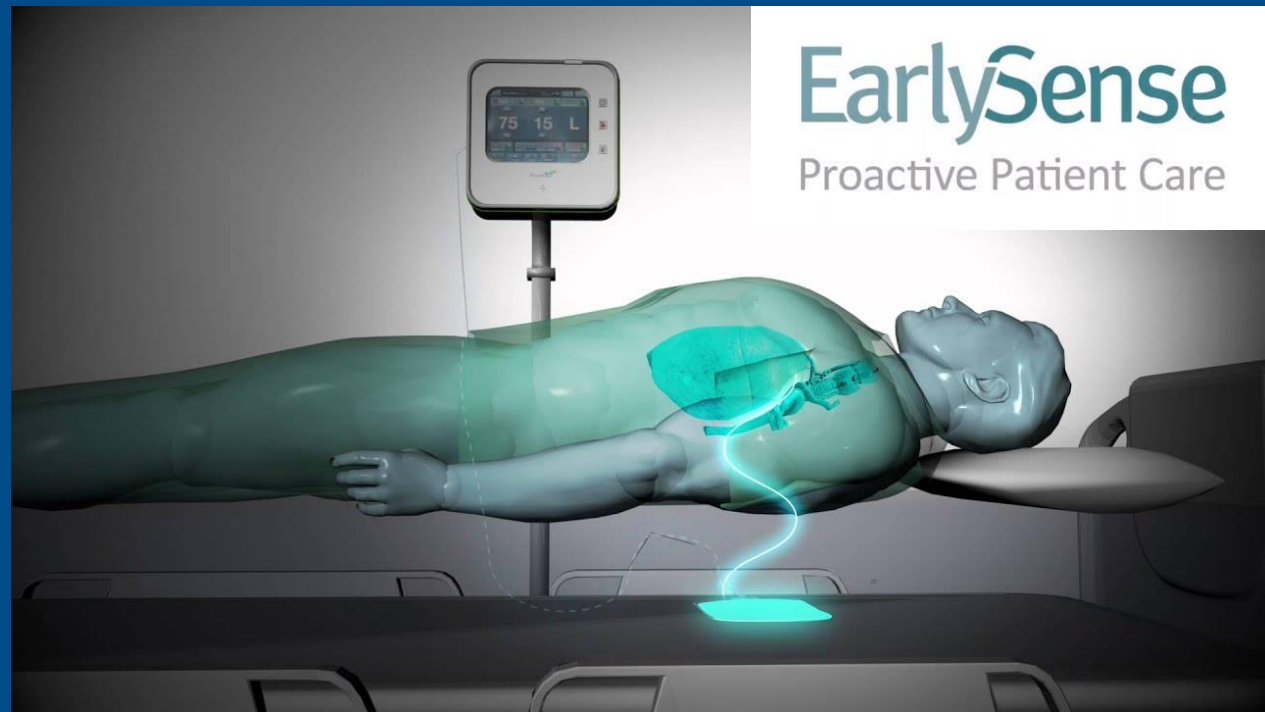
MATLAB EXPO 2019

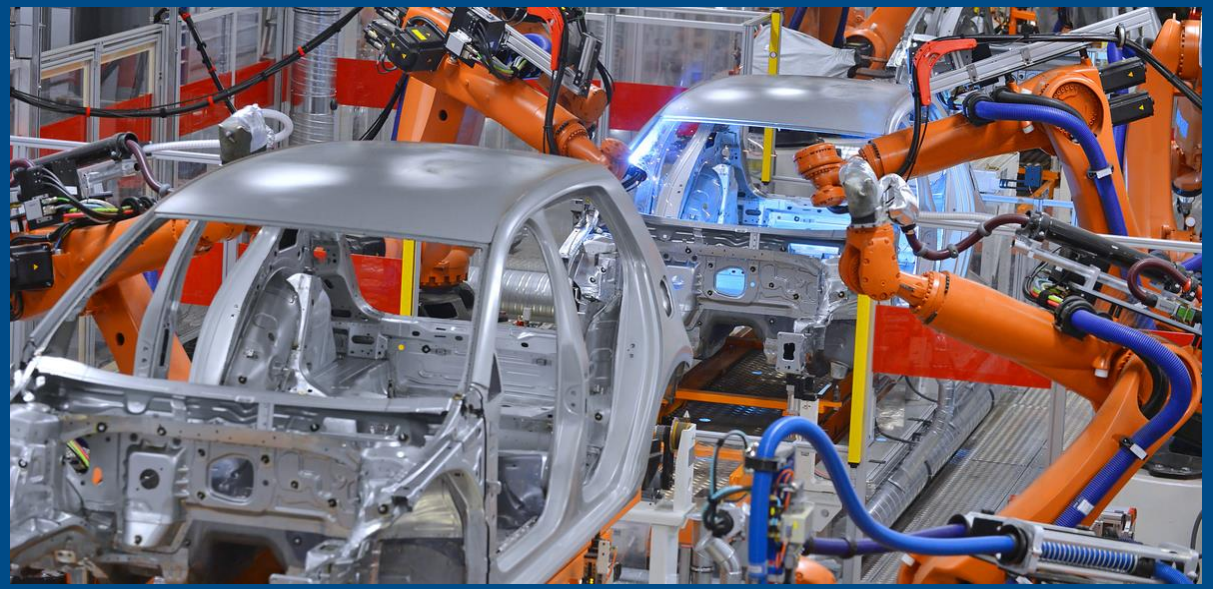
MATLAB과 Simulink 제품군의 새로운 기능들 (R2018b/R2019a)

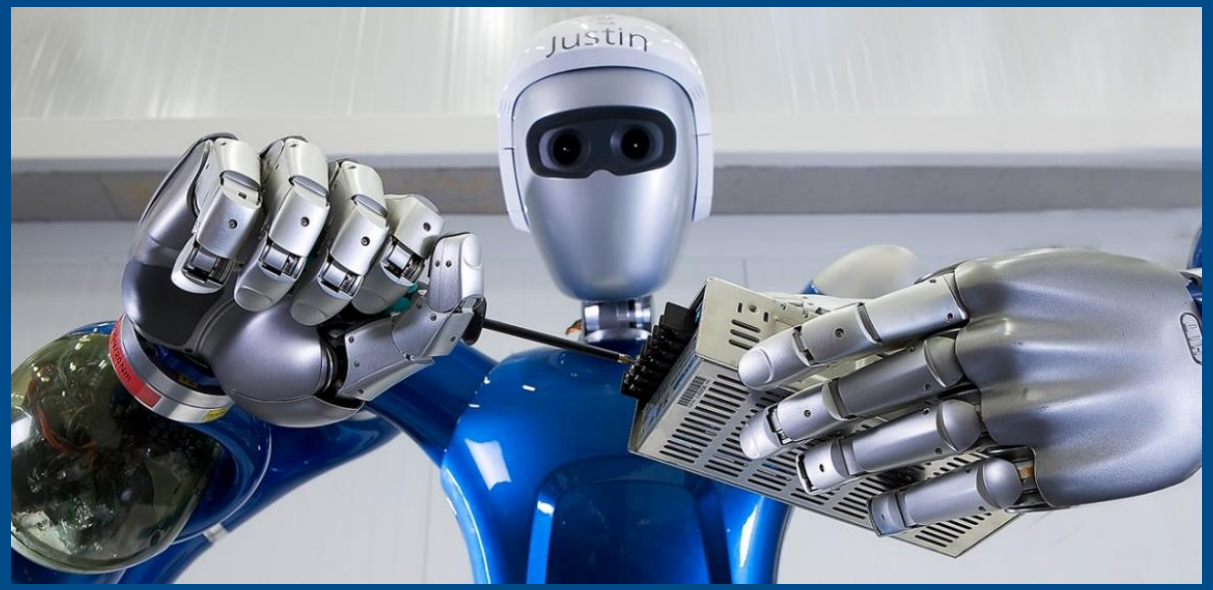
이영준


VOYAGE


EarlySense
Proactive Patient Care

Algorithms in Everything



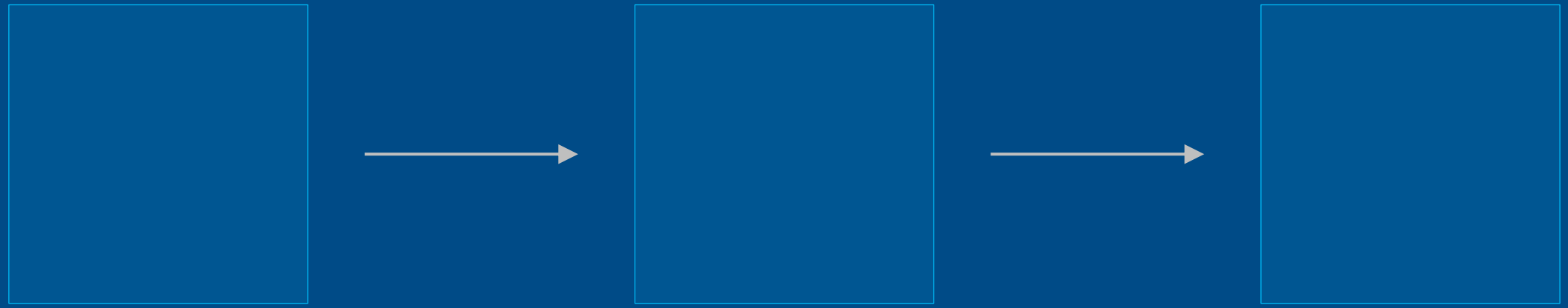


Using MATLAB & Simulink to Build Algorithms in Everything

Simplifying your work…

…often at higher levels of abstraction.

Using MATLAB & Simulink to Build Algorithms in Everything



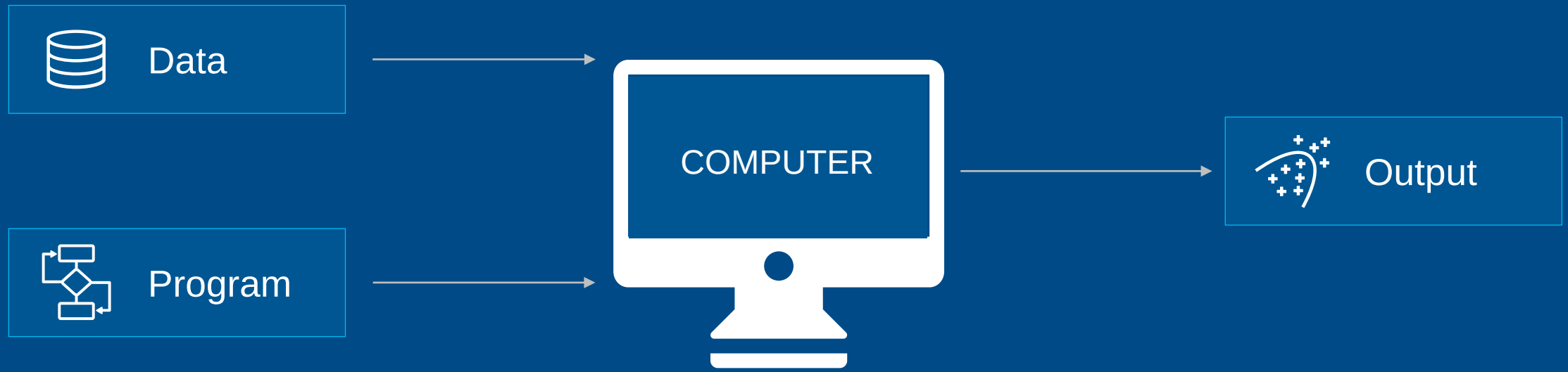
MATLAB&SIMULINK®

Artificial Intelligence

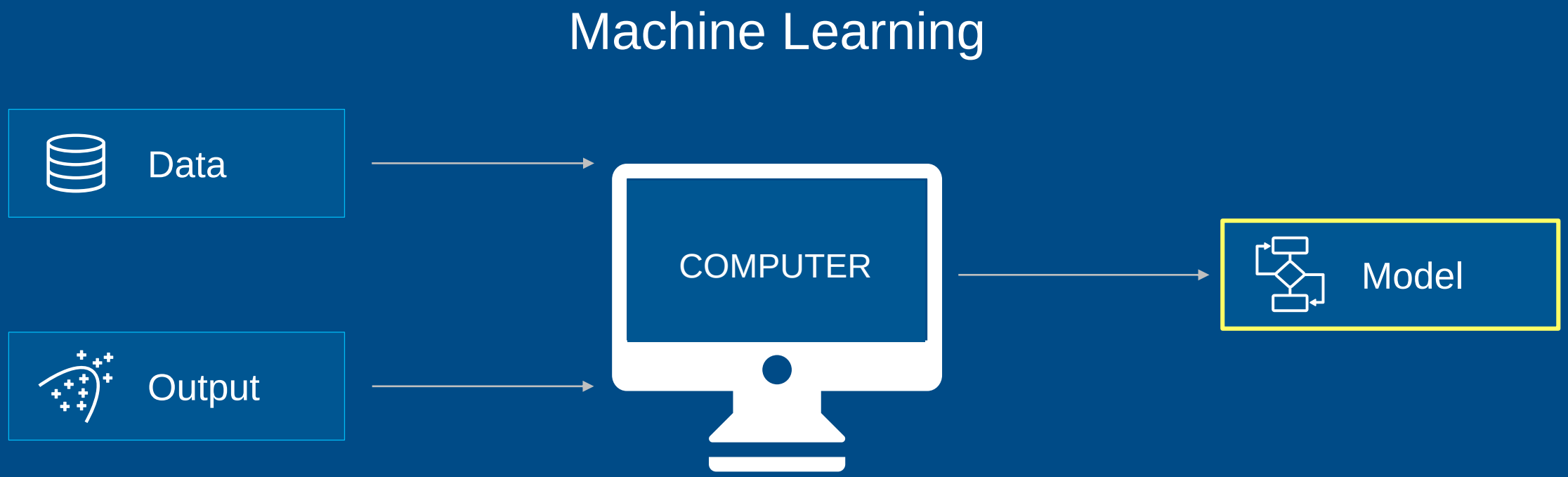
The capability of a machine to
match or exceed intelligent human behavior by
training a machine
to learn the desired behavior

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

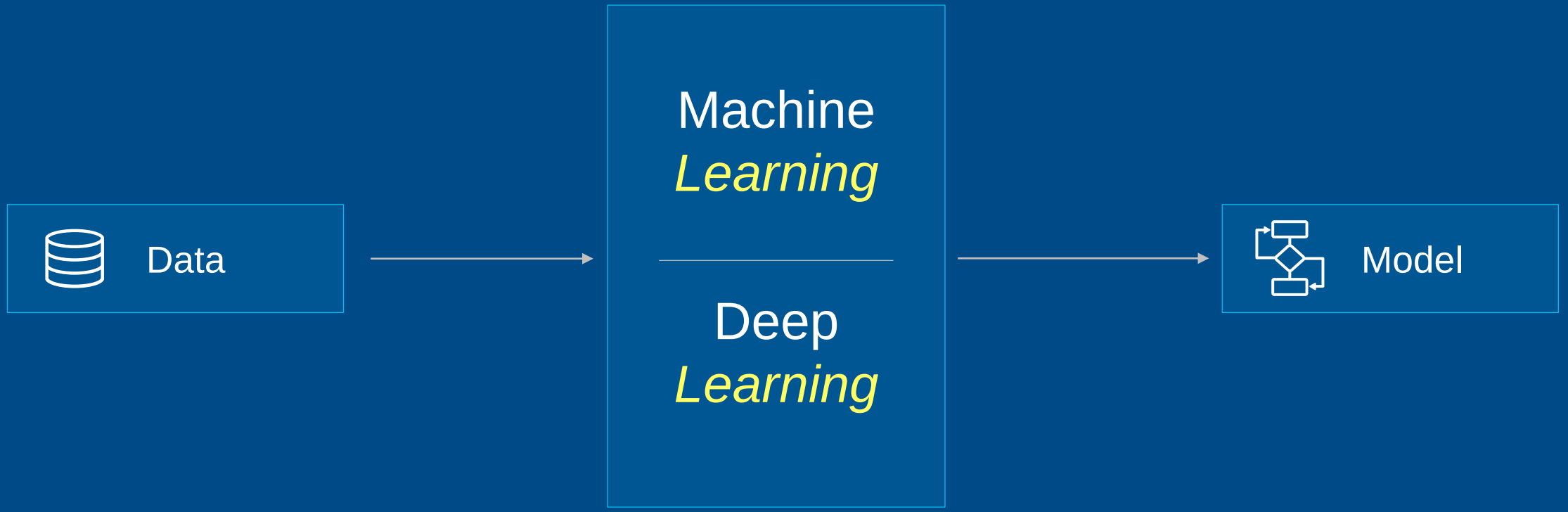
Traditional Programming



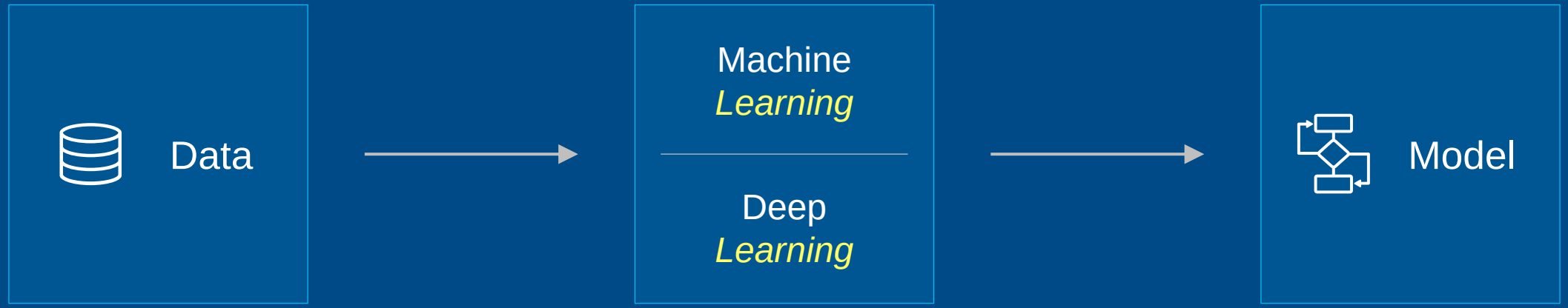
There are two ways to get a computer to do what you want



Artificial Intelligence



Using MATLAB and Simulink to Build Deep Learning Models



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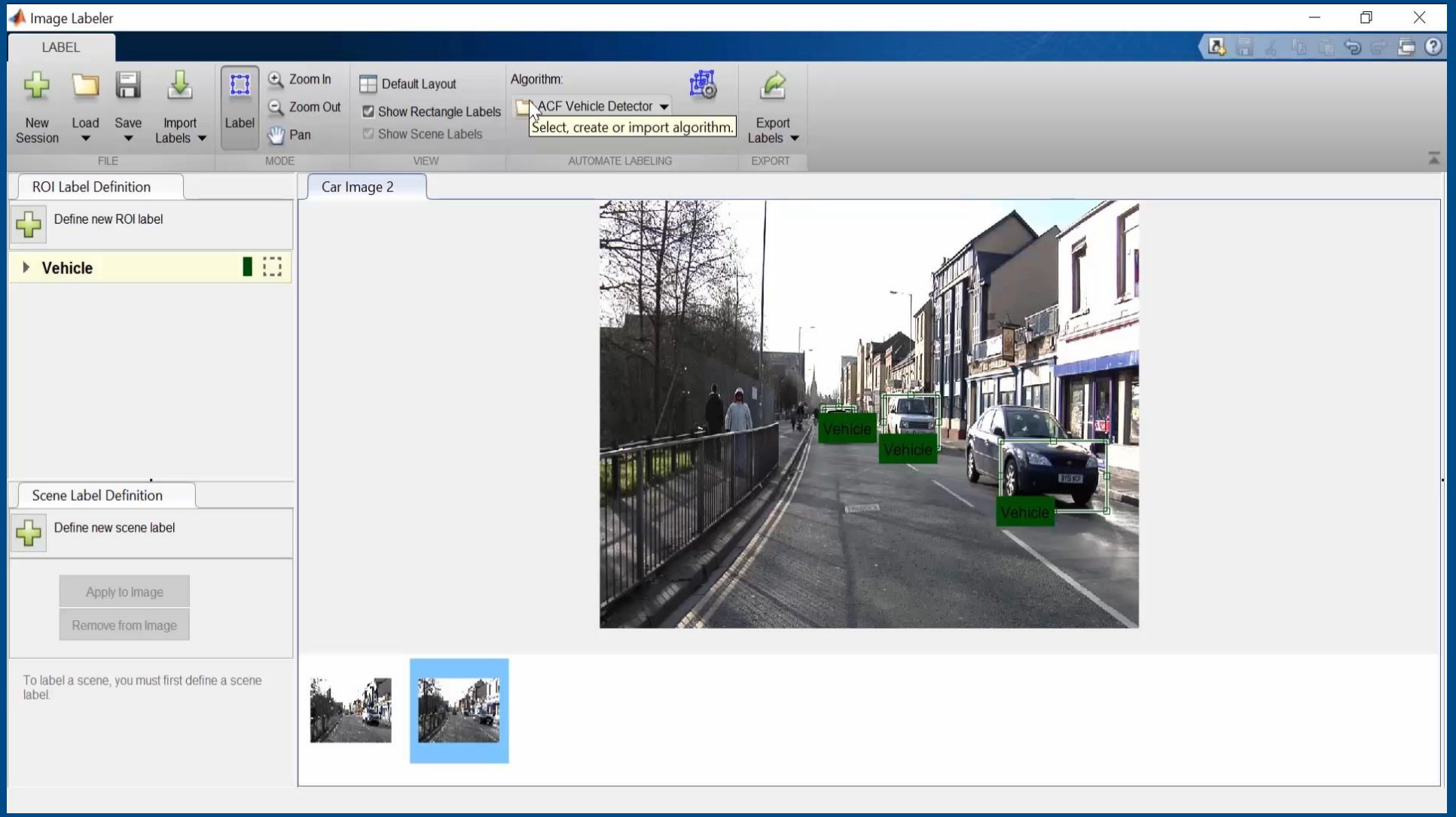
Using Apps for Ground Truth Labeling

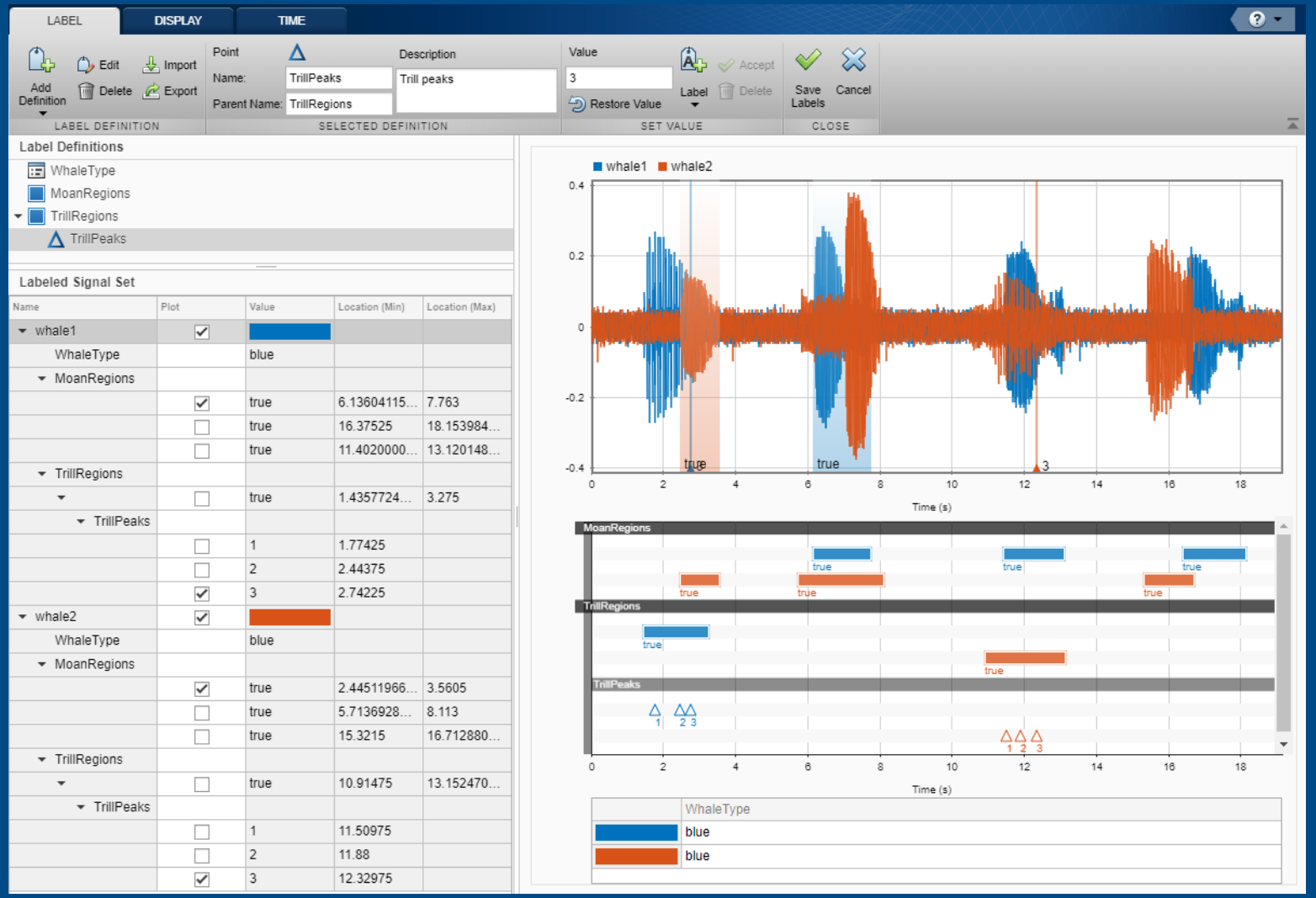
Image and Video Data



Computer Vision Toolbox

Using Apps for Ground Truth Labeling

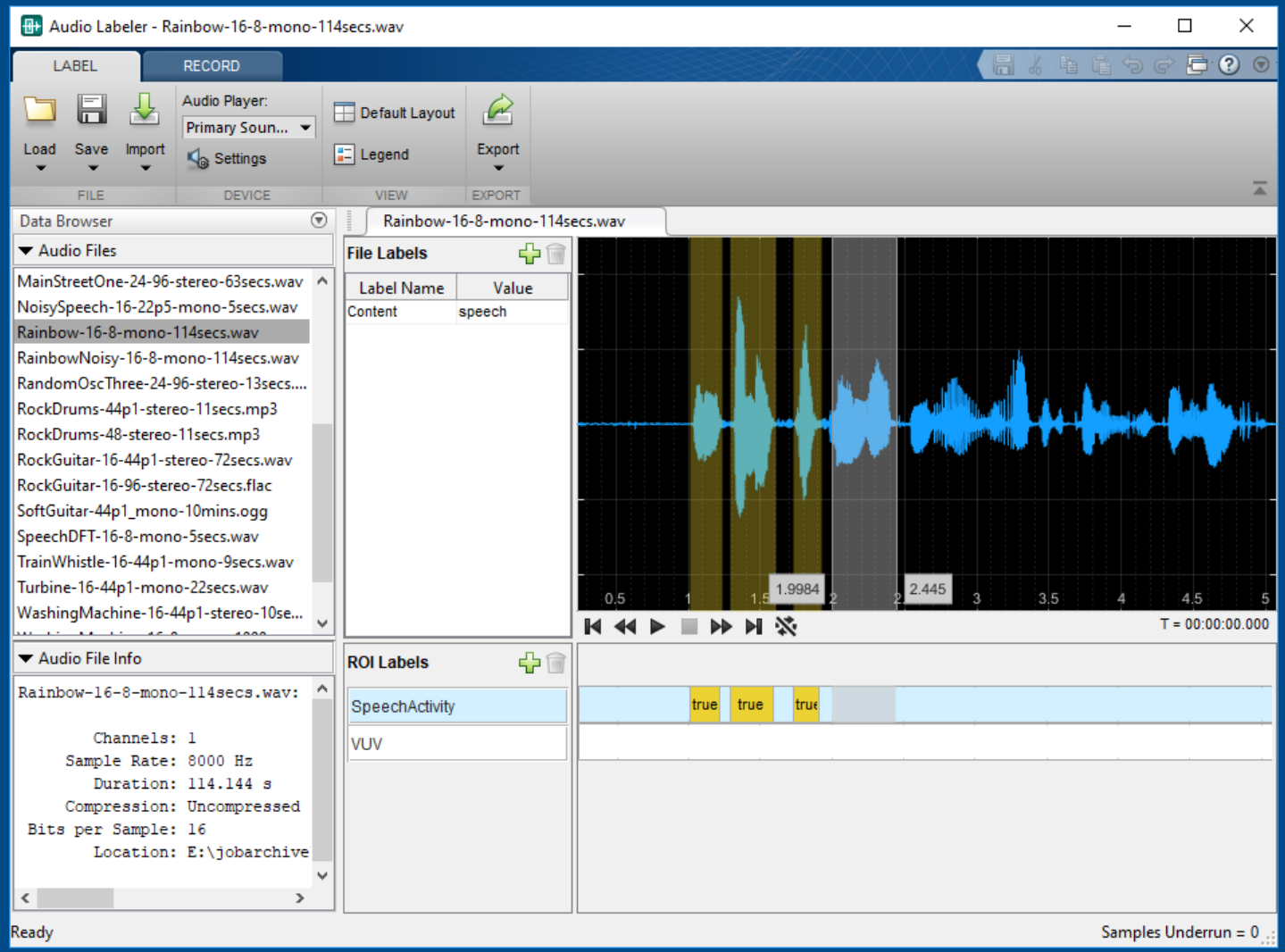
Signal Data



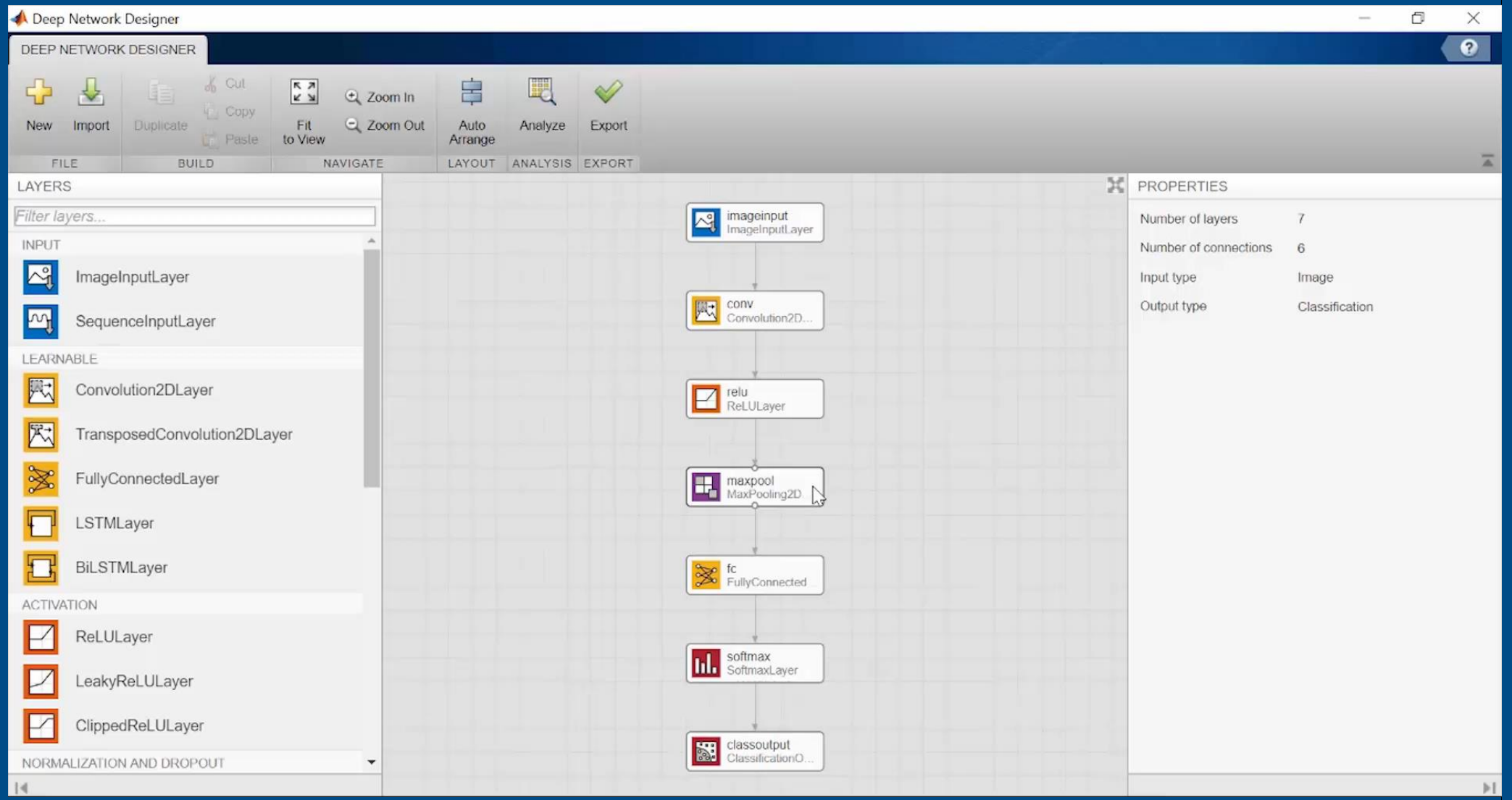
Signal Processing Toolbox

Using Apps for Ground Truth Labeling

Audio Data



Using Apps for Designing Deep Learning Networks

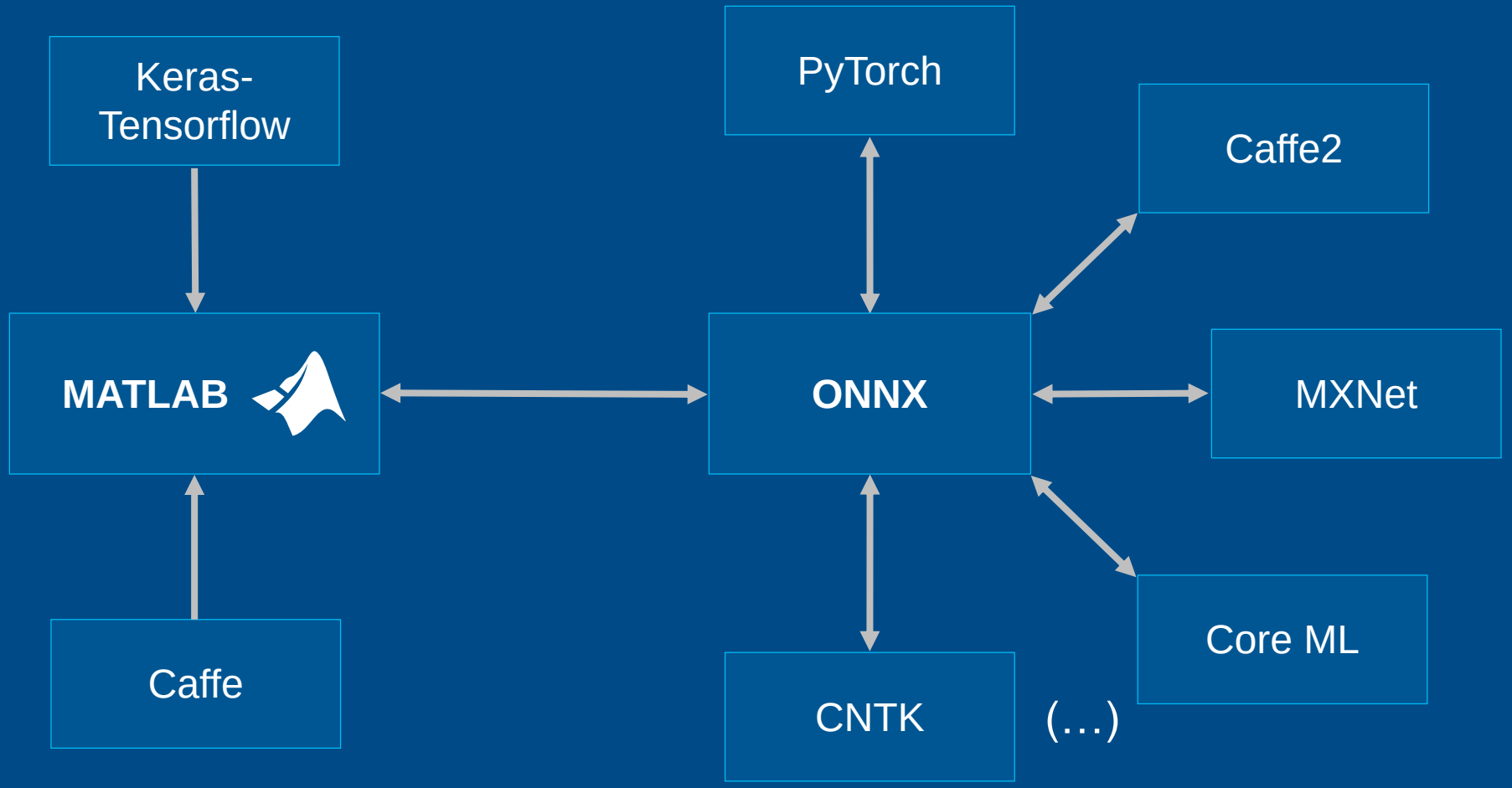


Deep Learning Toolbox

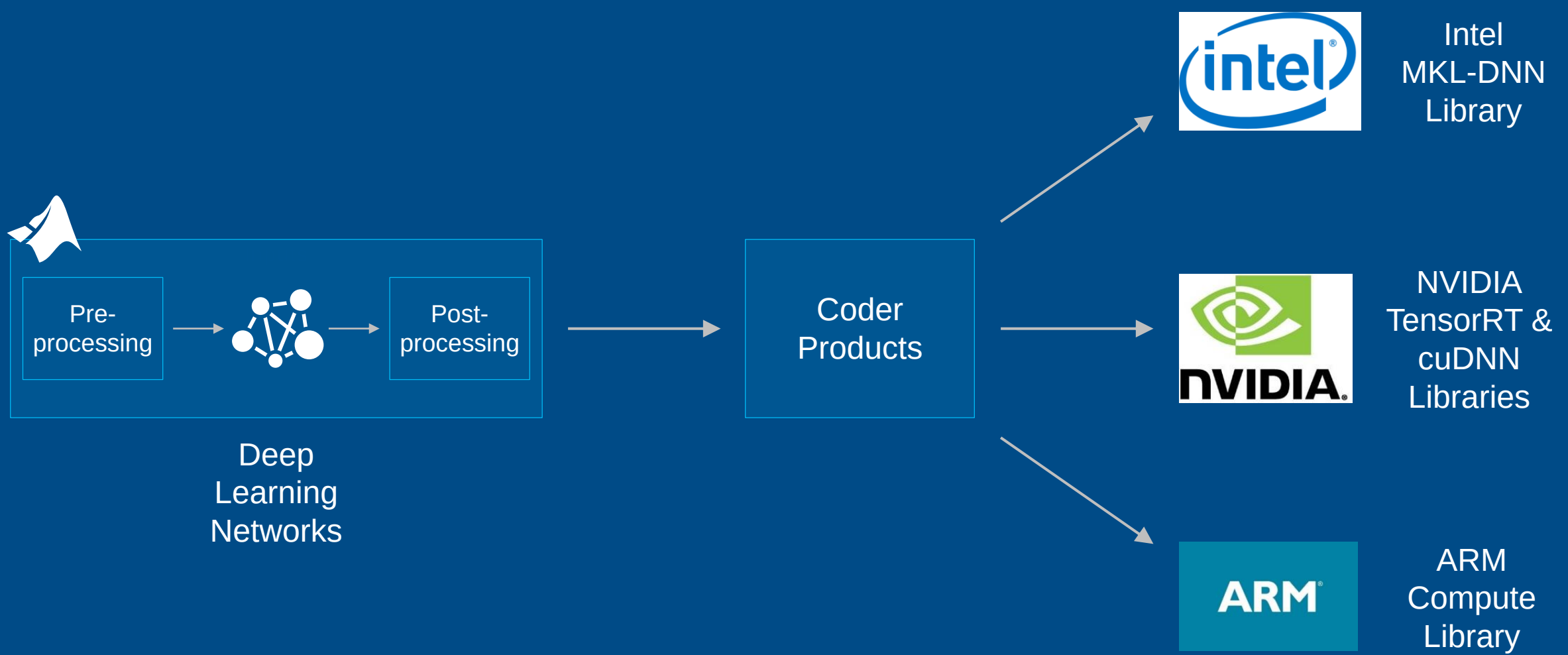
Using Transfer Learning with Pre-trained Models

- Inception-v3
- ResNet-101
- VGG-16
- Inception-ResNet-v2
- ResNet-18
- GoogLeNet
- DenseNet-201
- VGG-19
- SqueezeNet
- AlexNet
- ResNet-50

Using Models from Other Frameworks



Deploying Deep Learning Applications



MATLAB Coder
GPU Coder

Deploying Deep Learning Applications

Pre-processing

Deep Learning Networks

Find out more:
임베디드 하드웨어로의 딥러닝 응용프로그램 배포

인공지능과 딥러닝 트랙
송완빈

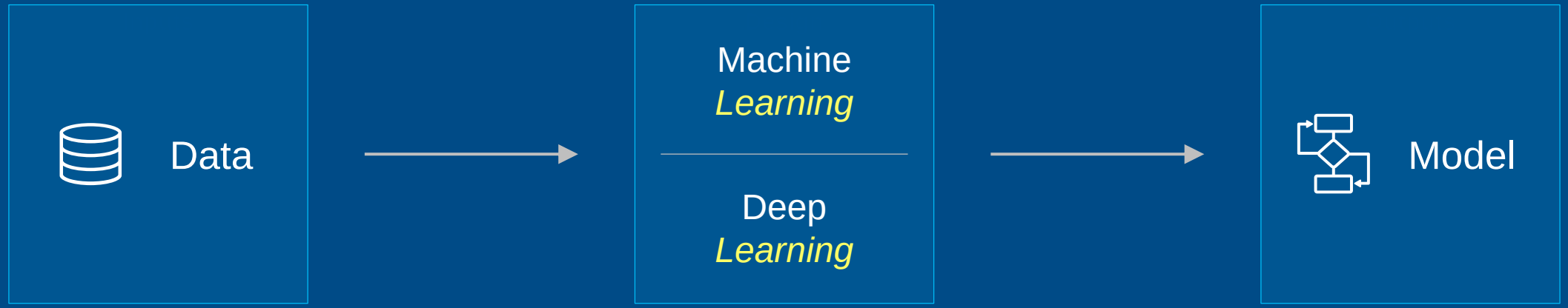
Intel MKL-DNN Library

NVIDIA TensorRT & cuDNN Libraries

ARM Compute Library

MATLAB Coder
GPU Coder

Using MATLAB and Simulink for Reinforcement Learning



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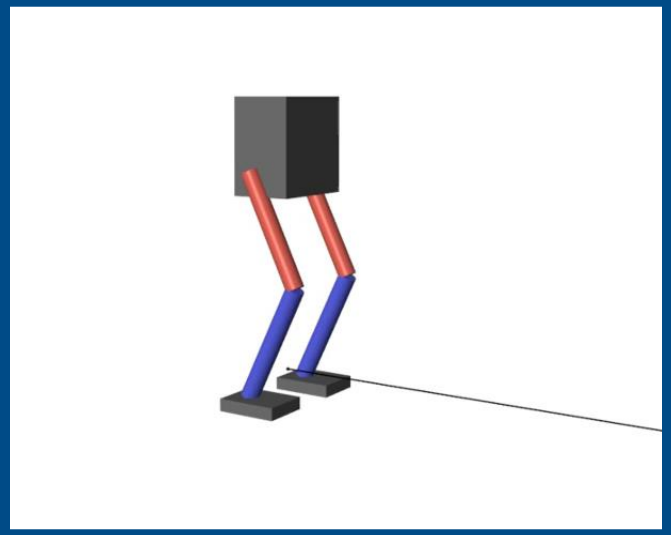
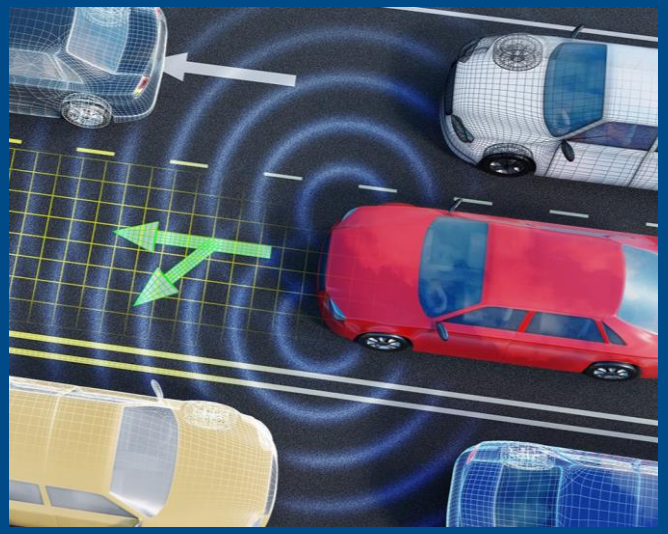
Reinforcement Learning Toolbox

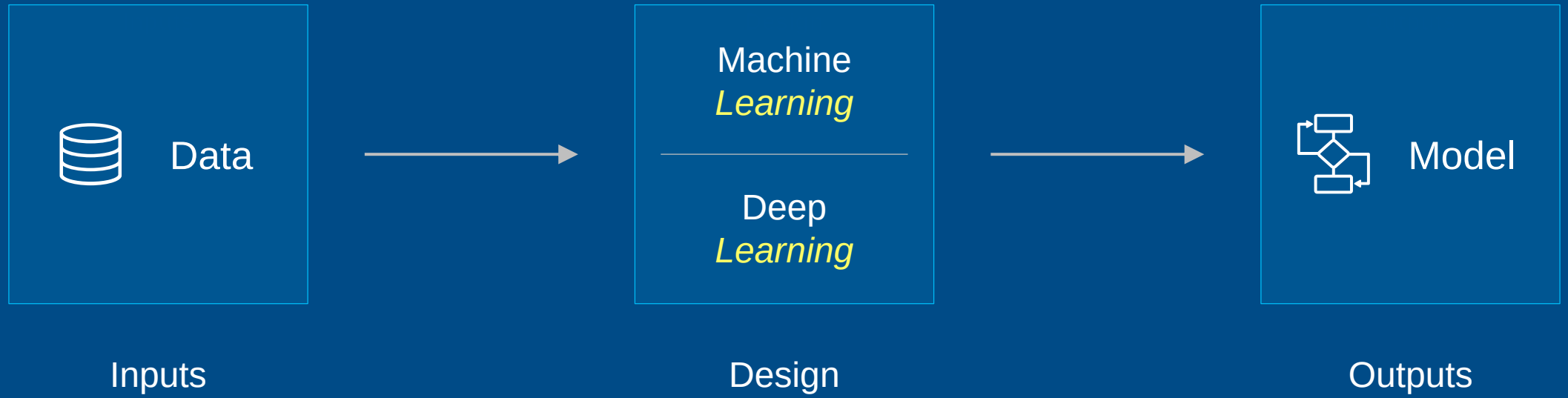
Using MATLAB and Simulink for Reinforcement Learning





Reinforcement Learning Toolbox

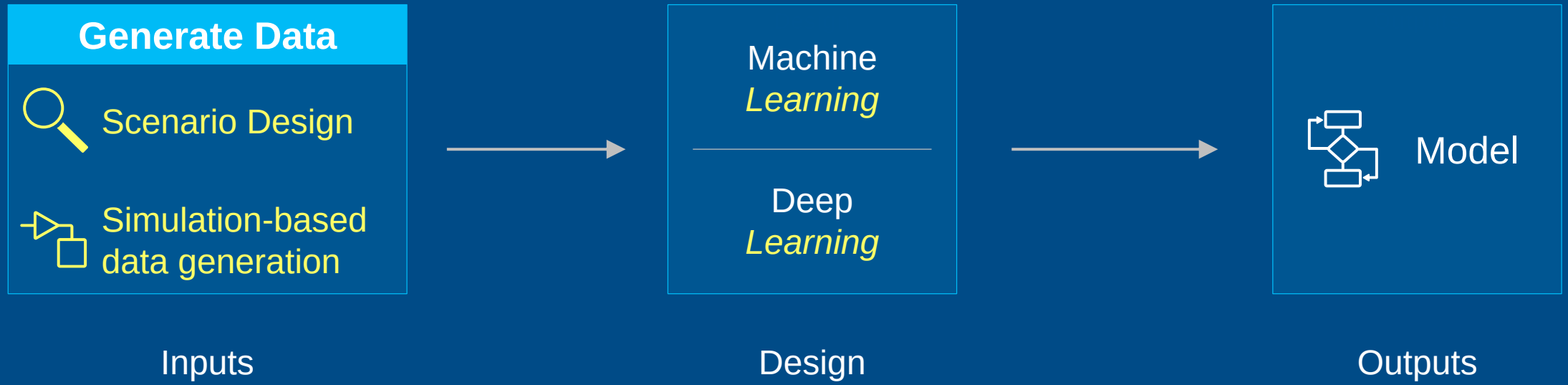
Using MATLAB and Simulink for Reinforcement Learning



MATLAB&SIMULINK®

Reinforcement Learning Toolbox

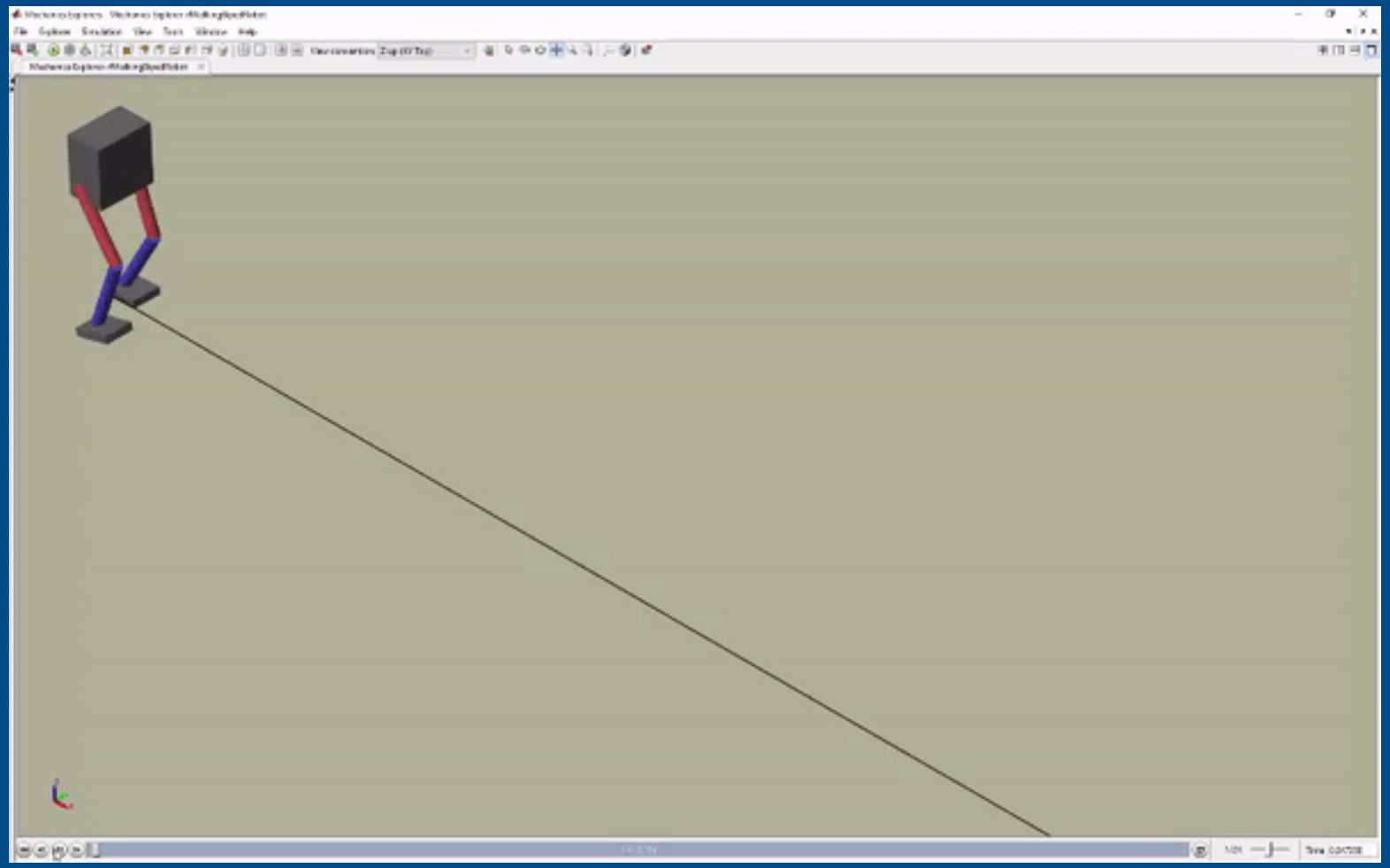
Using MATLAB and Simulink for Reinforcement Learning



MATLAB&SIMULINK®

Simulink
Reinforcement Learning Toolbox

Using MATLAB and Simulink for Reinforcement Learning



Reinforcement Learning Toolbox

Using MATLAB and Simulink for Reinforcement Learning

Generate Data

Scenario Desig

Simulation-bas
data generatior

Inputs

Model

Outputs

Find out more:
딥러닝과 강화학습

인공지능과 딥러닝 트랙
김종남

MATLAB&SIMULINK

Using MATLAB & Simulink to Build Algorithms in Everything

Inputs

Design

Outputs

MATLAB&SIMULINK®

Working with Text Data

Vehicle_Repairs.csv

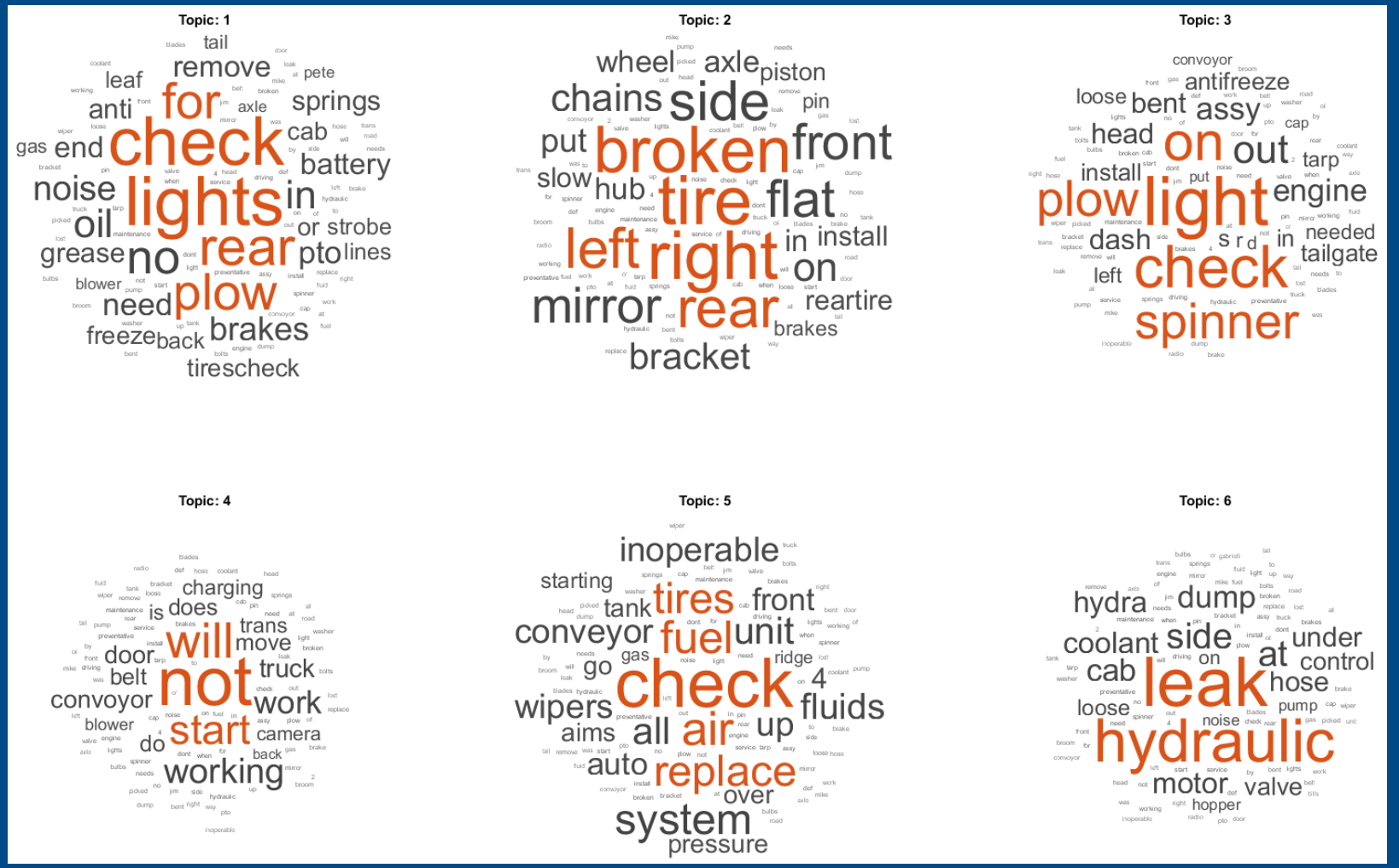
```
Dept,JobDate,jobno,Vehicleid,UnitNo,Reason,Notes,CostParts,CostLabor,CostTotal
1020,01/06/2015 12:00:00 AM,14073,118743,14,04    DRIVER'S REPORT,"PM SERVICE, CHECK TURN SIGNAL, CLUNKING NOISE WHEN DRIVING",493.85,0,493.85
1020,01/14/2015 12:00:00 AM,14232,230973,13,08    PM SERVICE             ***,"SERVICEROB,EXT,5604",38.869999999999997,0,38.869999999999997
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,O01469      ,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 SERVIVE",4697.55,0,
```

Working with Text Data

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

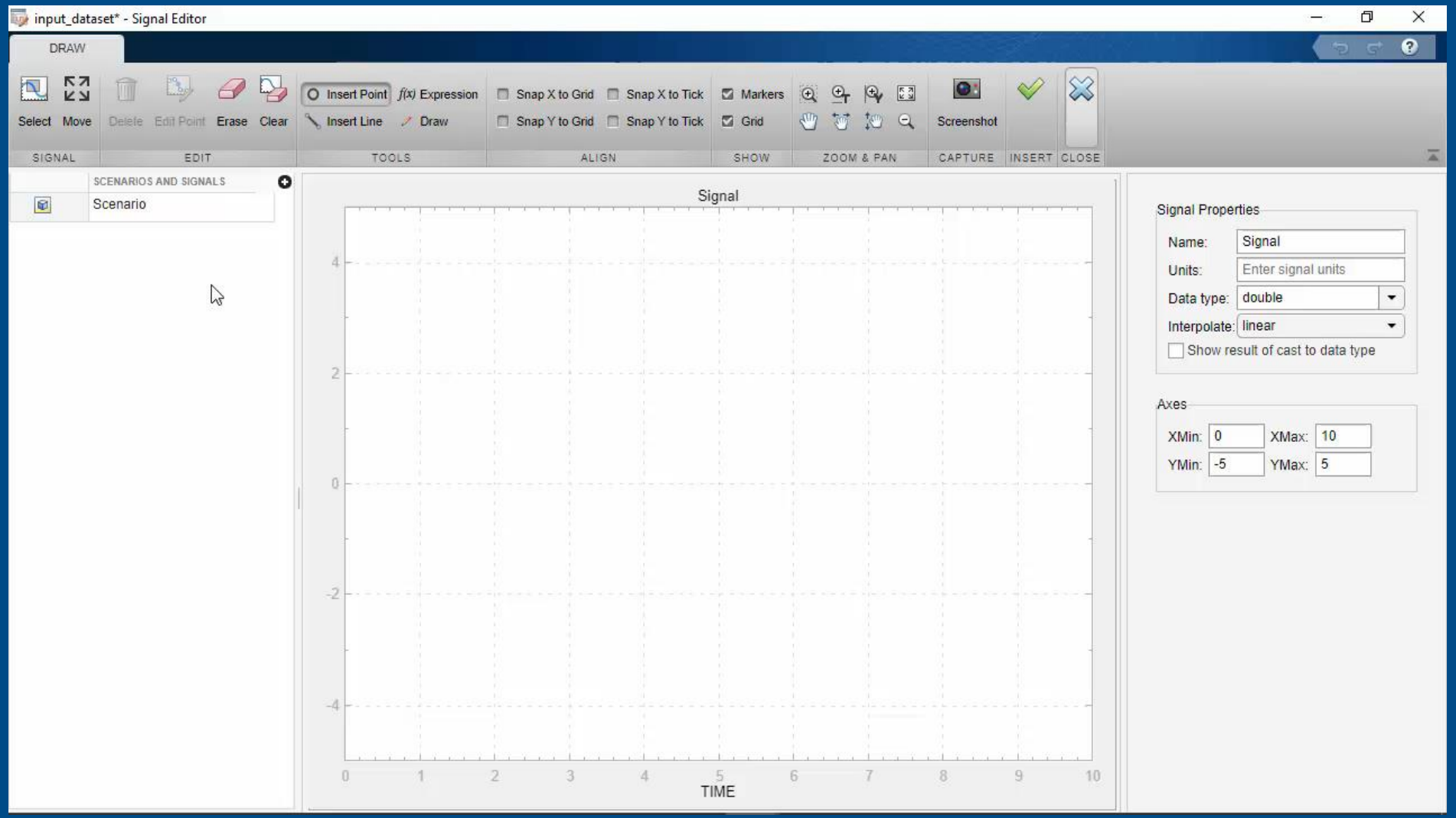
Reason	Notes
"04 DRIVER'S REPORT"	"PM SERVICE, CHECK TURN SIGNAL, CLUNKING NOISE WHEN DRIVING"
"08 PM SERVICE ***"	"SERVICEROB,EXT,5604"
"04 DRIVER'S REPORT"	"NEED 4 PLOW PINS"
"04 DRIVER'S REPORT"	"INSTALL SPINNER ASSY"
"13 SNOW BREAKDOWN"	"DONT START"
"04 DRIVER'S REPORT"	"DOG BONE PIN BROKEN"
"08 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"

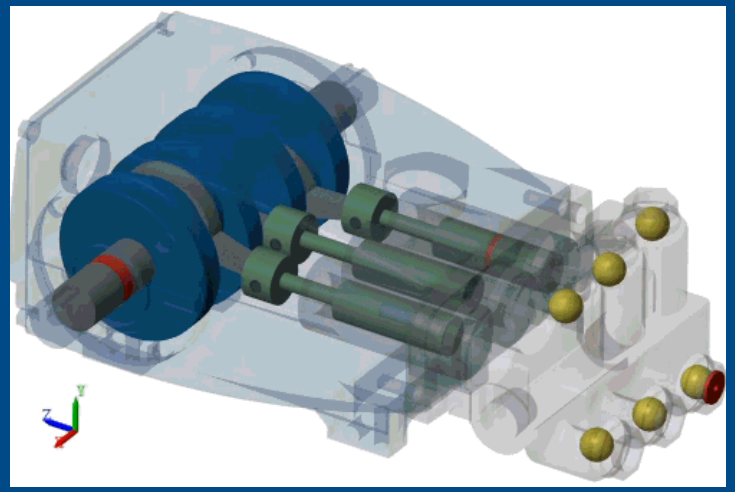
Working with Text Data

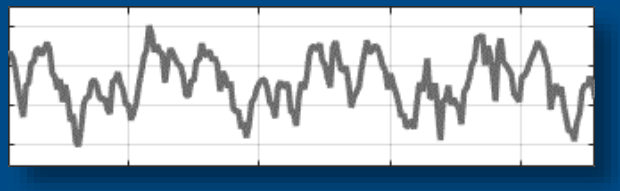


Deep Learning Toolbox
Statistics and Machine Learning Toolbox
Text Analytics Toolbox
MATLAB

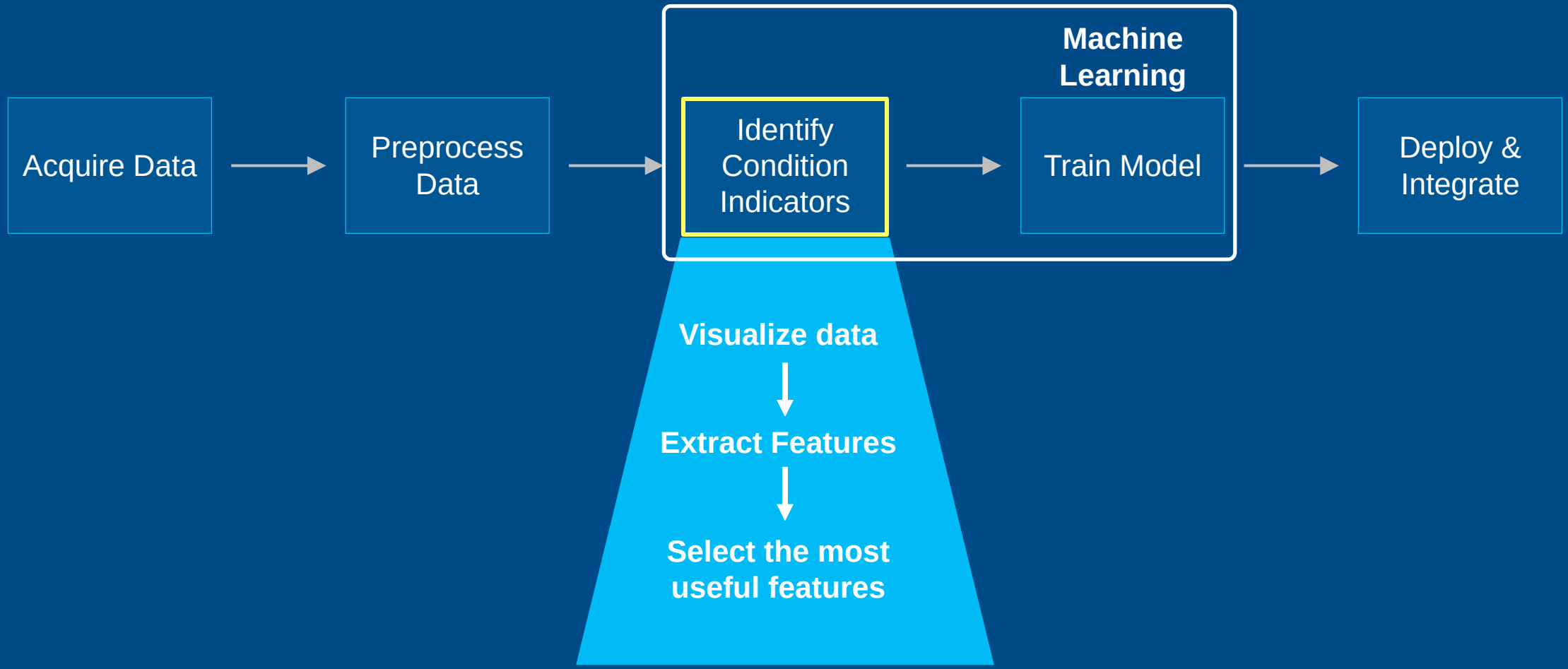
Creating Your Own Data



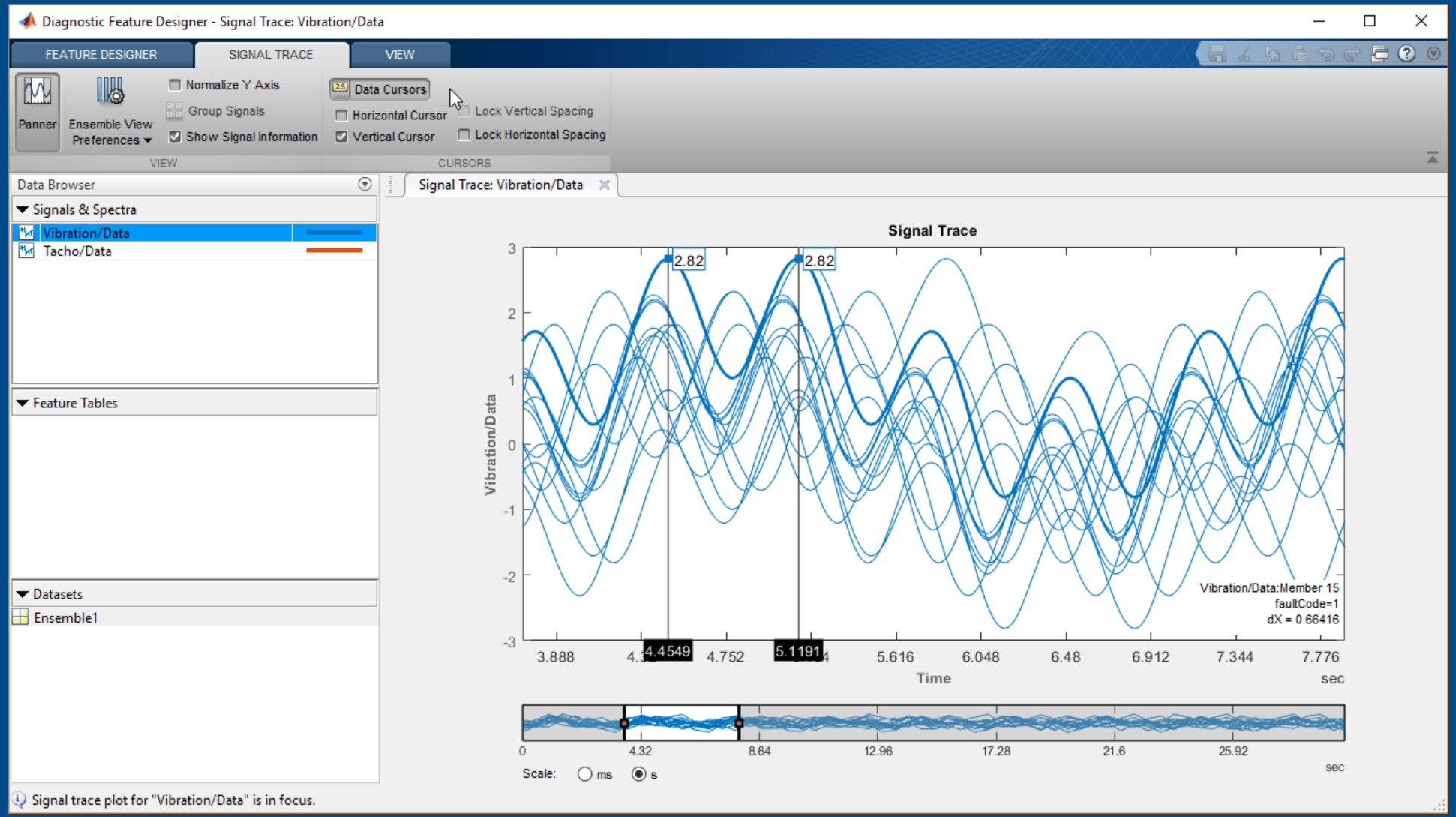




Identifying the Useful Data

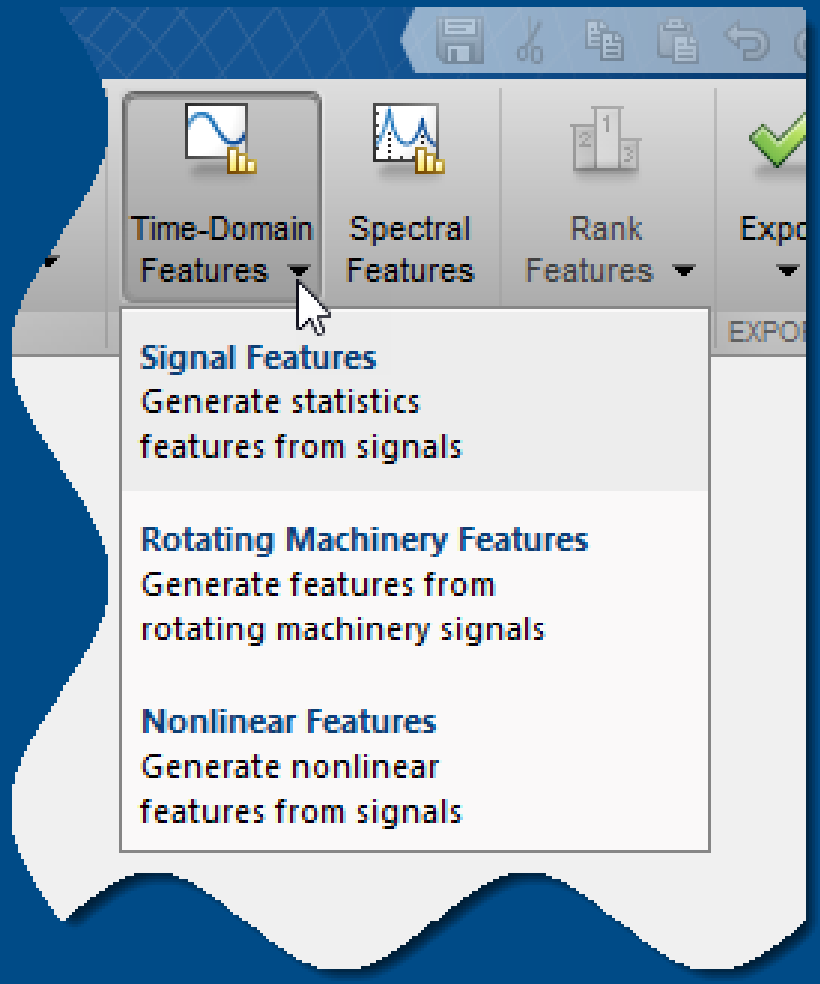


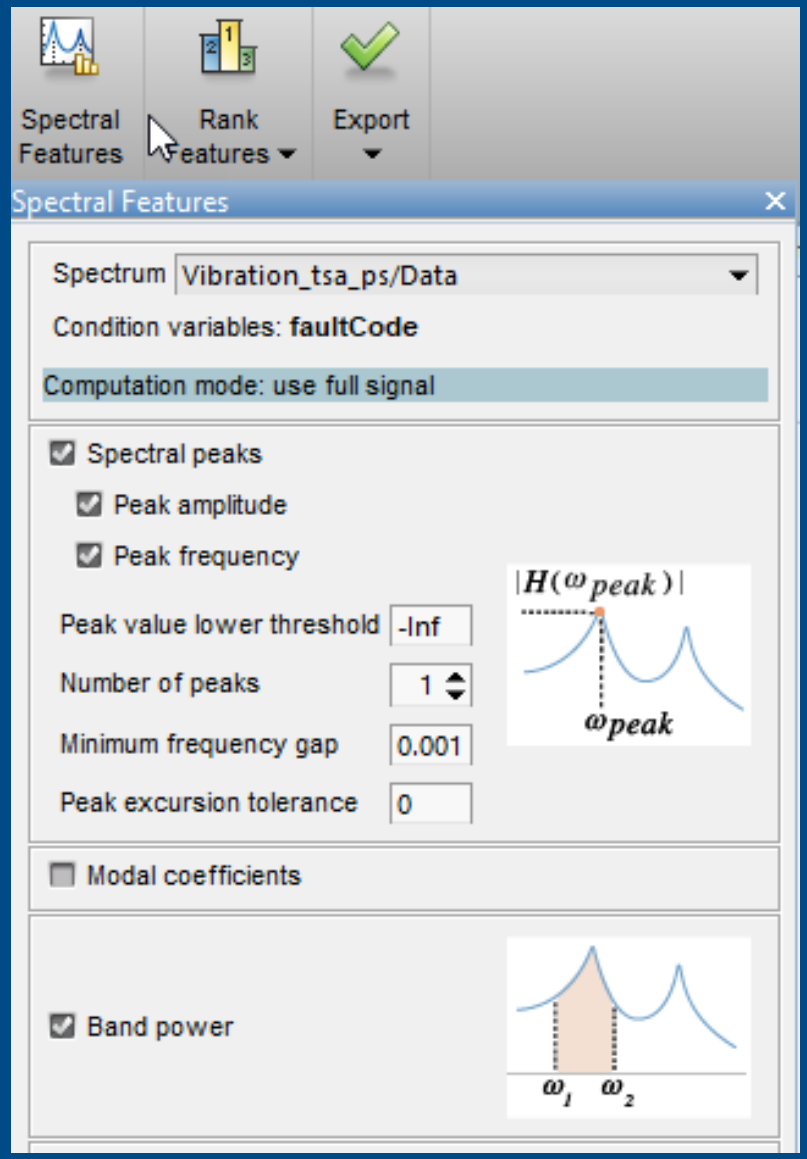
Identifying the Useful Data



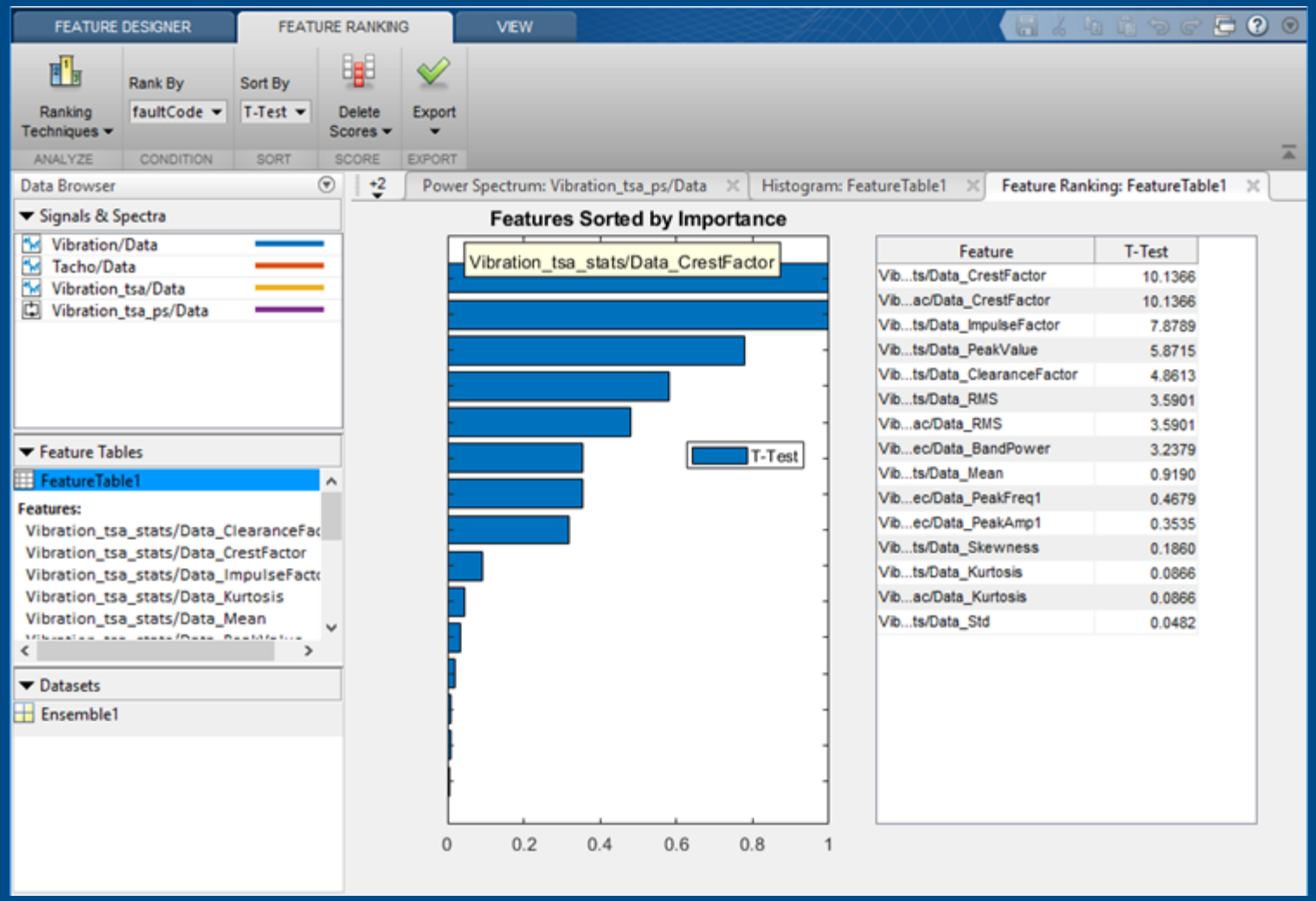
Predictive Maintenance Toolbox

Identifying the Useful Data



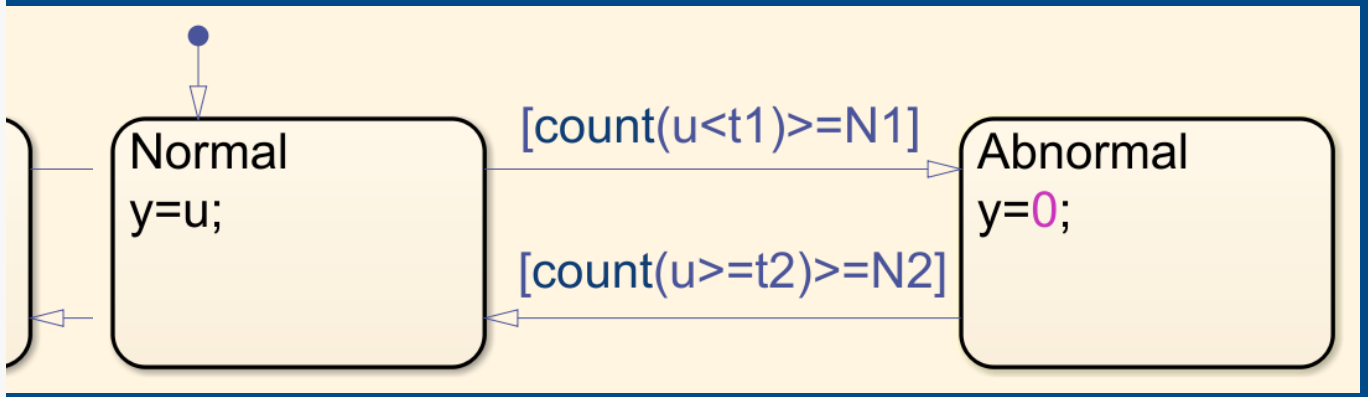


Identifying the Useful Data



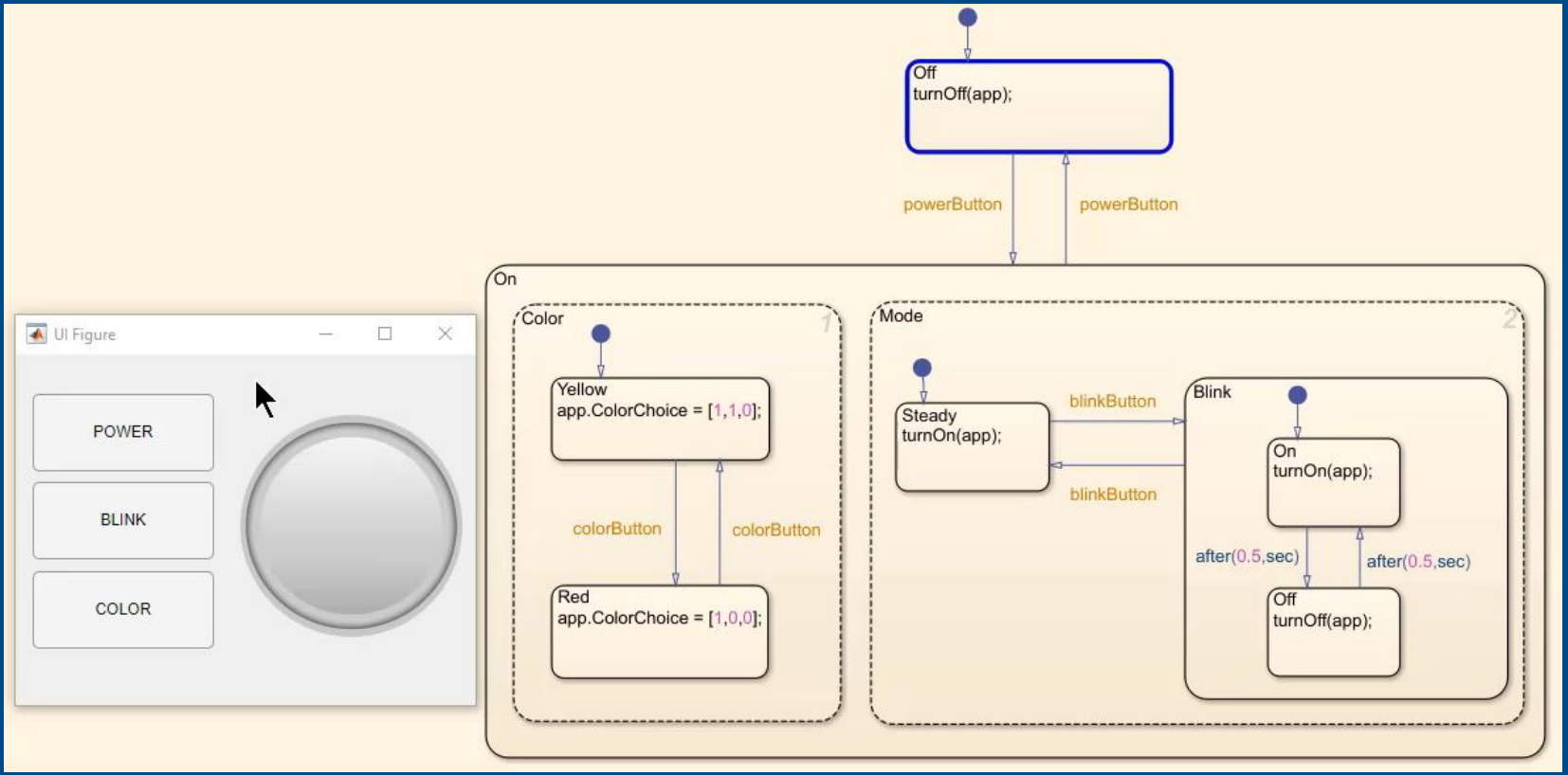
Designing Decision Logic with Stateflow

```
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
```



Stateflow
MATLAB

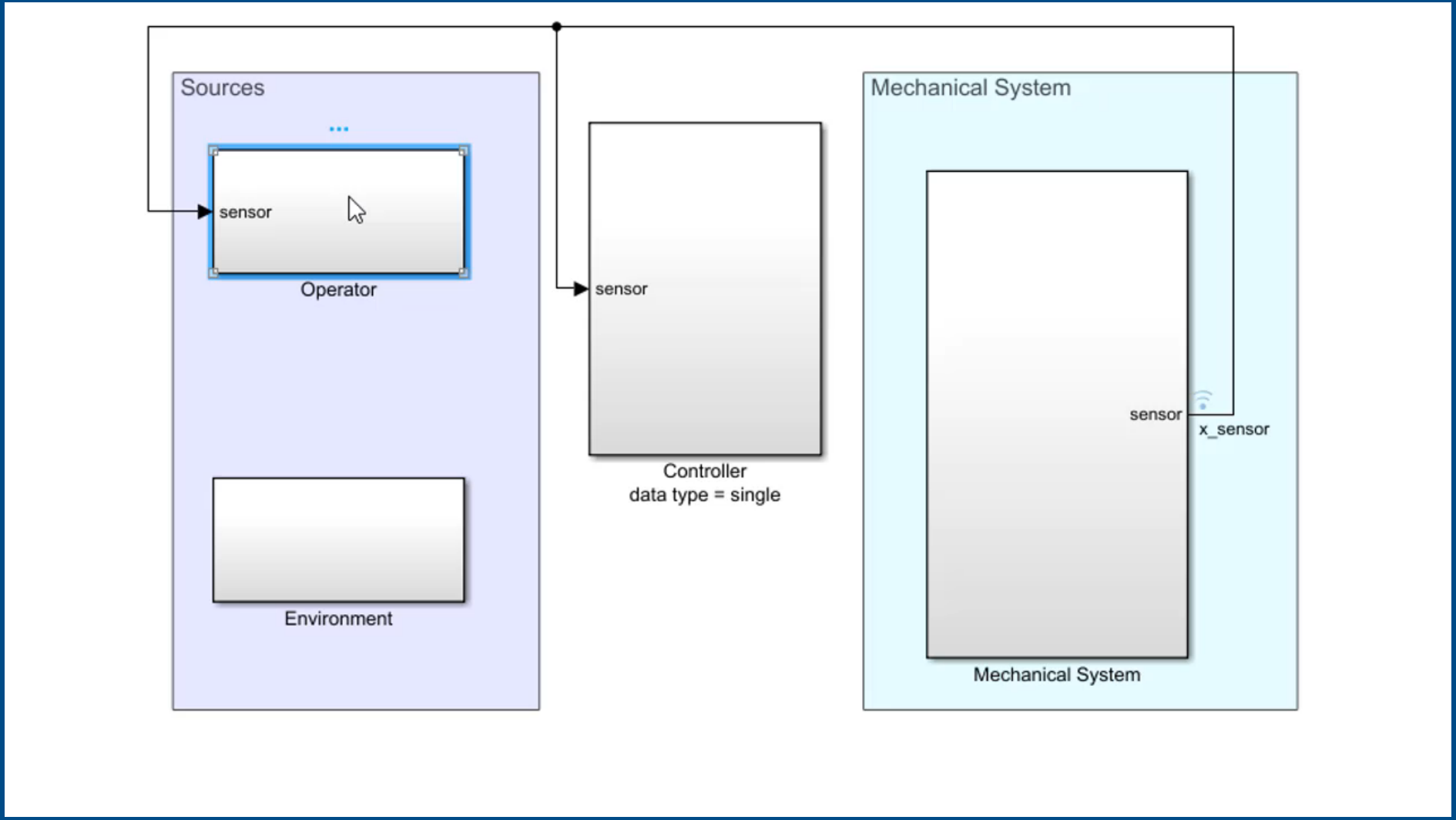
Using Stateflow in MATLAB



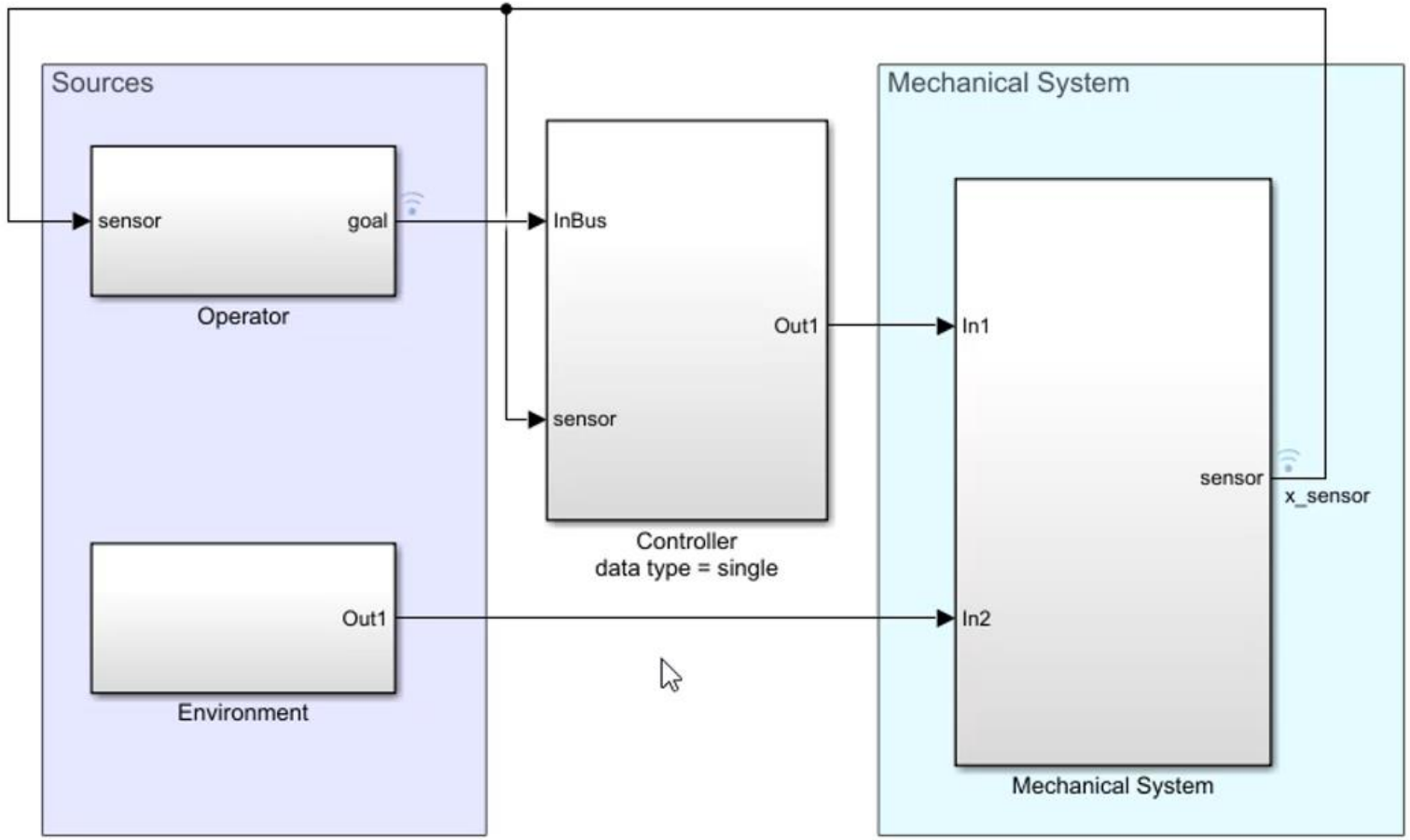

```
% Callbacks that handle component events
methods (Access = private)

    % 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
```

Stateflow
MATLAB

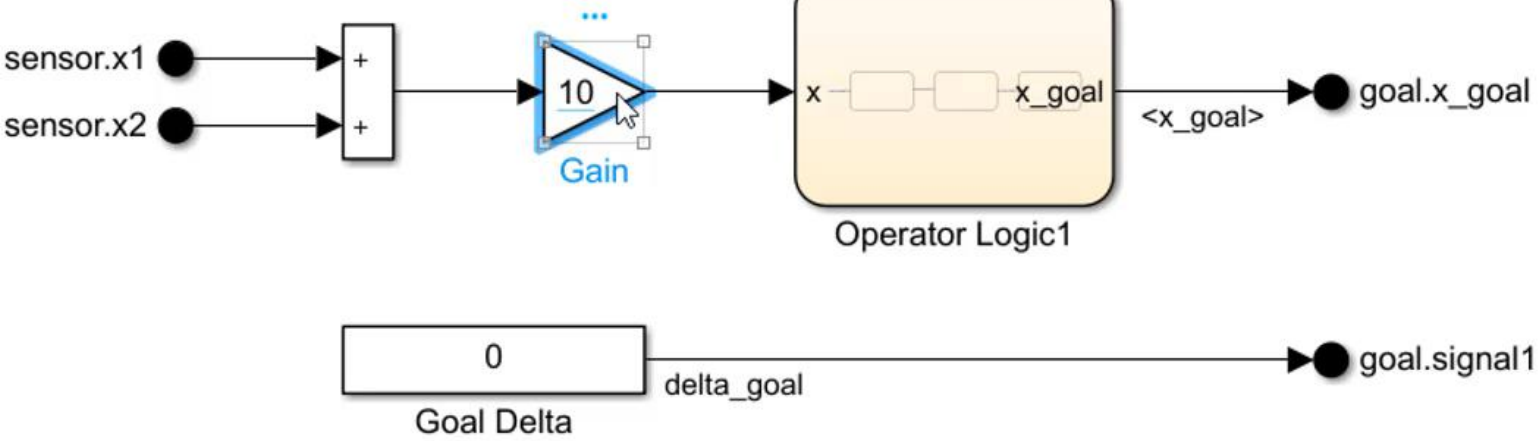
Editing at the Speed of Thought



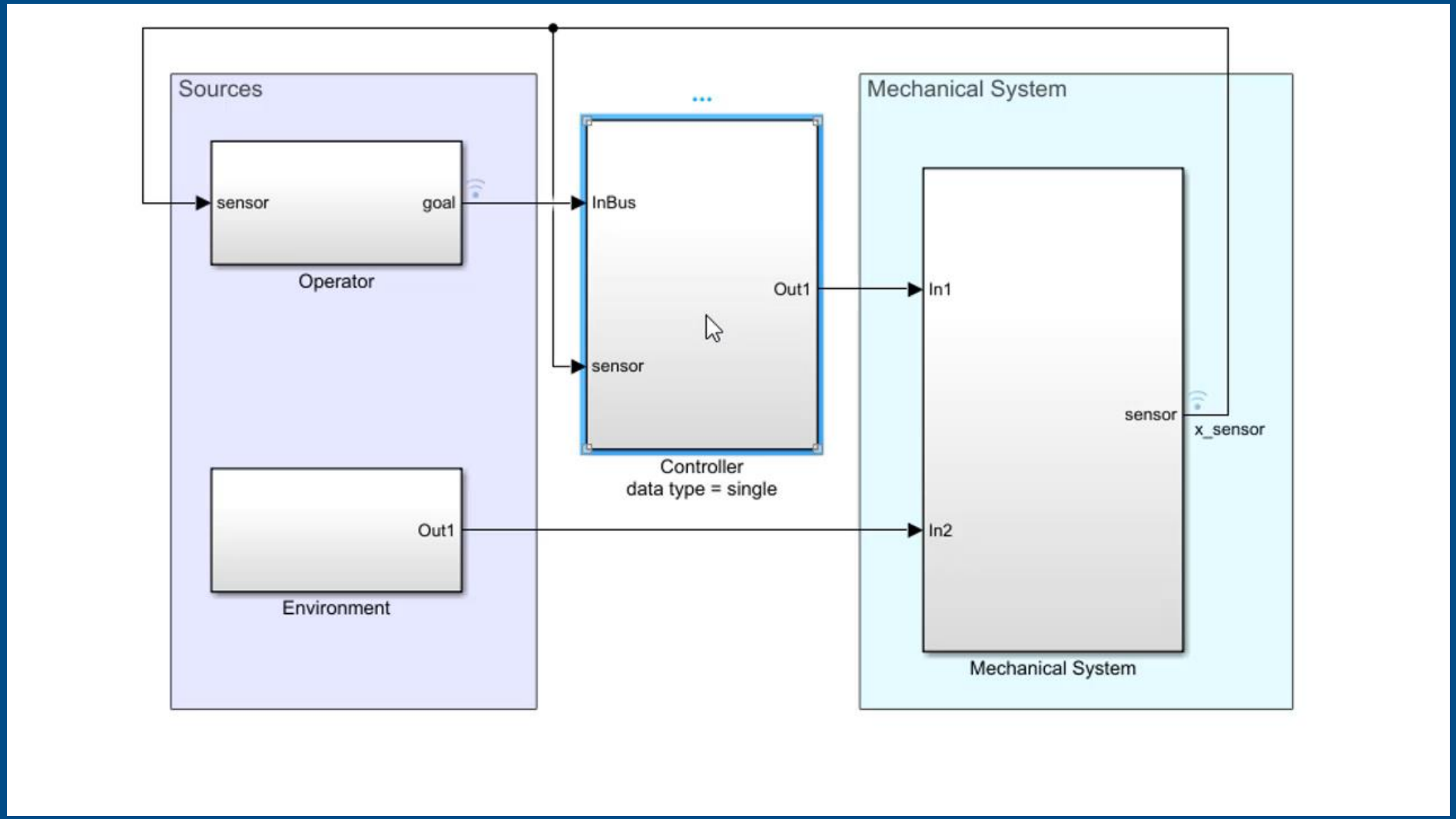
Editing at the Speed of Thought



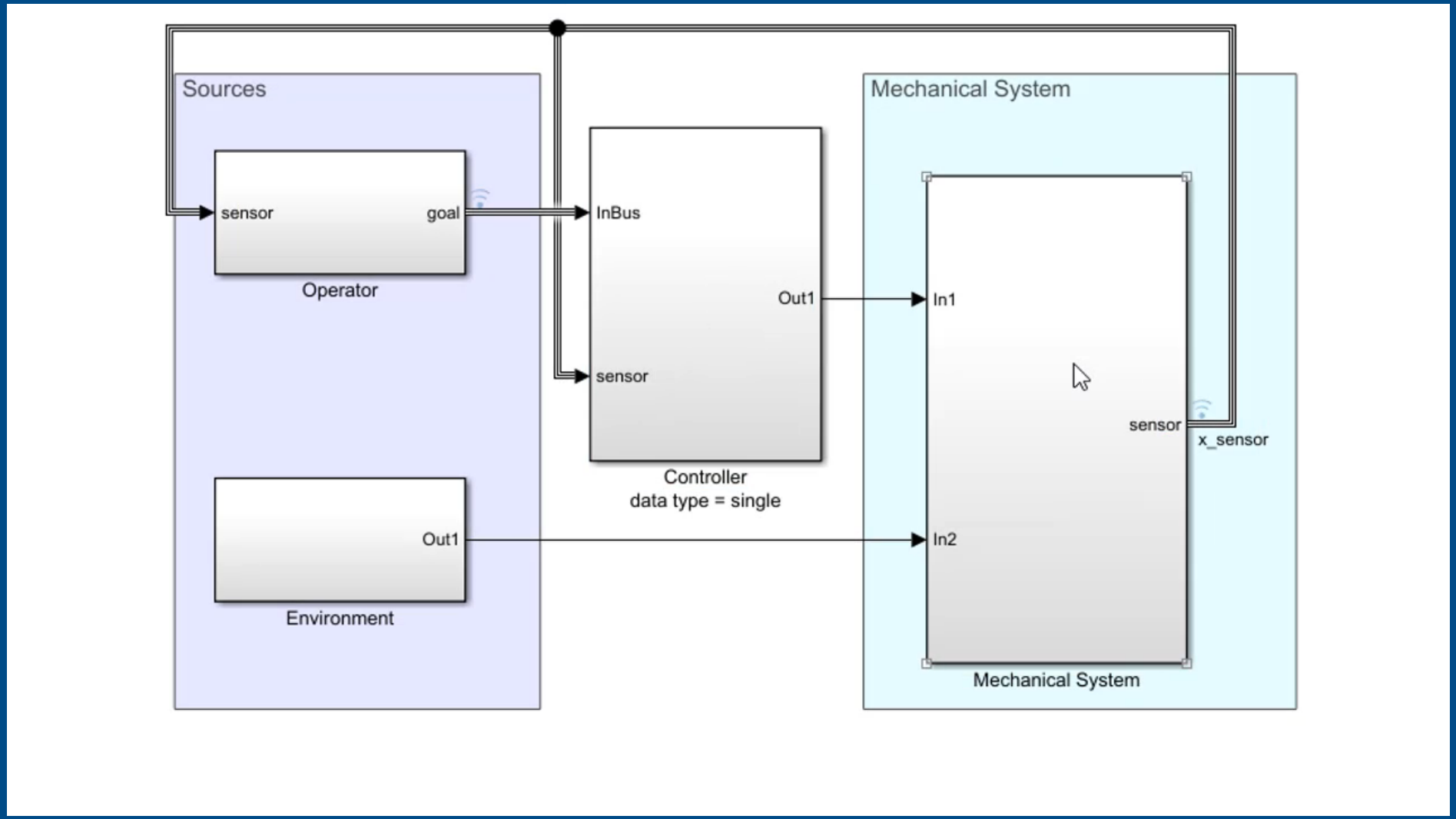
Editing at the Speed of Thought



Editing at the Speed of Thought

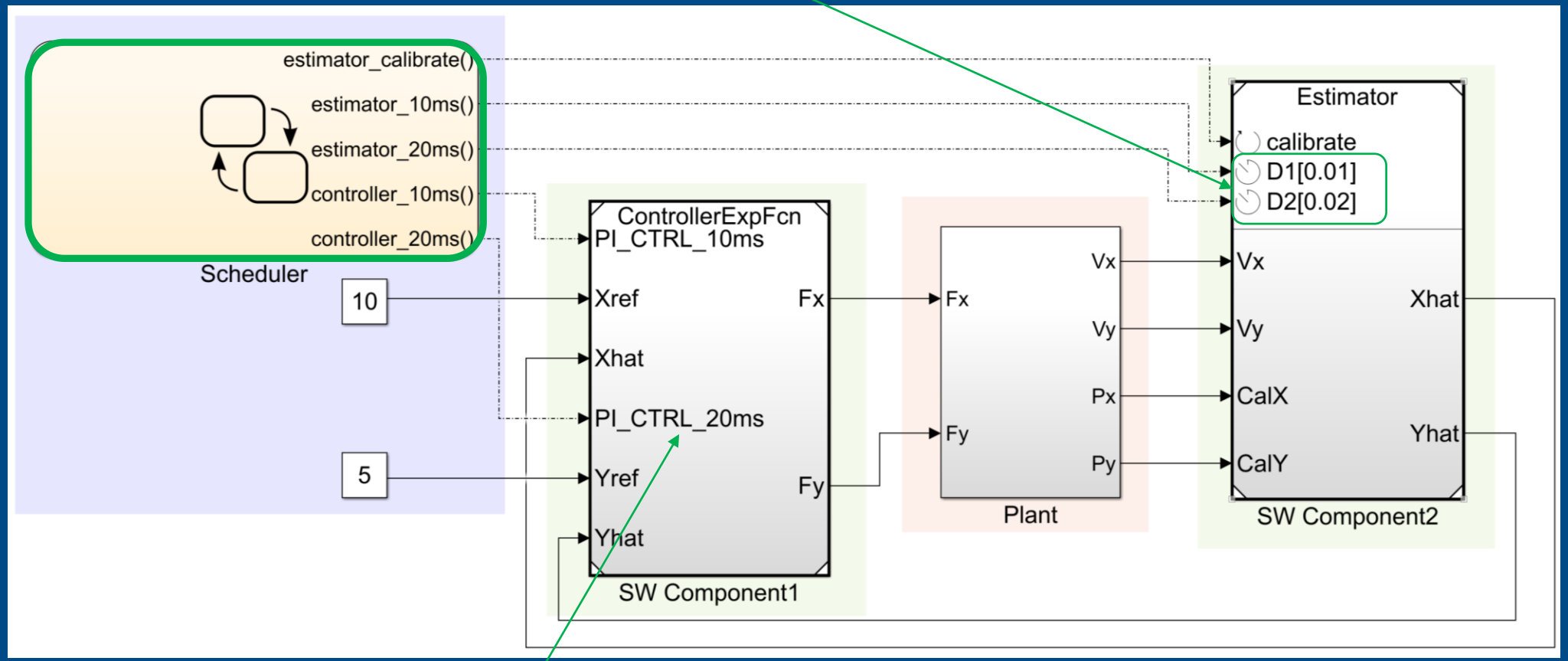


Editing at the Speed of Thought



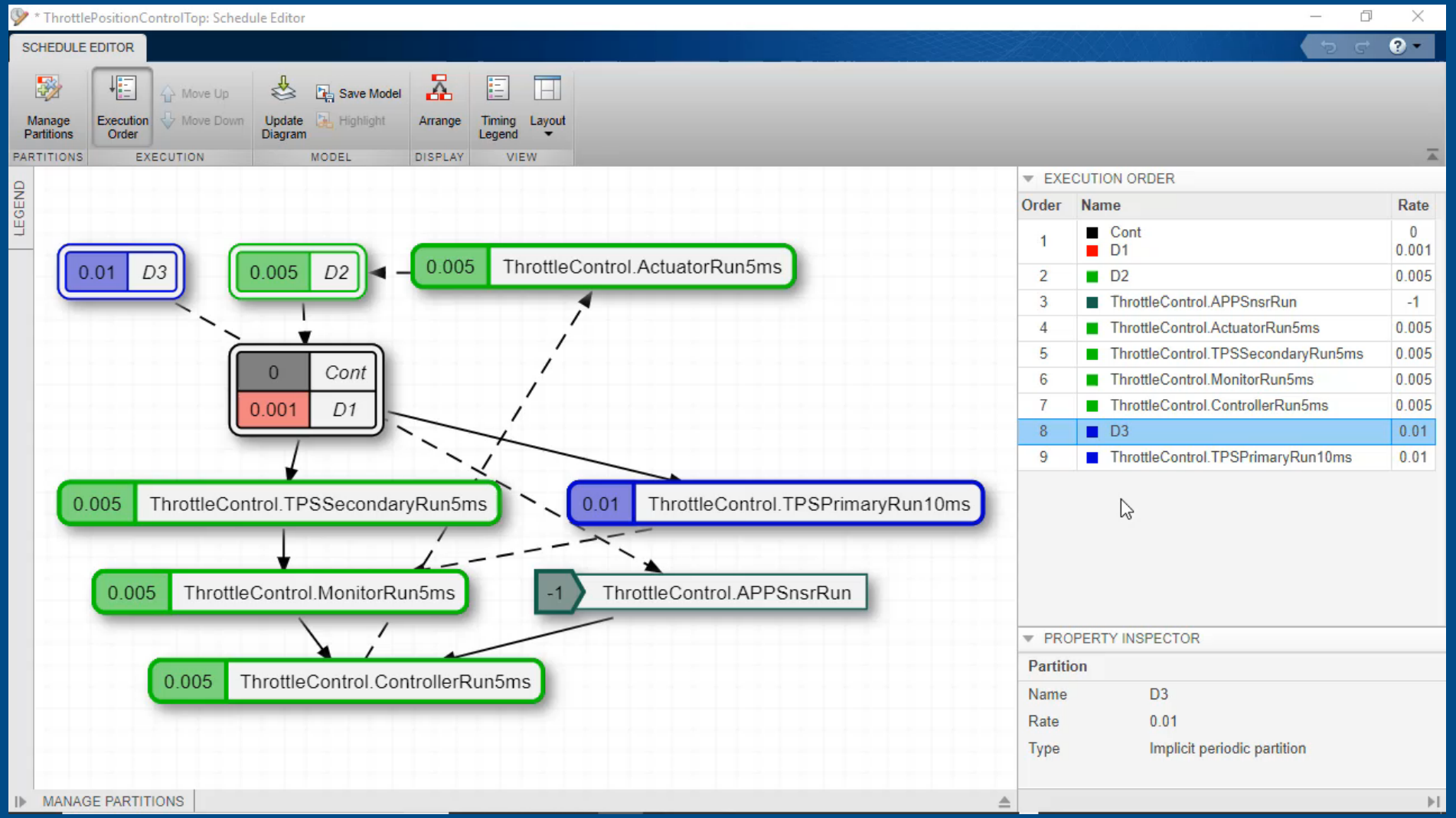
Controlling the Execution of Model Components

Schedulable Rate-Based Model

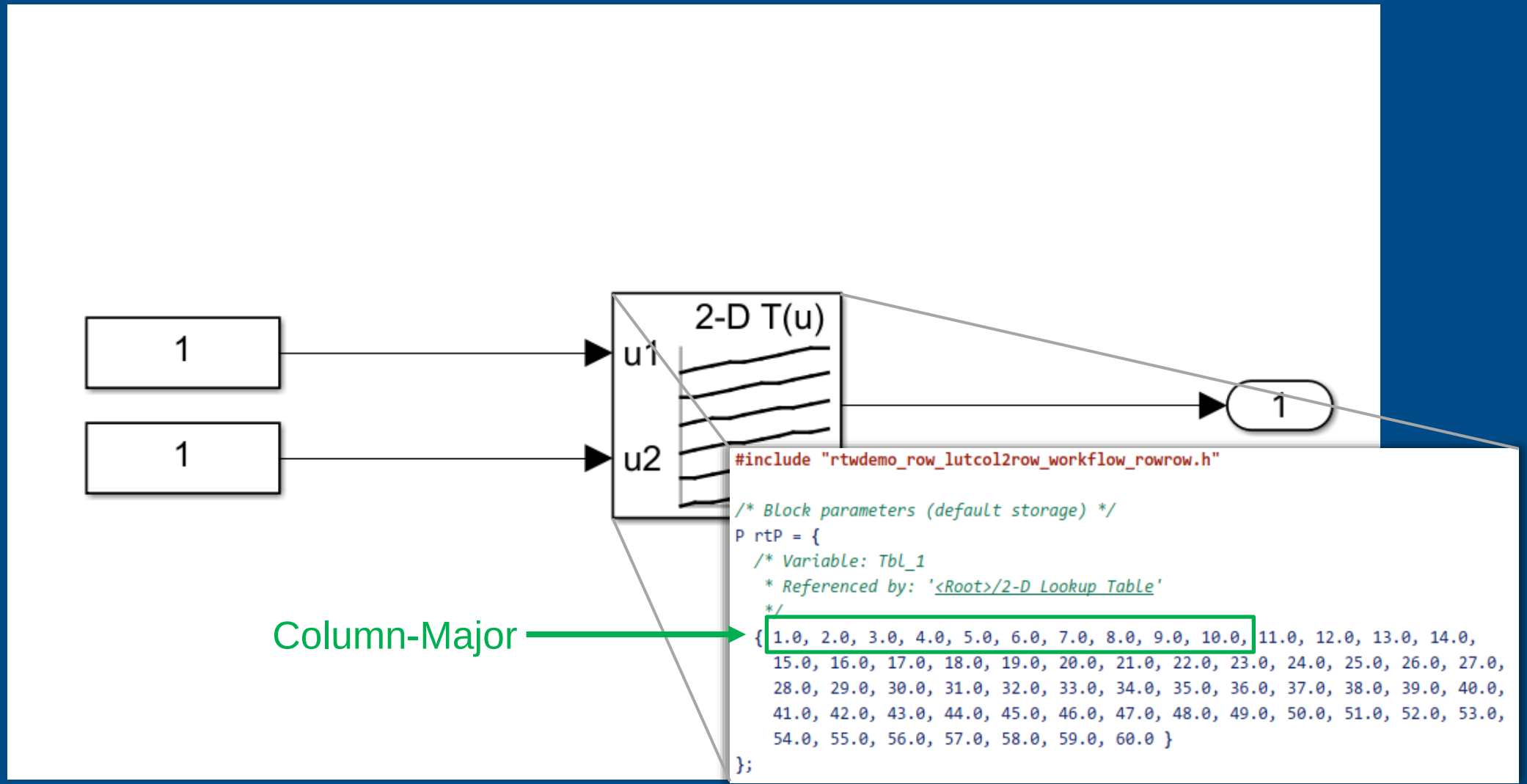


Export Function Model

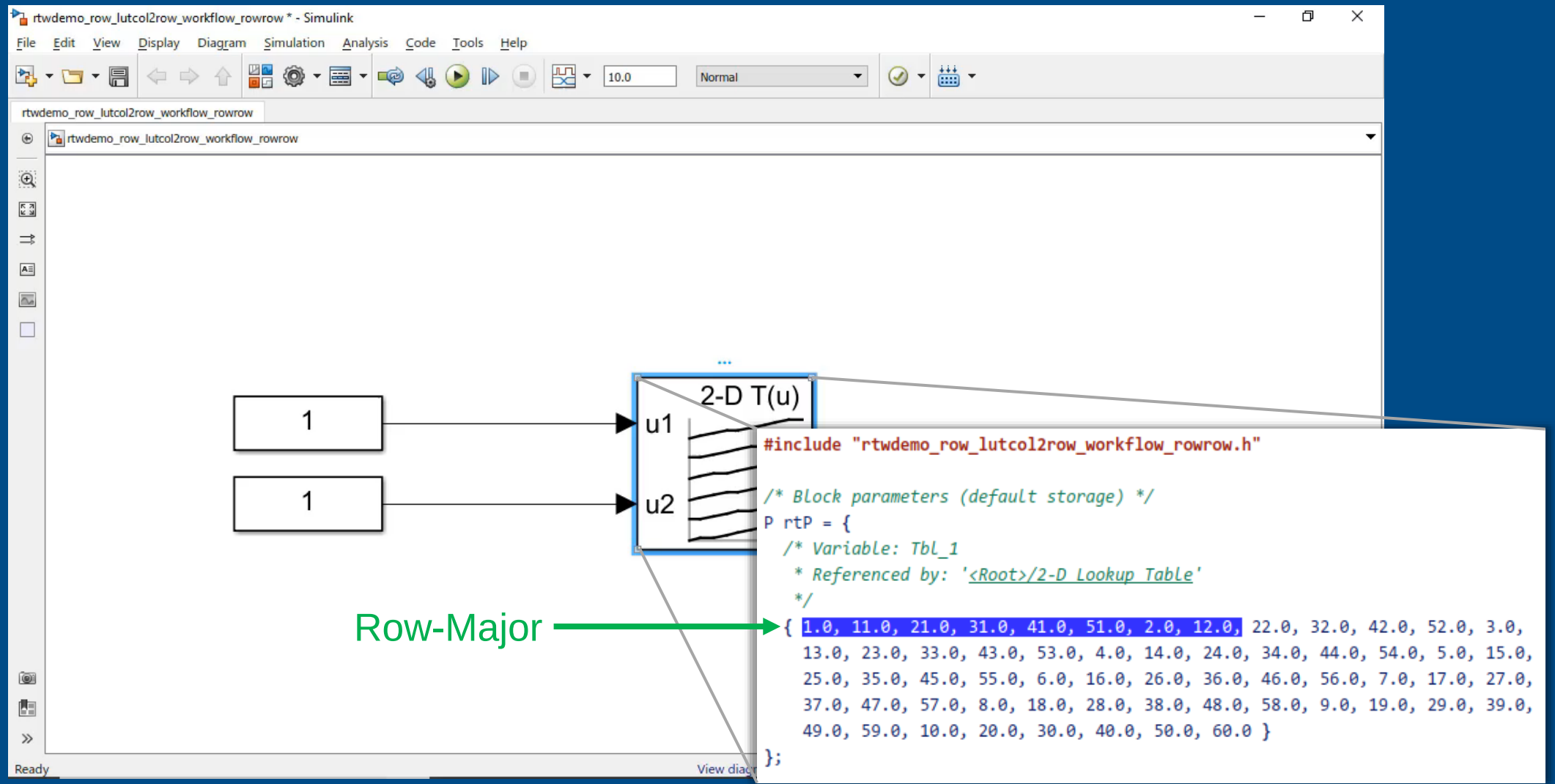
Controlling the Execution of Model Components



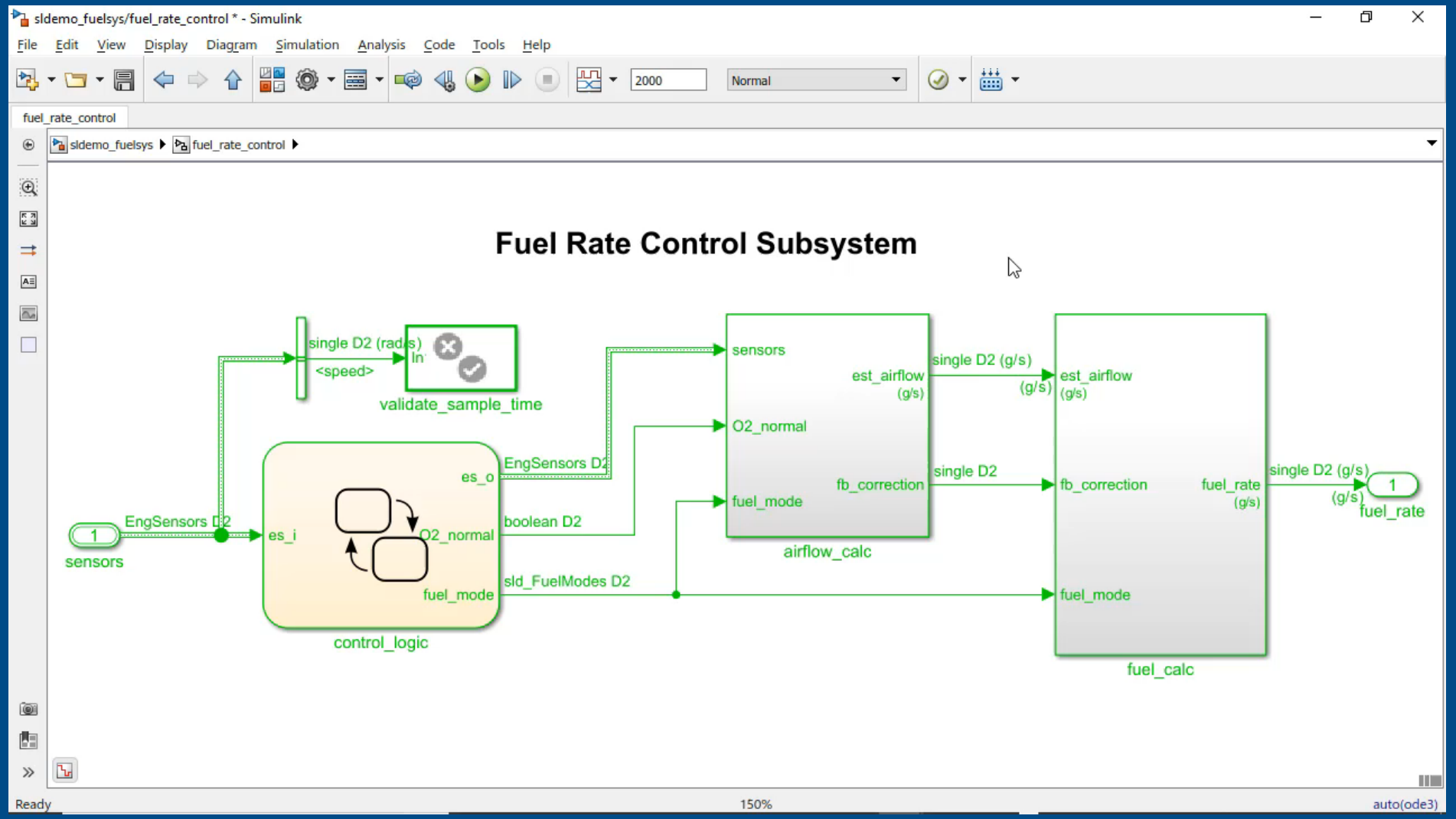
Simplifying Integration with External C/C++ Code



Simplifying Integration with External C/C++ Code

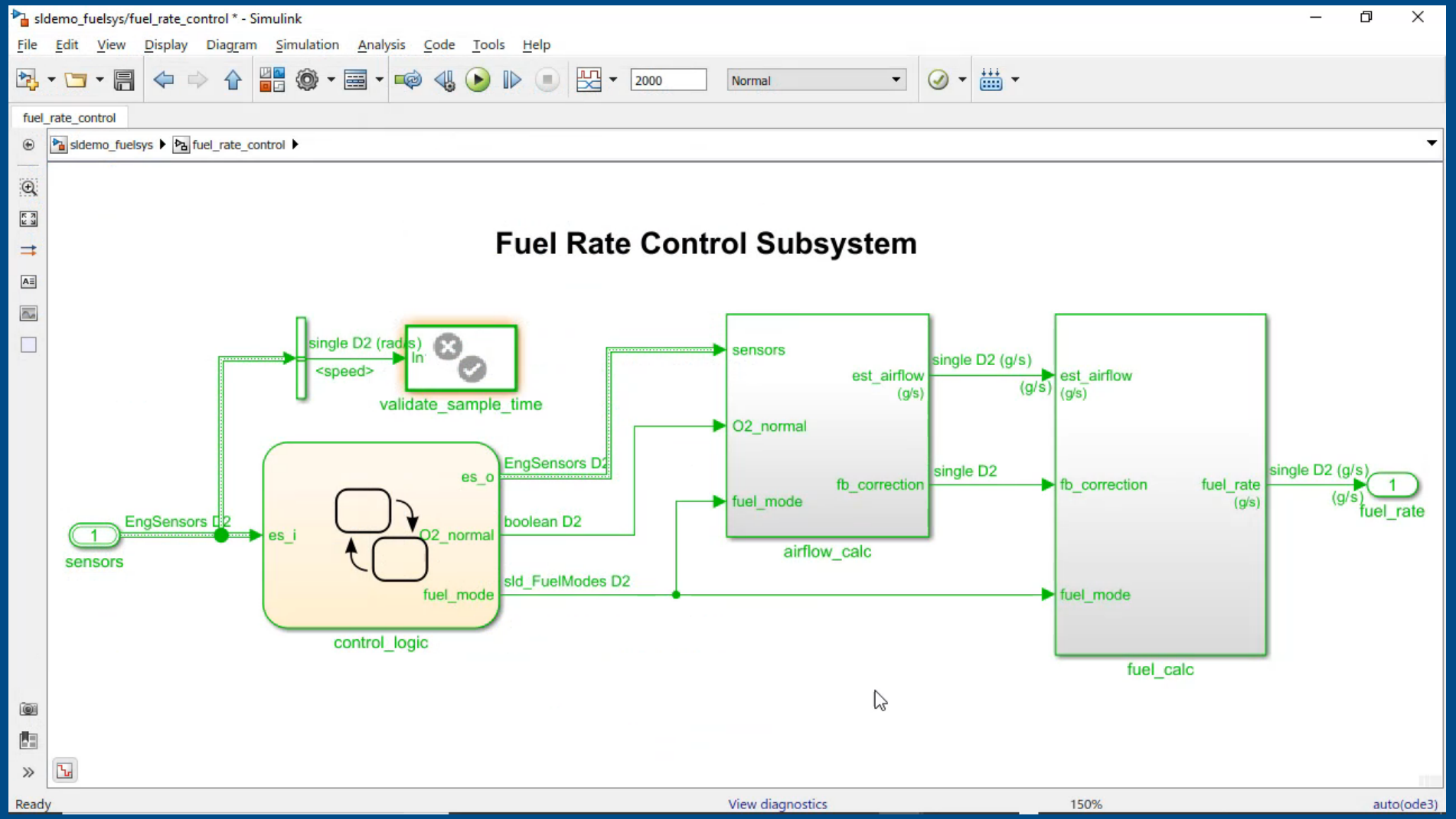


Viewing Generated Code Alongside the Model



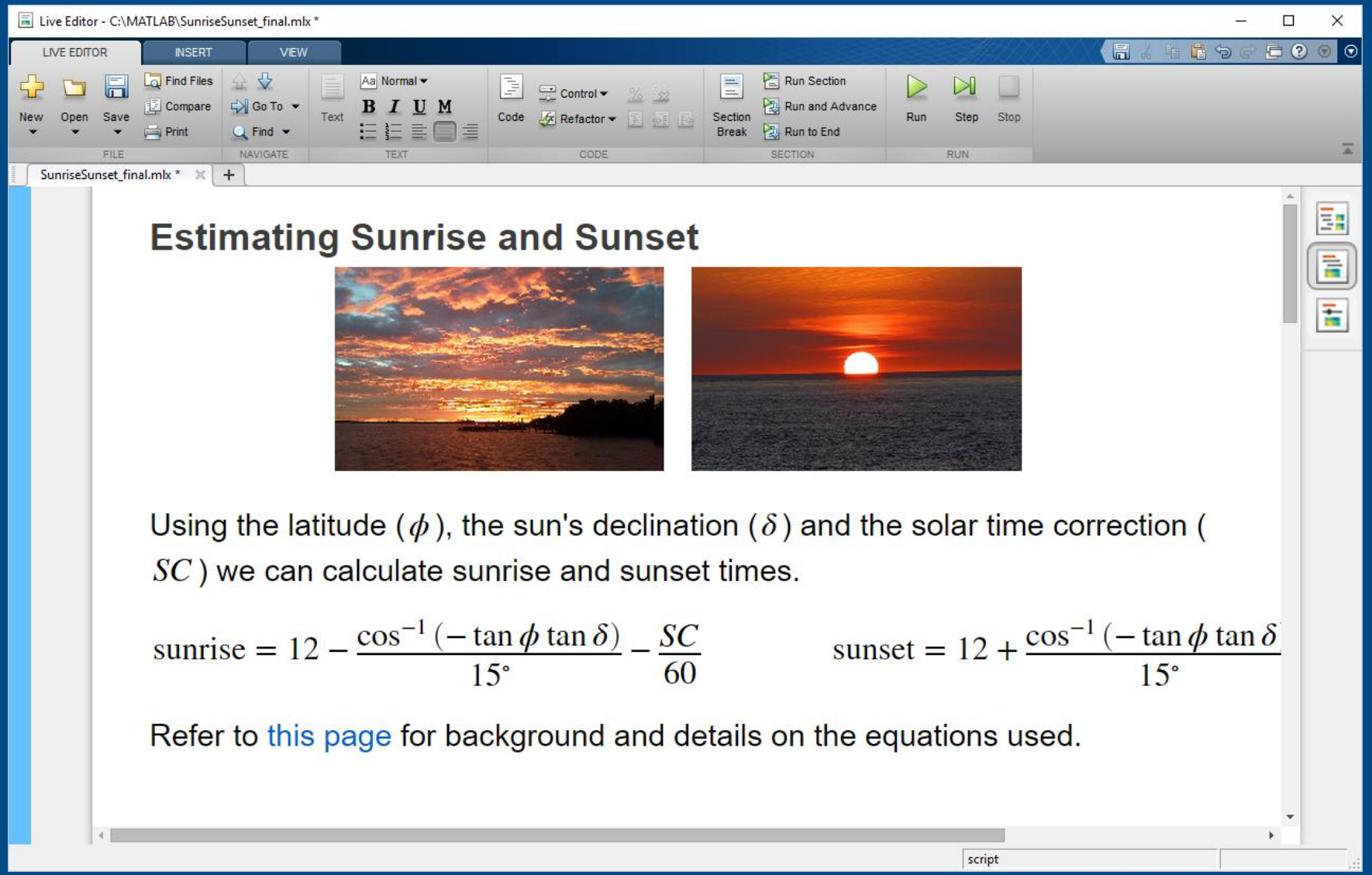
Embedded Coder

Viewing Generated Code Alongside the Model

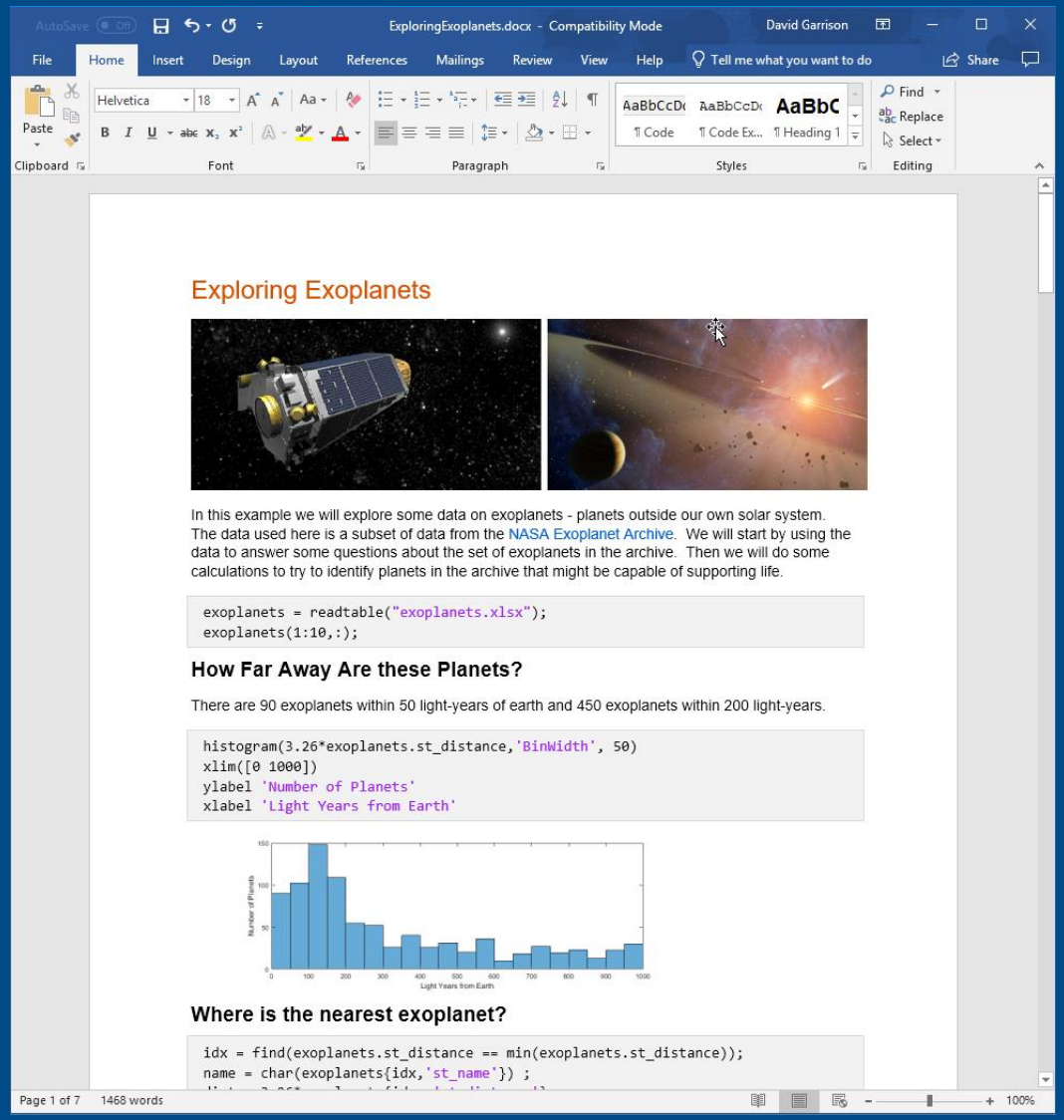


Embedded Coder

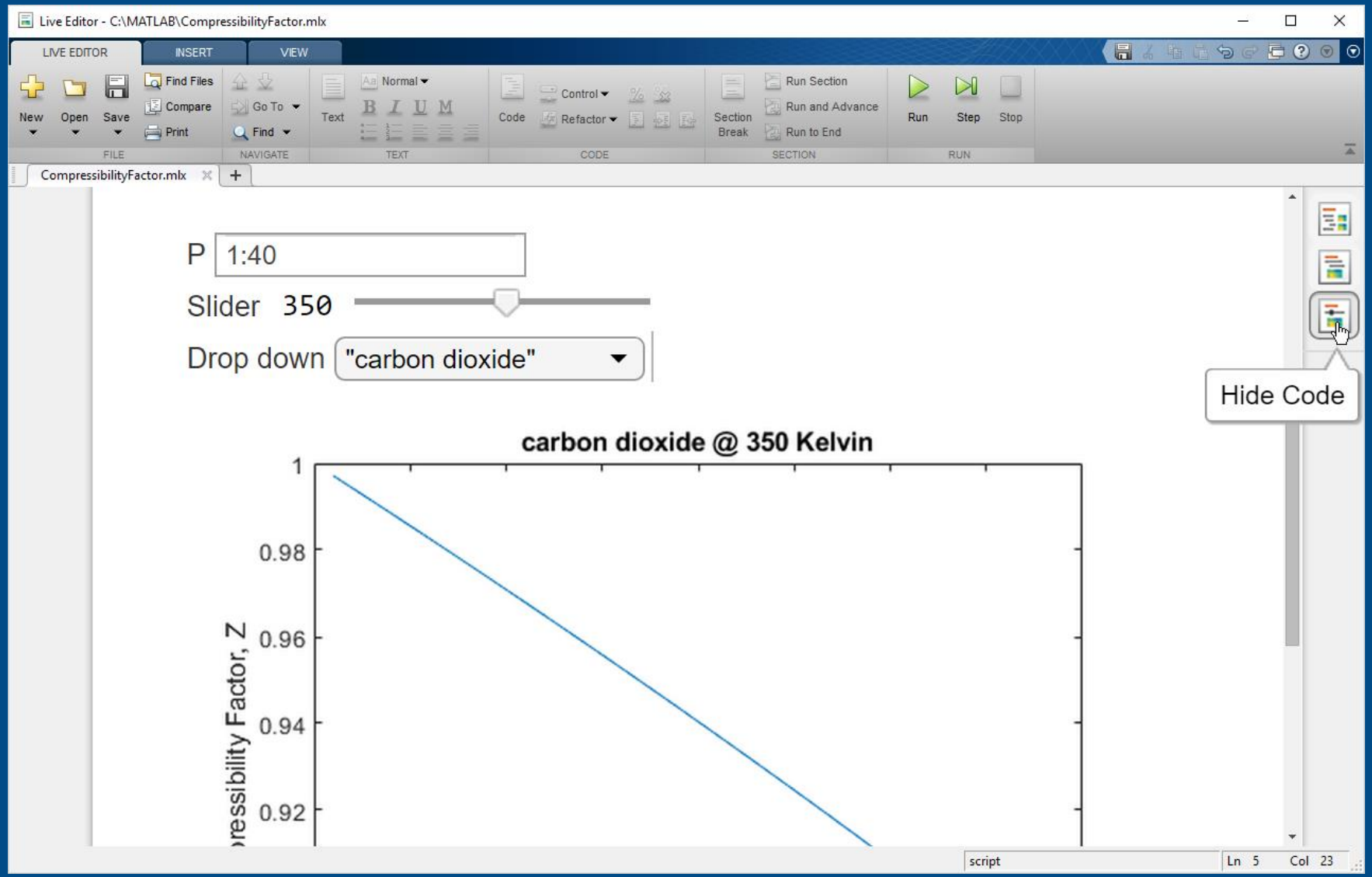
Sharing Live Scripts



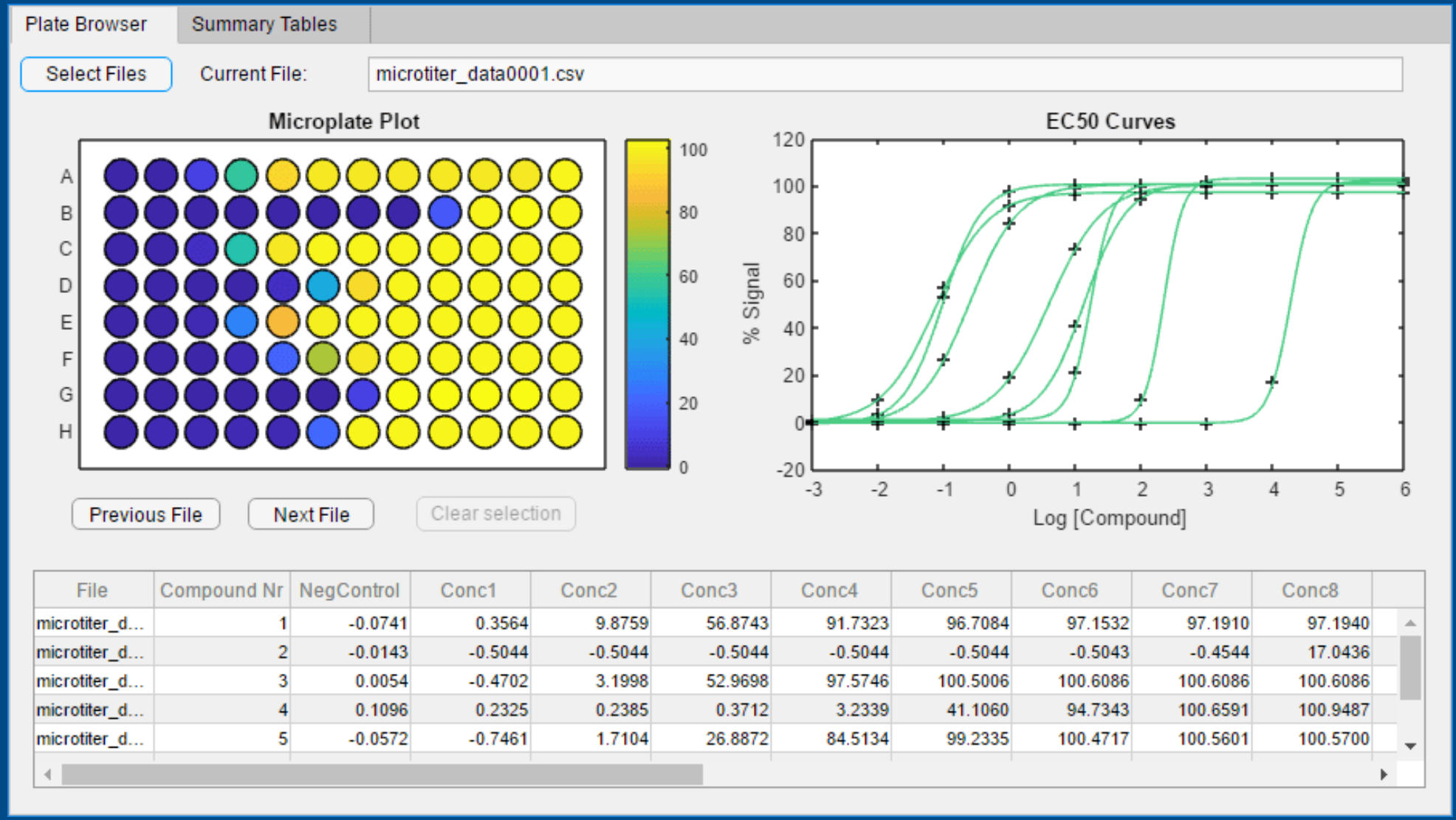
Sharing Live Scripts



Sharing Live Scripts

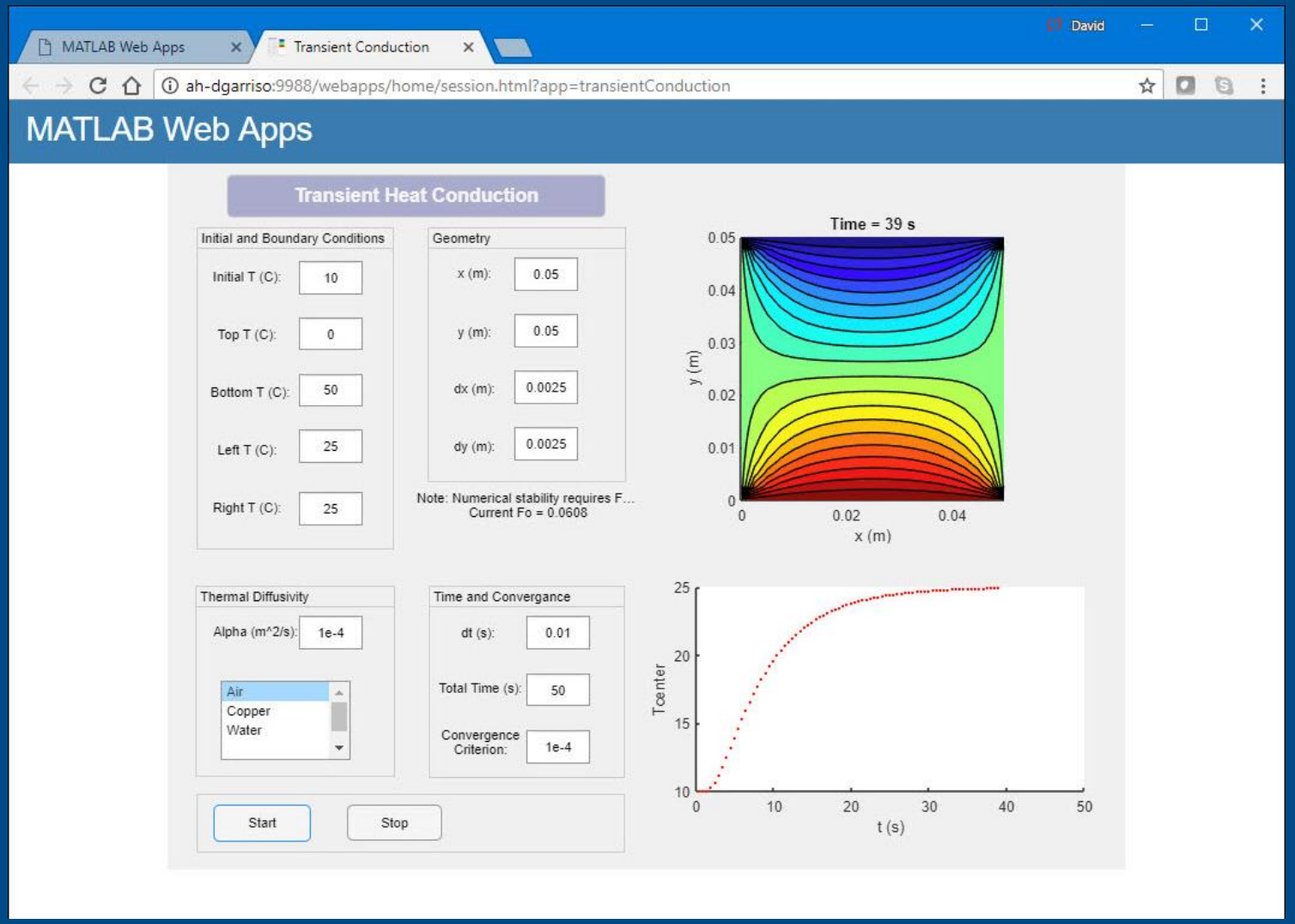


Creating Apps



File	Compound Nr	NegControl	Conc1	Conc2	Conc3	Conc4	Conc5	Conc6	Conc7	Conc8
microtiter_d...	1	-0.0741	0.3564	9.8759	56.8743	91.7323	96.7084	97.1532	97.1910	97.1940
microtiter_d...	2	-0.0143	-0.5044	-0.5044	-0.5044	-0.5044	-0.5044	-0.5043	-0.4544	17.0436
microtiter_d...	3	0.0054	-0.4702	3.1998	52.9698	97.5746	100.5006	100.6086	100.6086	100.6086
microtiter_d...	4	0.1096	0.2325	0.2385	0.3712	3.2339	41.1060	94.7343	100.6591	100.9487
microtiter_d...	5	-0.0572	-0.7461	1.7104	26.8872	84.5134	99.2335	100.4717	100.5601	100.5700

Deploying Web Apps



Using MATLAB & Simulink to Build Algorithms in Everything

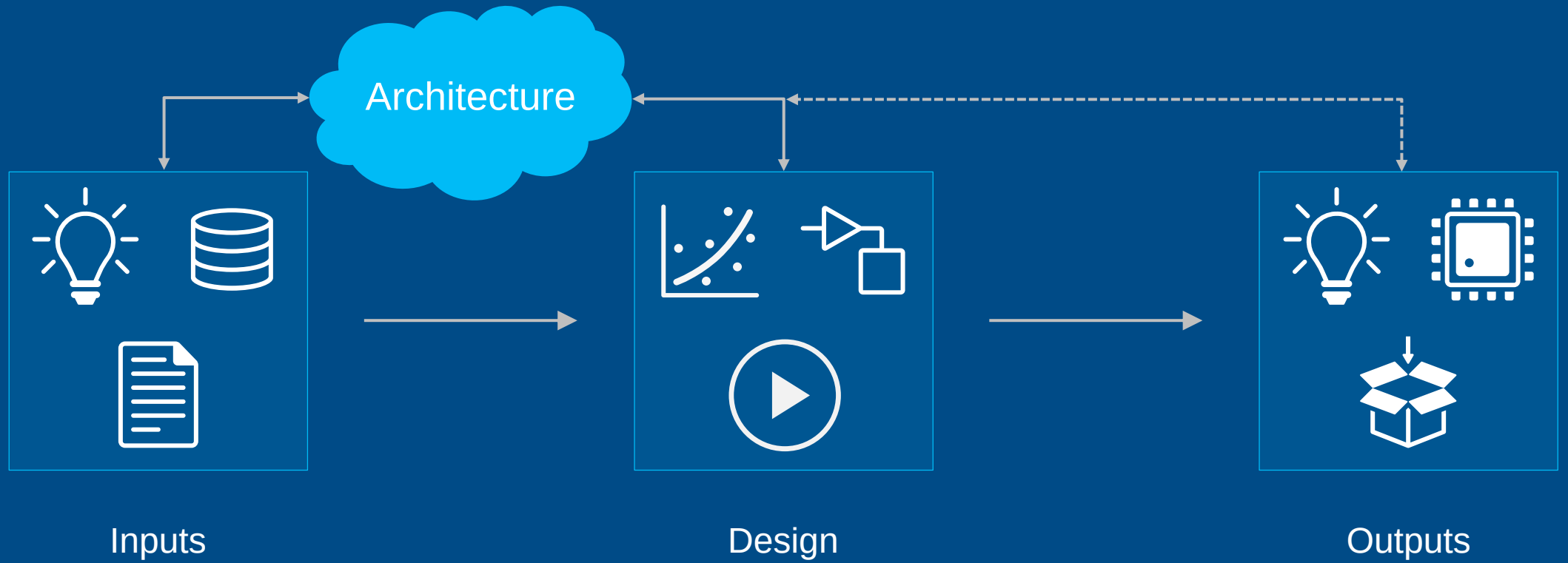
Inputs

Design

Outputs

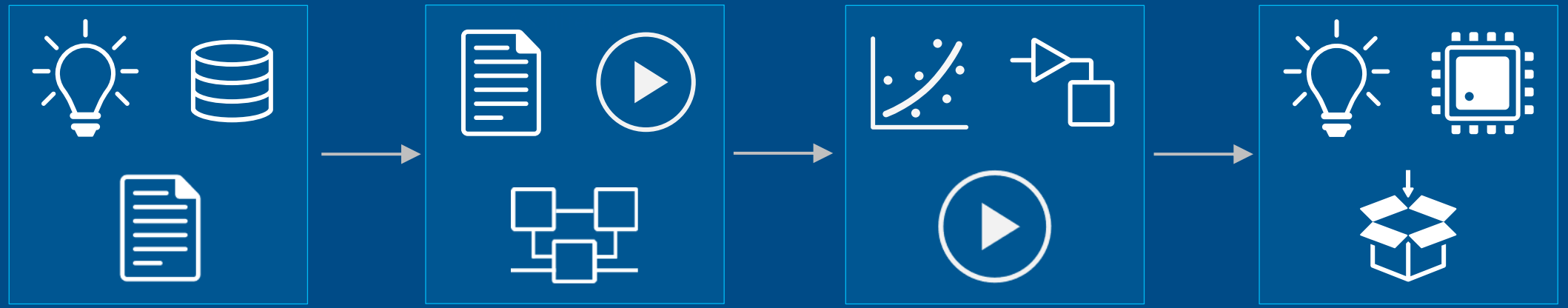
MATLAB&SIMULINK®

Evaluating Architectures



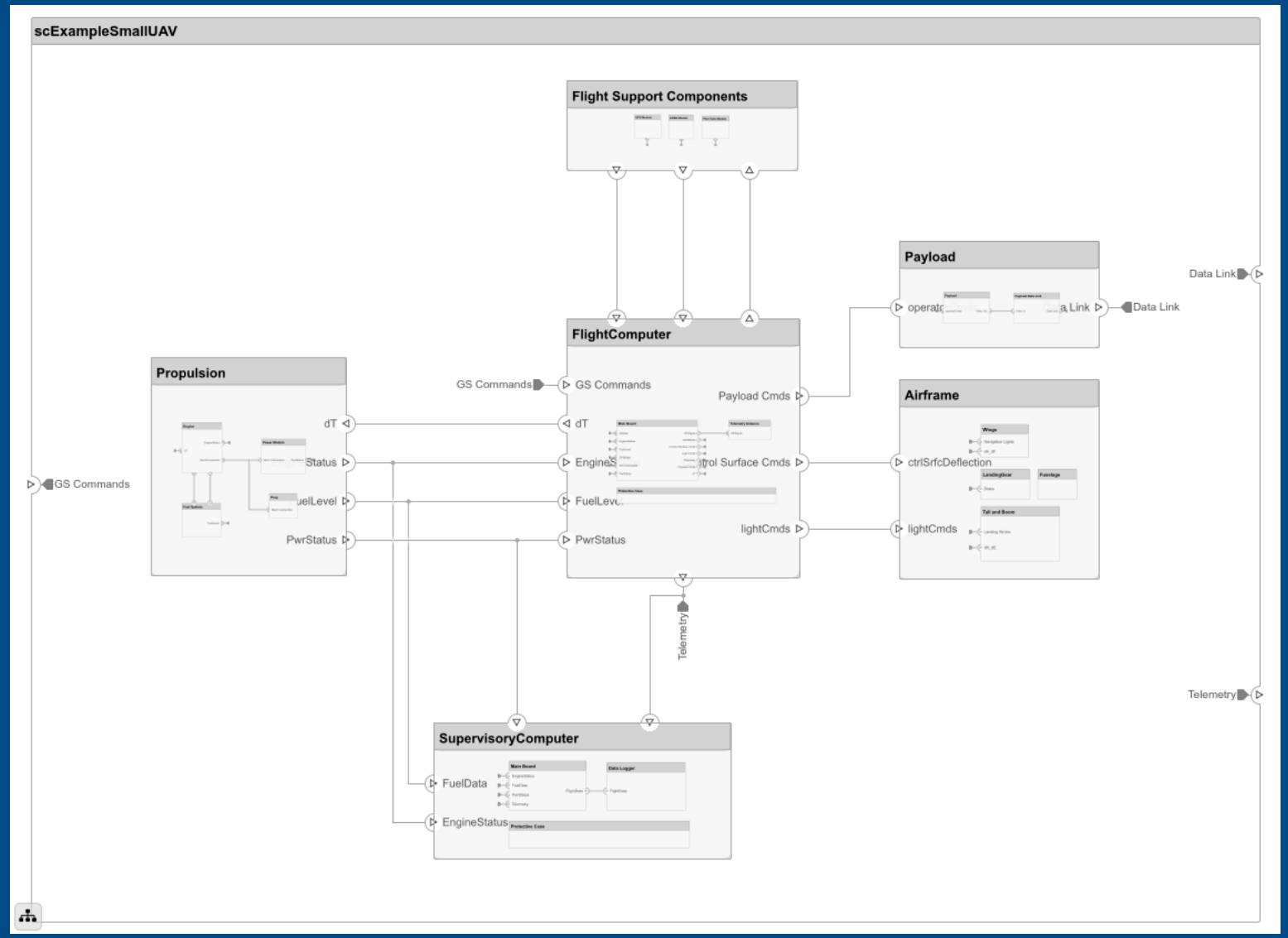
MATLAB&SIMULINK®

Evaluating Architectures



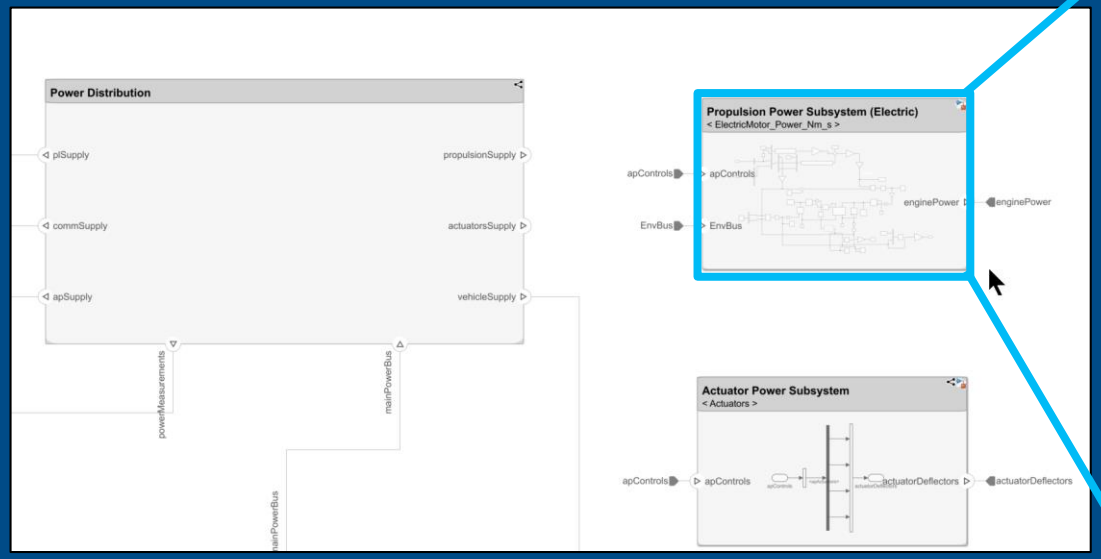
MATLAB&SIMULINK®

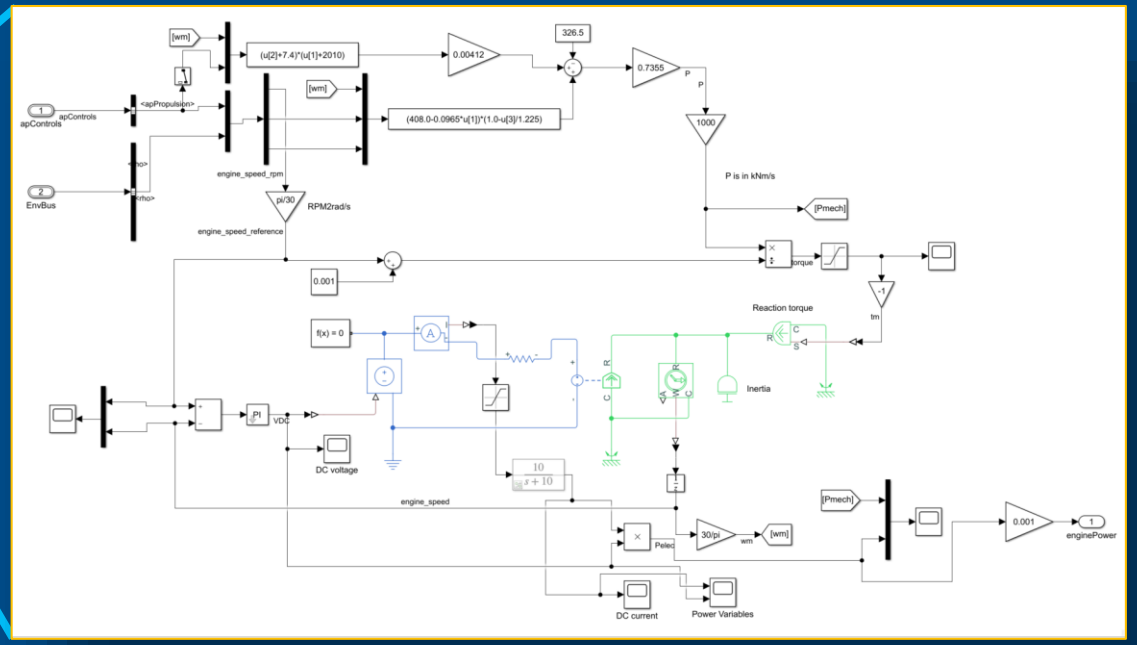
Designing System and Software Architectures



System Composer

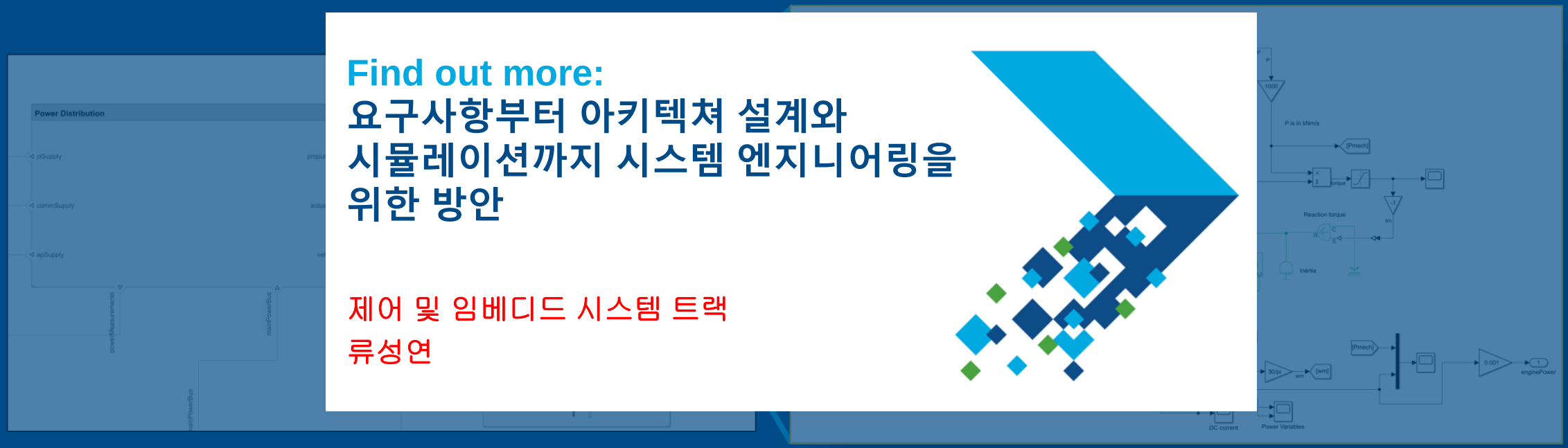
Designing System and Software Architectures





System Composer

Designing System and Software Architectures



Find out more:

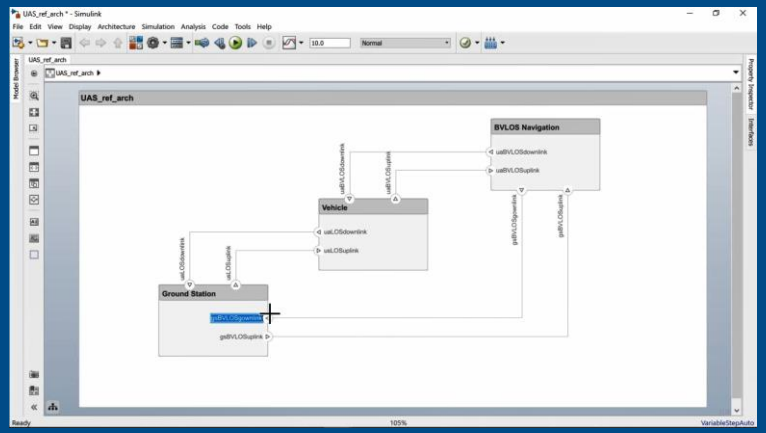
요구사항부터 아키텍쳐 설계와 시뮬레이션까지 시스템 엔지니어링을 위한 방안

제어 및 임베디드 시스템 트랙

류성연

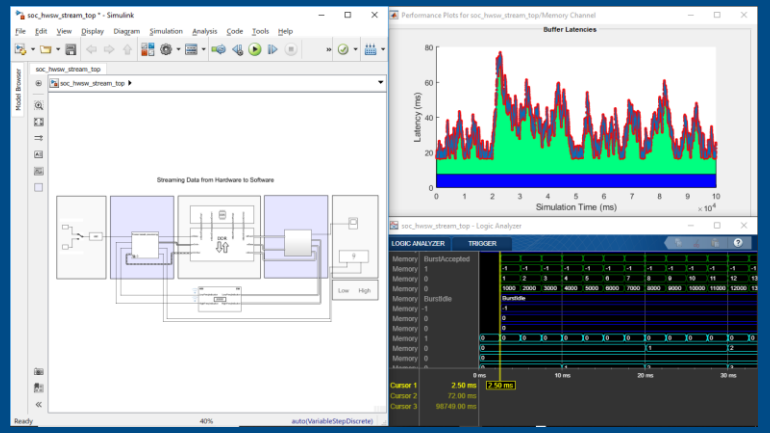
Designing Beyond System and Software Architectures

Systems and Software



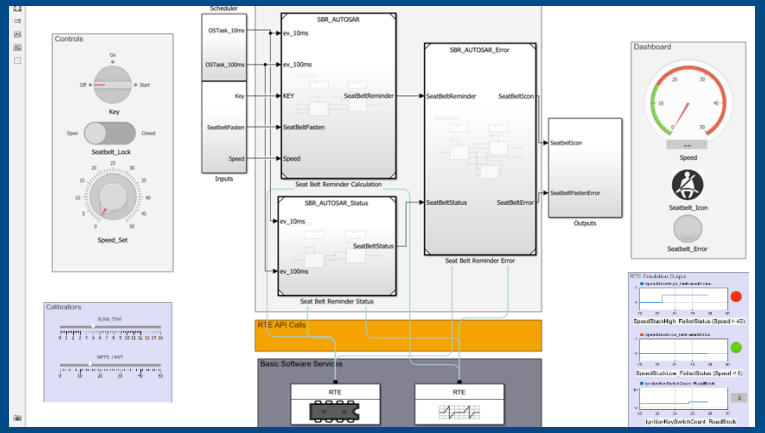
System Composer

SoC Hardware and Software



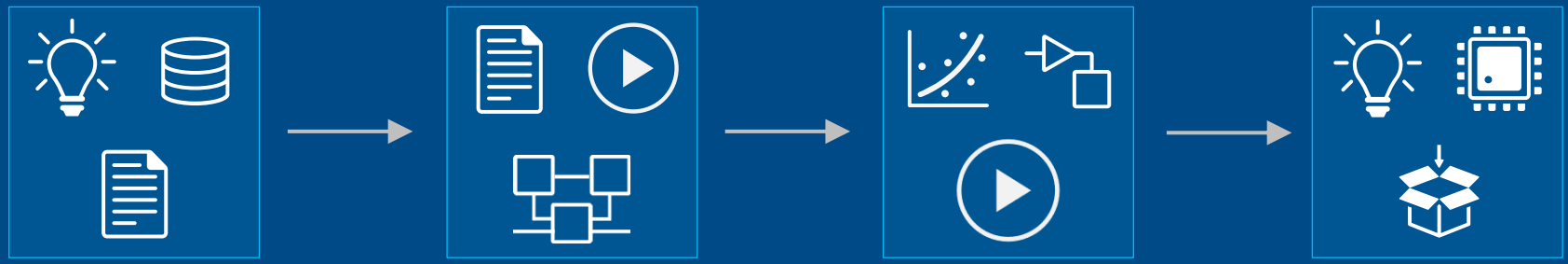
SoC Blockset

AUTOSAR Software



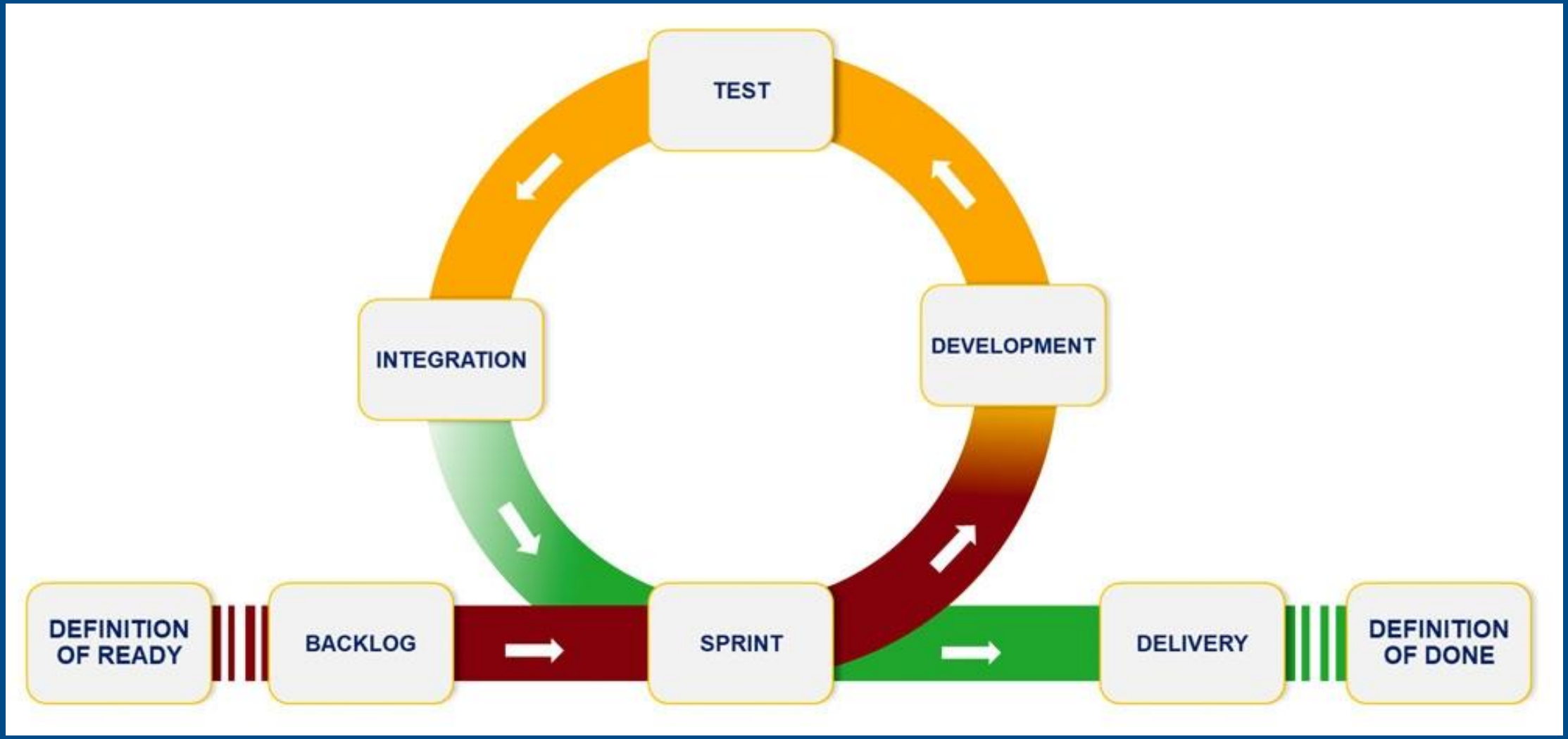
AUTOSAR Blockset

Using MATLAB & Simulink to Build Algorithms in Everything



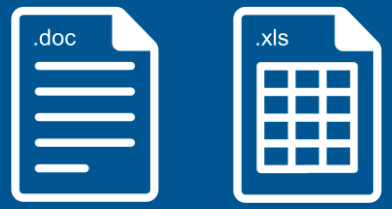
MATLAB&SIMULINK®

Using MATLAB & Simulink to Build Algorithms in Everything



Integrating with Third-party Requirements Tools

External Requirements



Requirements Management Tools

R2019a

ReqIF

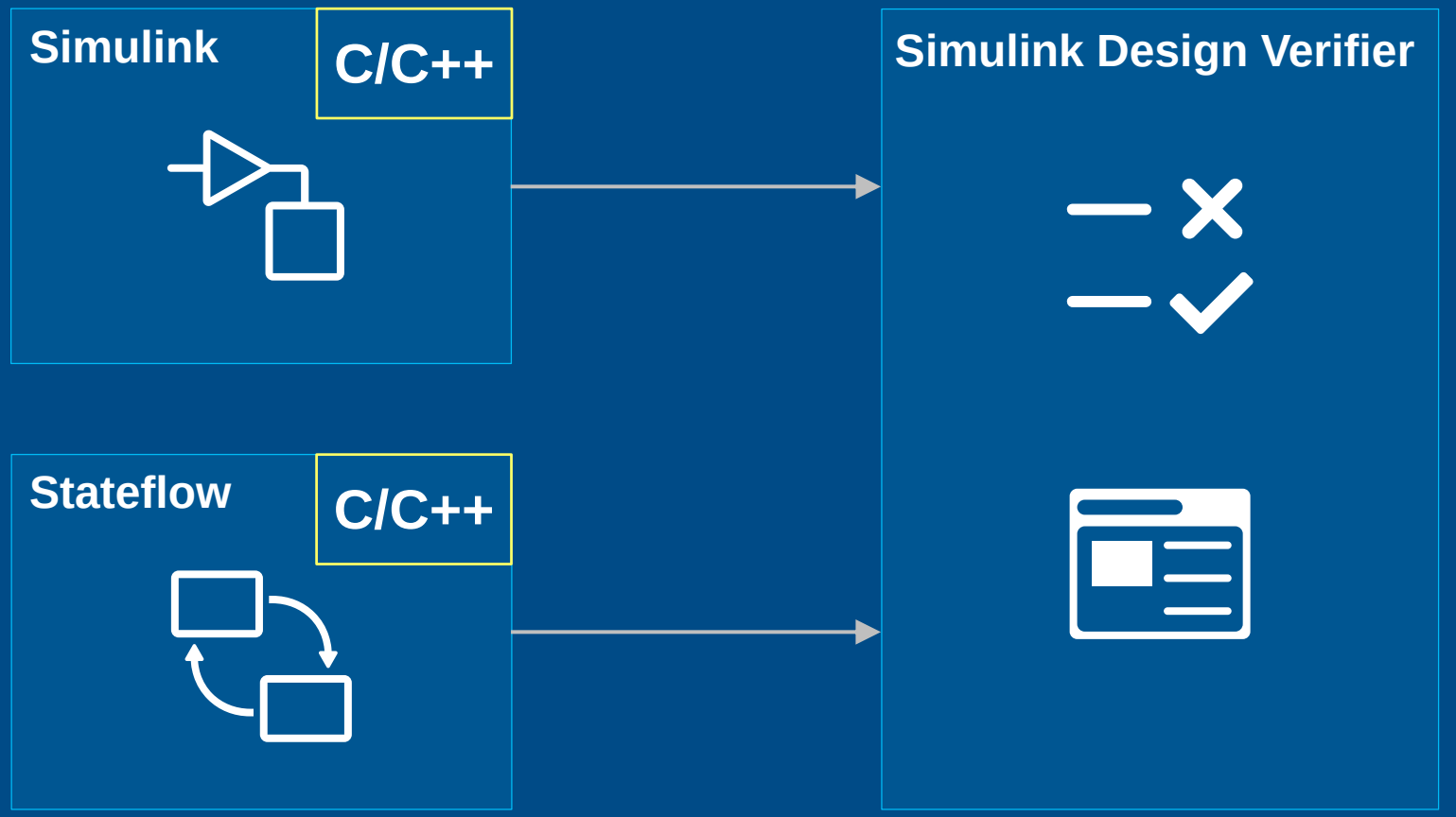
Simulink Requirements

External Requirements

Authored Requirements

Simulink Requirements

Include Custom Code in Test & Verification



Include Custom Code in Test & Verification

Simulink

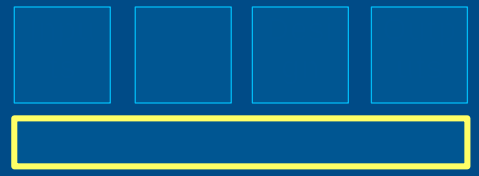
C/C++

Simulink Design Verifier

Find out more:
모델기반설계를 이용한 요구사항 기반 검증의 단순화

제어 및 임베디드 시스템
홍혁기

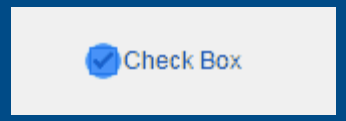
Using the MATLAB Unit Test Framework



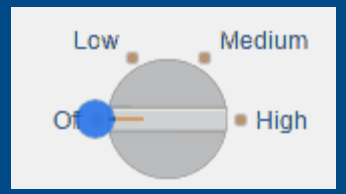
```
>> result.table
ans =
  2×6 table
                                Name                                Passed    Failed    Incomplete    Duration    Details
    ____________________________________________________________    ______    ______    __________    ________    _____________
    'test_Predictions/Test_ModelType'                               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

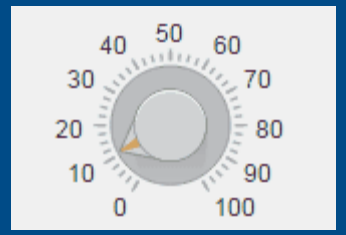
```
testCase.press(myApp.checkbox)
```



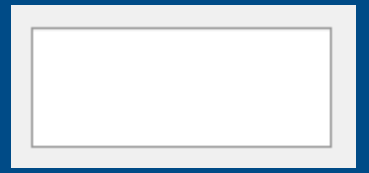

```
testCase.choose(myApp.discreteKnob, "Medium")
```



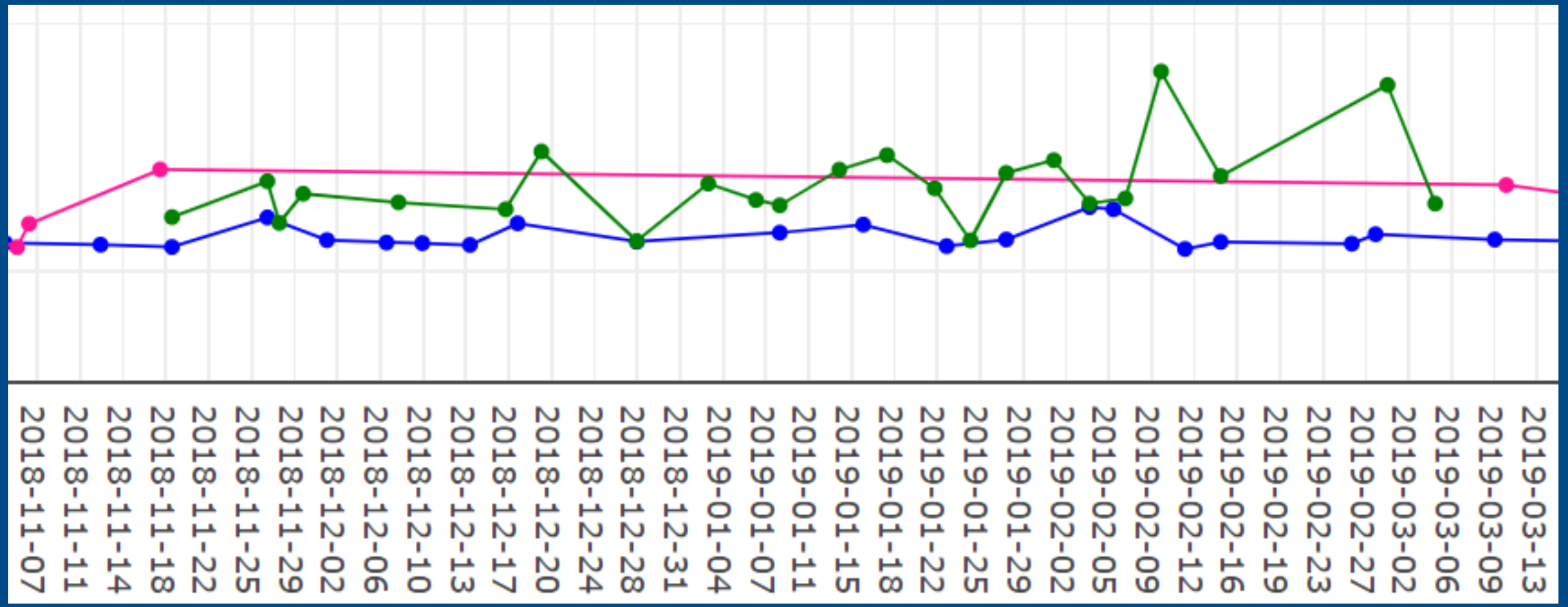

```
testCase.drag(myApp.continuousKnob, 10, 90)
```




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



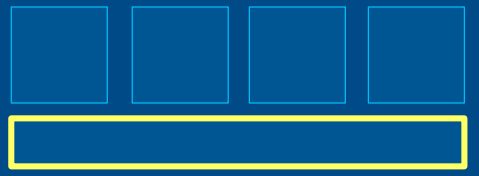
Using the MATLAB Performance Testing Framework

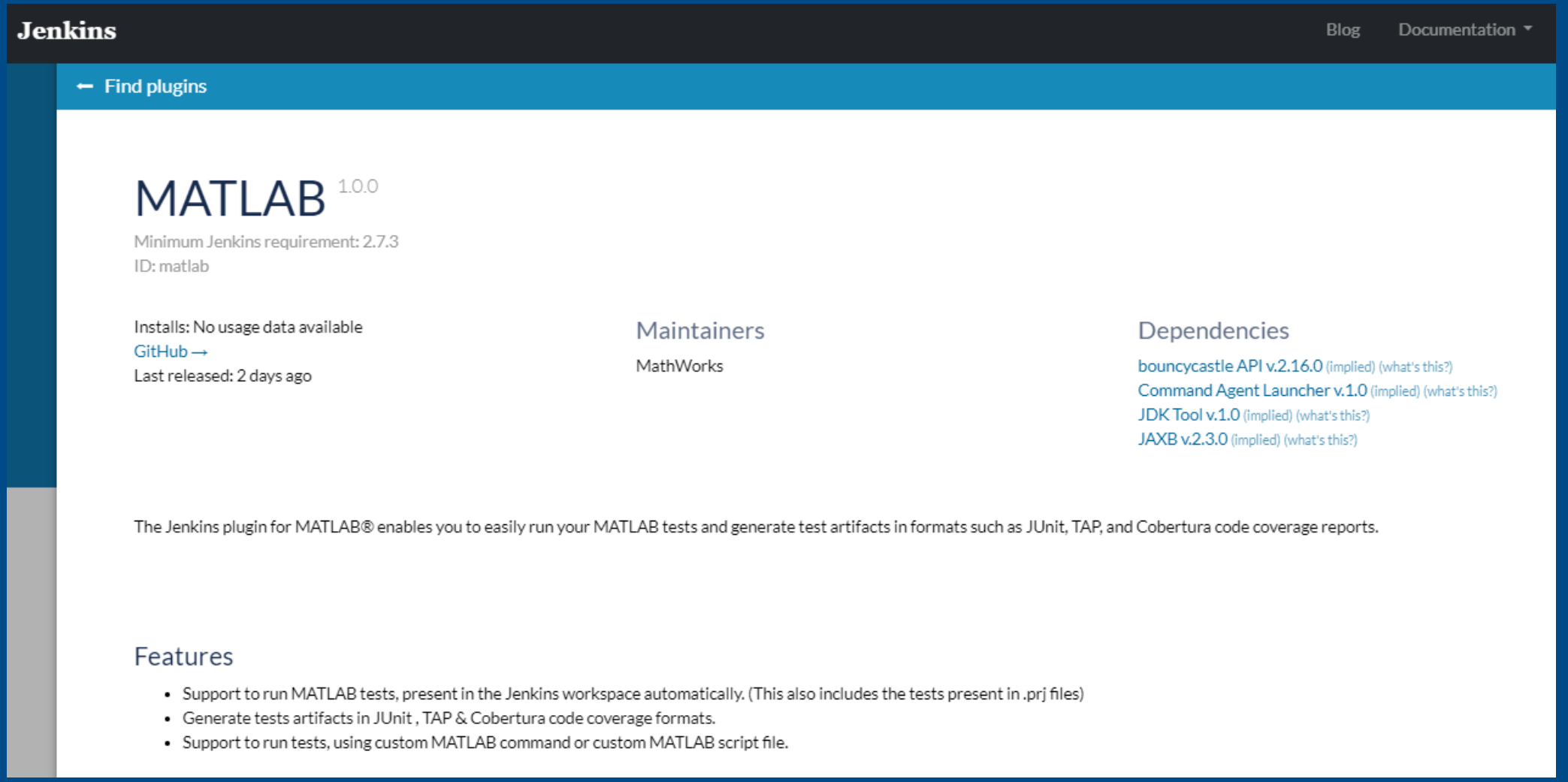


Using Continuous Integration

MATLAB https://plugins.jenkins.io/

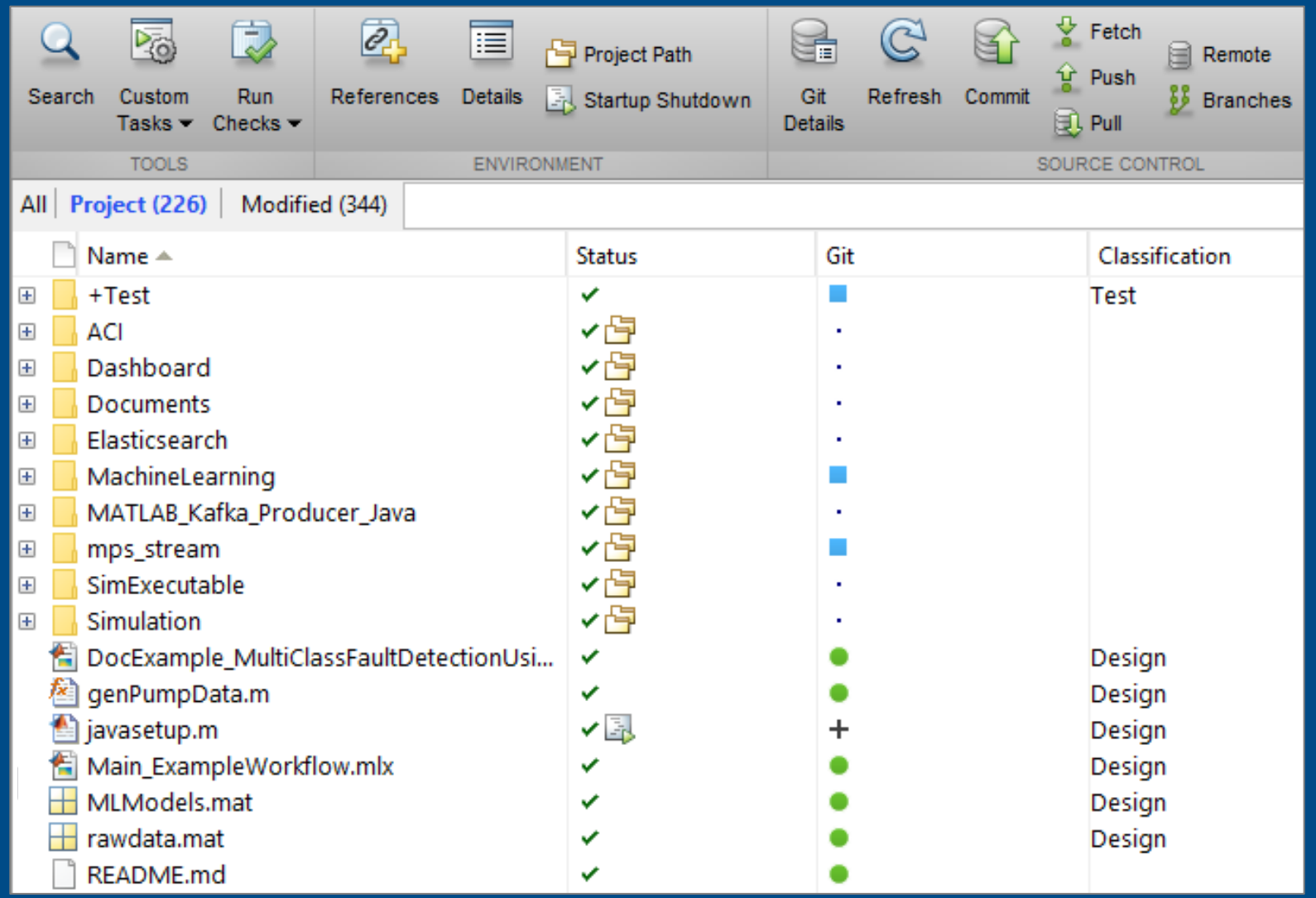
Using Continuous Integration





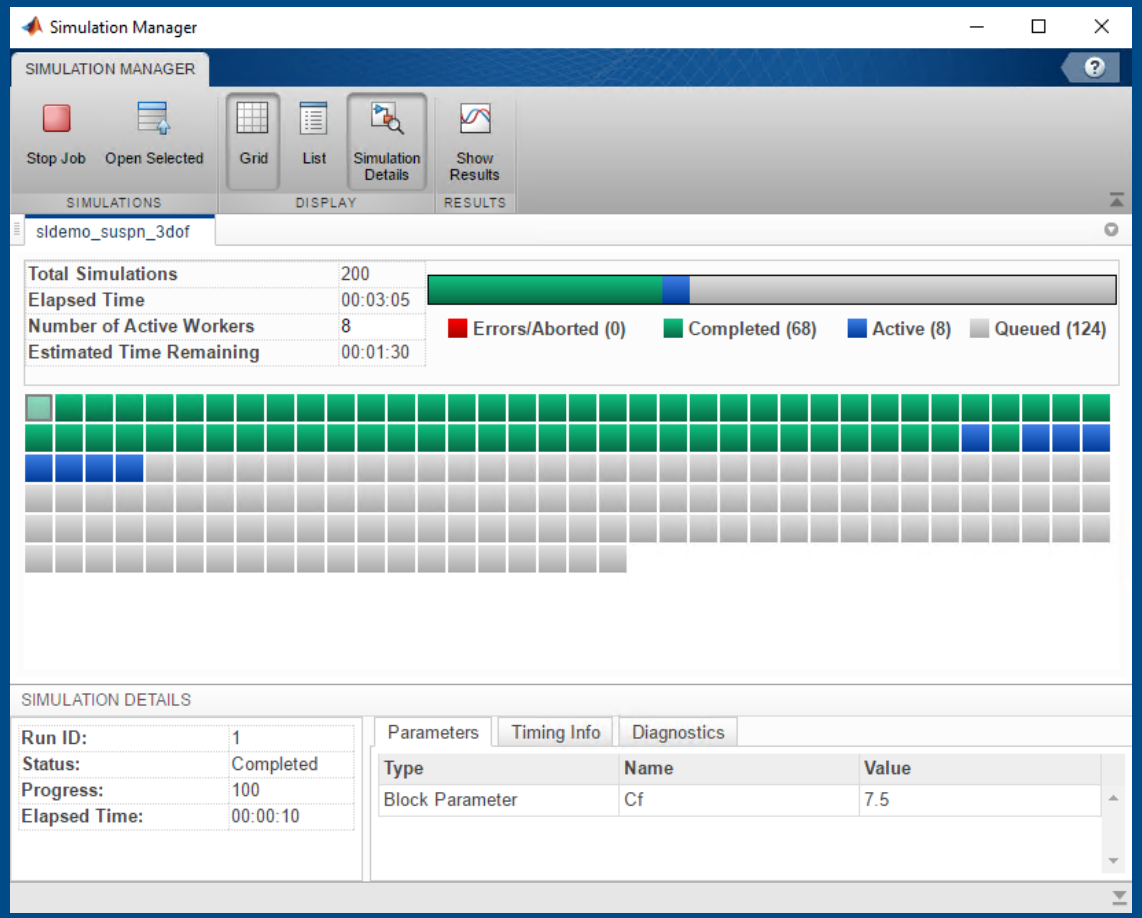
MATLAB **https://plugins.jenkins.io/matlab**

Using Projects in MATLAB

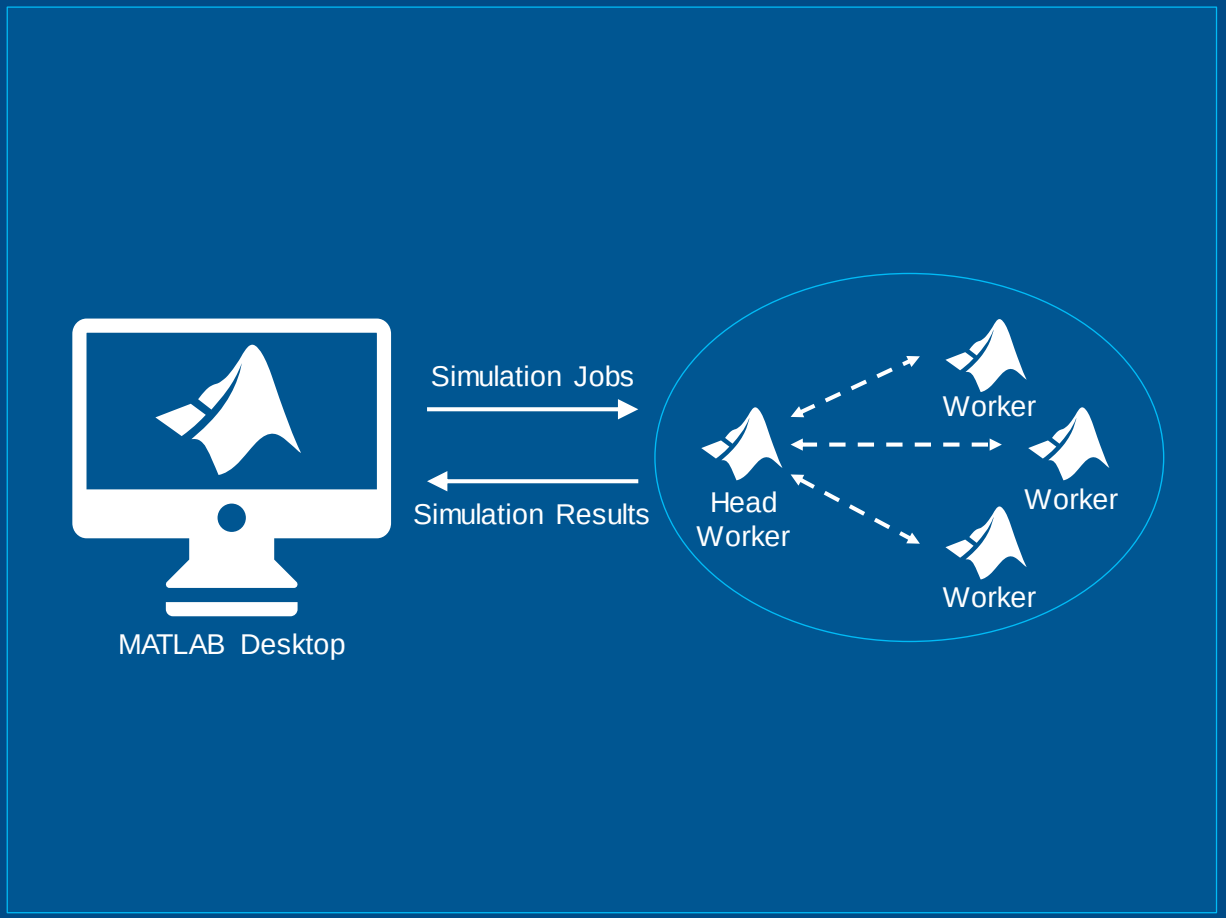


Parallel Simulations in Simulink

Simulation Manager

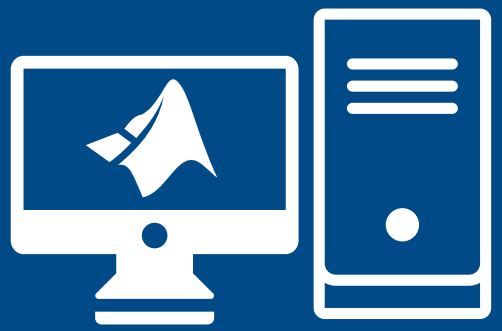


batchsim



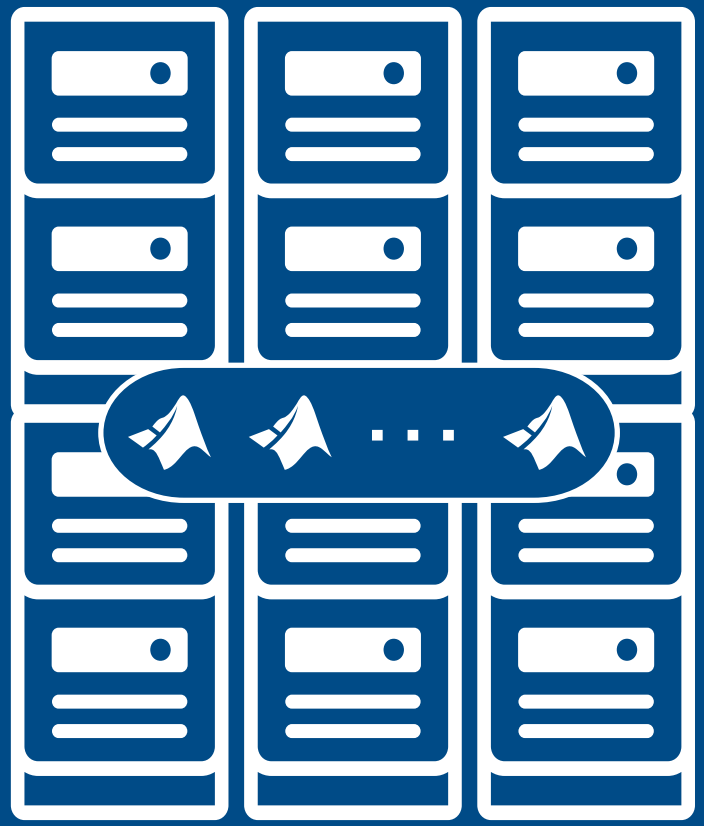
Simulink
Parallel Computing Toolbox

Scaling Computations on Clusters and Clouds



MATLAB

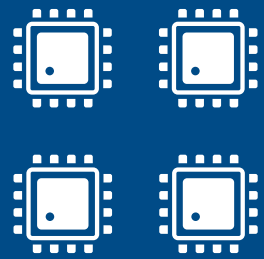
Parallel Computing Toolbox



MATLAB Parallel Server

Cloud

GPU

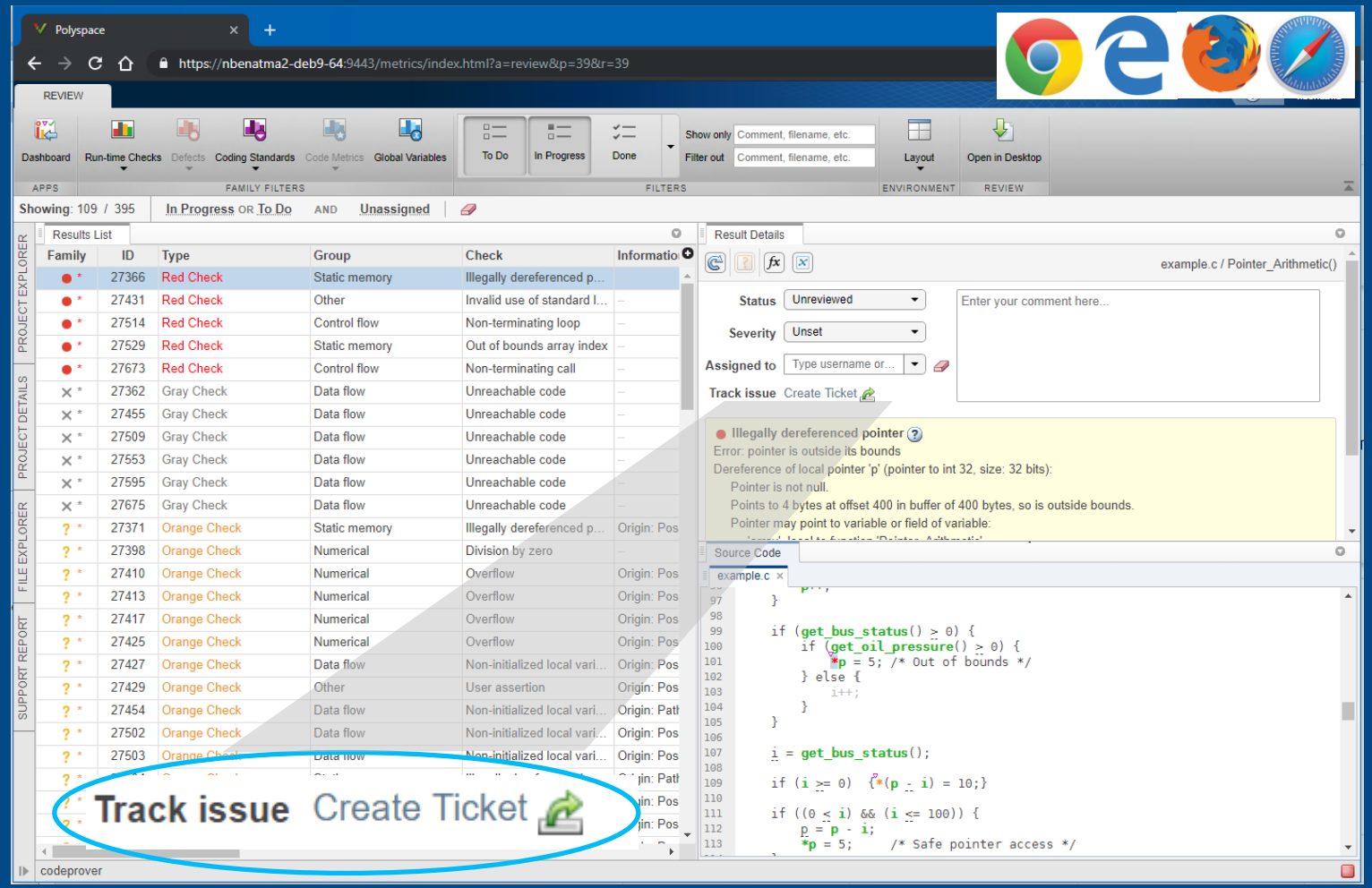


Multi-core CPU

MATLAB Parallel Server

Team-Based Collaboration for Code Verification and Review

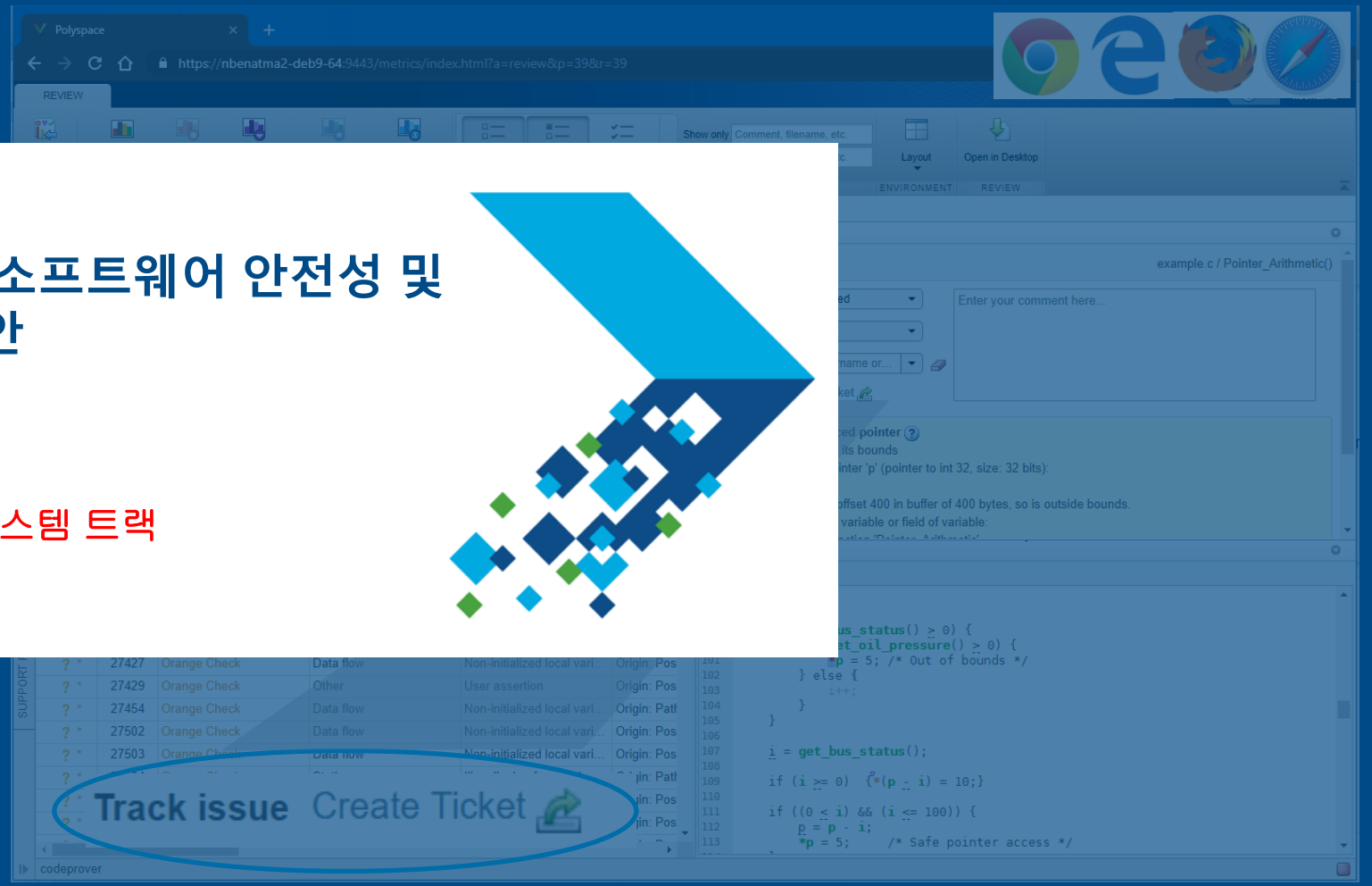
- Web browser-based view of results directly in the code
- Navigation tools for investigating code analysis and proving results
- Ability to triage, assign, and justify code analysis results
- Create and assign tickets in bug-tracking systems such as Jira



Polyspace Access

Team-Based Collaboration for Code Verification and Review

- Web browser-based view of results directly in
- Navigation tools investigating cod proving results
- Ability to triage, justify code anal
- Create and assign tickets in bug-tracking systems such as Jira

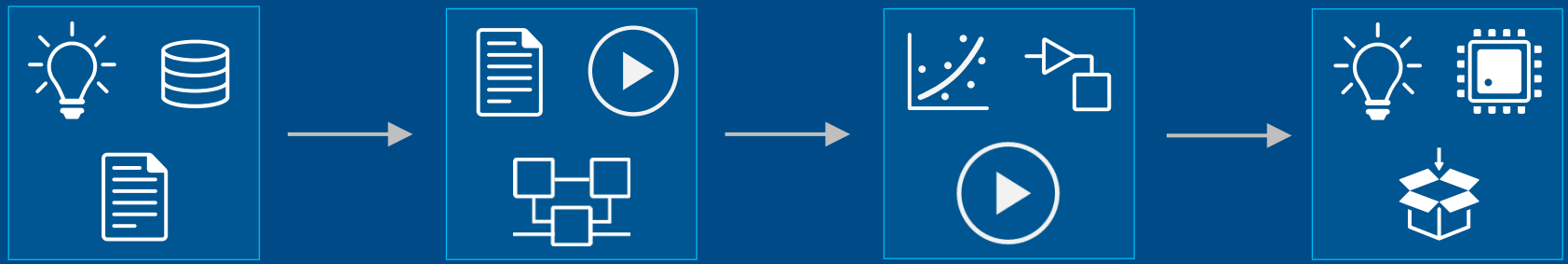


Find out more:
팀 협업을 통한 소프트웨어 안전성 및 보안성 확보 방안

제어 및 임베디드 시스템 트랙

Jay Abraham

Using MATLAB & Simulink to Build Algorithms in Everything



Test & Verification

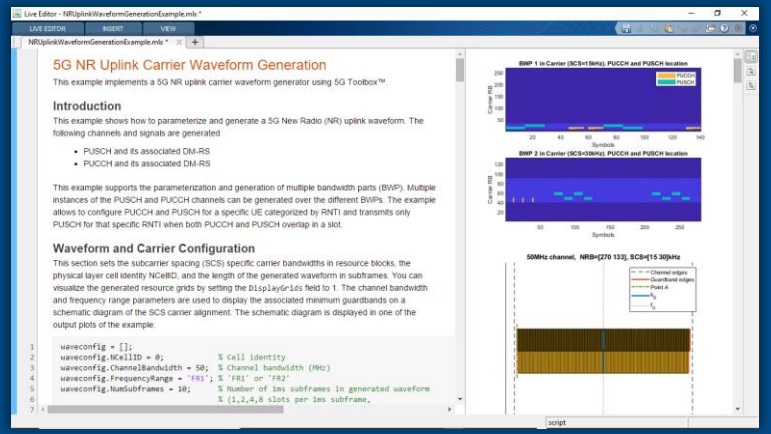
Collaboration

Scaling

MATLAB&SIMULINK

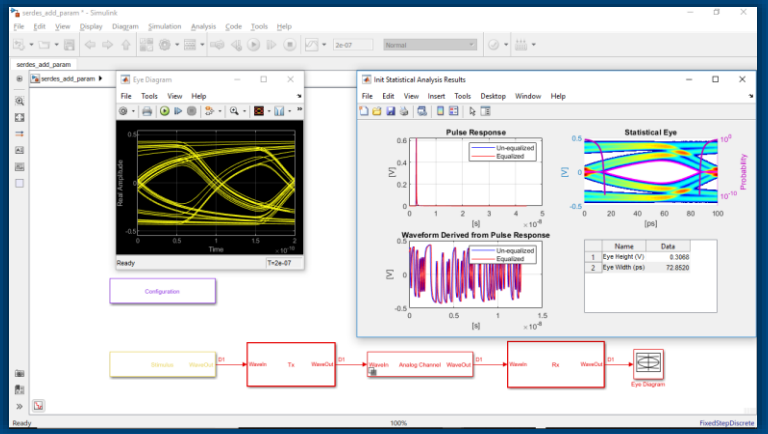
Specialized Tools for Building Algorithms in Everything

Communications



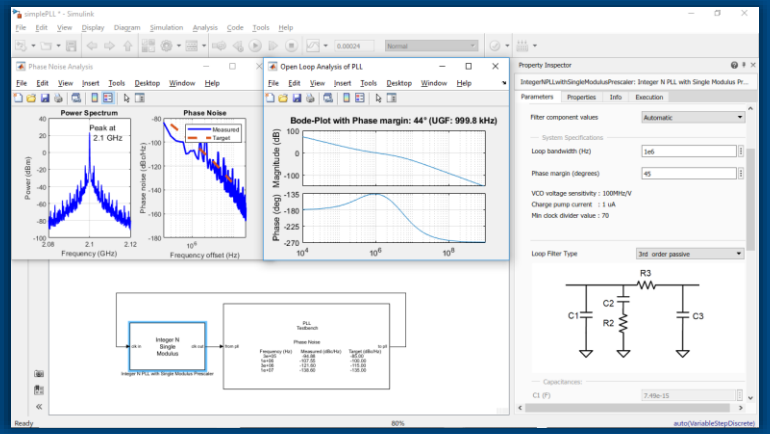
5G Toolbox

Physical interconnects



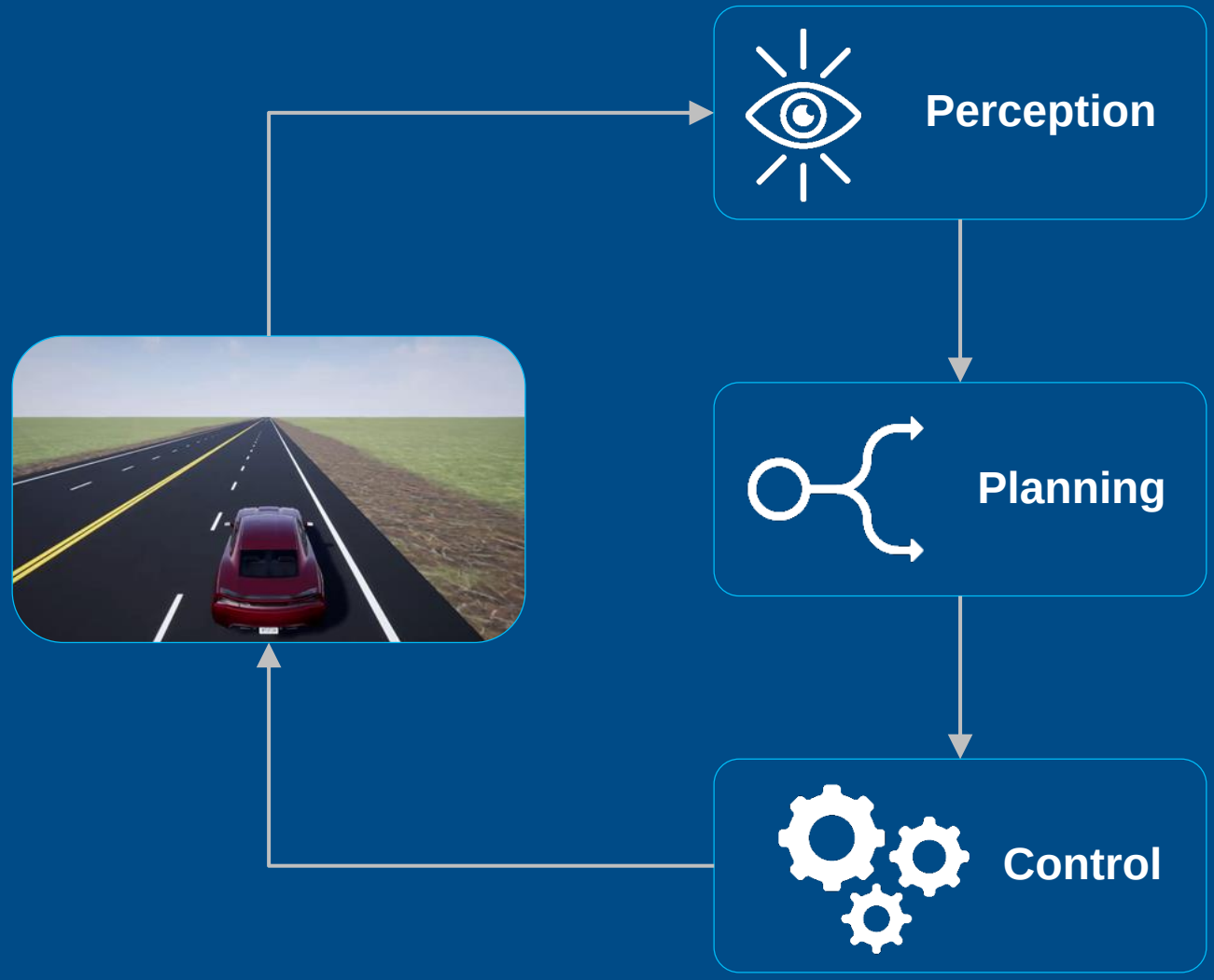
SerDes Toolbox

Analog Mixed-Signal

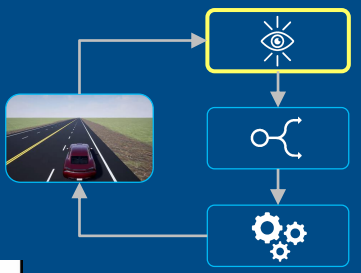


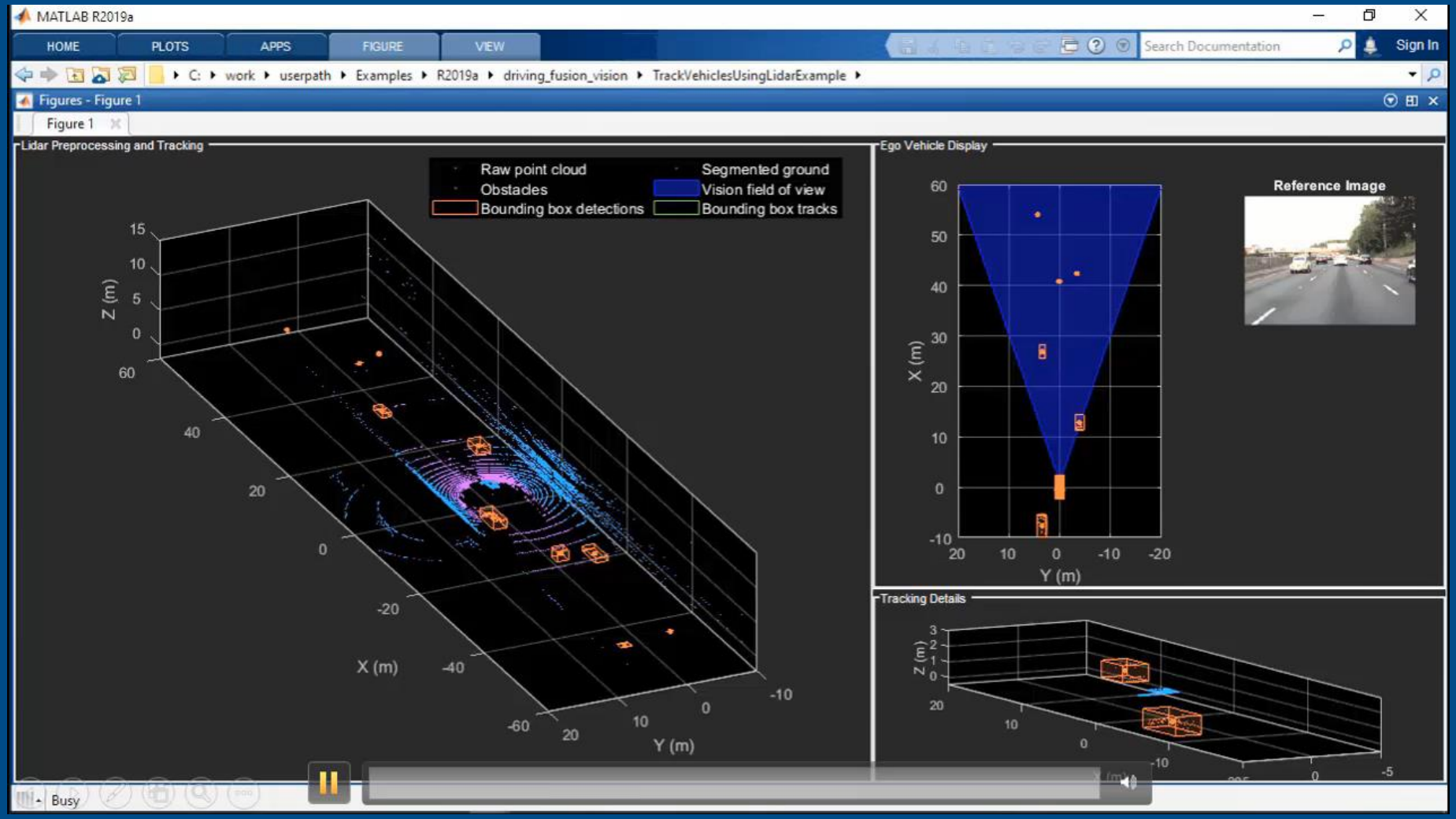
Mixed-Signal Blockset

Developing Autonomous Systems



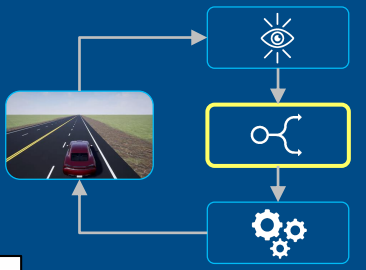
Evaluate Sensor Fusion Architectures

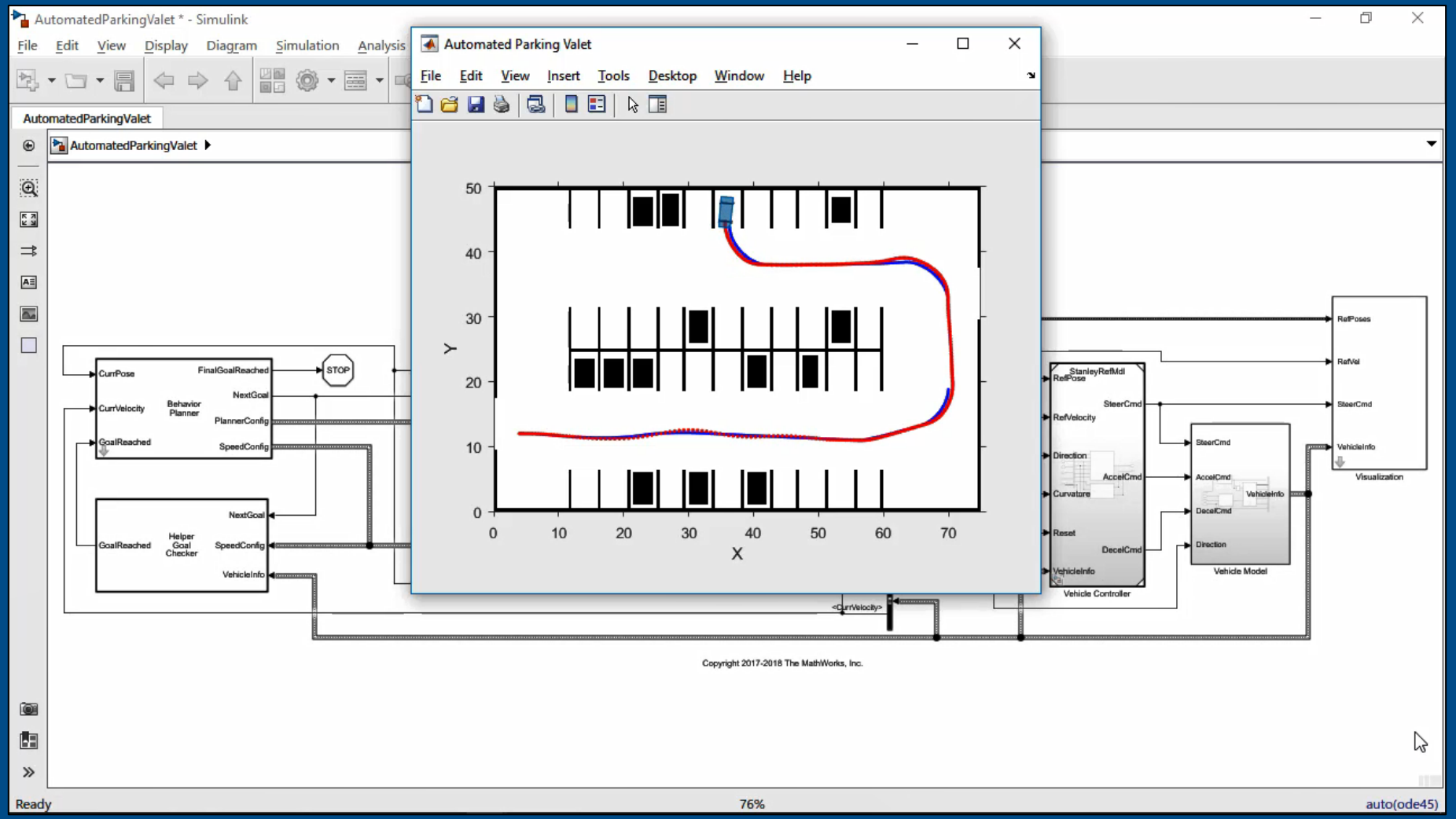




Sensor Fusion and Tracking Toolbox

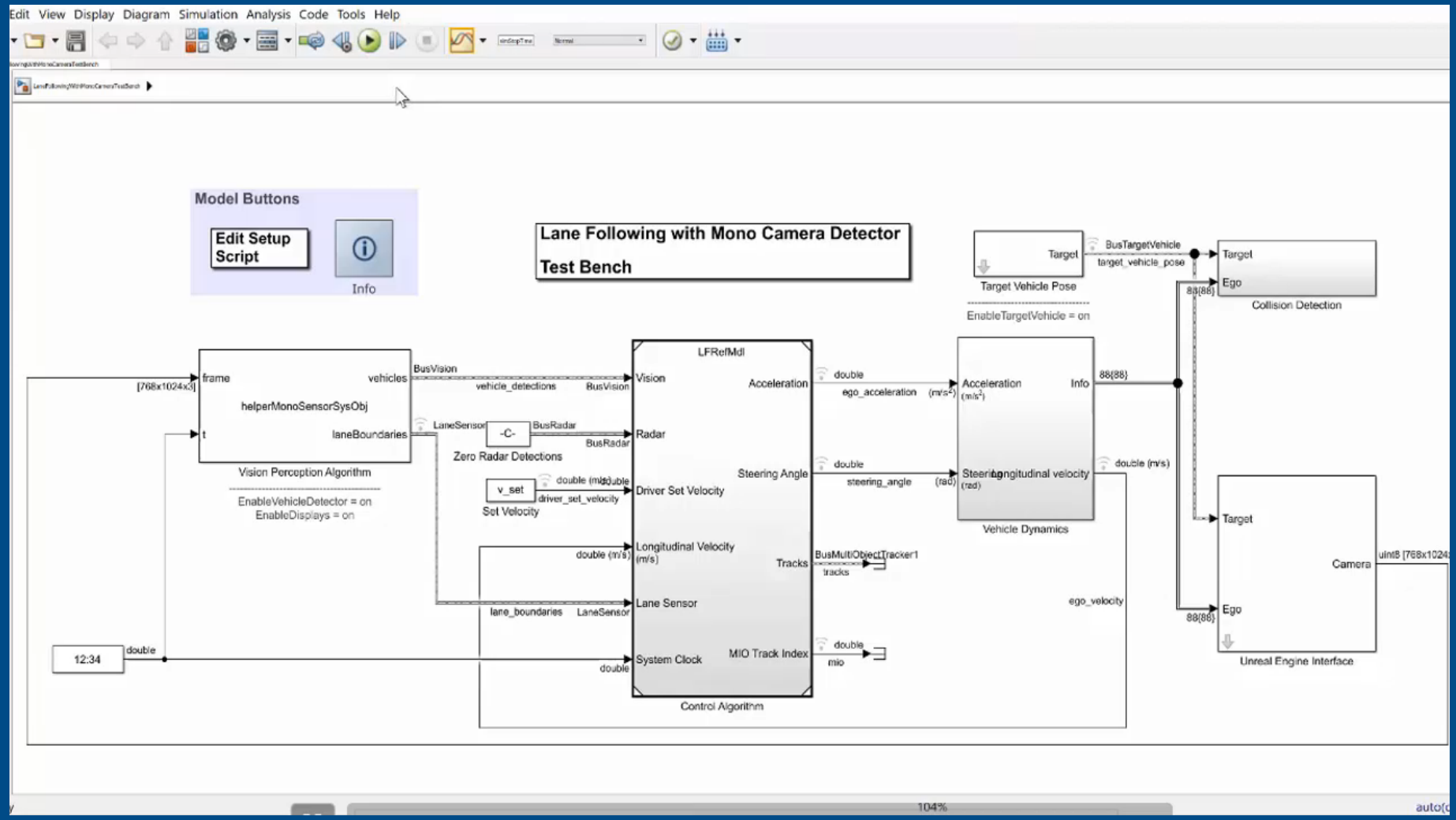
Simulate Path Planning Algorithms





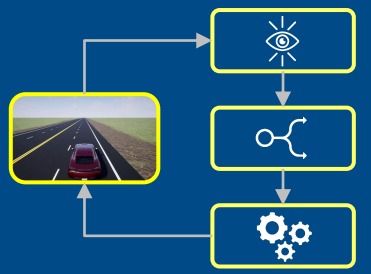
Automated Driving Toolbox

Design Lane-following and Spacing Control Algorithms

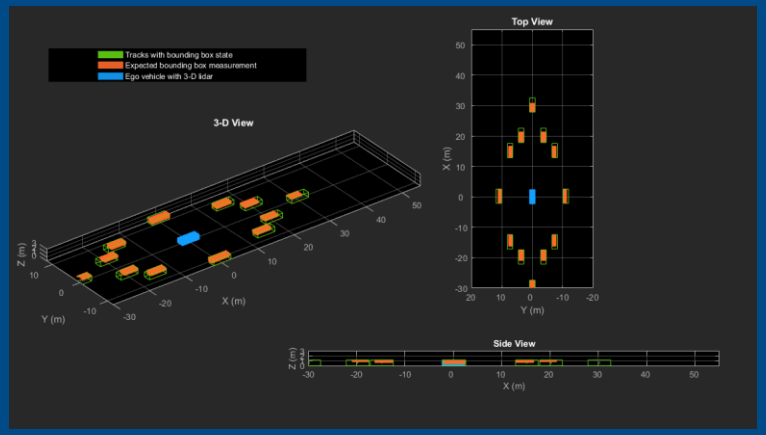


Model Predictive Control Toolbox

Developing Autonomous Systems

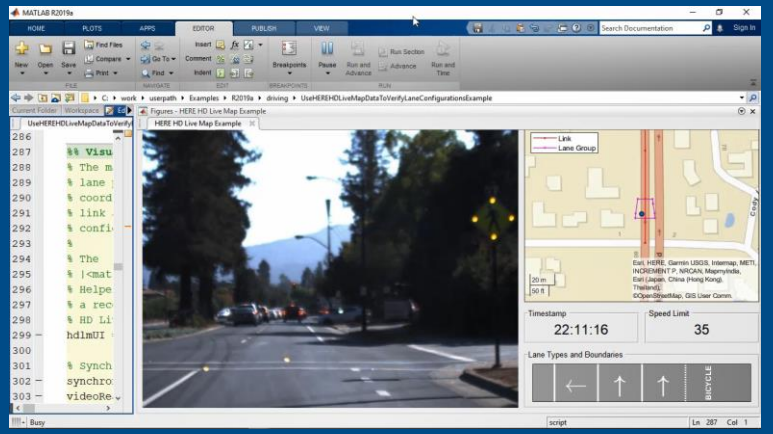


Lidar Processing & Tracking



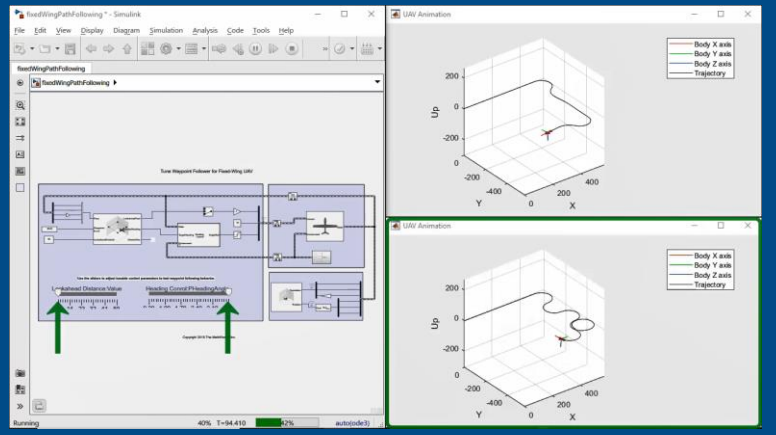
Computer Vision Toolbox

HERE HD Maps & OpenDRIVE Roads



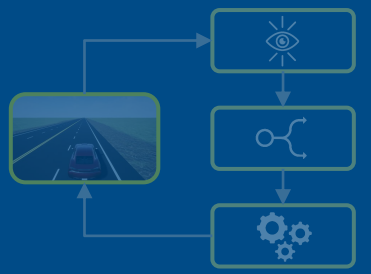
Automated Driving Toolbox

UAV Algorithms



Robotics System Toolbox

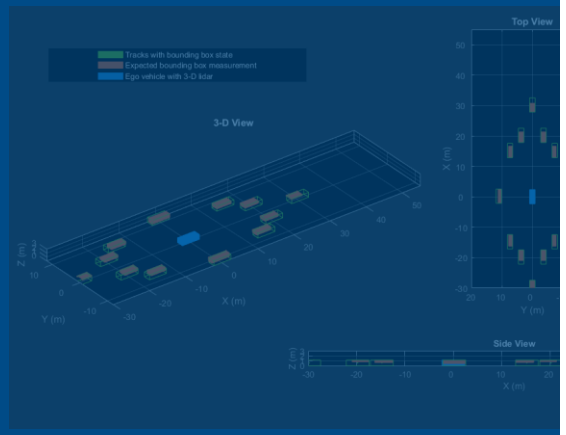
Developing Autonomous Systems

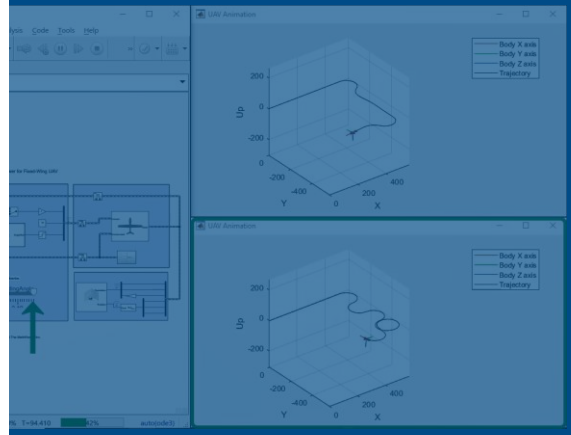


Lidar Processing & Tracking

HERE HD Maps &

UAV Algorithms





Find out more:

MATLAB 및 Simulink를 이용한 자율주행 시스템 설계 및 시뮬레이션

제어 및 임베디드 시스템 트랙

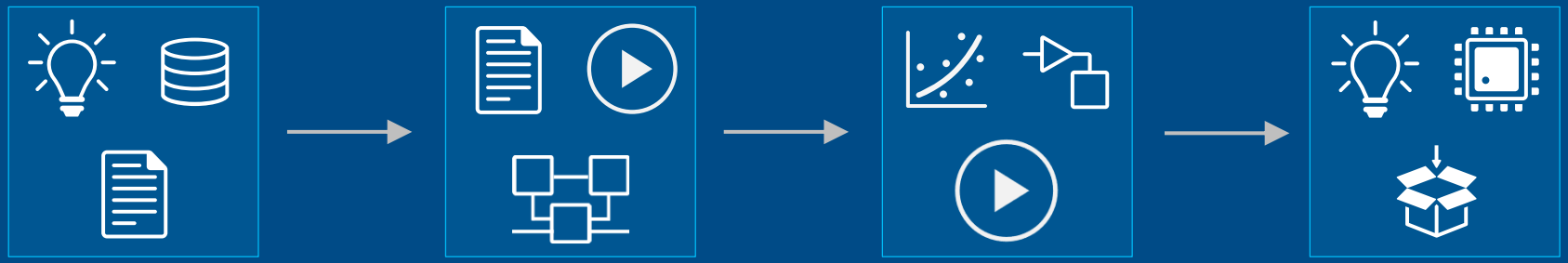
김종헌

Computer Vision Toolbox

Automated Driving Toolbox

Robotics System Toolbox

Using MATLAB & Simulink to Build Algorithms in Everything



Test & Verification

Collaboration

Scaling

MATLAB&SIMULINK

Attend Sessions this Afternoon

	엔지니어링 데이터 애널리틱스	인공지능과 딥러닝	제어 및 임베디드 시스템	센서 신호처리 및 무선기술	Tech Talk Special
11:40	인공지능 및 엔터프라이즈 환경 개발을 위한 빅데이터 개발 프레임워크 *성호현 부장, MathWorks Korea*	딥러닝과 강화학습 *김종남 부장, MathWorks Korea*	팀 협업을 통한 소프트웨어 안전성 및 보안성 확보 방안 *Jay Abraham, MathWorks*		
12:10	점심 식사				
13:10	APM기반의 자기진단: 반도체 공정용 건식 진공 펌프의 상태 진단의 새로운 지평 *정완섭 박사, 한국표준과학연구원*	GPU 기반 임베디드 딥러닝 코드 적용을 위한 MATLAB 솔루션 활용 *김영태 팀장, SFA 스마트연구 센터*	Simscape모델의 HDL 변환을 통한 전력 전자의 HIL 테스트 환경 *Joel Van Sickel, MathWorks*	5G New Radio 기본: 차세대 무선 통신 기술 이해하기 *서기환 차장, MathWorks Korea*	Simulink 기반 Legacy C/C++ Code 통합, 결과 시각화 및 검증 방안 *유성재 부장, MathWorks Korea*
13:40	휴식				
13:50	건정성 관리 예측 모델 개발을 위한 MATLAB 활용 방안 *엄준상 차장, MathWorks Korea*	신호 및 시계열 데이터를 위한 딥러닝 *송완빈 대리, MathWorks Korea*	모델기반설계를 이용한 FPGA모터제어기 개발 적용 사례 *나태웅 선임연구원, LG전자 L&A 센터*	MATLAB을 활용한 5G RF 중계기의 TSYNC 모듈의 개발 *김형우 책임연구원, (주)씨에스*	에너지 최적화를 위한 에너지 관리 시스템(EMS) *강효석 차장, MathWorks Korea*
14:20	휴식				
14:30	MATLAB을 이용한 원전기기 금속 이물질 충격신호 분석 *문성인 박사, 한국원자력연구원*	철도 궤도 결함 탐지를 위한 영역 기반 및 픽셀 기반 딥러닝 기법 적용 사례 *황성호 선임연구원, 한국철도기술연구원*	MATLAB 및 Simulink 를 이용한 자율주행 시스템 설계 및 시뮬레이션 *김종헌 부장, MathWorks Korea*	자율시스템을 위한 센서 융합 및 추적 *서기환 차장, MathWorks Korea*	Simulink를 이용한 배터리 관리 시스템(Battery Management System) 개발 *강효석 차장, MathWorks Korea*
15:00	전시부스 관람				
15:40	제조 생산 현장에서 관리 시스템까지 빠른 인공지능 기반 시스템 구축 *엄준상 차장, MathWorks Korea*	임베디드 하드웨어로의 딥러닝 응용프로그램 배포 *송완빈 대리, MathWorks Korea*	모델기반설계를 이용한 요구사항 기반 검증의 단순화 *홍혁기 부장, MathWorks Korea*	FPGA, ASIC, SoC 개발을 위한 모델 기반 설계 도입 방안 *정승혁 과장, MathWorks Korea*	Powertrain Blockset을 이용한 전동식 파워트레인 설계 및 검증 방안 *류성연 차장, MathWorks Korea*
16:10	휴식				
16:20	MATLAB를 활용한 머신러닝 기반 가상발전소 운영 시스템 구축 *백승엽 대표, 브이젠㈜*	MATLAB을 사용한 영화에서 사용되는 색채심리학 분류 *한영수 박사, 한국외국어대학교*	요구사항 부터 아키텍쳐 설계와 시뮬레이션까지 시스템 엔지니어링을 위한 방안 *류성연 차장*	SoC Blockset 소개 *정승혁 과장, MathWorks Korea*	간편해진 C/C++코드 생성 설정 방법 소개 *유재홍 부장, MathWorks Korea*
16:50	경품 추첨 및 맺음말				

Read the Release Notes

R2019a at a Glance

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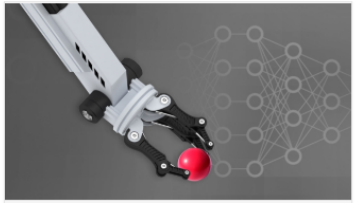
Release Highlights



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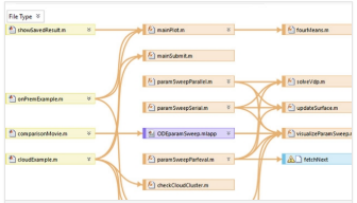

Projects

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

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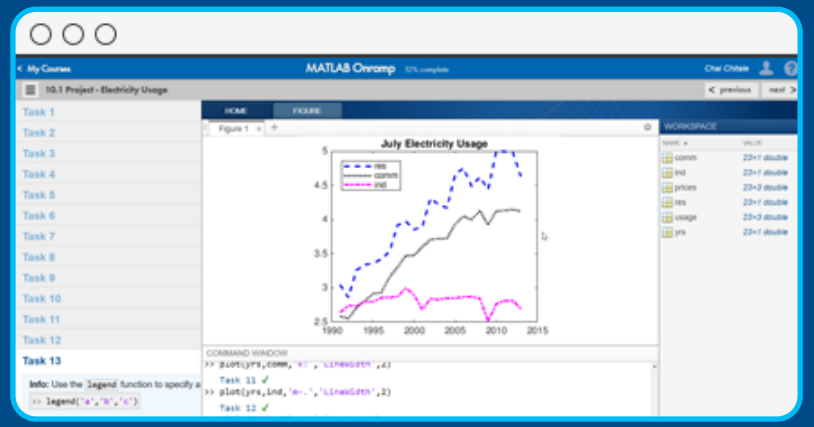
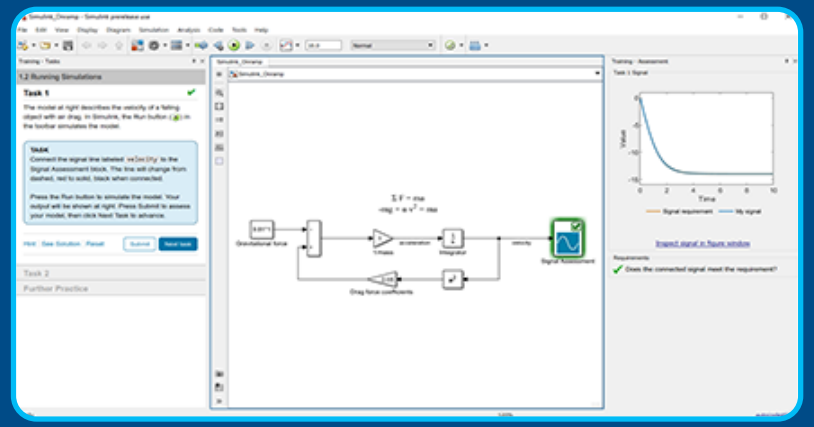
Get Started



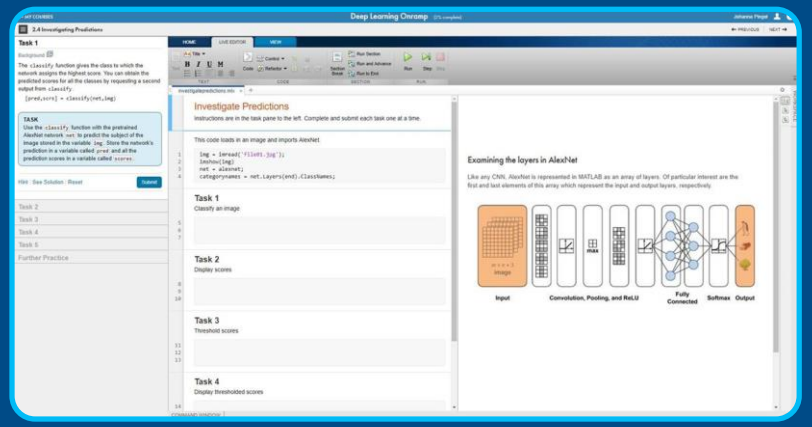
MATLAB Onramp

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

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