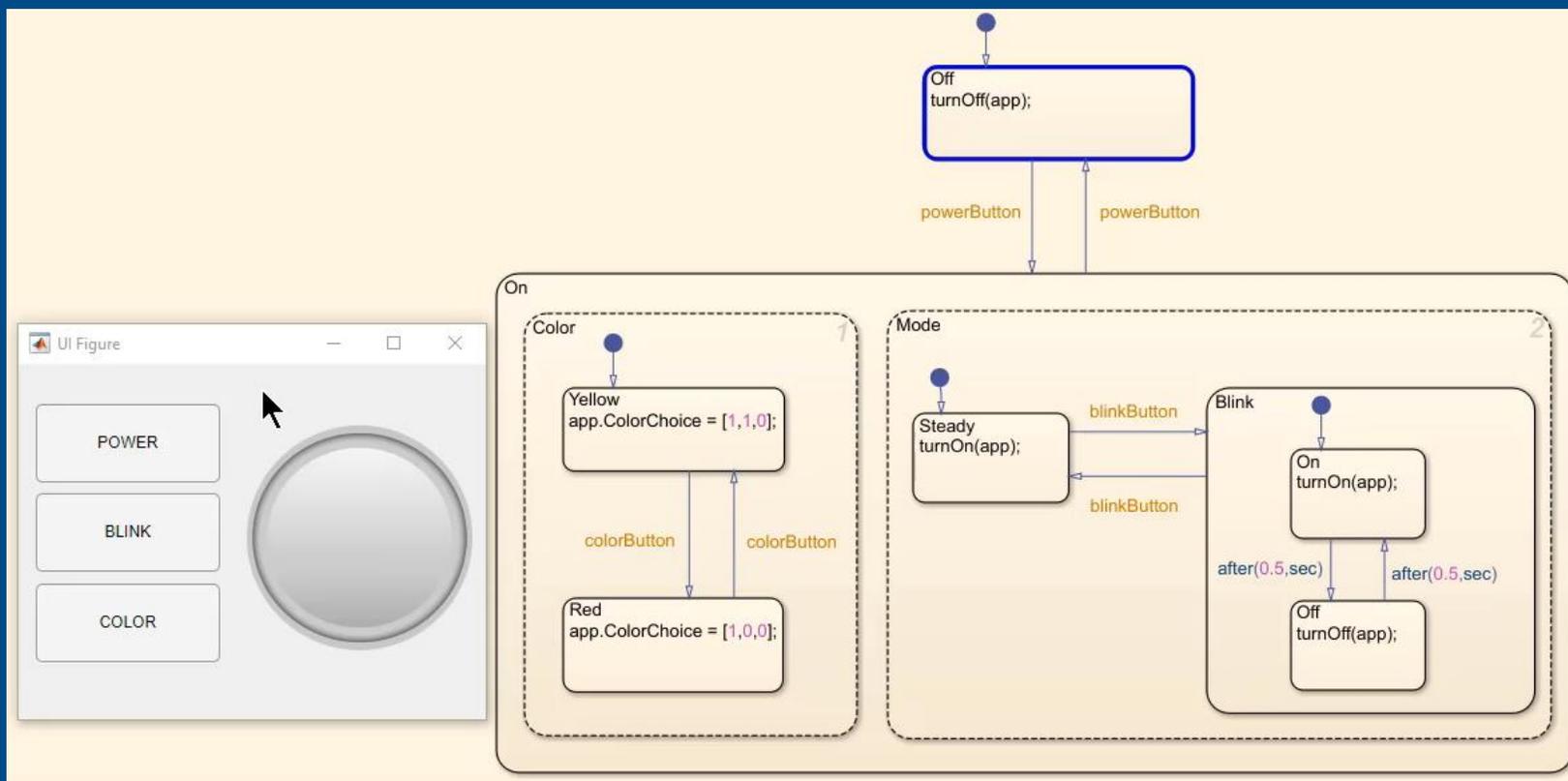
inNormalRegion = true;
counter = 0;
for i=1:length(inData)
    if(inNormalRegion)
        if(inData(i)<t1)
            counter = counter+1;
            if(counter>=N1)
                inNormalRegion = false;
            end
        else
            counter = 0;
        end
    else
        if(inData(i)>=t2)
            counter = counter+1;
            if(counter>=N2)
                inNormalRegion = true;
            end
        else
            counter = 0;
        end
    end
    if(inNormalRegion)
        outData(i) = inData(i);
    else
        outData(i) = 0;
    end
end
end

```





Using Stateflow in MATLAB



```

% Callbacks that handle component events
methods (Access = private)

% Code that executes after component creation
function startupFcn(app)
    app.LanternLogic = BlinkLanternLogic('app',app);
end

% Button pushed function: POWERButton
function POWERButtonPushed(app, event)
    app.LanternLogic.powerButton();
end

% Button pushed function: COLORButton
function COLORButtonPushed(app, event)
    app.LanternLogic.colorButton();
end

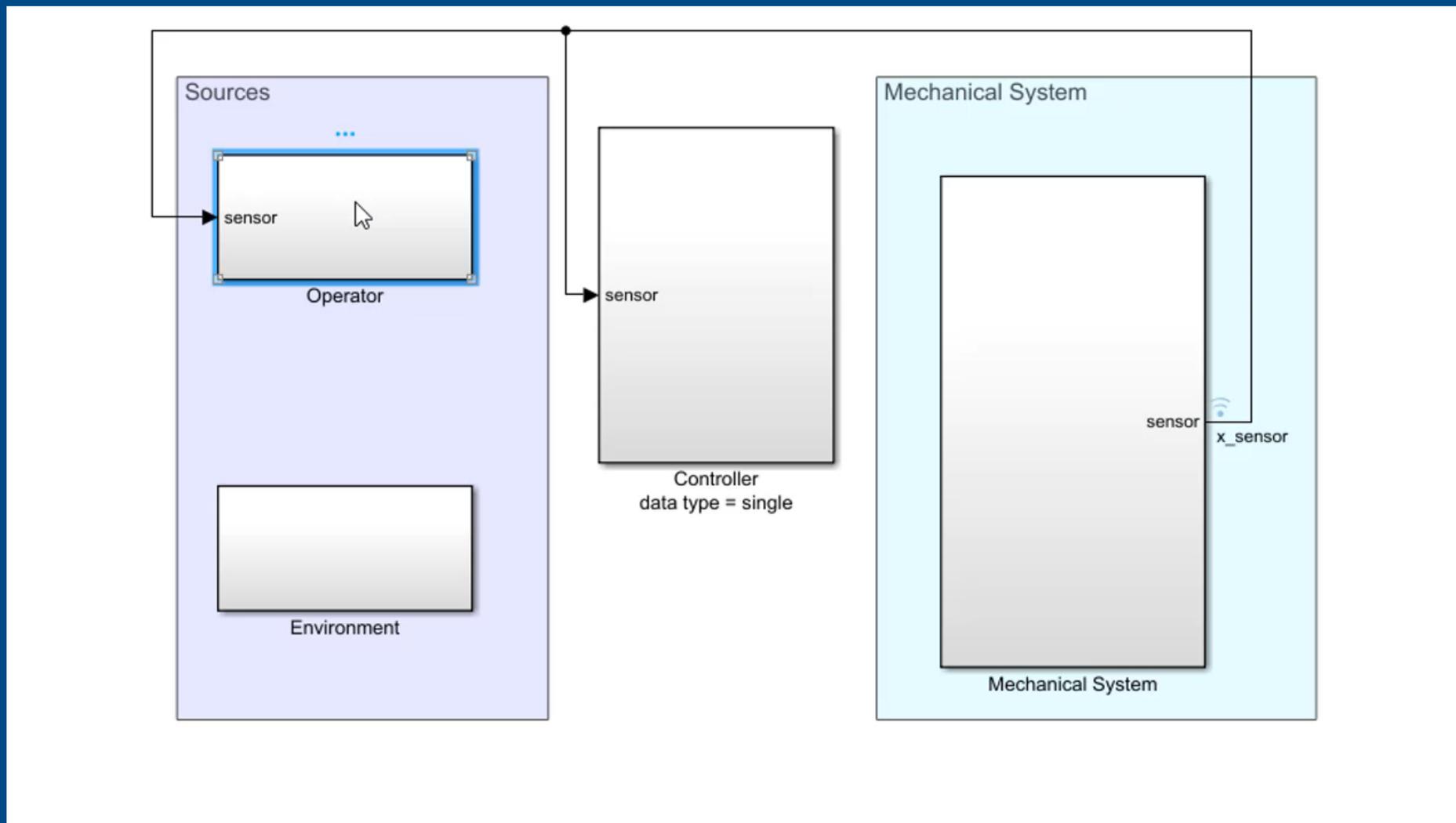
% Close request function: UIFigure
function UIFigureCloseRequest(app, event)
    delete(app.LanternLogic);
    delete(app);
end

% Button pushed function: BLINKButton
function BLINKButtonPushed(app, event)
    app.LanternLogic.blinkButton();
end
end

```

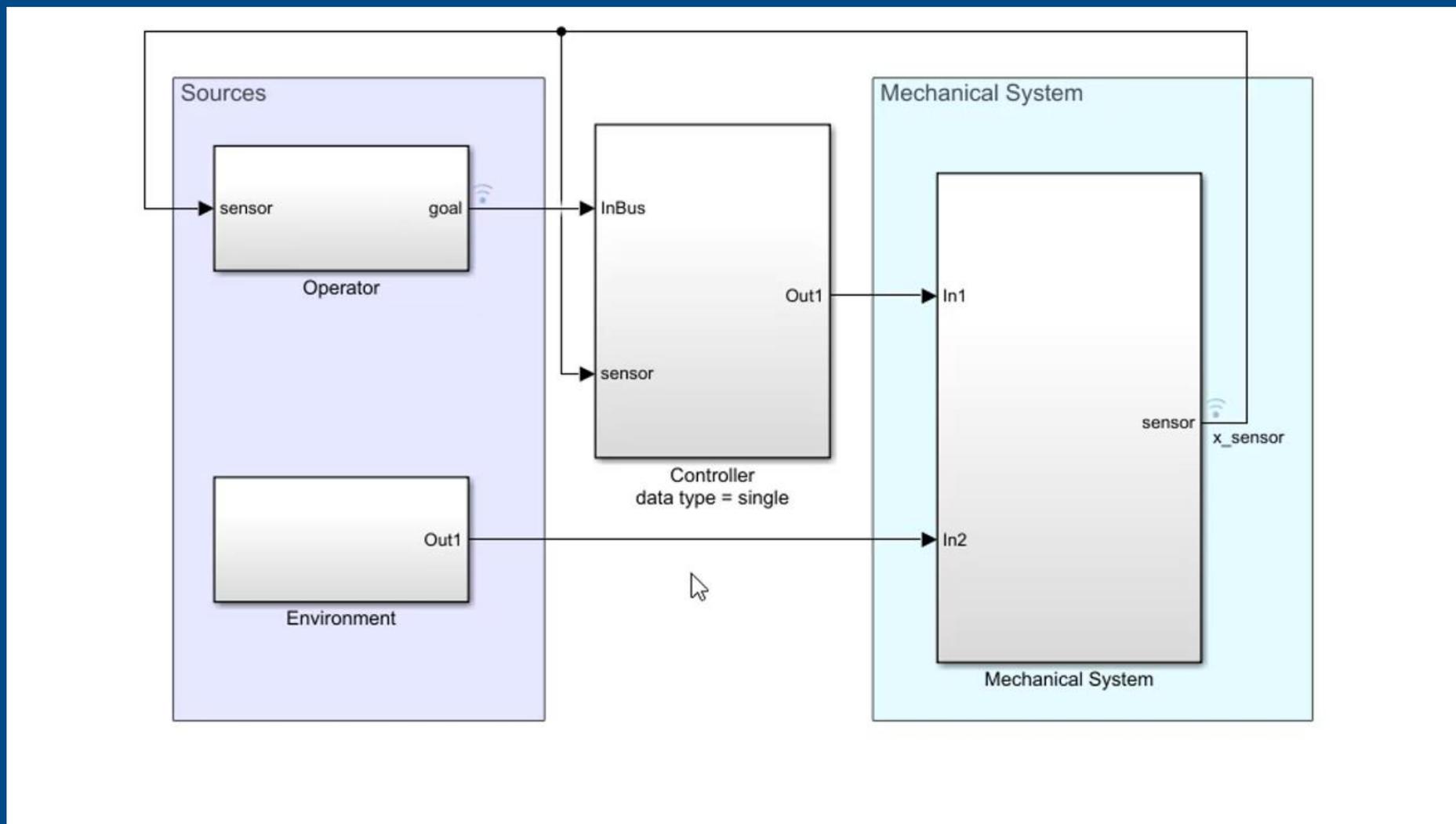


Editing at the Speed of Thought



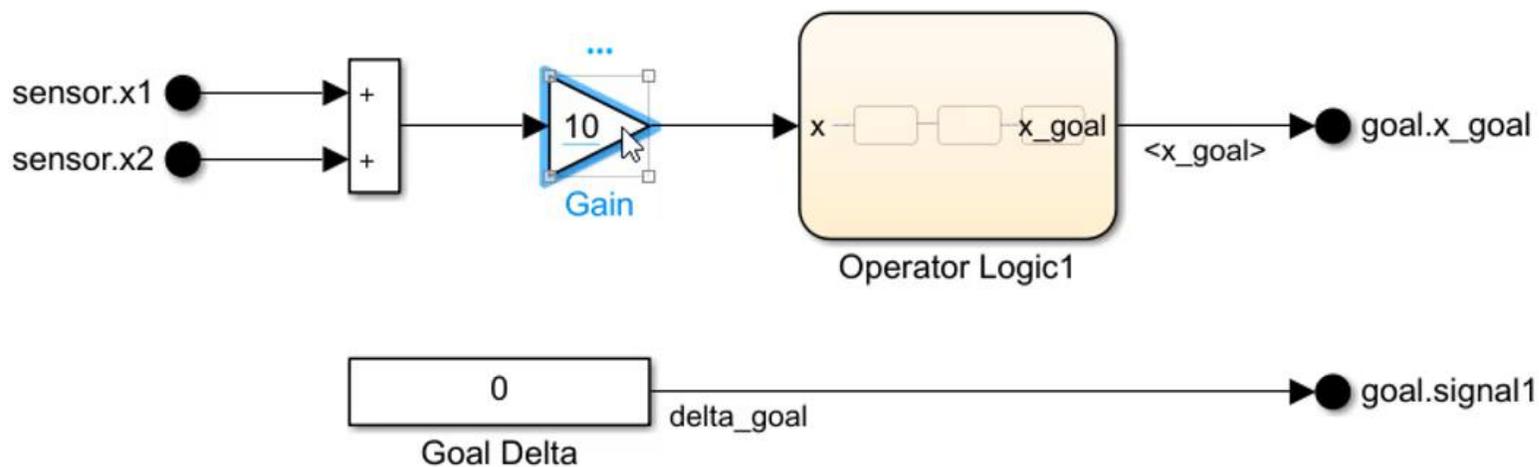


Editing at the Speed of Thought



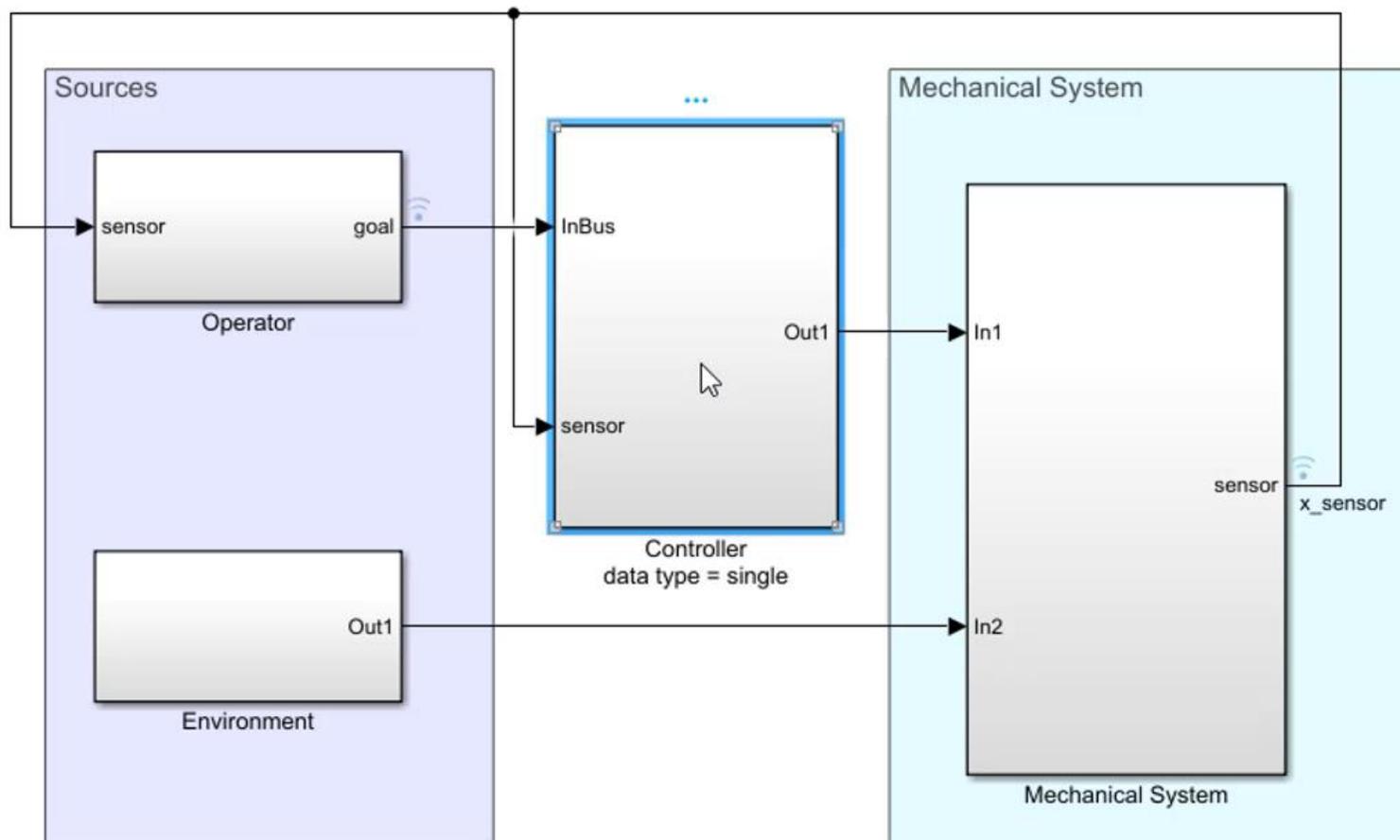


Editing at the Speed of Thought

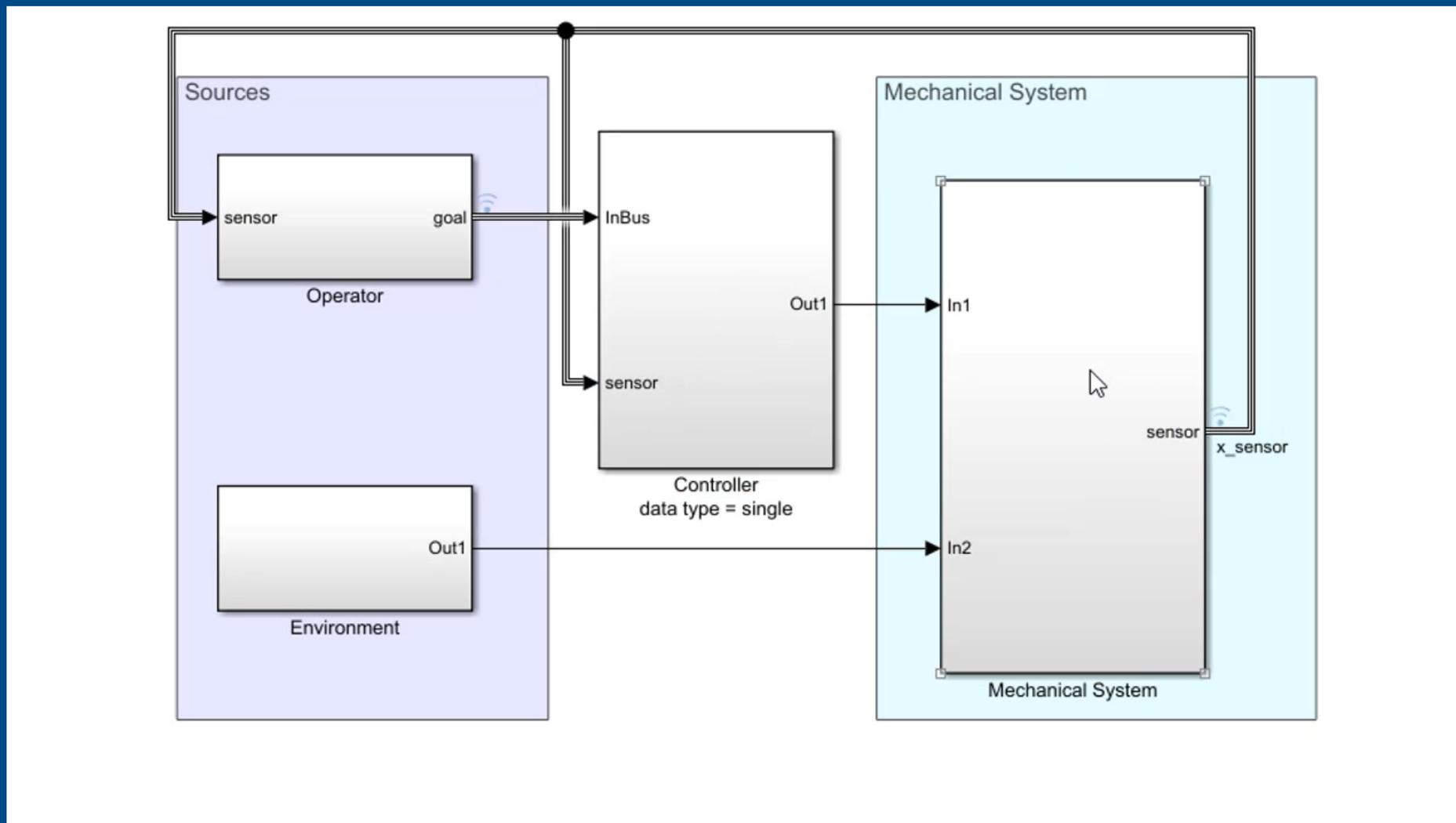
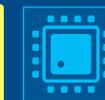




Editing at the Speed of Thought



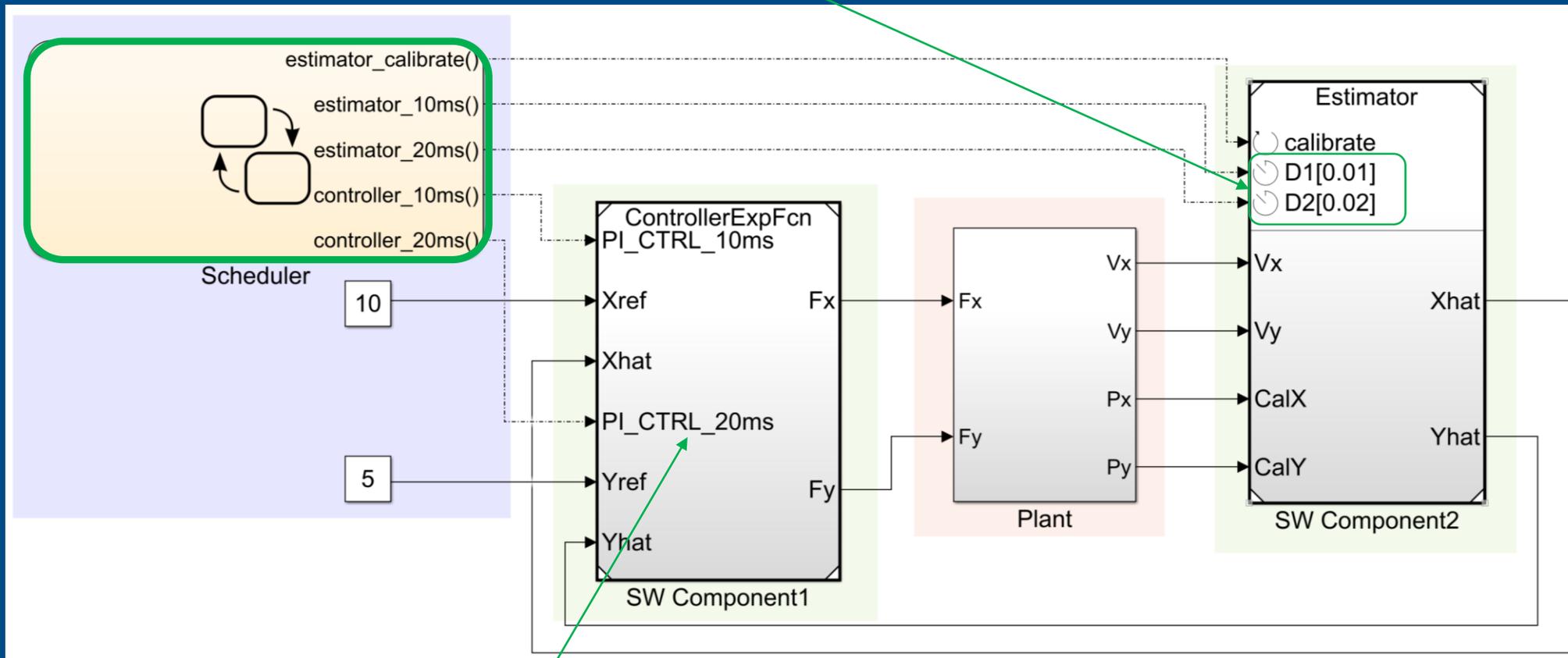
Editing at the Speed of Thought





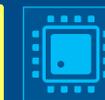
Controlling the Execution of Model Components

Schedulable Rate-Based Model



Export Function Model

Controlling the Execution of Model Components



SCHEDULE EDITOR

MANAGE PARTITIONS EXECUTION MODEL DISPLAY VIEW

LEGEND

EXECUTION ORDER

Order	Name	Rate
1	Cont	0
2	D1	0.001
3	D2	0.005
4	ThrottleControl.APPSnsrRun	-1
5	ThrottleControl.ActuatorRun5ms	0.005
6	ThrottleControl.TPSSecondaryRun5ms	0.005
7	ThrottleControl.MonitorRun5ms	0.005
8	D3	0.01
9	ThrottleControl.TPSPrimaryRun10ms	0.01

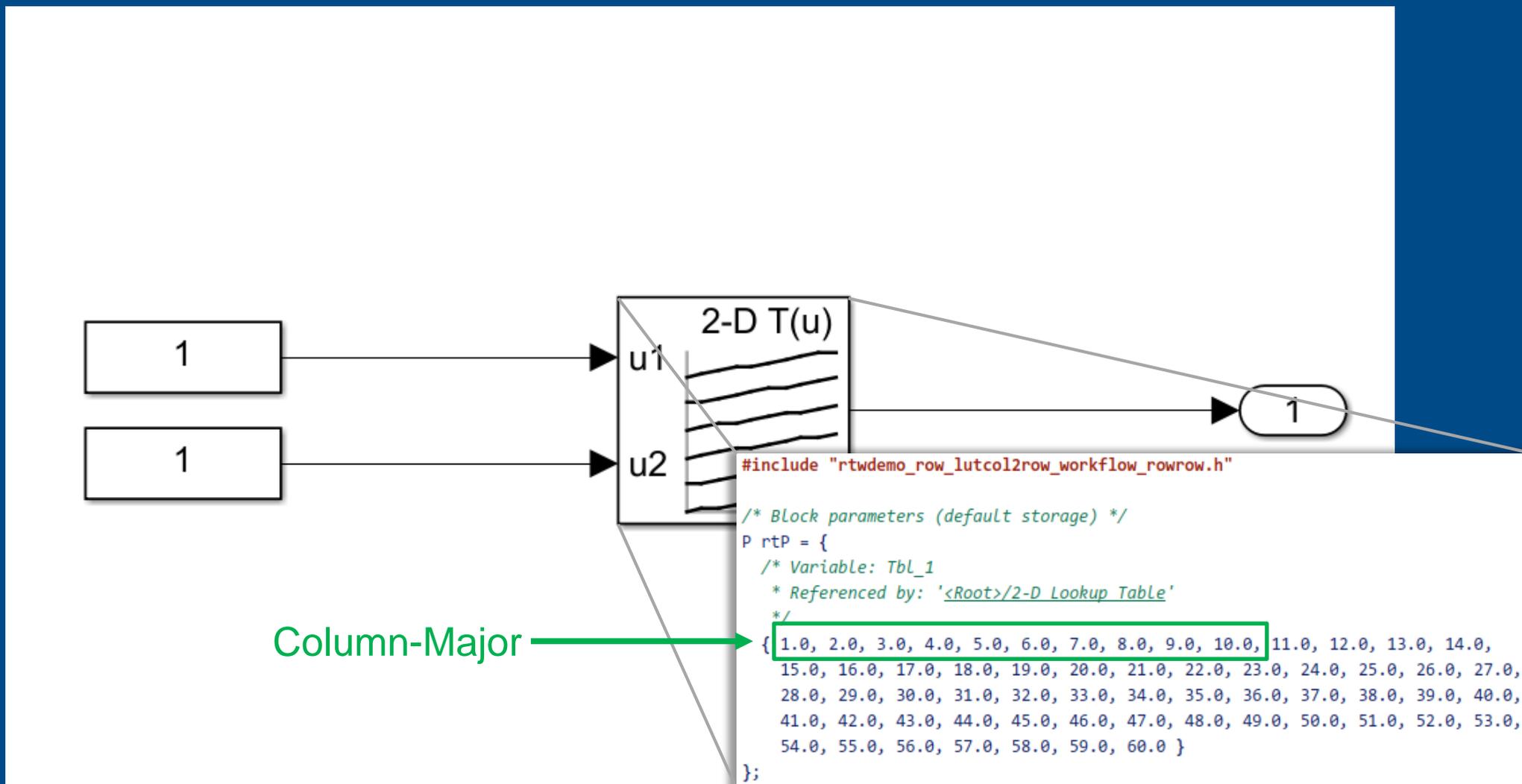
PROPERTY INSPECTOR

Partition

Name	D3
Rate	0.01
Type	Implicit periodic partition

MANAGE PARTITIONS

Simplifying Integration with External C/C++ Code



Simplifying Integration with External C/C++ Code



rtwdemo_row_lutcol2row_workflow_rowrow * - Simulink

File Edit View Display Diagram Simulation Analysis Code Tools Help

rtwdemo_row_lutcol2row_workflow_rowrow

rtwdemo_row_lutcol2row_workflow_rowrow

1

1

u1

u2

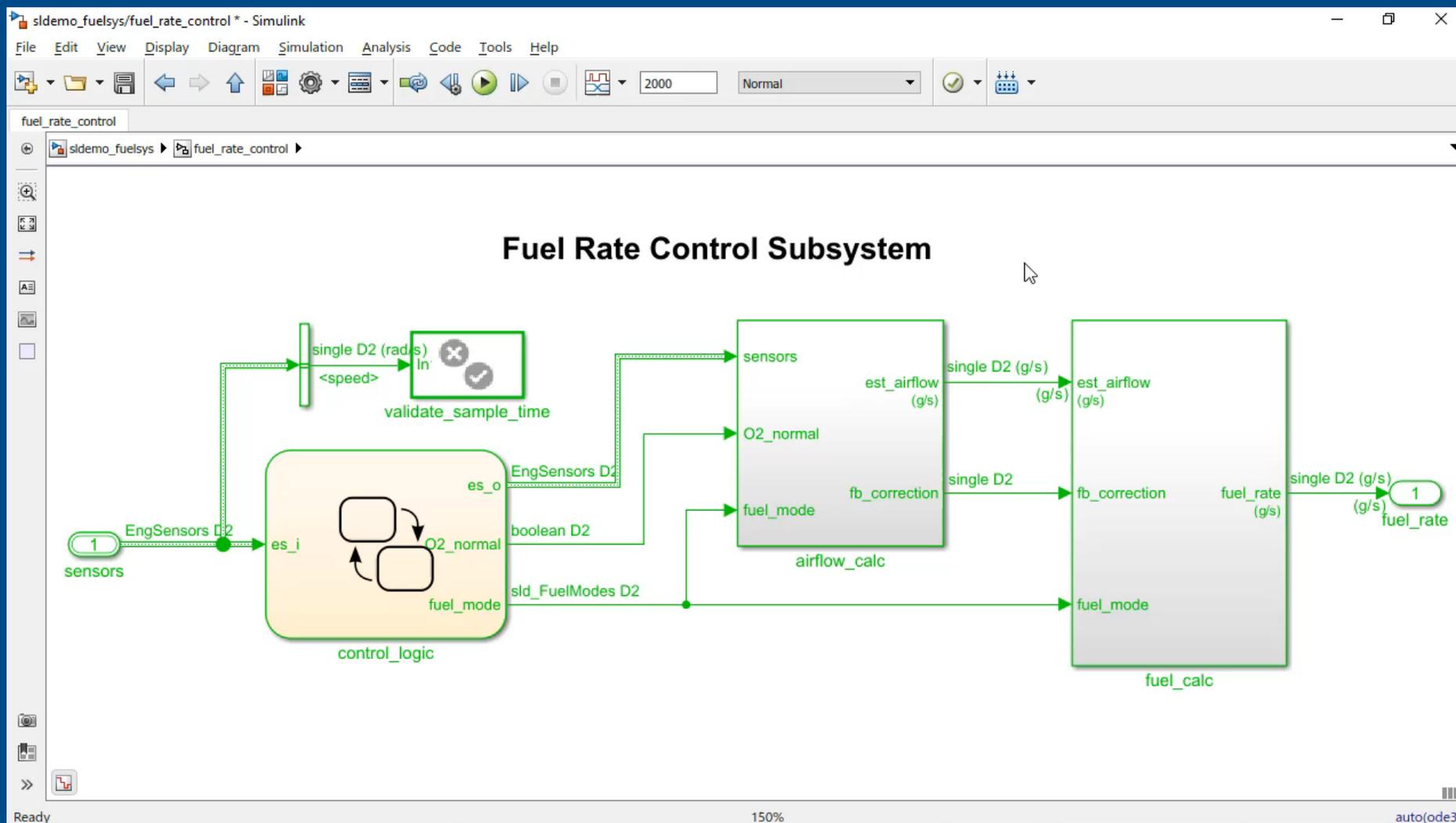
2-D T(u)

Row-Major

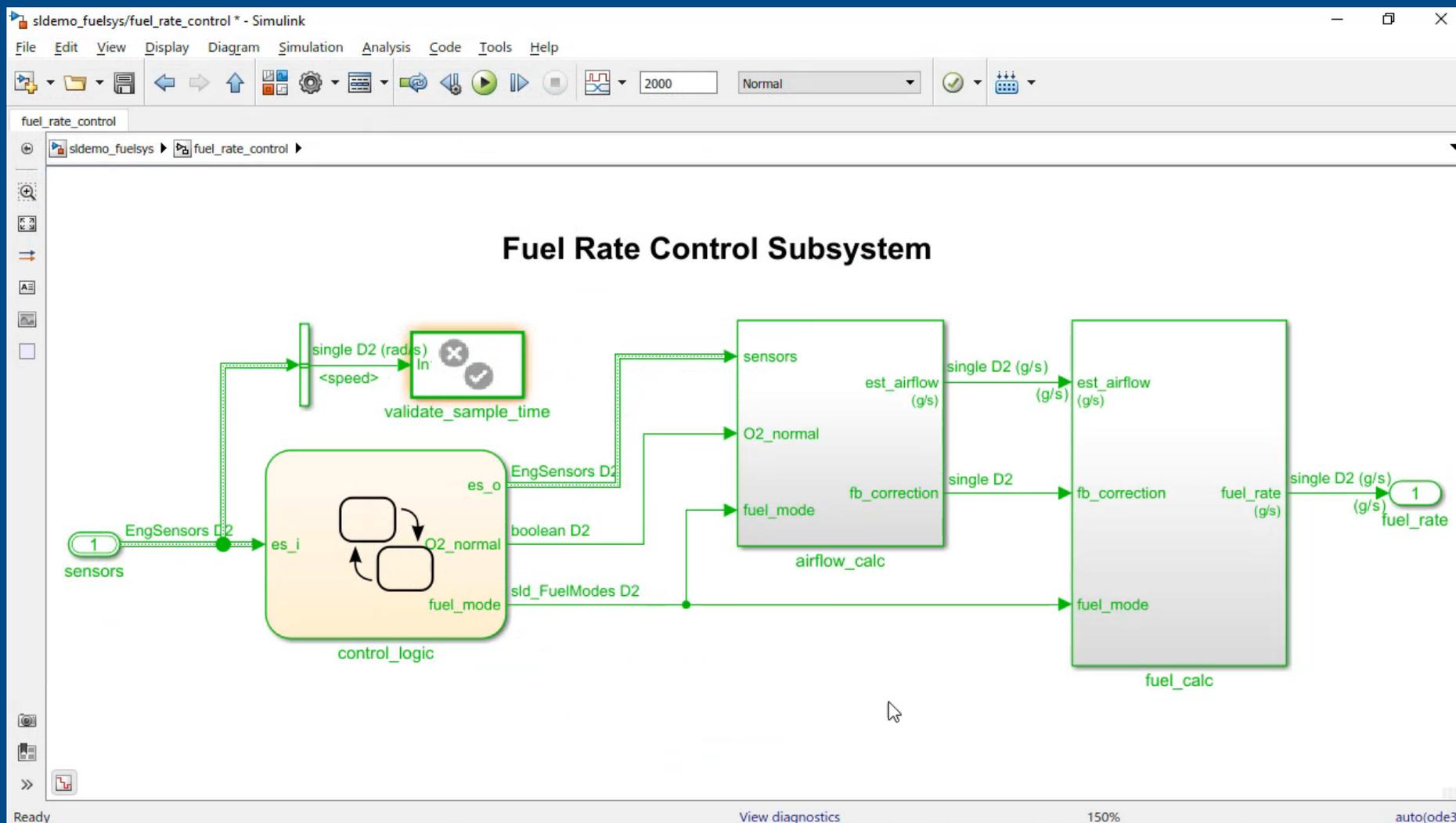
```
#include "rtwdemo_row_lutcol2row_workflow_rowrow.h"

/* Block parameters (default storage) */
P rtP = {
  /* Variable: Tbl_1
   * Referenced by: '<Root>/2-D Lookup Table'
   */
  { 1.0, 11.0, 21.0, 31.0, 41.0, 51.0, 2.0, 12.0, 22.0, 32.0, 42.0, 52.0, 3.0,
    13.0, 23.0, 33.0, 43.0, 53.0, 4.0, 14.0, 24.0, 34.0, 44.0, 54.0, 5.0, 15.0,
    25.0, 35.0, 45.0, 55.0, 6.0, 16.0, 26.0, 36.0, 46.0, 56.0, 7.0, 17.0, 27.0,
    37.0, 47.0, 57.0, 8.0, 18.0, 28.0, 38.0, 48.0, 58.0, 9.0, 19.0, 29.0, 39.0,
    49.0, 59.0, 10.0, 20.0, 30.0, 40.0, 50.0, 60.0 }
};
```

Viewing Generated Code Alongside the Model



Viewing Generated Code Alongside the Model



Sharing Live Scripts



Live Editor - C:\MATLAB\SunriseSunset_final.mlx *

LIVE EDITOR INSERT VIEW

New Open Save Find Files Compare Go To Text **B I U M** Code Control Refactor Run Section Run and Advance Run Step Stop Section Break Run to End

SunriseSunset_final.mlx * +

Estimating Sunrise and Sunset




Using the latitude (ϕ), the sun's declination (δ) and the solar time correction (SC) we can calculate sunrise and sunset times.

$$\text{sunrise} = 12 - \frac{\cos^{-1}(-\tan \phi \tan \delta)}{15^\circ} - \frac{SC}{60} \qquad \text{sunset} = 12 + \frac{\cos^{-1}(-\tan \phi \tan \delta)}{15^\circ}$$

Refer to [this page](#) for background and details on the equations used.

script



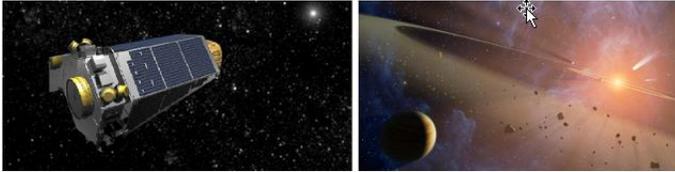
Sharing Live Scripts

AutoSave [OFF] ExploringExoplanets.docx - Compatibility Mode David Garrison

File Home Insert Design Layout References Mailings Review View Help Tell me what you want to do Share

Clipboard Font Paragraph Styles Editing

Exploring Exoplanets



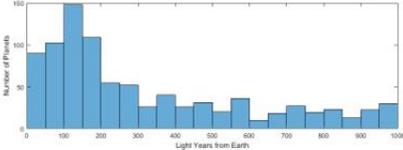
In this example we will explore some data on exoplanets - planets outside our own solar system. The data used here is a subset of data from the [NASA Exoplanet Archive](#). We will start by using the data to answer some questions about the set of exoplanets in the archive. Then we will do some calculations to try to identify planets in the archive that might be capable of supporting life.

```
exoplanets = readtable("exoplanets.xlsx");
exoplanets(1:10,:);
```

How Far Away Are these Planets?

There are 90 exoplanets within 50 light-years of earth and 450 exoplanets within 200 light-years.

```
histogram(3.26*exoplanets.st_distance,'BinWidth', 50)
xlim([0 1000])
ylabel 'Number of Planets'
xlabel 'Light Years from Earth'
```



Where is the nearest exoplanet?

```
idx = find(exoplanets.st_distance == min(exoplanets.st_distance));
name = char(exoplanets(idx,'st_name'));
```

Page 1 of 7 1468 words 100%

Sharing Live Scripts



Live Editor - C:\MATLAB\CompressibilityFactor.mlx

LIVE EDITOR INSERT VIEW

New Open Save Find Files Compare Print Go To Find Text Code Refactor Run Section Run and Advance Run Step Stop

CompressibilityFactor.mlx

P

Slider 350

Drop down "carbon dioxide"

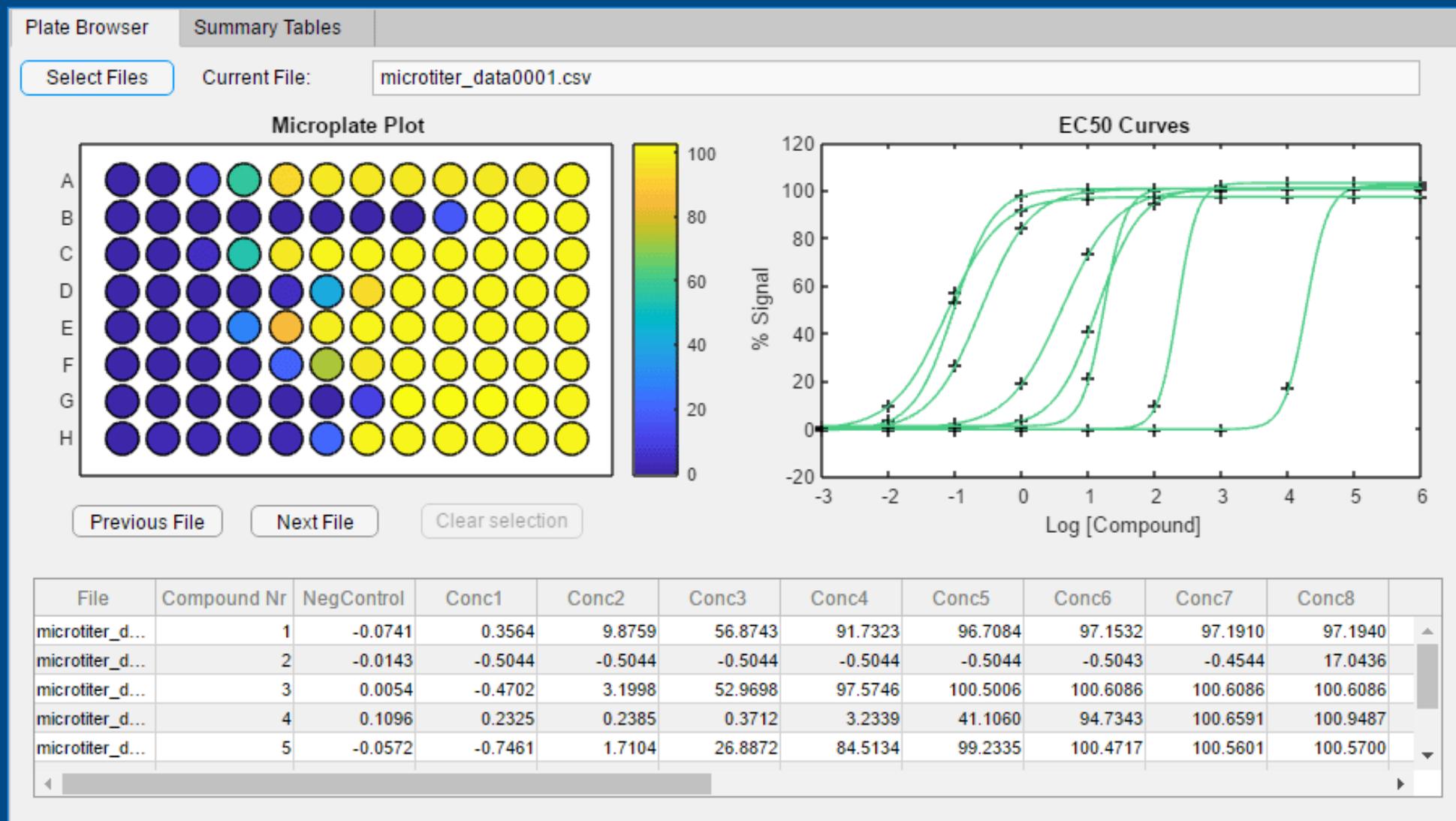
carbon dioxide @ 350 Kelvin

Compressibility Factor, Z	Value
1.00	0.00
0.98	0.20
0.96	0.40
0.94	0.60
0.92	0.80
0.91	1.00

Hide Code

script Ln 5 Col 23

Creating Apps



Deploying Web Apps



MATLAB Web Apps

Transient Heat Conduction

Initial and Boundary Conditions

Initial T (C):

Top T (C):

Bottom T (C):

Left T (C):

Right T (C):

Geometry

x (m):

y (m):

dx (m):

dy (m):

Note: Numerical stability requires F...
Current Fo = 0.0608

Thermal Diffusivity

Alpha (m²/s):

Air
Copper
Water

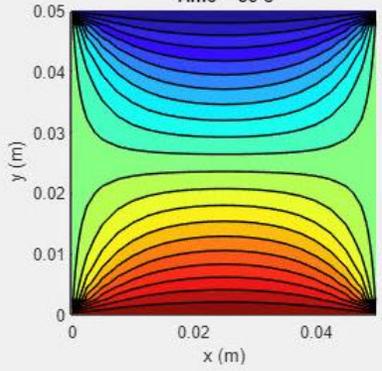
Time and Convergence

dt (s):

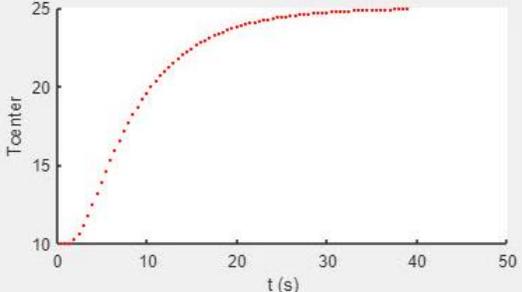
Total Time (s):

Convergence Criterion:

Time = 39 s



Temperature vs. Time



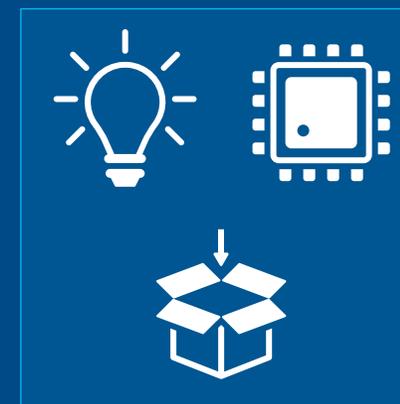
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Inputs



Design



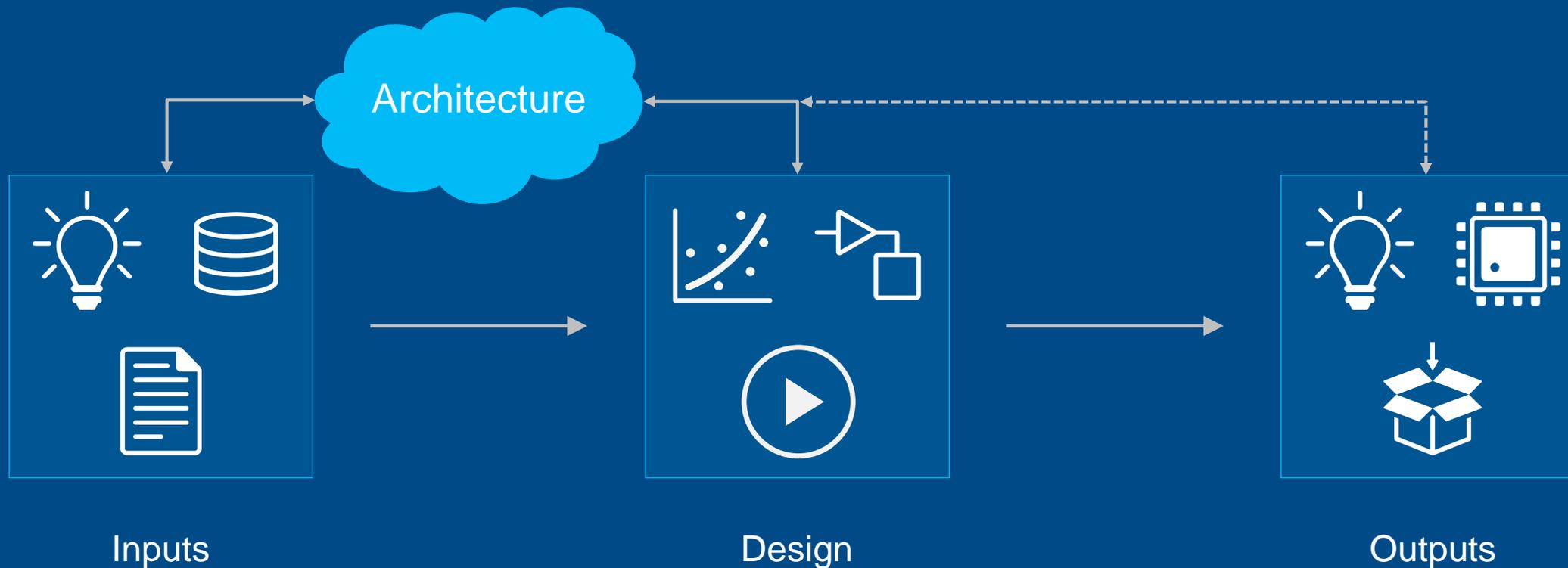
Outputs



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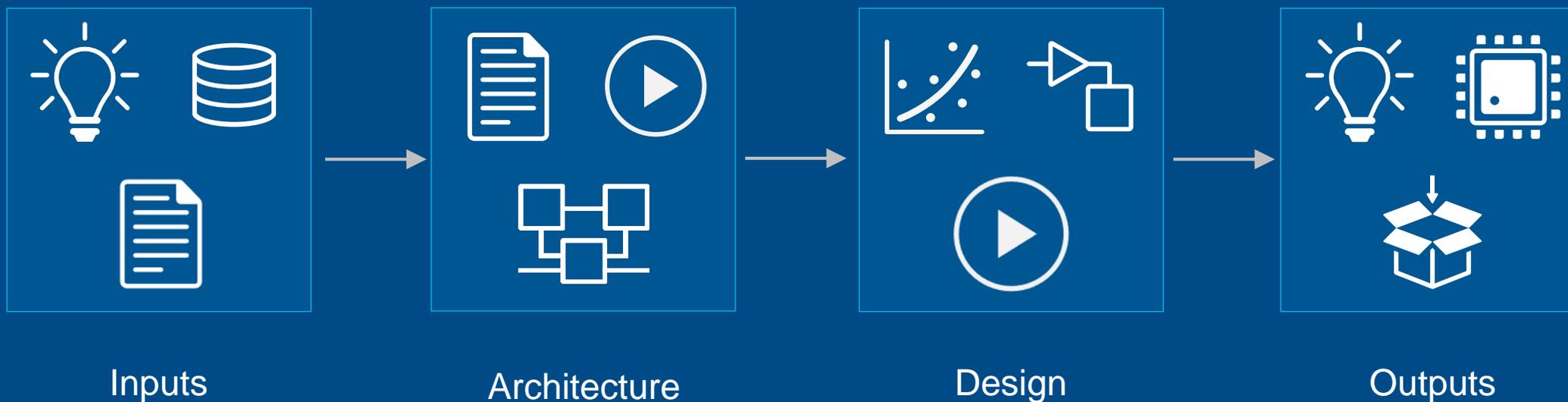
Evaluating Architectures



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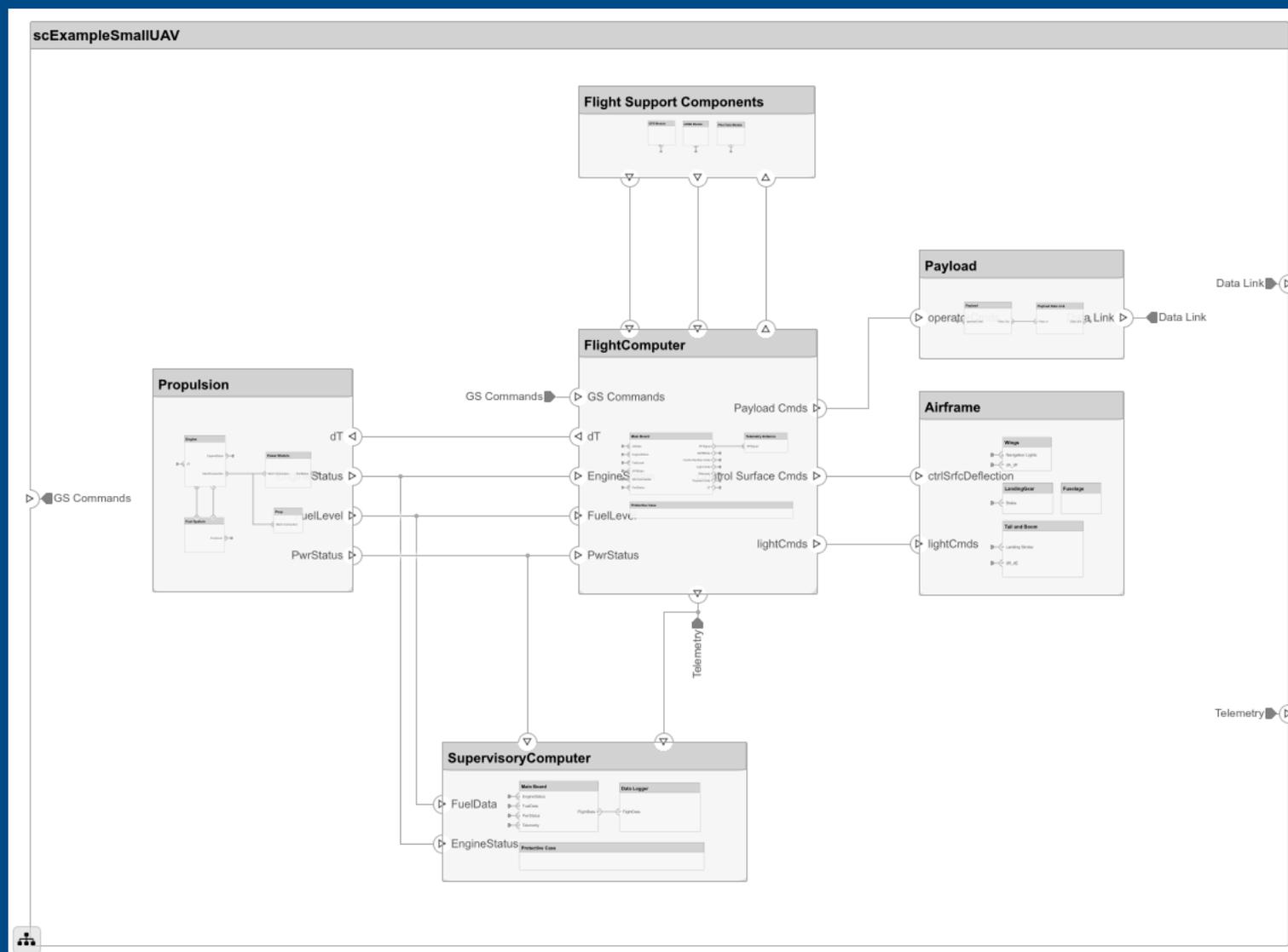
Evaluating Architectures



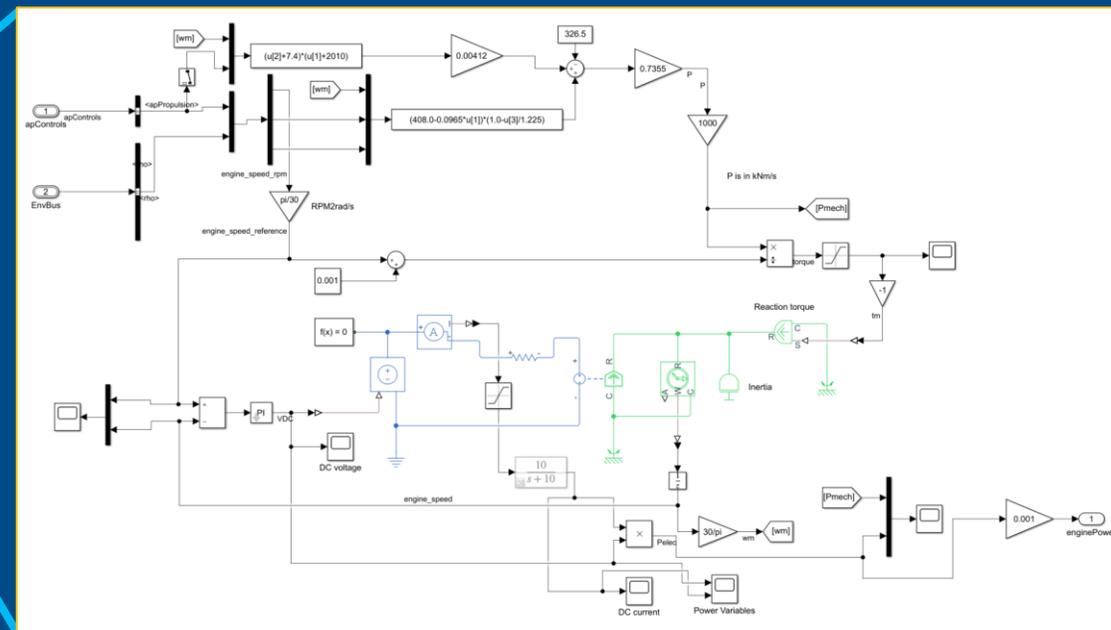
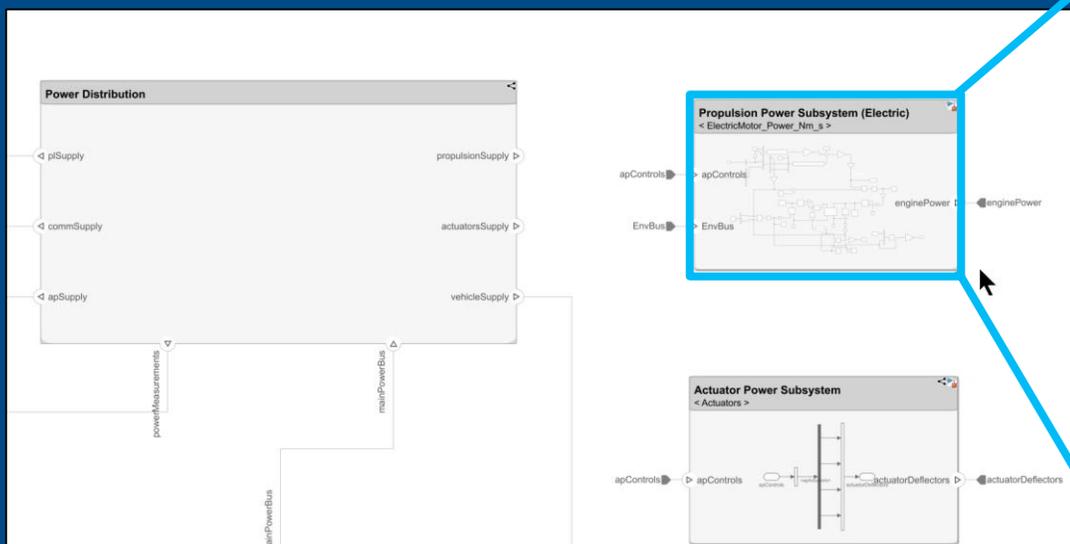
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Designing System and Software Architectures



Designing System and Software Architectures



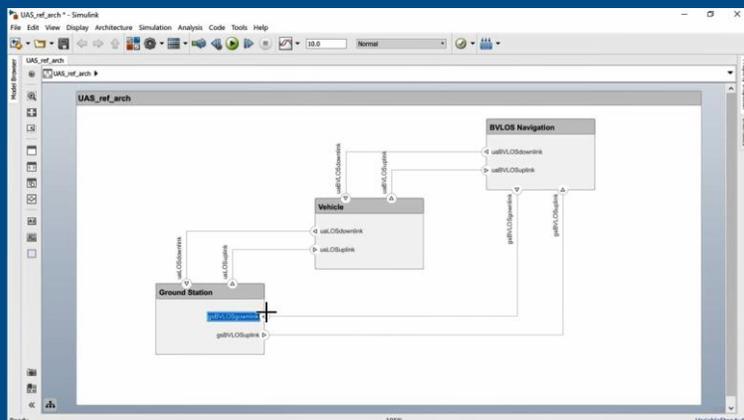
Designing **Beyond** System and Software Architectures



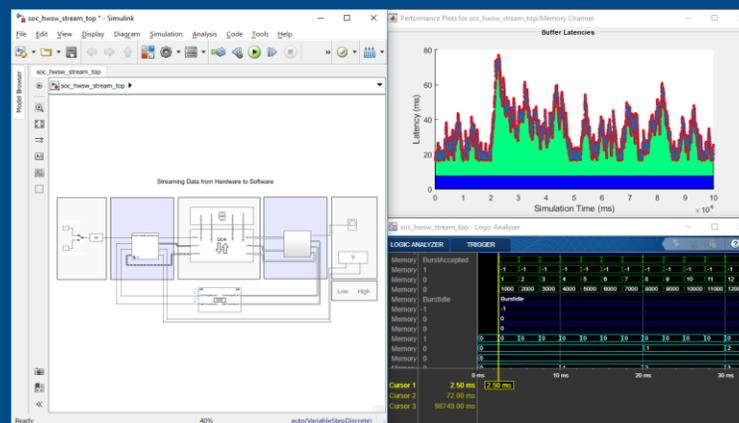
Systems and Software

SoC Hardware and Software

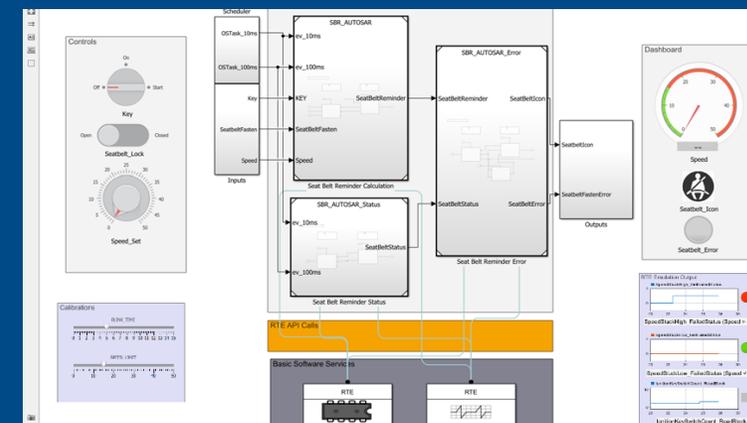
AUTOSAR Software



System Composer



SoC Blockset



AUTOSAR Blockset

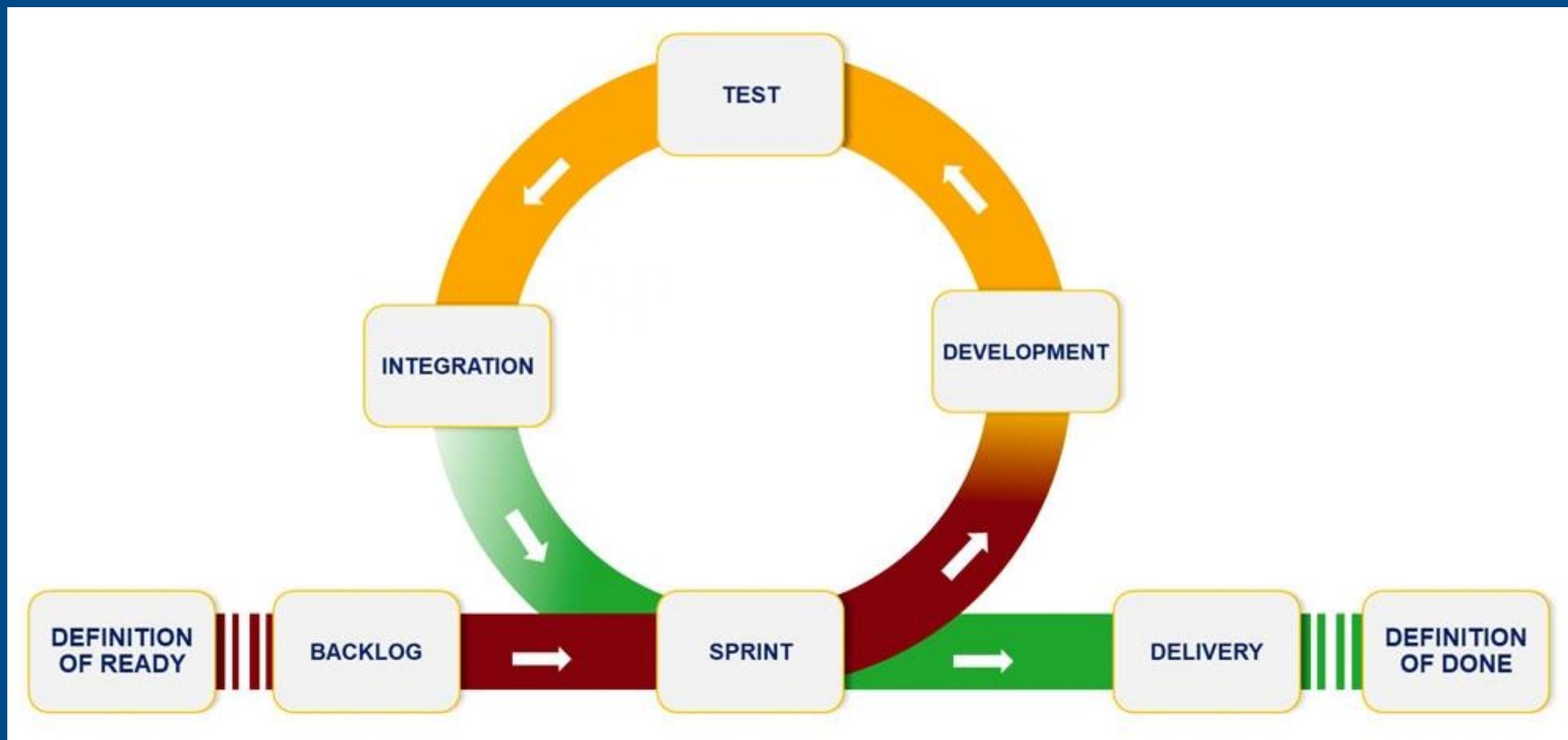
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Integrating with Third-party Requirements Tools



↔ Test & Verification

External Requirements



Requirements
Management
Tools

R2019a



ReqIF

Simulink Requirements

External Requirements



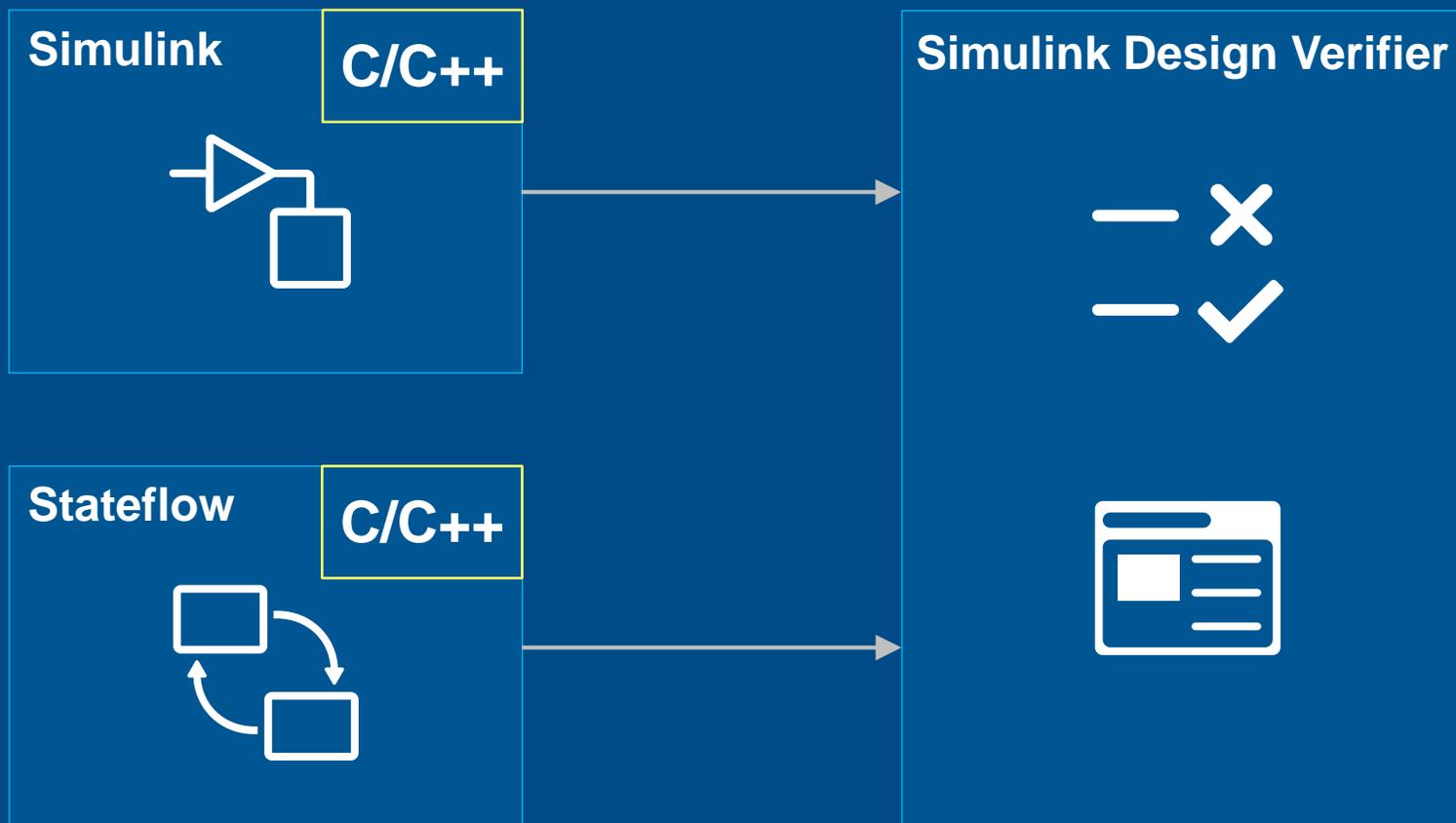
Authored Requirements



Include Custom Code in Test & Verification



⇄ Test & Verification



Using the MATLAB Unit Test Framework



⇌ Test & Verification

```
>> result.table
```

```
ans =
```

```
2×6 table
```

Name	Passed	Failed	Incomplete	Duration	Details
'test_Predictions/Test_ModelType'	true	false	false	0.12241	[1×1 struct]
'test_Predictions/Test_Prediction'	false	true	true	0.11542	[1×1 struct]

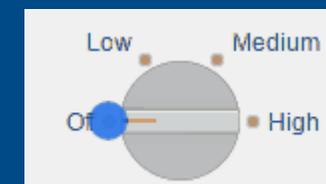
Using the MATLAB App Testing Framework



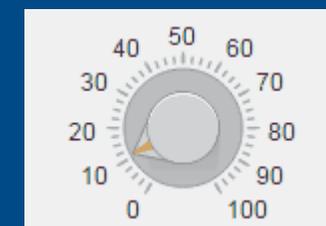
```
testCase.press(myApp.checkbox)
```



```
testCase.choose(myApp.discreteKnob, "Medium")
```



```
testCase.drag(myApp.continuousKnob, 10, 90)
```



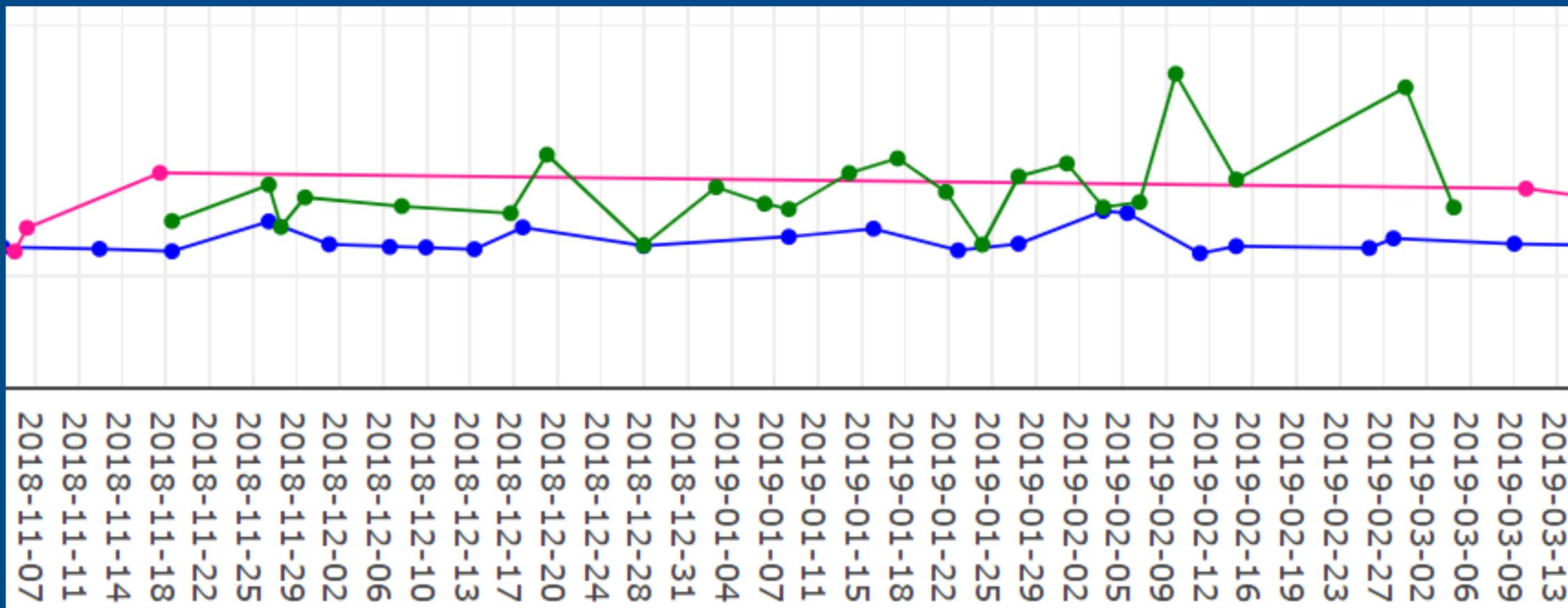
```
testCase.type(myApp.editfield, myTextVar)
```



Using the MATLAB Performance Testing Framework



↔ Test & Verification



Using Continuous Integration



⇄ Test & Verification

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- VectorCAST Execution
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- jQuery
- Analysis Model API

MATLAB

Using Continuous Integration



⇄ Test & Verification

Jenkins

Blog Documentation ▾

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MATLAB ^{1.0.0}

Minimum Jenkins requirement: 2.7.3
ID: matlab

Installs: No usage data available GitHub → Last released: 2 days ago	Maintainers MathWorks	Dependencies bouncycastle API v.2.16.0 (implied) (what's this?) Command Agent Launcher v.1.0 (implied) (what's this?) JDK Tool v.1.0 (implied) (what's this?) JAXB v.2.3.0 (implied) (what's this?)
--	--------------------------	---

The Jenkins plugin for MATLAB® enables you to easily run your MATLAB tests and generate test artifacts in formats such as JUnit, TAP, and Cobertura code coverage reports.

Features

- Support to run MATLAB tests, present in the Jenkins workspace automatically. (This also includes the tests present in .prj files)
- Generate tests artifacts in JUnit, TAP & Cobertura code coverage formats.
- Support to run tests, using custom MATLAB command or custom MATLAB script file.

Using Projects in MATLAB



Collaboration

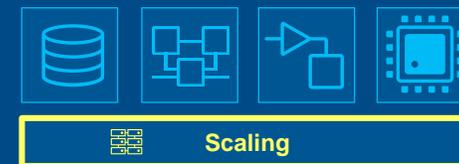
Search Custom Tasks Run Checks References Details Project Path Startup Shutdown Git Refresh Commit Fetch Push Pull Remote Branches

TOOLS ENVIRONMENT SOURCE CONTROL

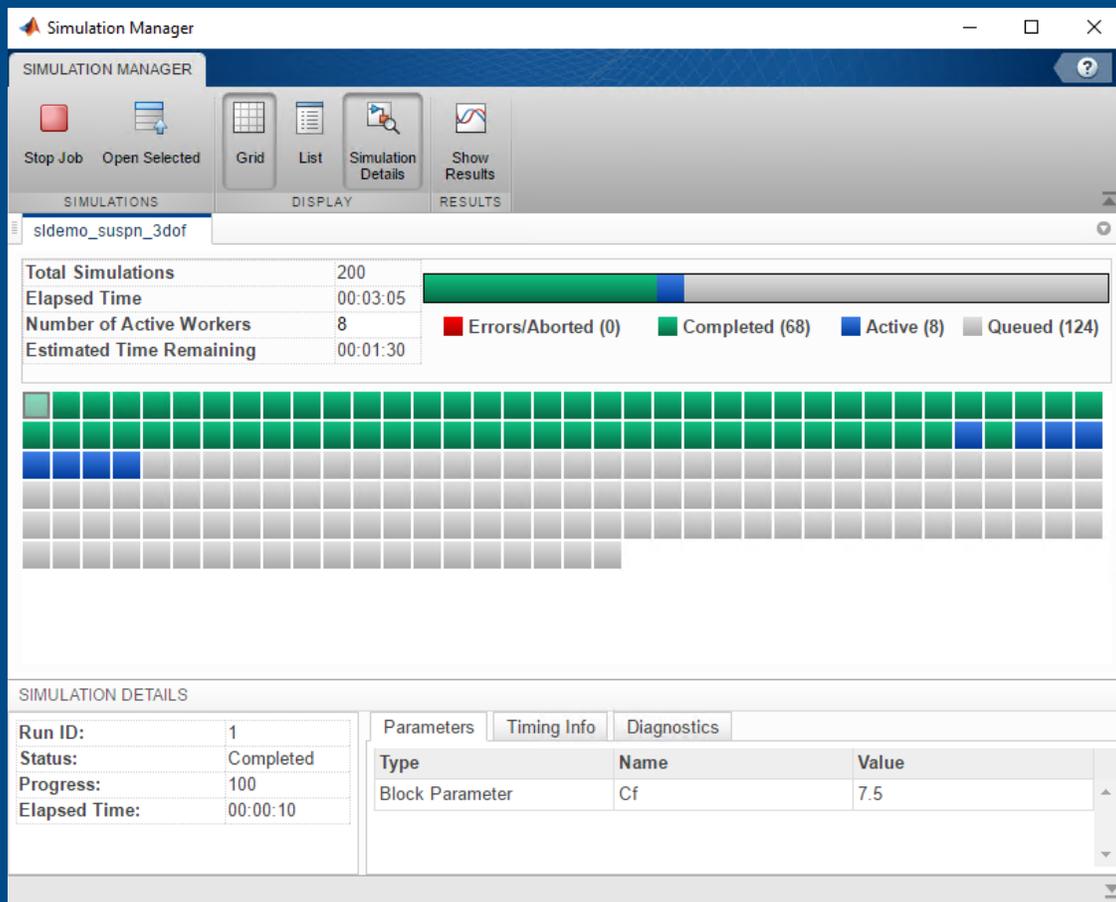
All **Project (226)** Modified (344)

Name	Status	Git	Classification
+Test	✓	■	Test
ACI	✓	·	
Dashboard	✓	·	
Documents	✓	·	
Elasticsearch	✓	·	
MachineLearning	✓	■	
MATLAB_Kafka_Producer_Java	✓	·	
mps_stream	✓	■	
SimExecutable	✓	·	
Simulation	✓	·	
DocExample_MultiClassFaultDetectionUsi...	✓	●	Design
genPumpData.m	✓	●	Design
javasetup.m	✓	+	Design
Main_ExampleWorkflow.mlx	✓	●	Design
MLModels.mat	✓	●	Design
rawdata.mat	✓	●	Design
README.md	✓	●	

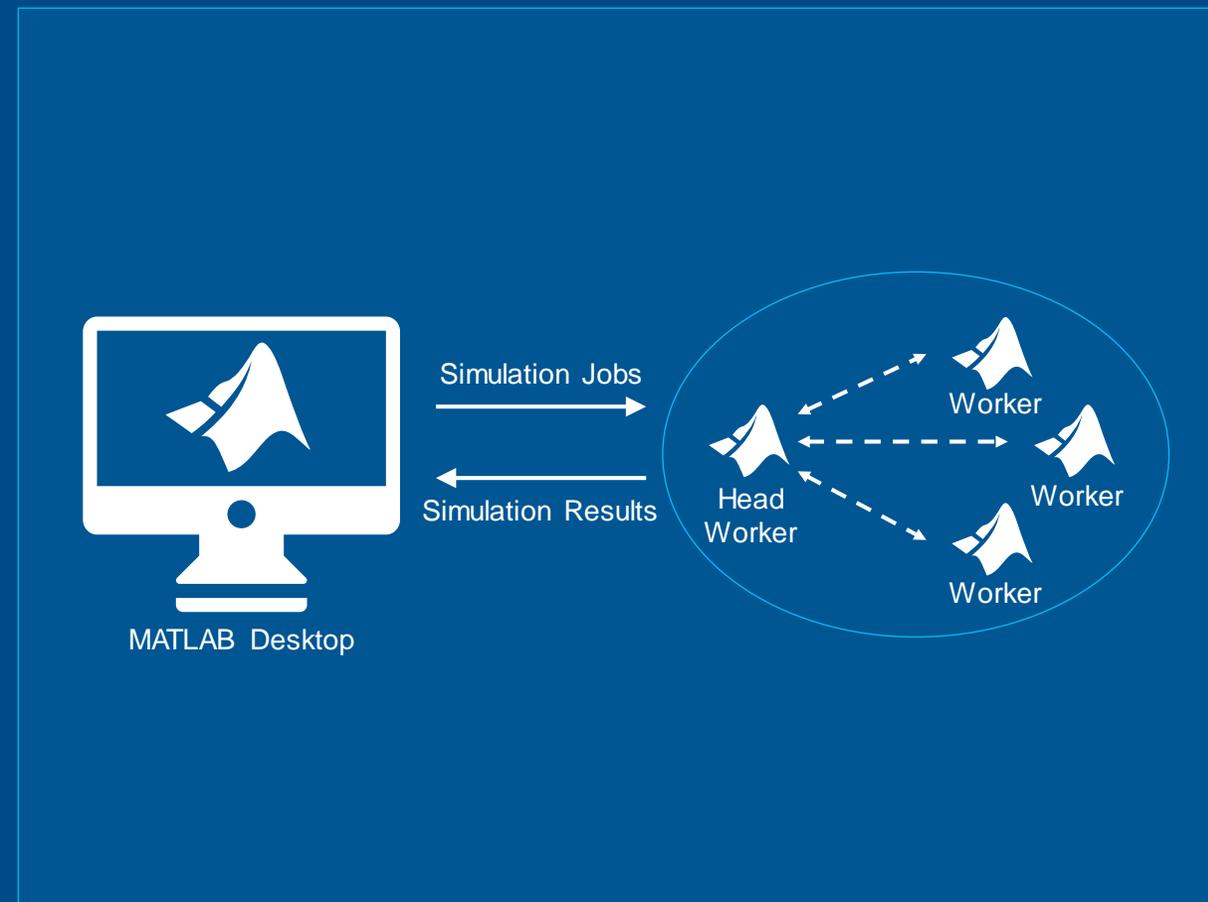
Parallel Simulations in Simulink



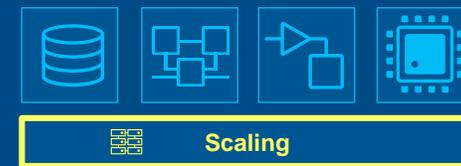
Simulation Manager



batchsim



Scaling Computations on Clusters and Clouds



MATLAB



MATLAB Parallel Server



Cloud



GPU



Multi-core CPU

Parallel Computing Toolbox

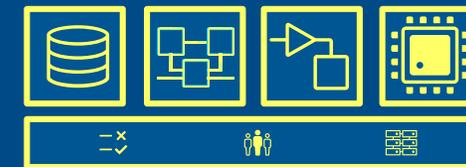
Using MATLAB & Simulink to Build Algorithms in Everything



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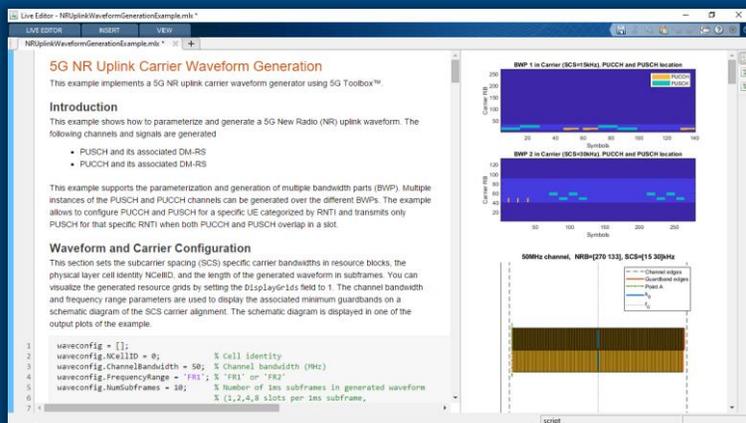
Specialized Tools for Building Algorithms in Everything



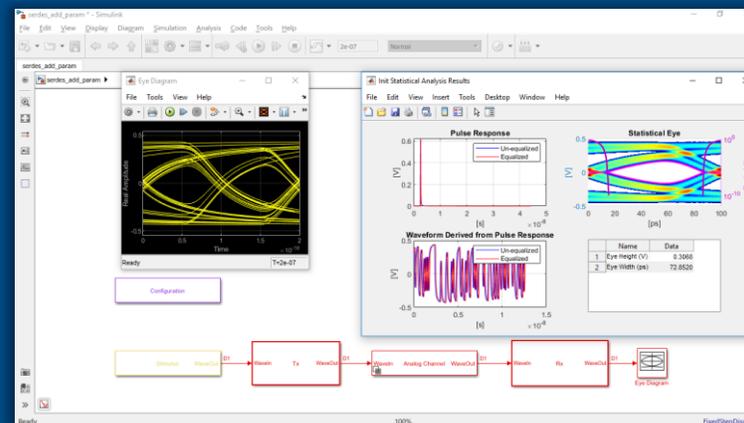
Communications

Physical interconnects

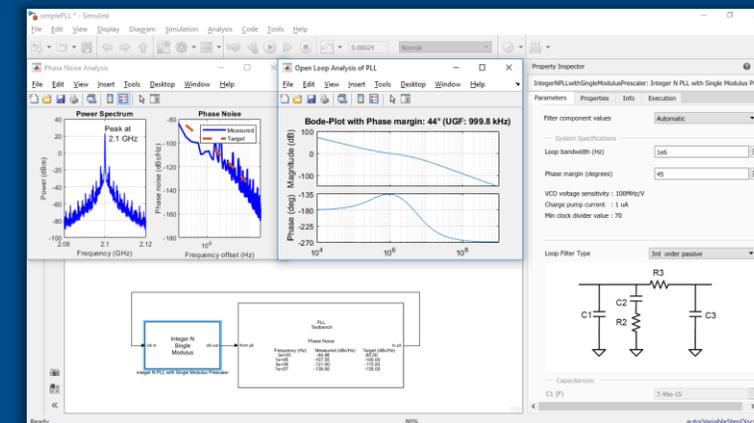
Analog Mixed-Signal



5G Toolbox

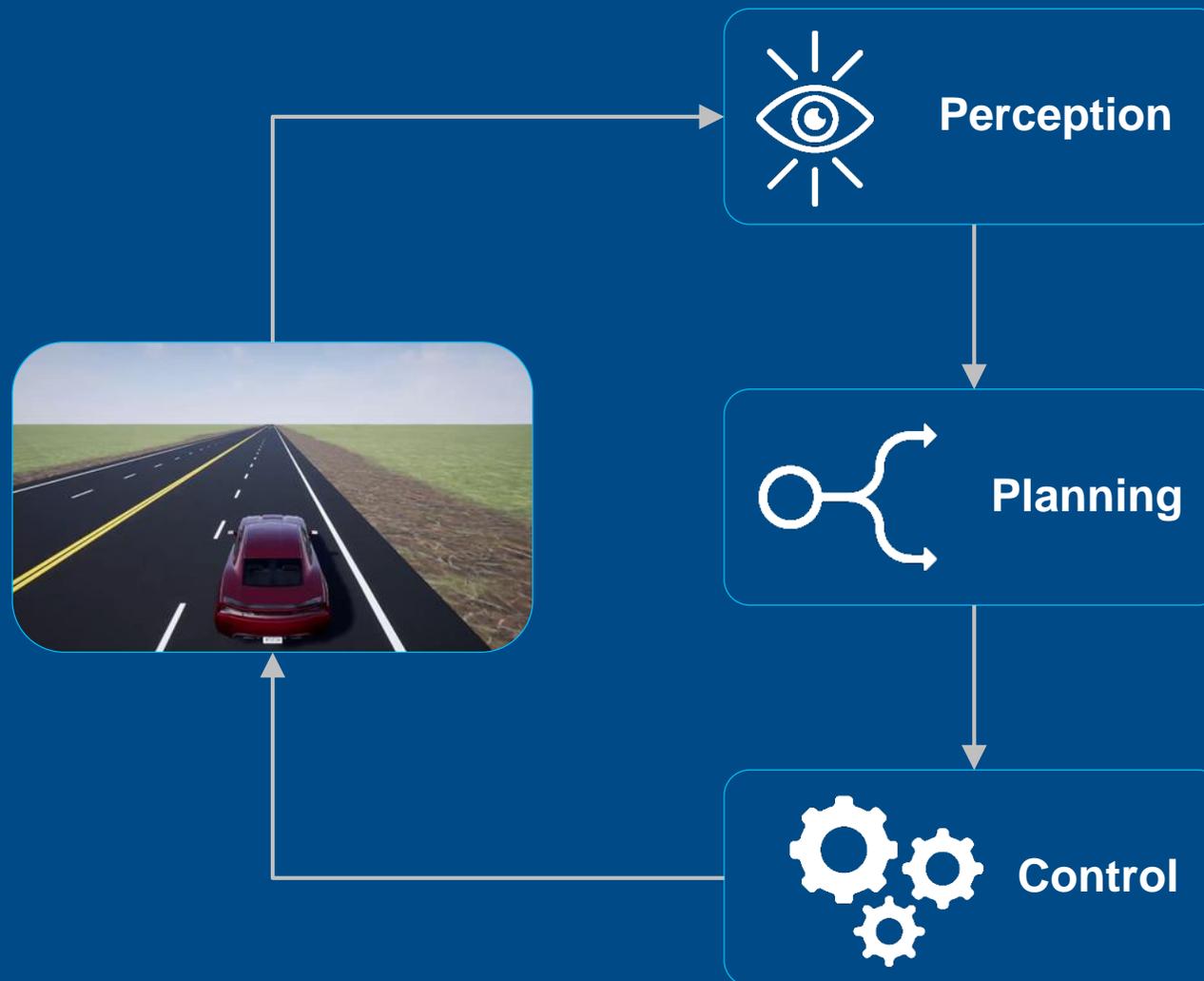


SerDes Toolbox

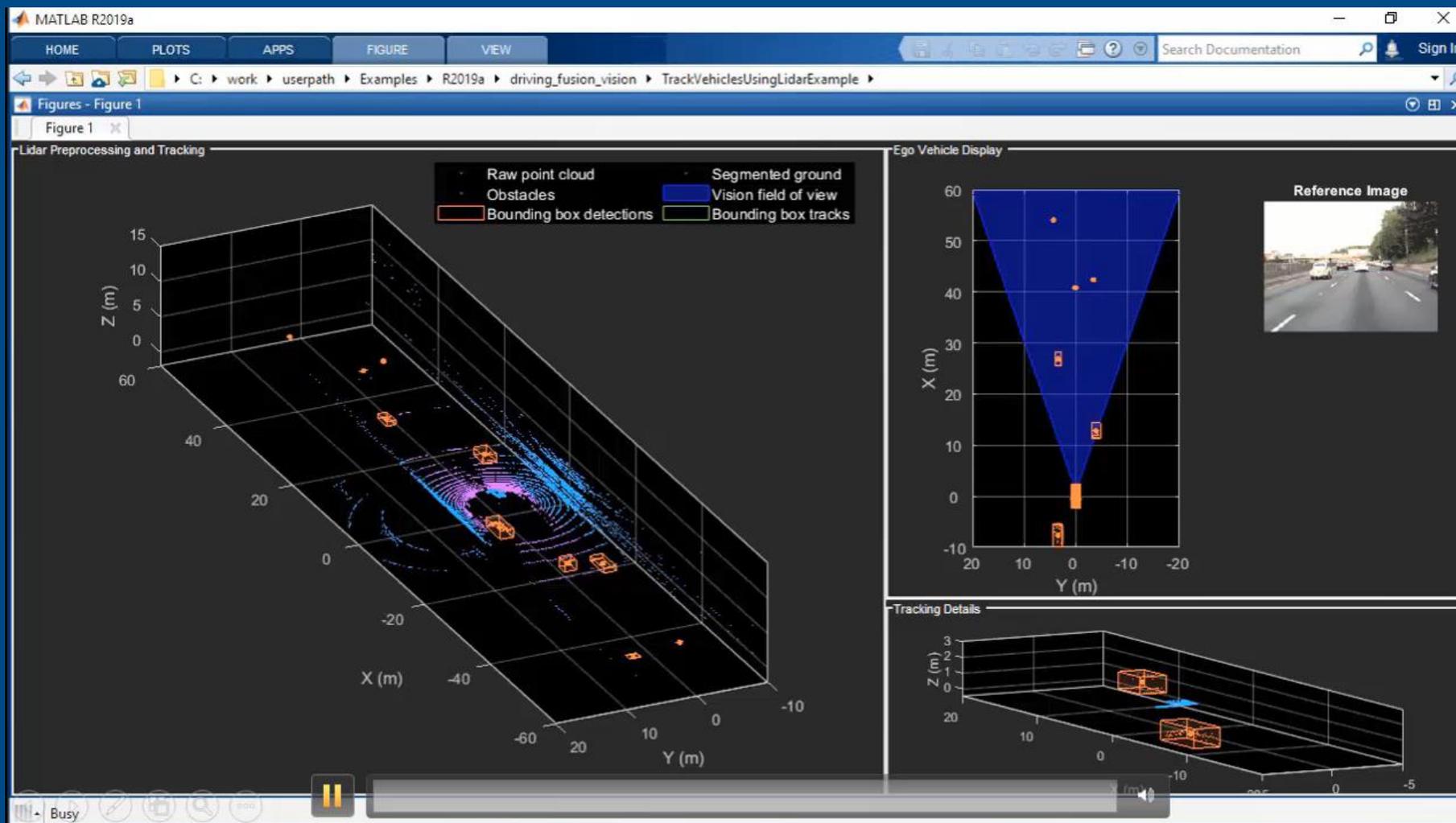
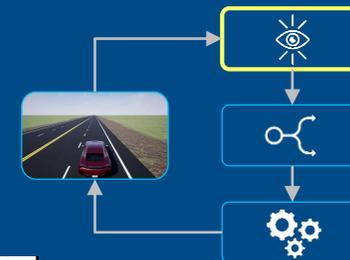


Mixed-Signal Blockset

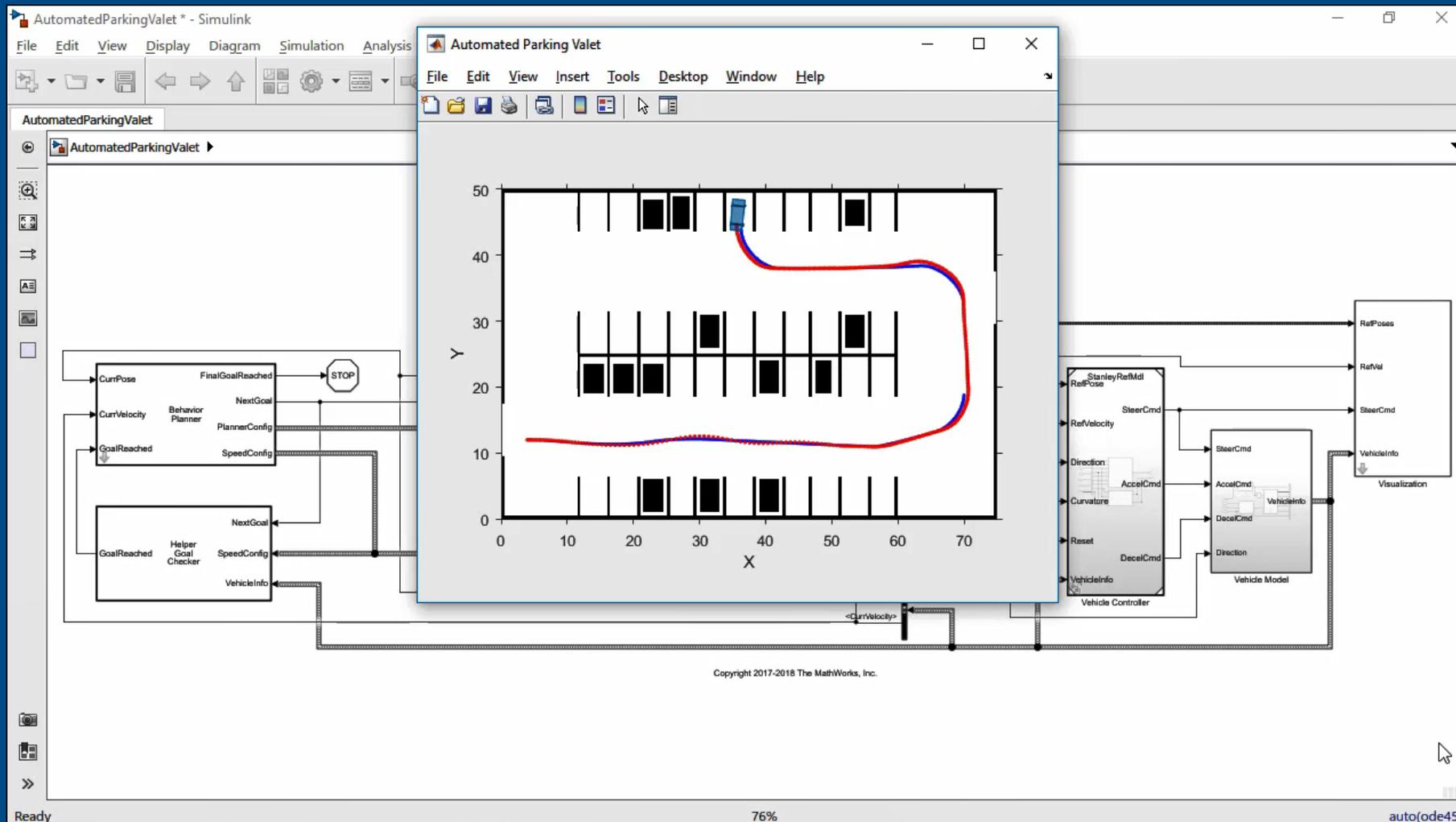
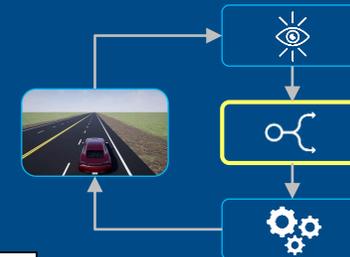
Developing Autonomous Systems



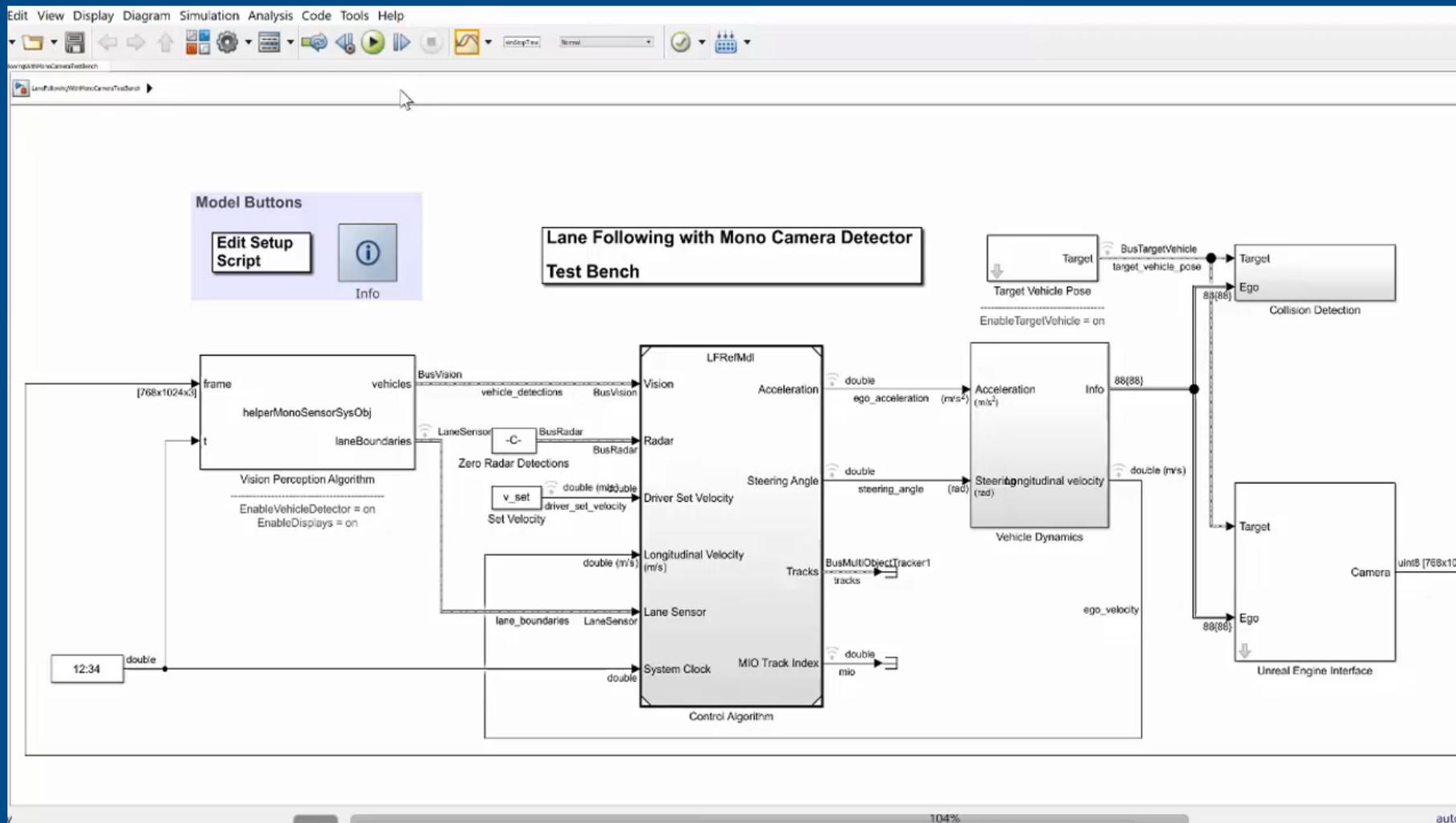
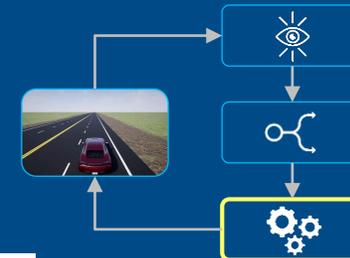
Evaluate Sensor Fusion Architectures



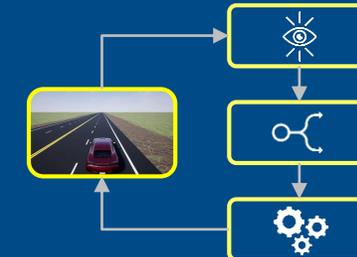
Simulate Path Planning Algorithms



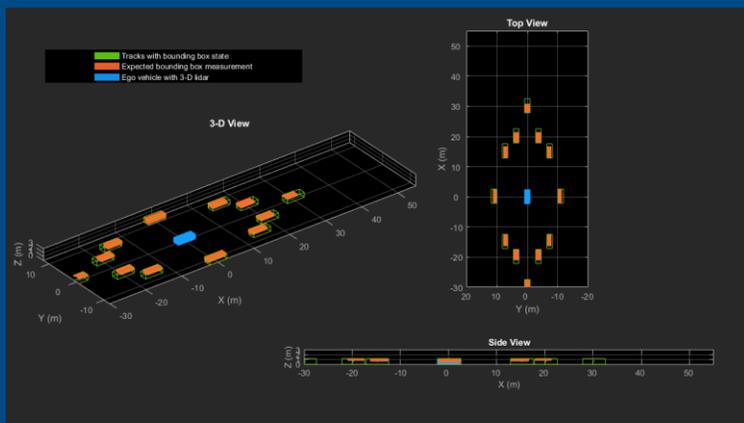
Design Lane-following and Spacing Control Algorithms



Developing Autonomous Systems

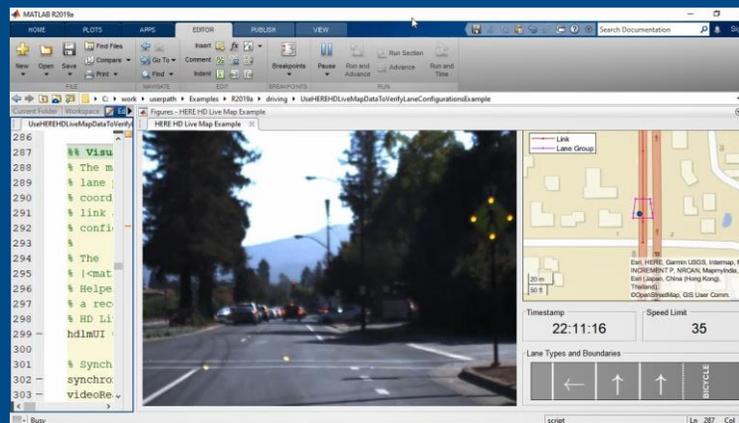


Lidar Processing & Tracking



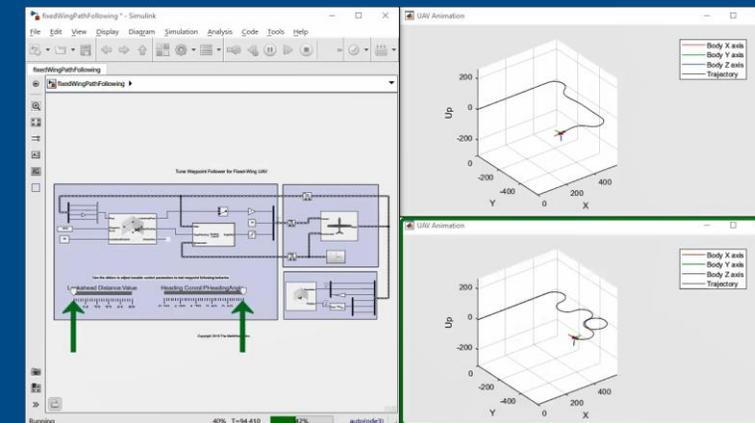
Computer Vision Toolbox

HERE HD Maps & OpenDRIVE Roads



Automated Driving Toolbox

UAV Algorithms



Robotics System Toolbox

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R2019a at a Glance

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Release Highlights



Deep Learning

Develop controllers and decision making systems using reinforcement learning, train deep learning models on NVIDIA DGX and cloud platforms, and apply deep learning to 3-D data.

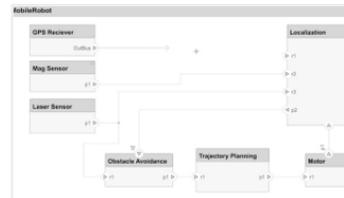
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Automotive

Design and simulate AUTOSAR software, interface with HERE HD maps, and generate energy balance reports.

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Systems Engineering

Design and analyze system and software architectures with System Composer.

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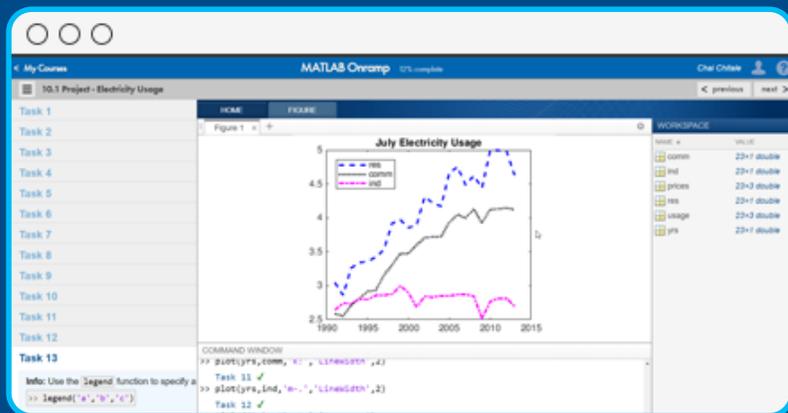


Projects

Use projects in MATLAB and Simulink to organize, manage, and share your work.

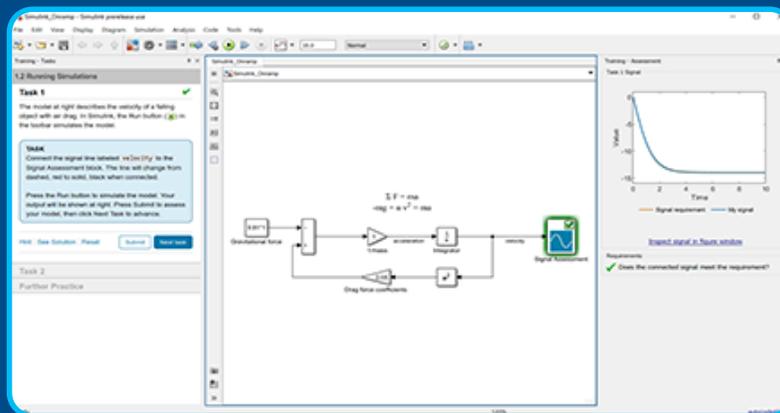
[» Learn more](#)

Get Started



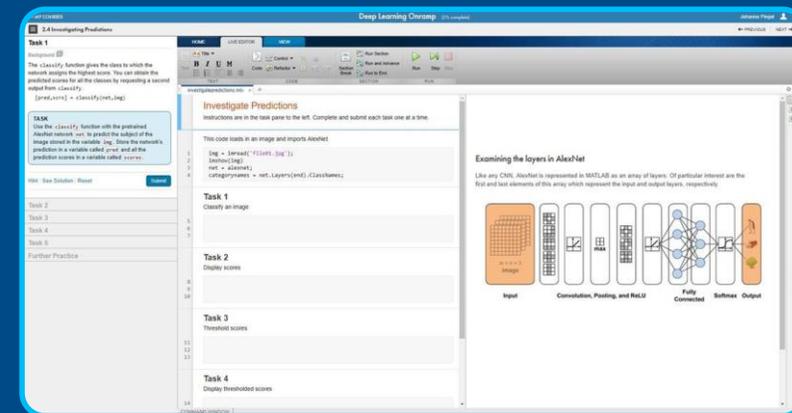
MATLAB Onramp

Quickly learn the essentials of MATLAB.



Simulink Onramp

Learn to create, edit, and troubleshoot Simulink models.



Deep Learning Onramp

Learn to use deep learning techniques in MATLAB for image recognition.

MATLAB EXPO 2019

