MATLAB EXPO 2018

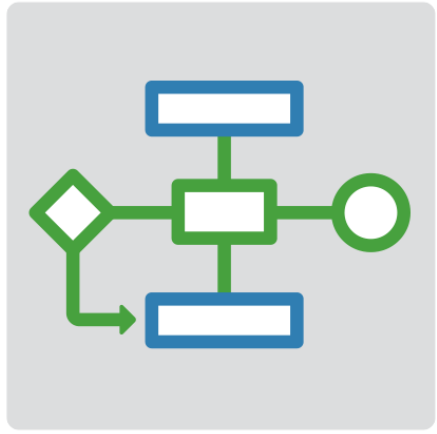
What's New in MATLAB and Simulink R2017b R2018a

Cynthia Cudicini
Daniel Martins

Platform Productivity

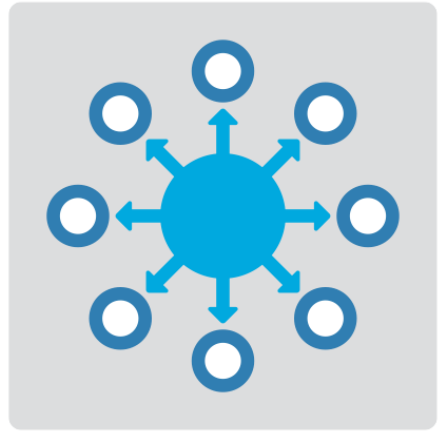
Getting your work done faster

Workflow Depth



Support for your entire workflow

Application Breadth



Products for the work you do

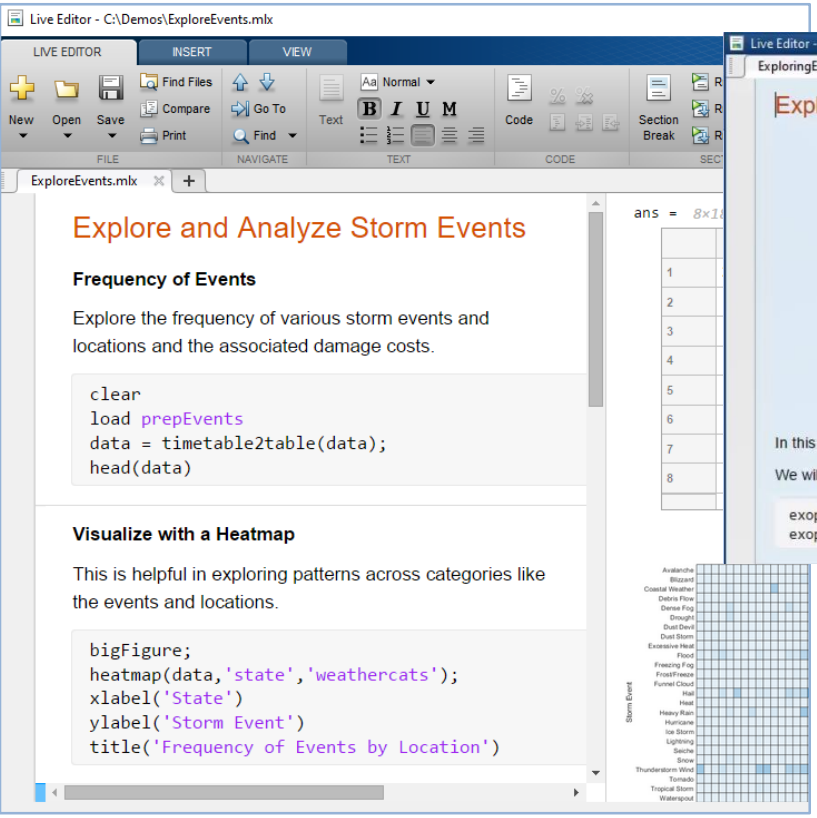
Platform Productivity

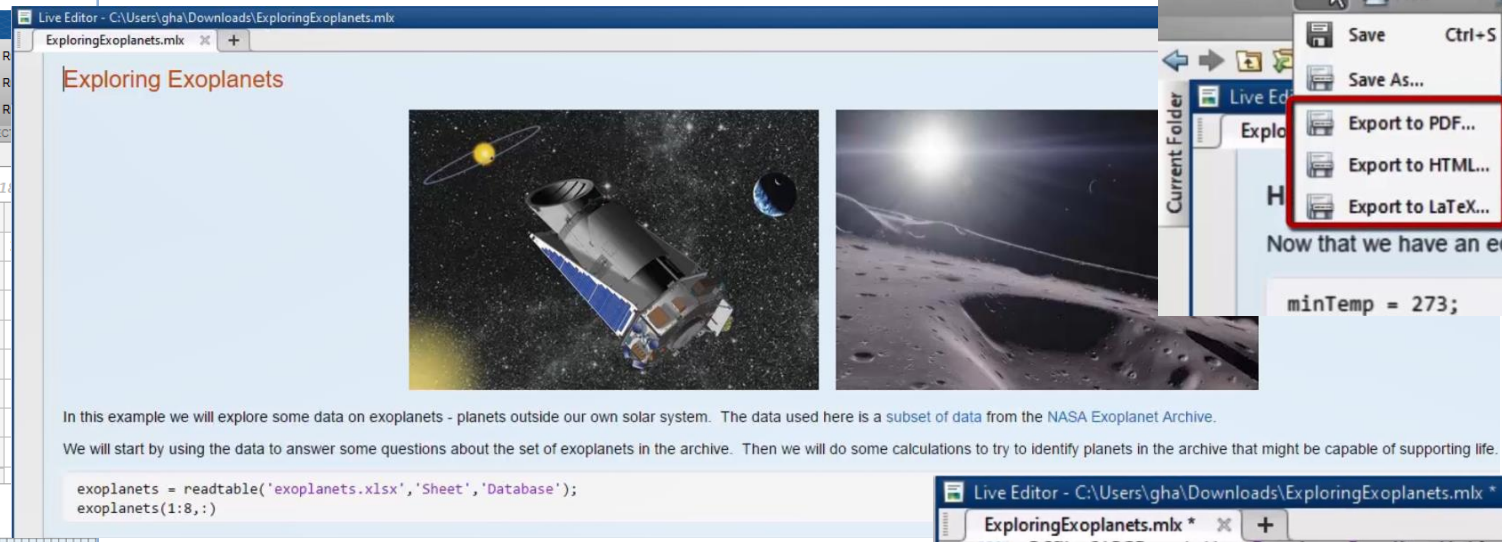
Workflow Depth

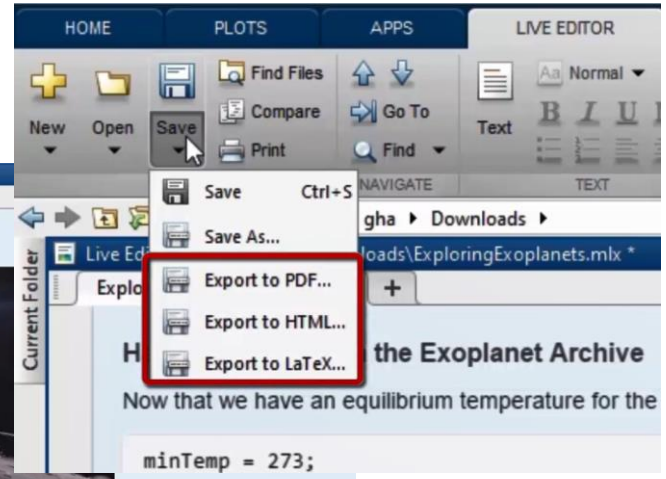
Application Breadth

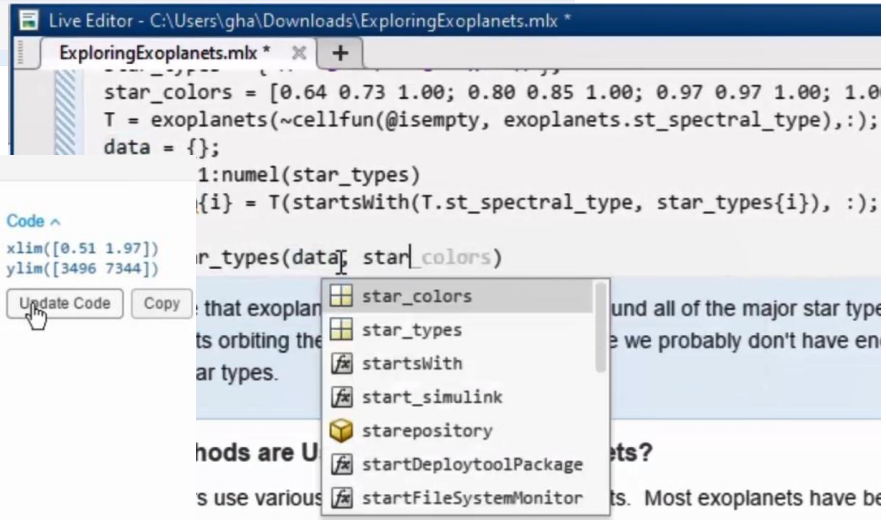
- **Create Your Designs Faster**
- **Simplify Analysis**
- **Simulate Faster and Scale Your Work**
- **Collaborate**

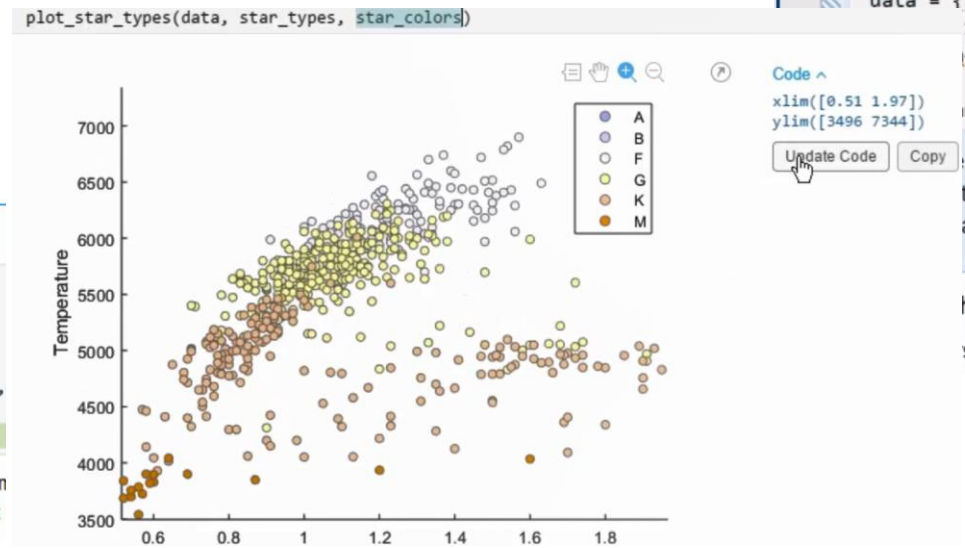
Create Your Designs Faster – Live Editor

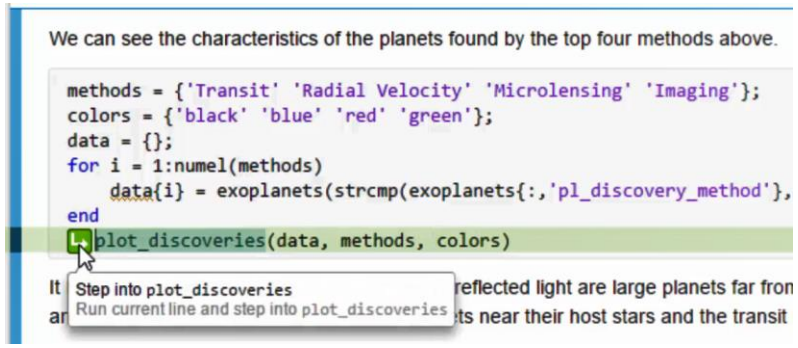




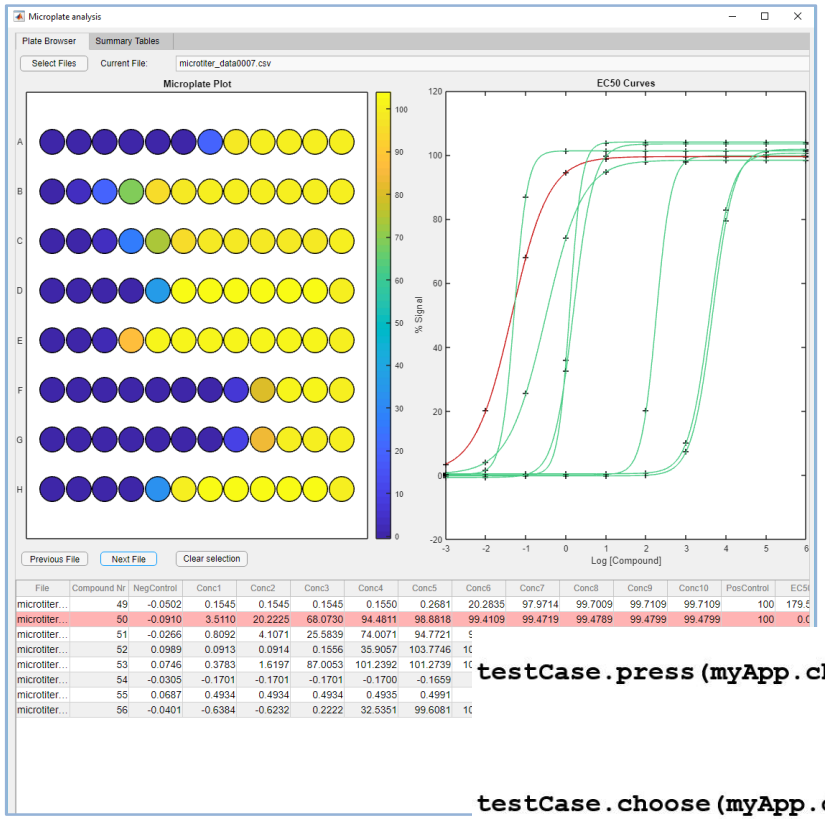




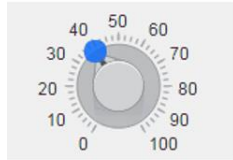


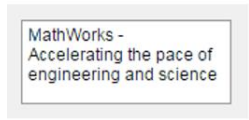


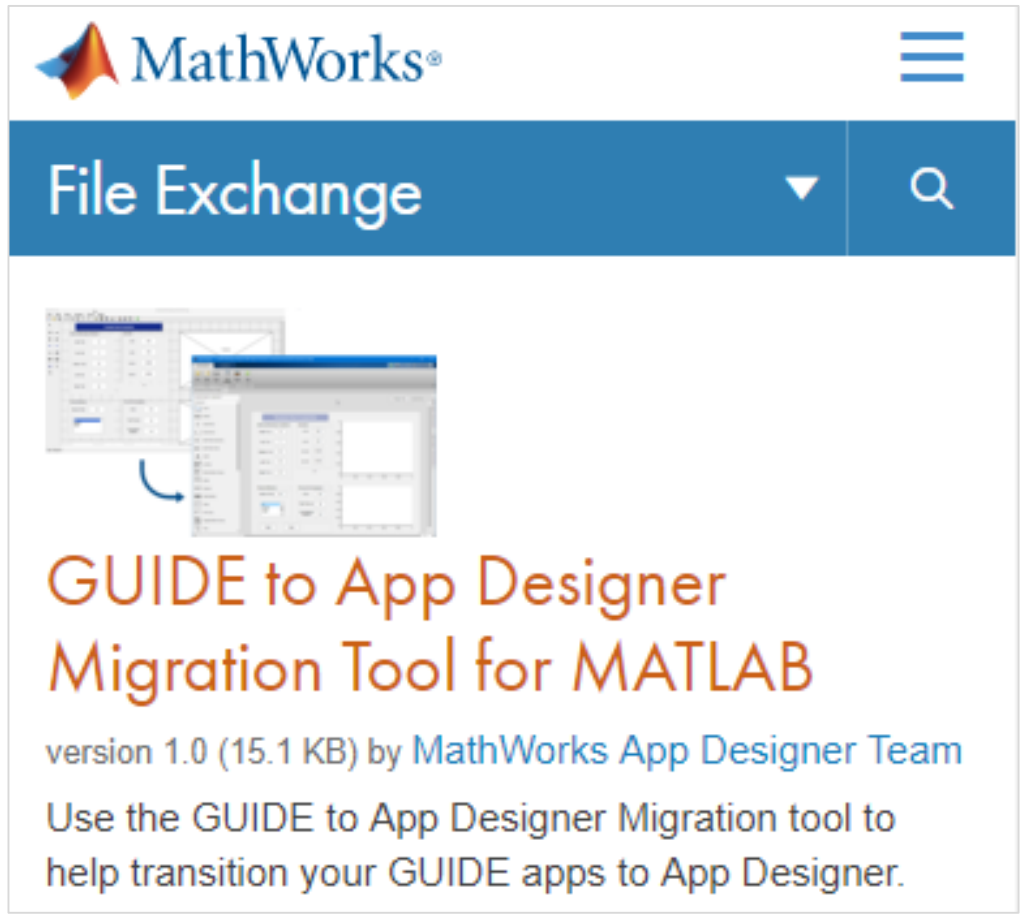
Create Your Designs Faster – App Designer



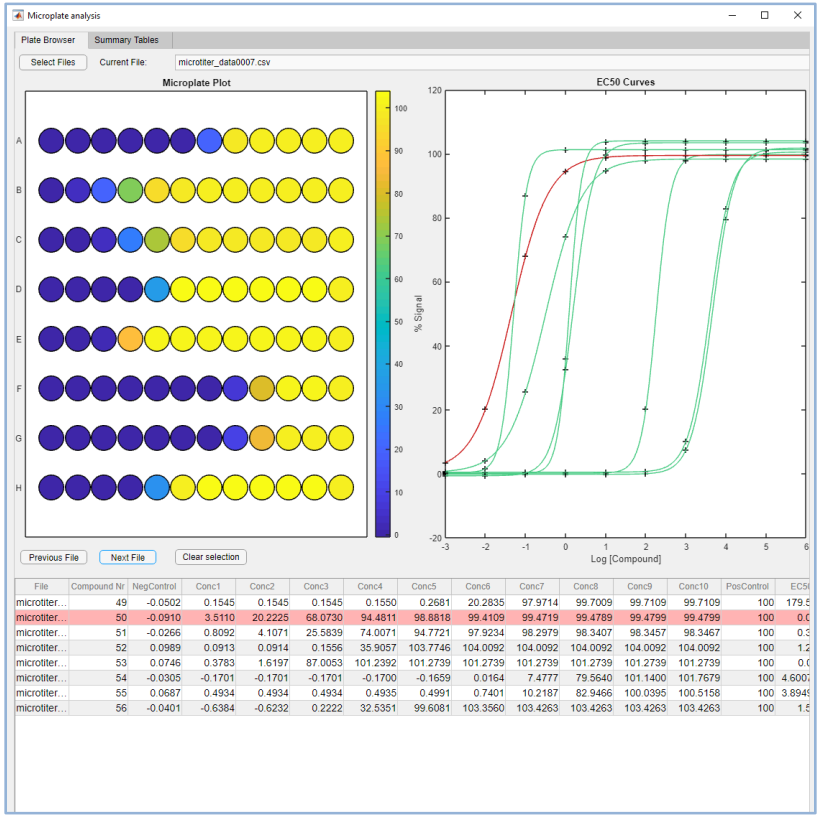

```
testCase.press(myApp.checkbox)

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

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

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



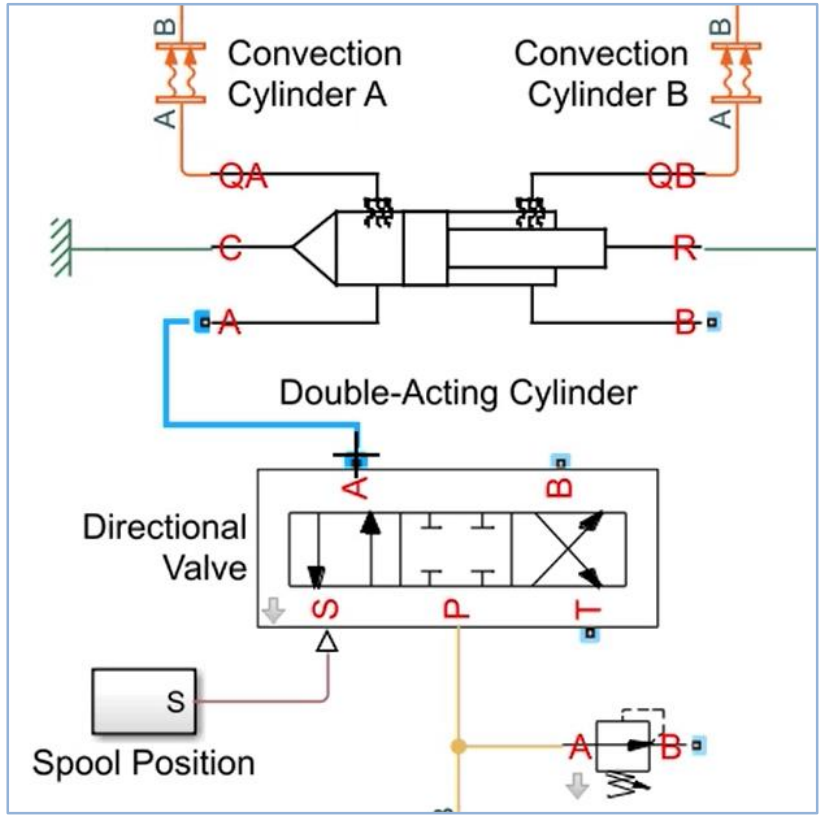




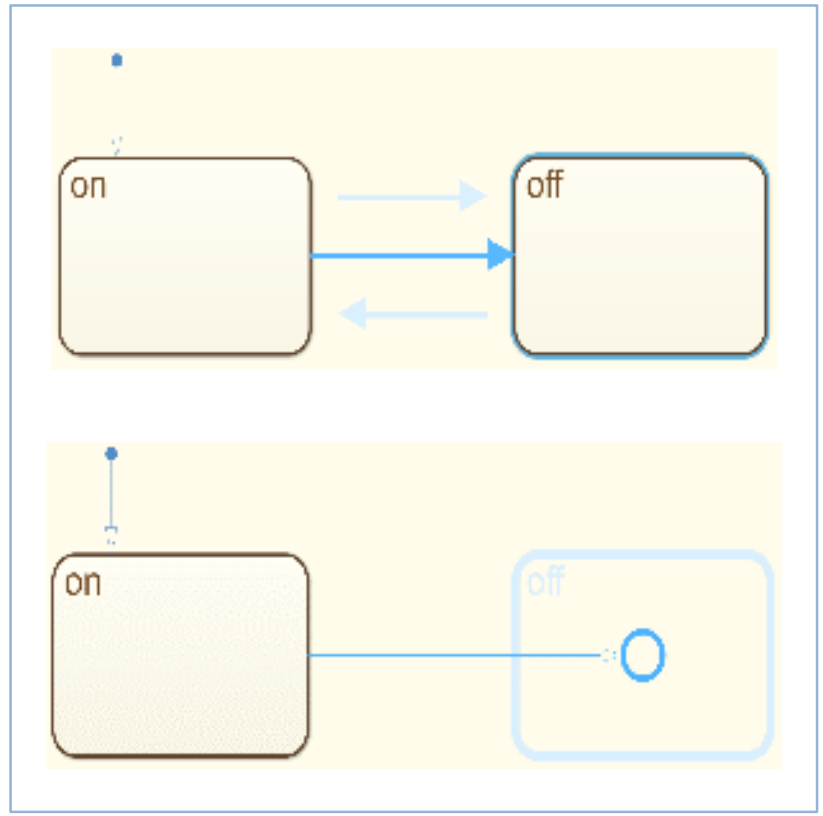
Create Your Designs Faster – Simulink and Stateflow



MATLAB



Simulink

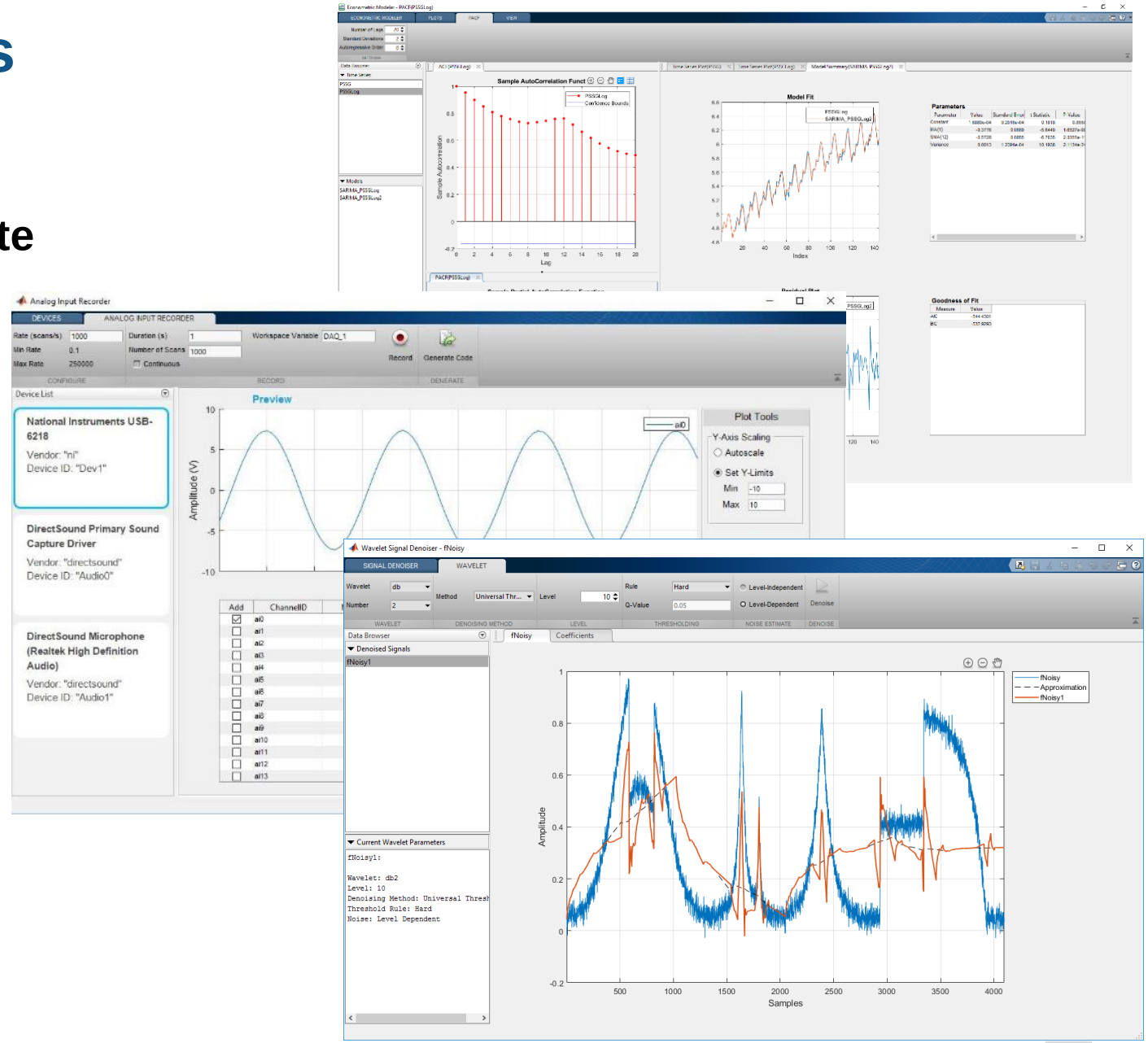


Stateflow

Simplify Analysis with Apps

These interactive applications automate common technical computing tasks

- Econometric Modeler app
  - Perform time series analysis, specification testing, modeling, and diagnostics
- Analog Input Recorder app
  - Acquire and visualize analog input signals
- Wavelet Signal Denoiser app
  - Visualize and denoise time series data

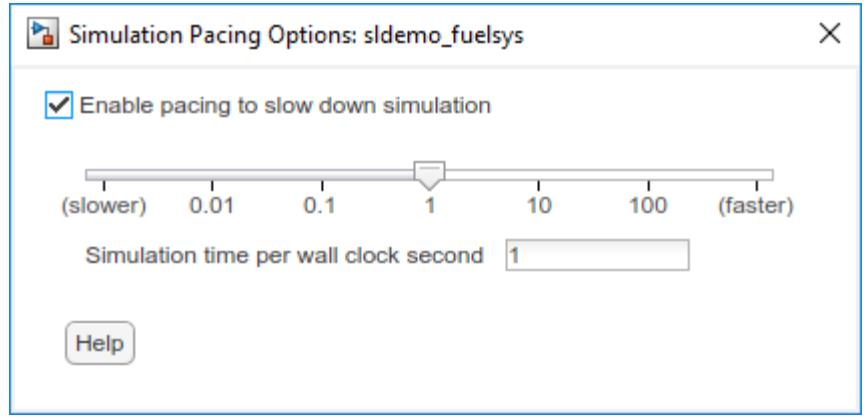


Econometrics Toolbox
Data Acquisition Toolbox
Wavelet Toolbox

Simplify Analysis by Simulating at Wall Clock Speed

Slow down the simulation for easier model interactivity

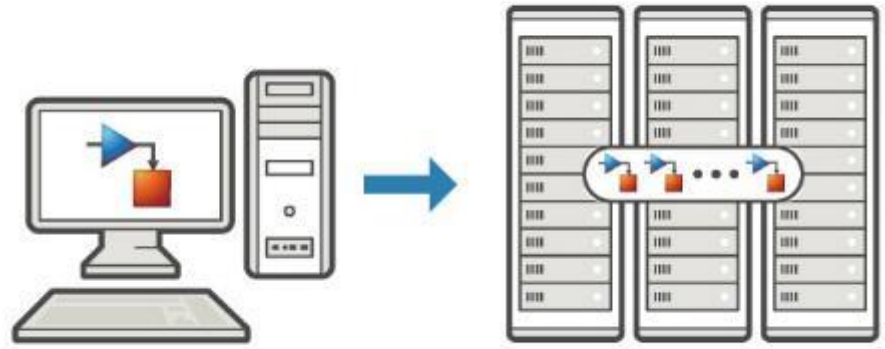
- Especially for models controlled and monitored via Dashboard blocks and other displays
- Useful when model is connected to hardware

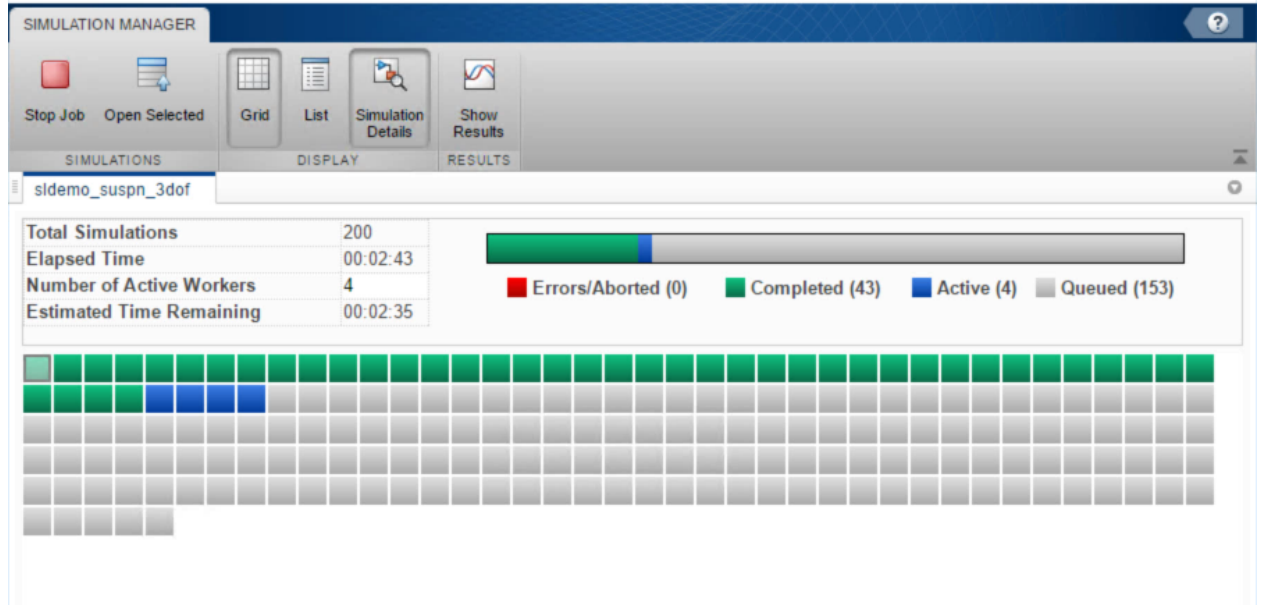


Scale Your Work

Use parallel computing to run multiple simulations faster

- Run multiple parallel simulations with `parsim`
- Monitor simulation status and progress in the Simulation Manager



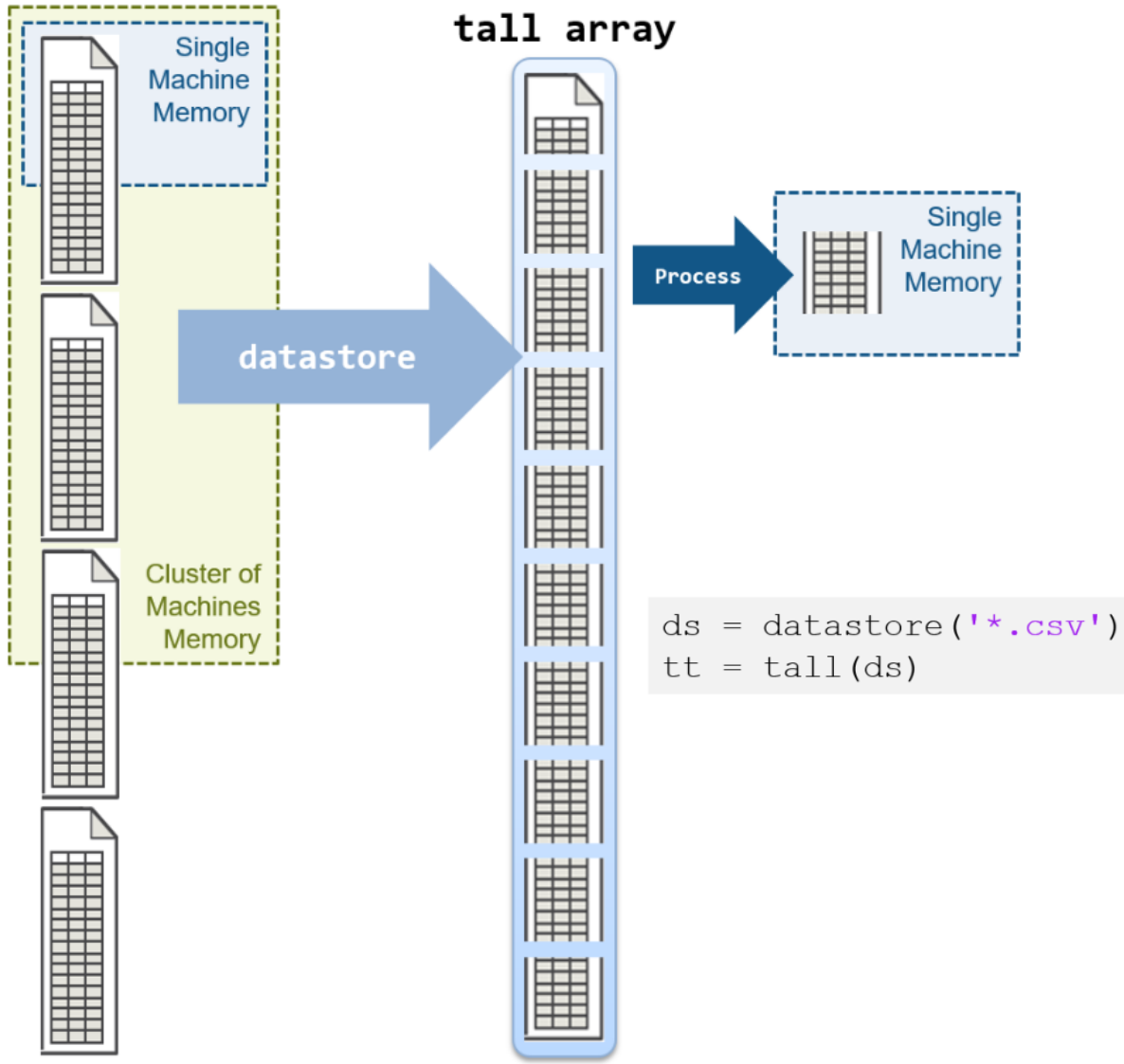


Parallel Computing Toolbox
MATLAB Distributed Computing Server

Scale Your Work

Use tall arrays to manipulate and analyze data that is too big to fit in memory

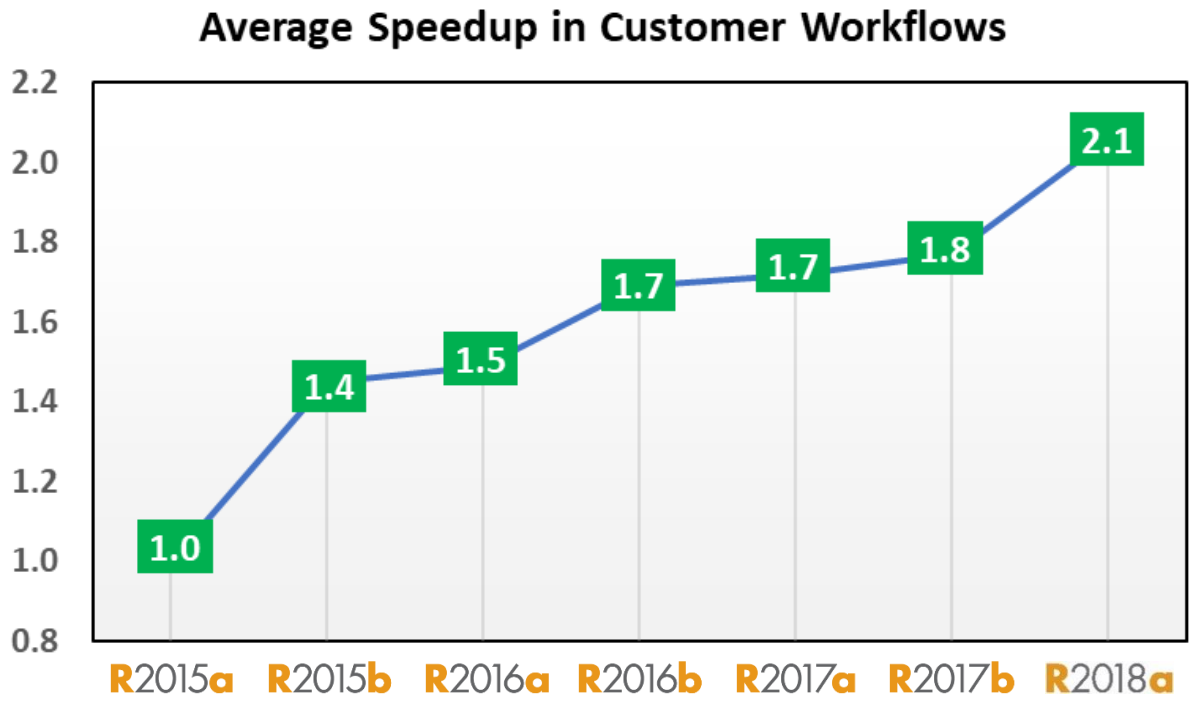
- Use familiar MATLAB functions and syntax
- Support for hundreds of functions
- Works with Spark + Hadoop clusters



Simulate Faster

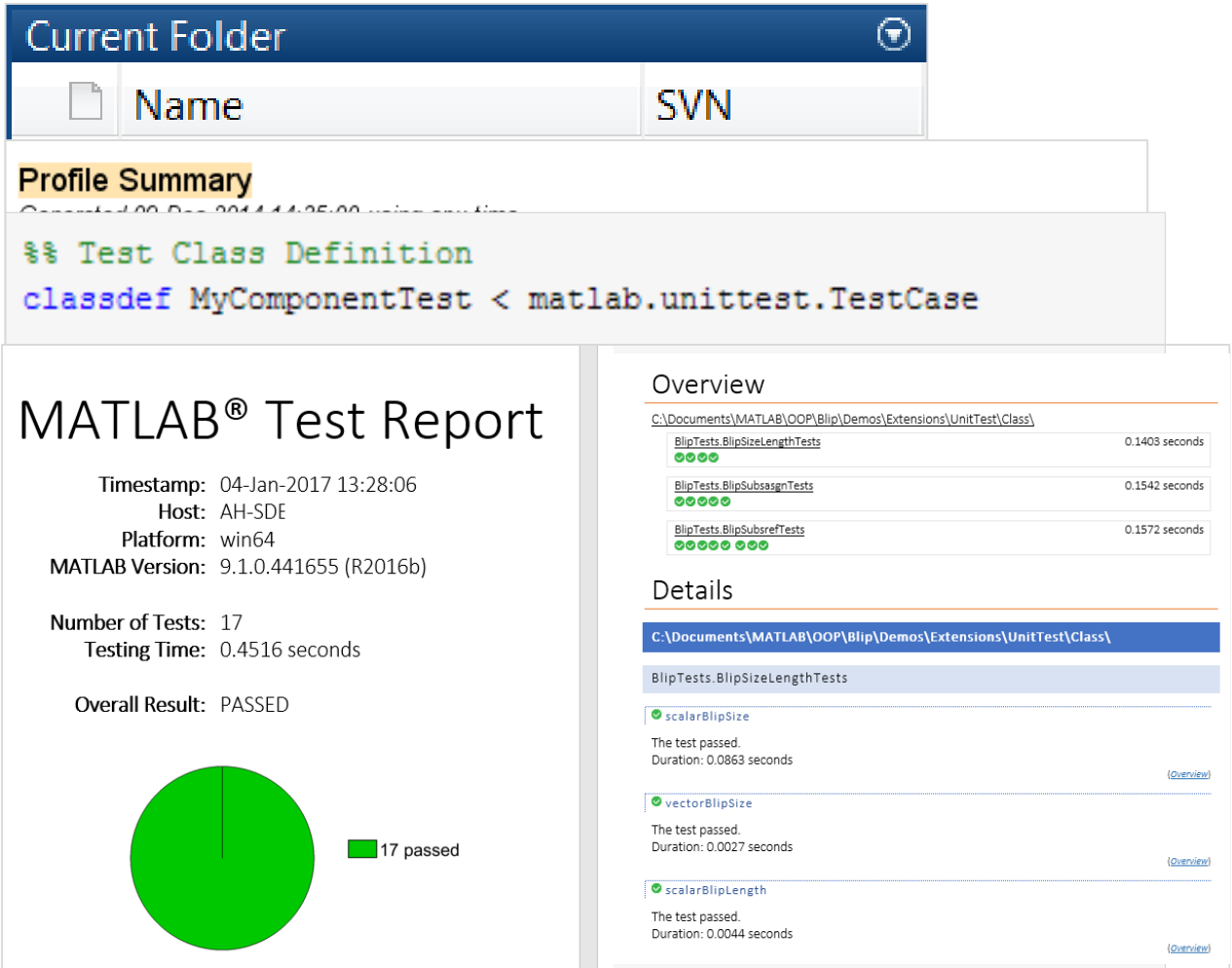
Redesigned execution engine runs MATLAB code faster

- All MATLAB code can now be JIT compiled
- MATLAB runs your code over twice as fast as it did just three years ago
- No need to change a single line of your code
- Increased speed of MATLAB startup in R2018a

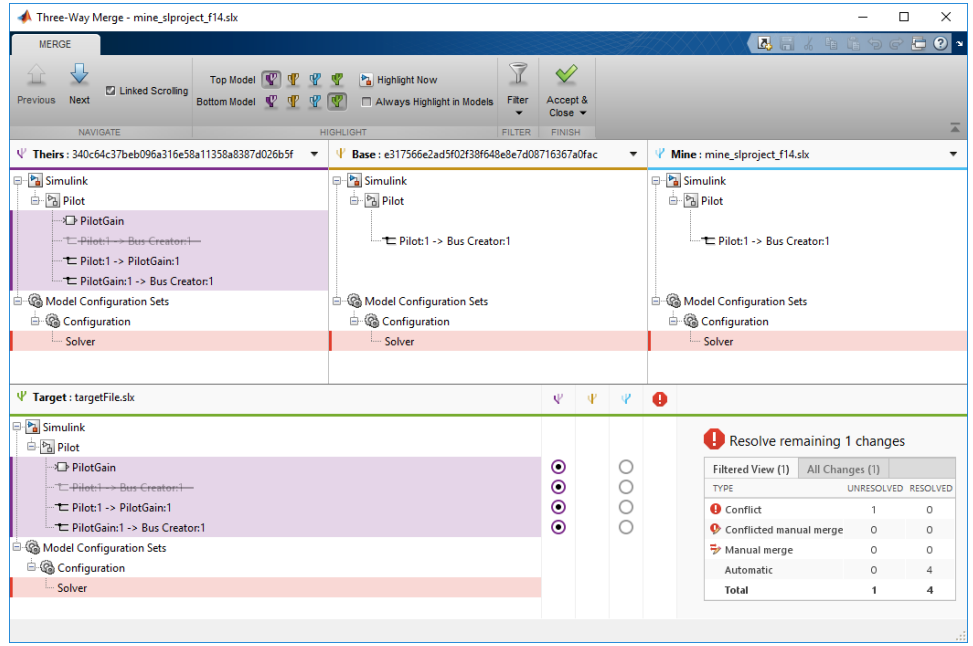


Team Collaboration

Use advanced software development features to manage, test, and integrate MATLAB code

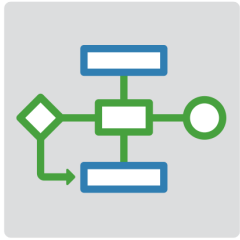


Identify differences between model elements, Stateflow charts, and MATLAB Function blocks



Platform Productivity

Workflow Depth



Application Breadth

- **Deployment of MATLAB Algorithms and Applications**
- **Code Generation from Simulink Models**
- **Verification and Validation**

Deploy MATLAB Algorithms and Applications

Access Data

Sensors

Files

Databases

Analyze Data

Data exploration

Preprocessing

Domain-specific algorithms

Develop

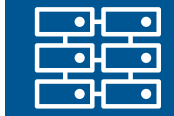
AI model

Algorithm development

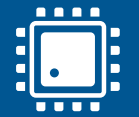
Modeling & simulation

Deploy

Desktop apps

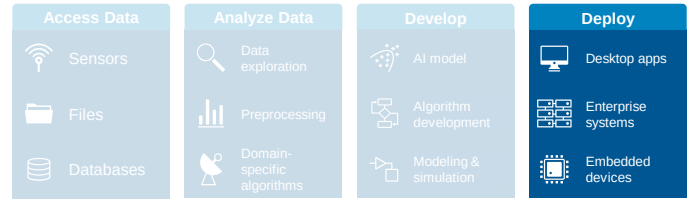


Enterprise systems



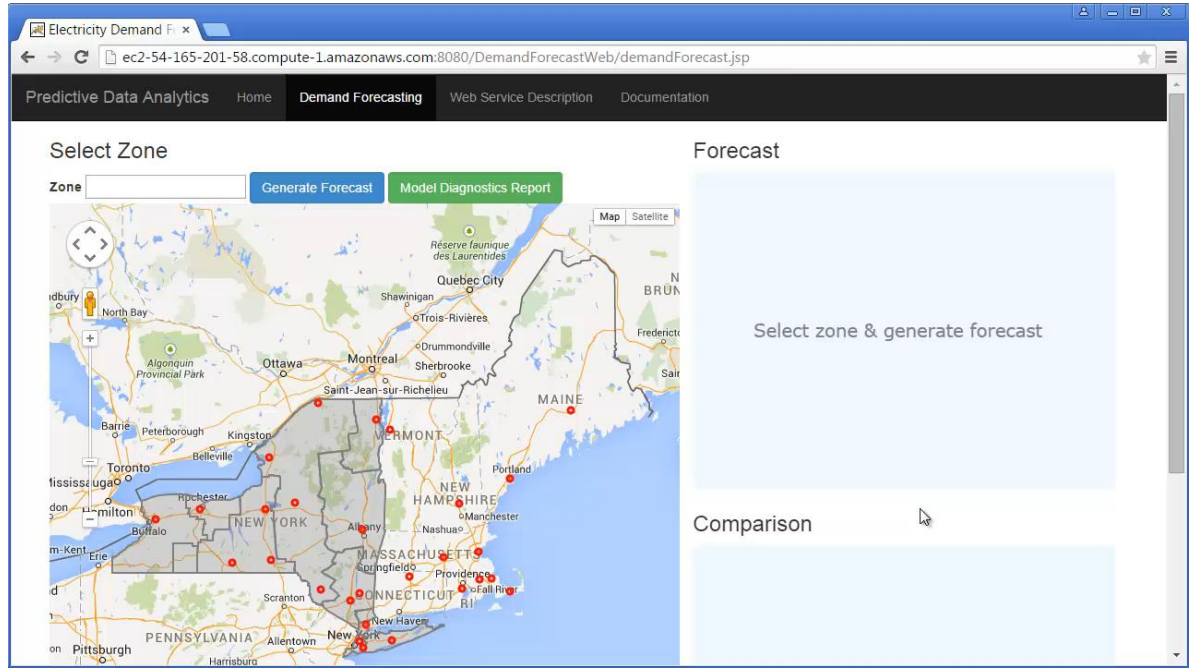
Embedded devices

Deploy MATLAB Algorithms and Applications



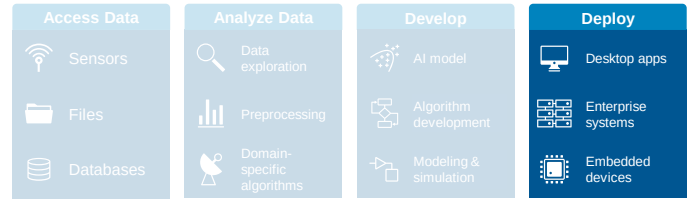
Share your work outside of MATLAB without having to recode your algorithms

- Standalone desktop applications
- Add-ins for Microsoft Excel
- Software components to integrate with other languages *(C/C++, .NET, Python, Java)*
- Software components for web and enterprise applications



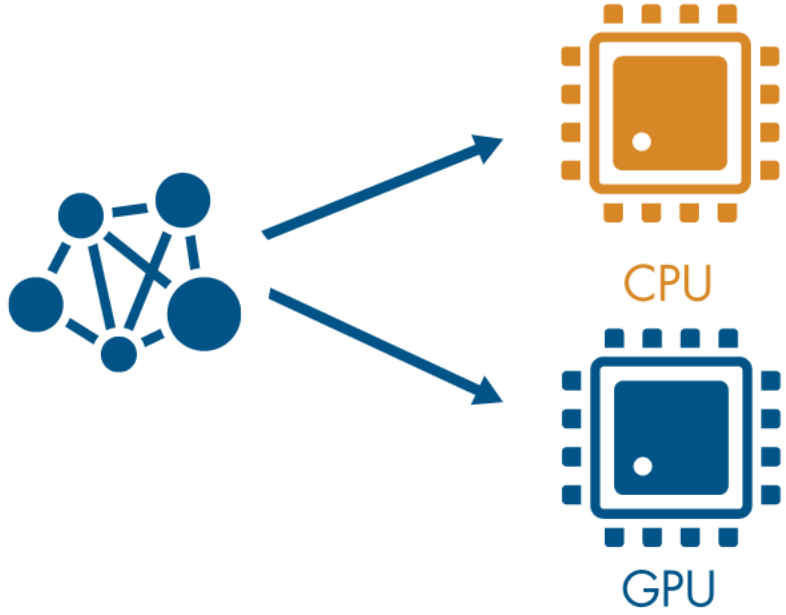
MATLAB Compiler
MATLAB Compiler SDK
MATLAB Production Server

Deploy MATLAB Algorithms



Deploy machine learning and deep learning models using automatically generated code

- Generate C code for predictive machine learning and deep learning models
- Generate optimized CUDA code for deep learning, embedded vision, and autonomous systems

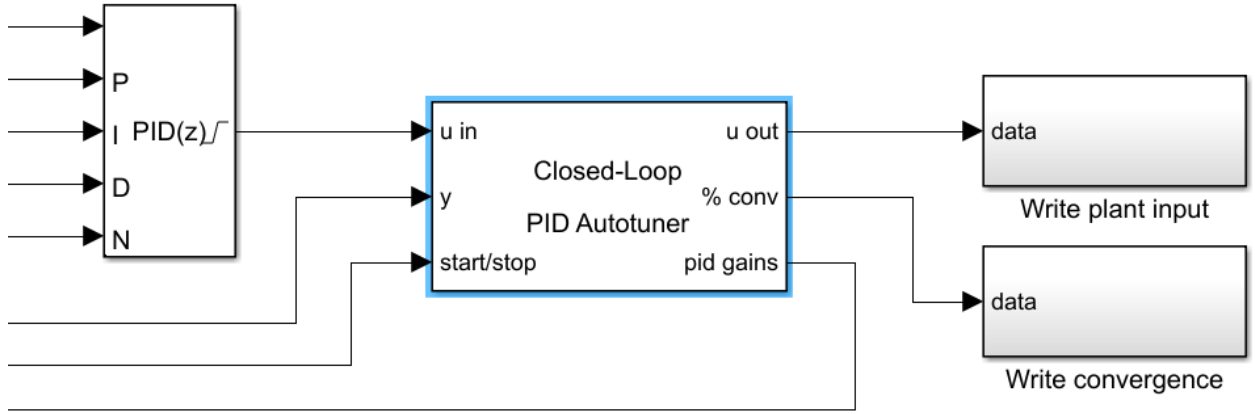


MATLAB Coder
GPU Coder

PID Control Tuning

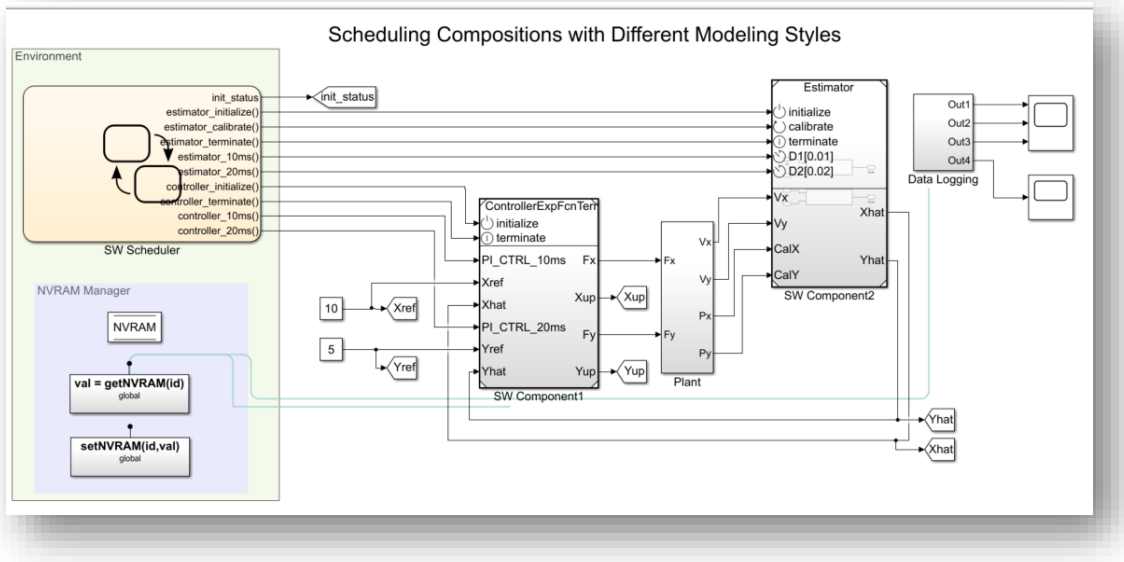
Implement an embedded PID auto-tuning algorithm

- Automatically tune PID controller gains in real time against a physical plant
- No model of plant dynamics required
- Deploy the auto-tuning algorithm to embedded software using automatic code generation

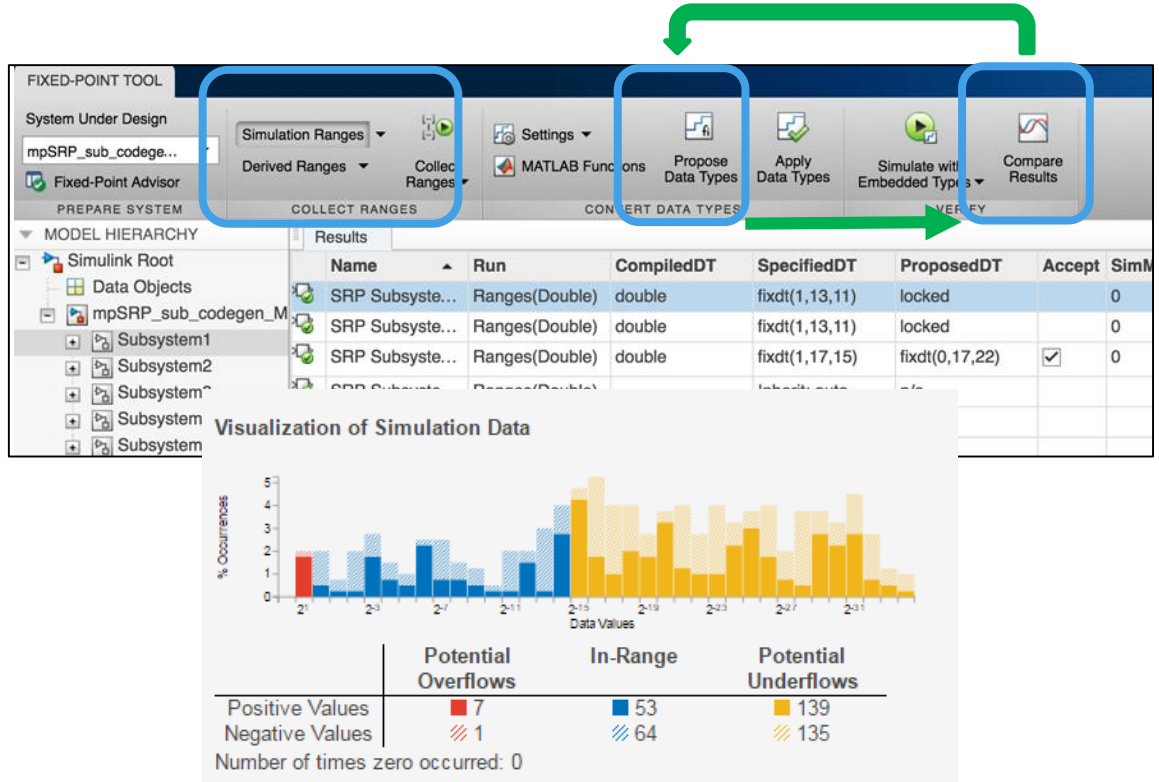


Prepare Your Model for Code Generation

Prepare model components for code generation



Prepare model data for code generation

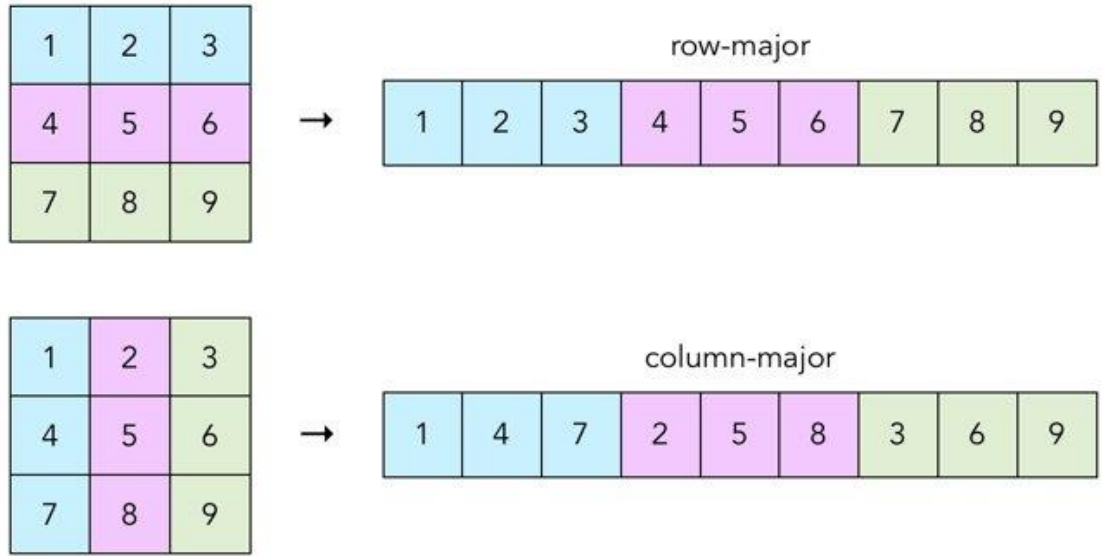


Simulink Coder
Fixed-Point Designer

Generate Code from Simulink Models

Access and define all the information in your model related to code generation

- View and define implementation data in one place
- View implementation details without model details
- Improve code performance and ease integration with other C code

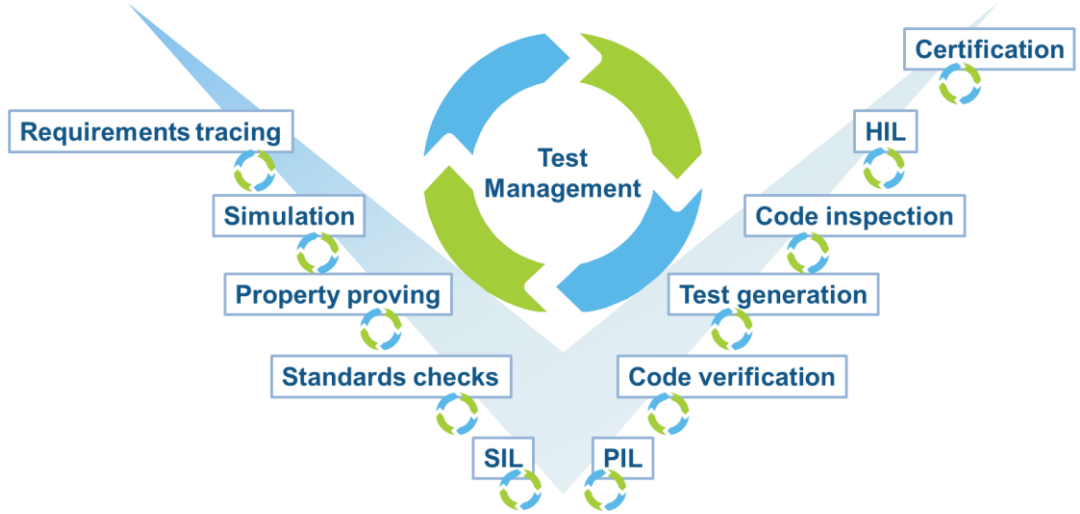


Row-major memory layout option

MATLAB Coder
Embedded Coder
Simulink Fixed-Point

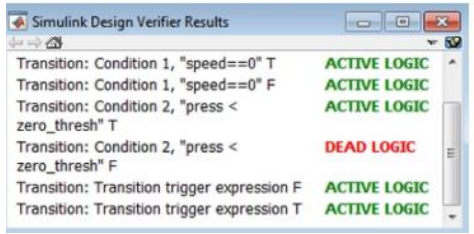
Verification and Validation

Products for the entire workflow

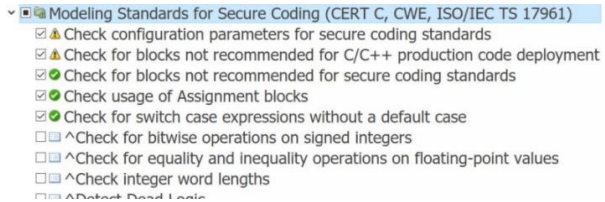


Simulink Requirements R2017b

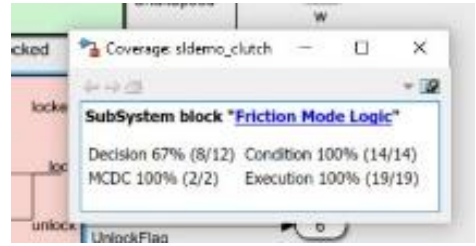
Simulink Design Verifier



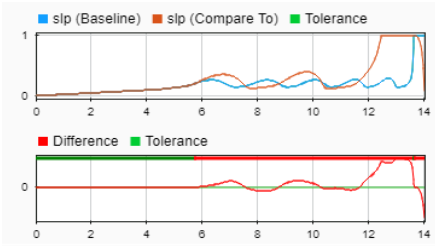
Simulink Check R2017b



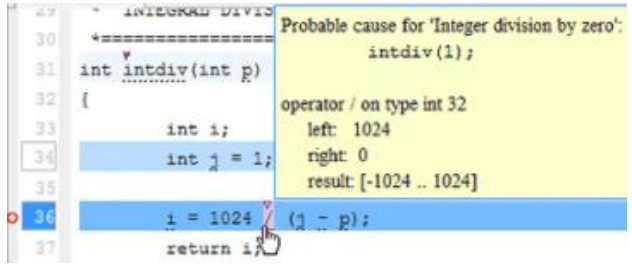
Simulink Coverage R2017b



Simulink Test



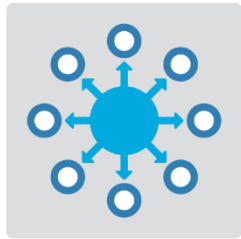
Polyspace



Platform Productivity

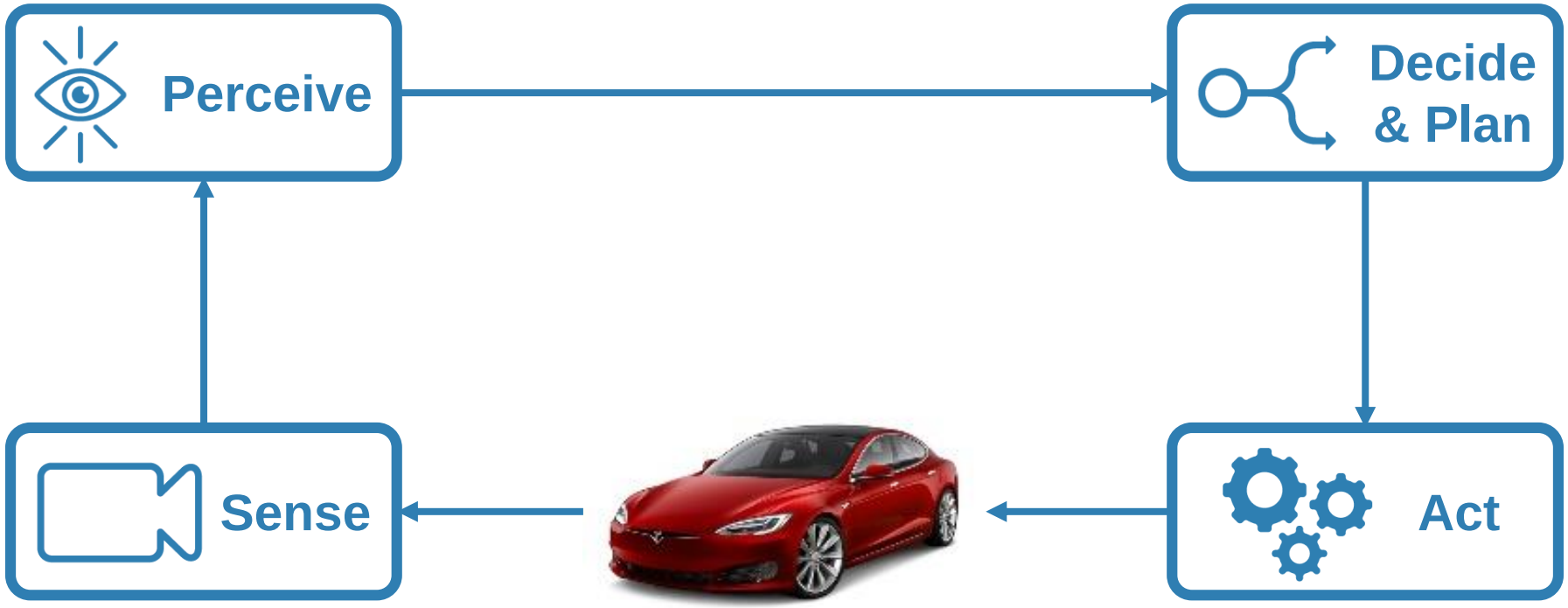
Workflow Depth

Application Breadth

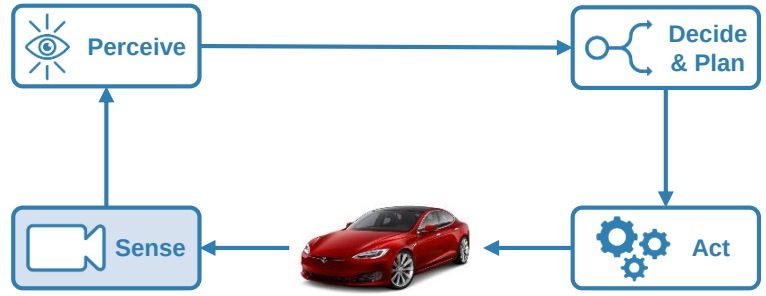


- Autonomous Systems
- Wireless Communications
- Artificial Intelligence (AI)

Designing Autonomous Systems

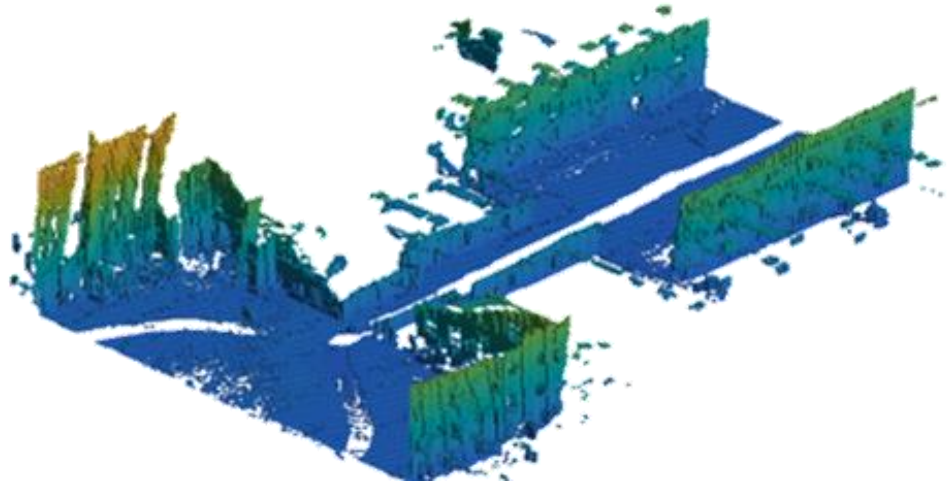


Designing Autonomous Systems



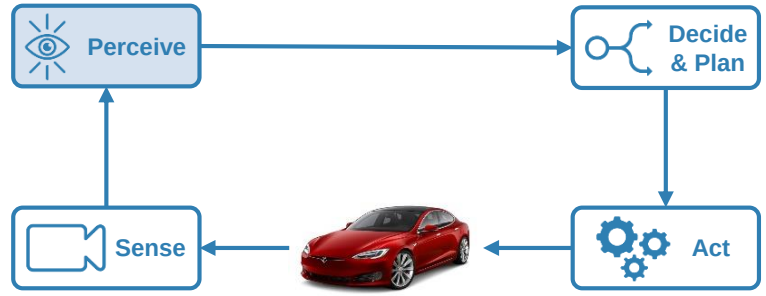
Mapping of environments using sensor data

- Segment and register lidar point clouds
- Lidar-Based SLAM: Localize robots and build map environments using lidar sensors



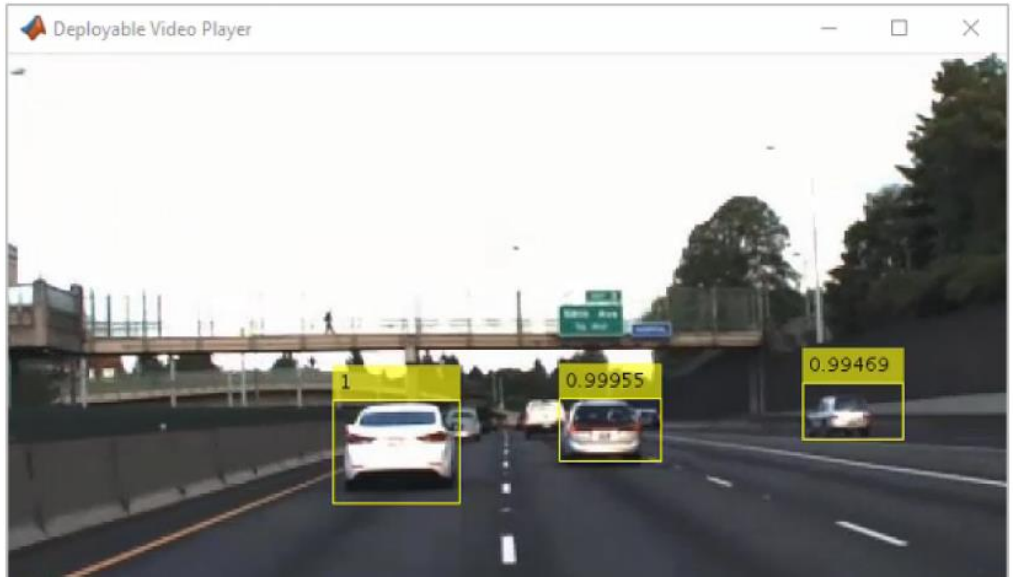
Computer Vision System Toolbox
Robotics System Toolbox

Designing Autonomous Systems



Understanding the environment using computer vision and deep learning techniques

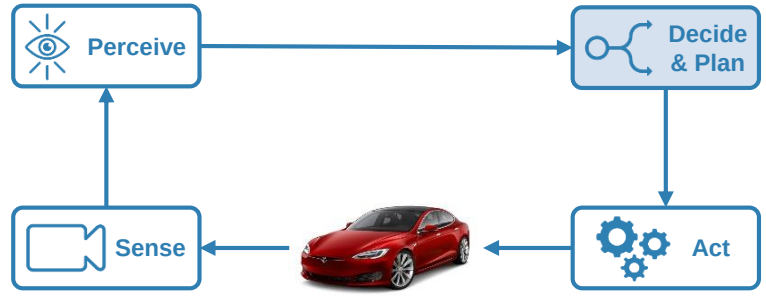
- Object detection and tracking
- Semantic segmentation using deep learning



Neural Network Toolbox
Computer Vision System Toolbox
Automated Driving System Toolbox

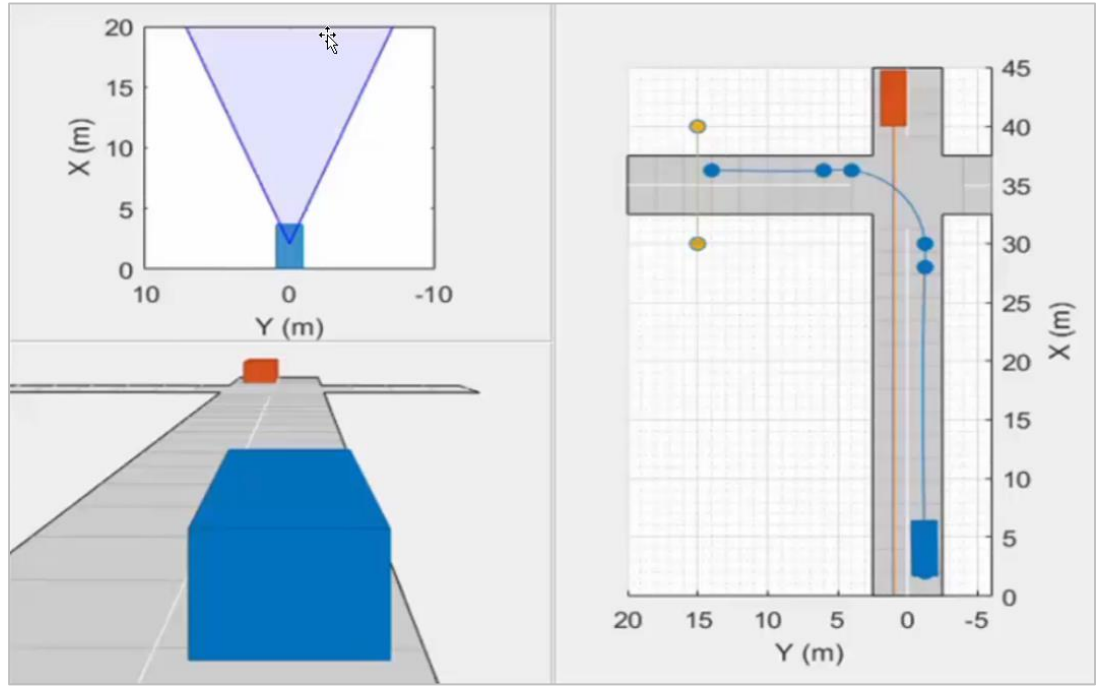
CamVid Database: Brostow, Gabriel J., Julien Fauqueur, and Roberto Cipolla. "Semantic object classes in video: A high-definition ground truth database." *Pattern Recognition Letters*Vol 30, Issue 2, 2009, pp 88-97.

Designing Autonomous Systems



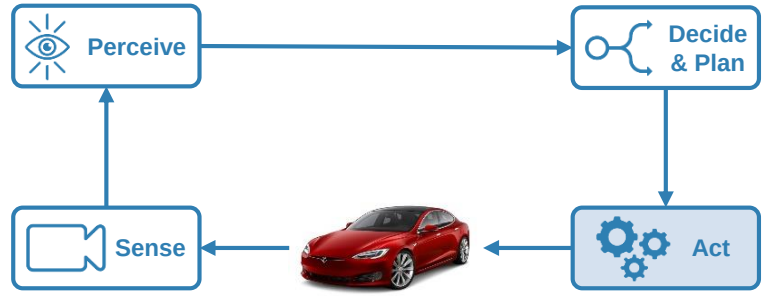
Design synthetic driving scenarios to test controllers and sensor fusion algorithms

- Interactively design synthetic driving scenarios composed of roads and actors *(vehicles, pedestrians, etc.)*
- Generate visual and radar detections of actors

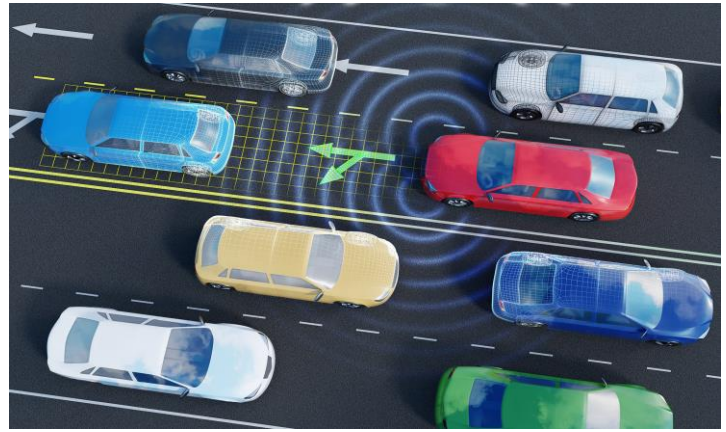


Driving Scenario Designer App

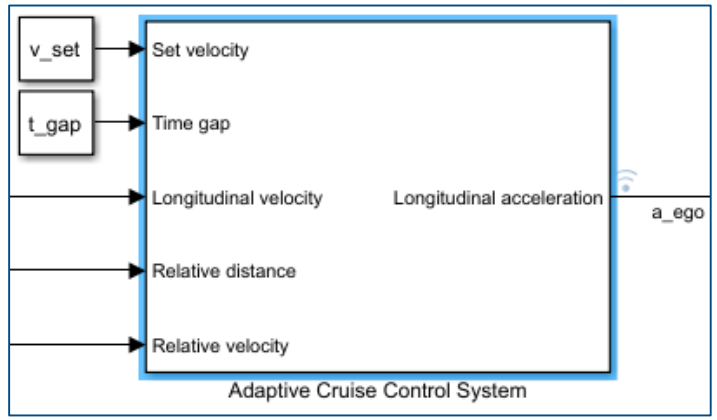
Designing Autonomous Systems

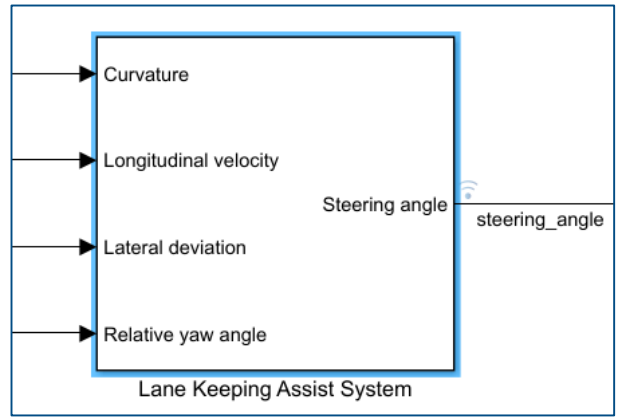


Model predictive control for adaptive cruise control and lane-keeping algorithms

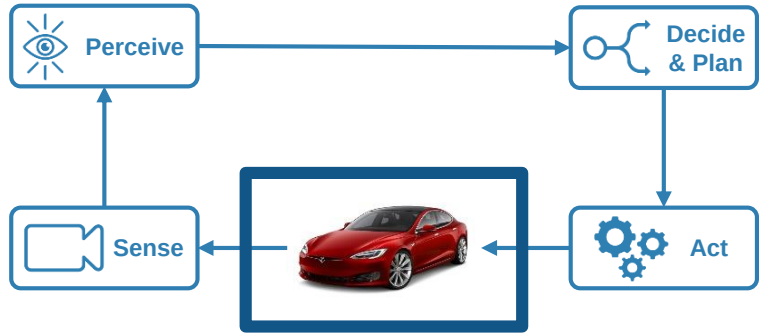


- Use prebuilt blocks instead of starting from scratch
- Simplified application-specific interfaces for configuring model predictive controllers
- Flexibility to customize for your application





Full Vehicle Simulation



Ride & handling

Chassis controls

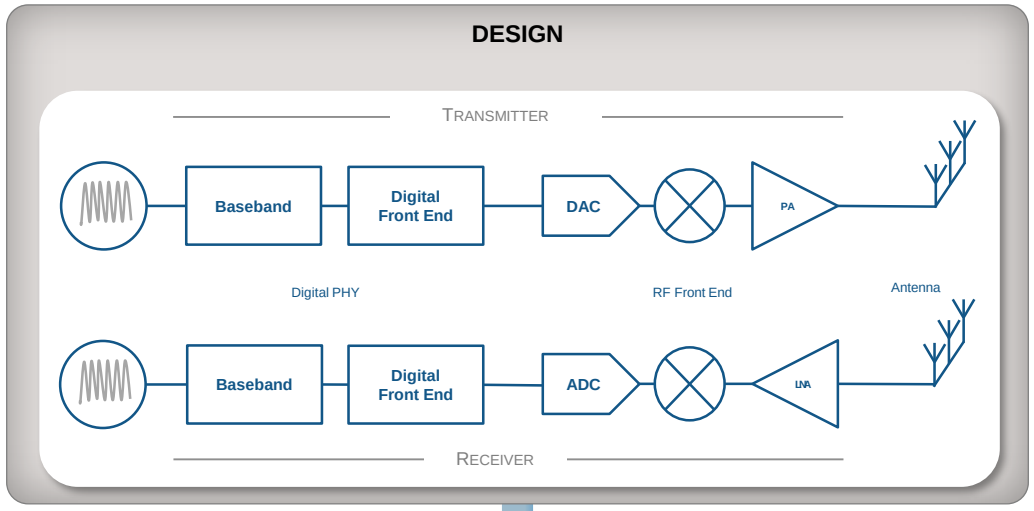
Automated Driving

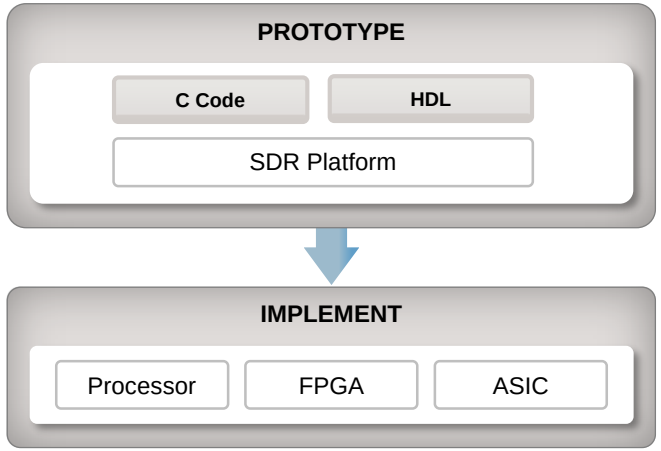
Vehicle Dynamics Blockset New Product

Design with the Latest Wireless Standards

NB-IoT

Model-Based Design for Wireless Communications

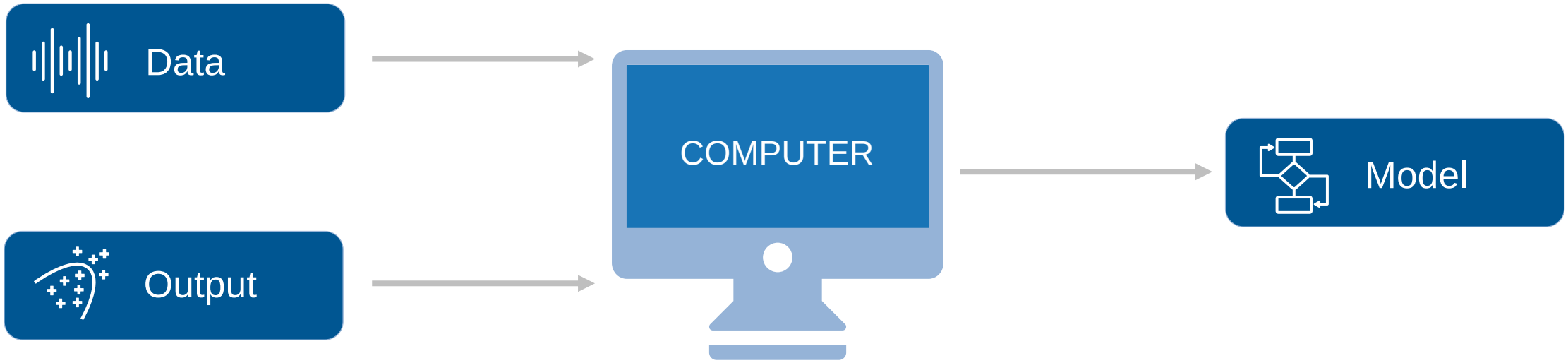




- **Algorithm Design and Verification**
- **RF, Digital and Antenna Co-Design**
- **System Verification and Testing**
- **Rapid Prototyping and Production**

Code Generation and Verification
Fixed-Point Designer
HDL Coder
HDL Verifier
LTE HDL Toolbox R2017b
Embedded Coder

Artificial Intelligence



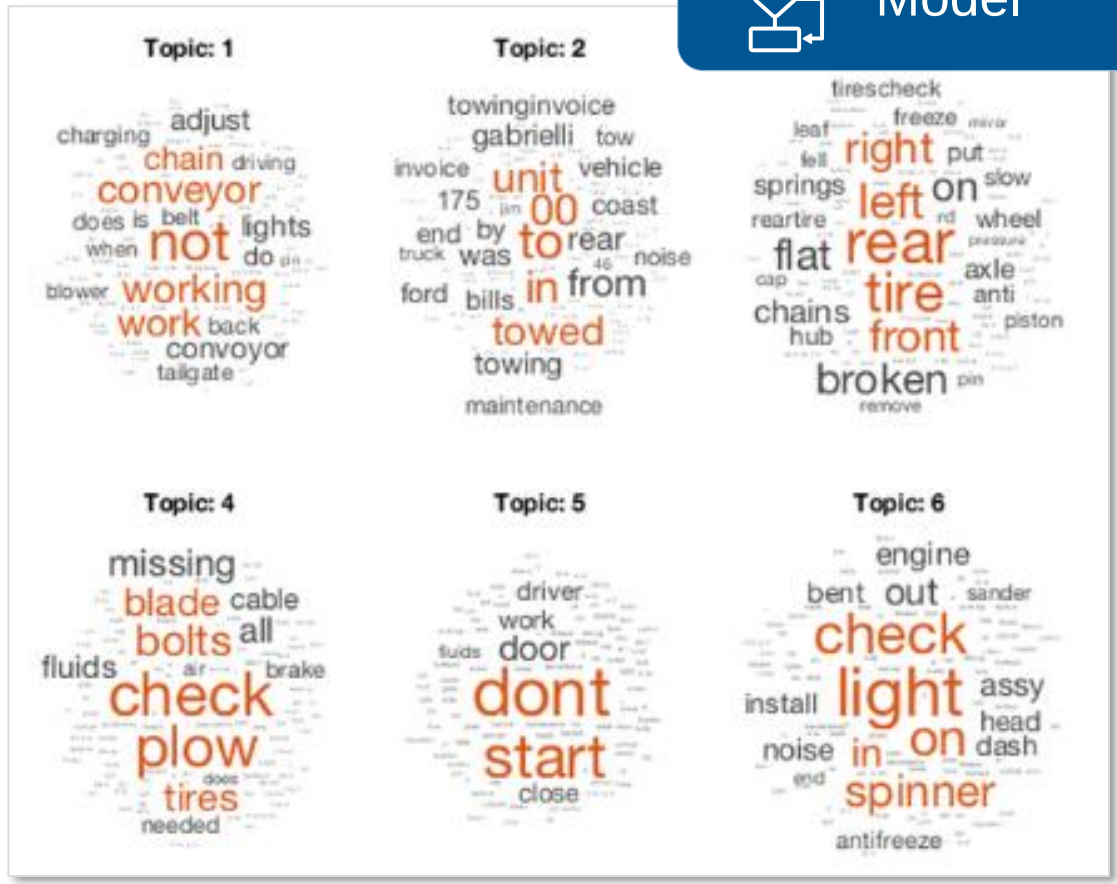
Text Analytics

Data

```
repairNotes = 617×1 string array
    "PM SERVICE, CHECK TURN SIGNAL, CLUNKING NOISE
    "SERVICEROB,EXT,5604"
    "NEED 4 PLOW PINS"
    "INSTALL SPINNER ASSY"
    "DONT START"
    "DOG BONE PIN BROKEN"
    "NEED SERVICE, CHECK BRAKES"
    "HYD CAP CHECK ENGINE LIGHT ON"
    "TARP VALVE STICKINGRIGHT SIDE MIRROR BRACKET
    "HANDLES IN CAB LOOSE"
    "NO PLOW LIGHTS"
```

Output

Model



Text Analytics

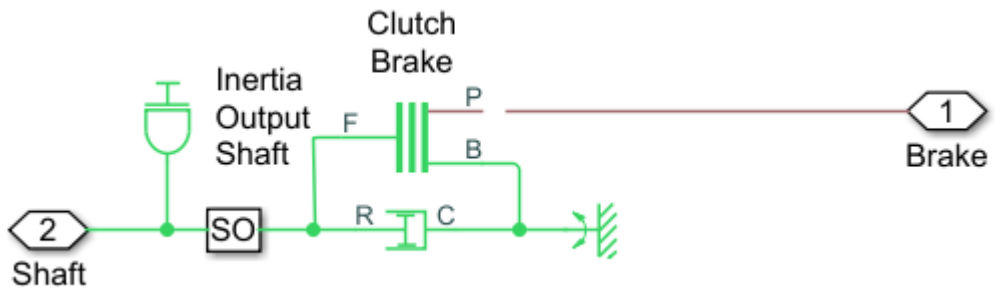
Work with text from equipment logs and operator reports

- **Preprocess** raw text data by extracting, filtering, and splitting
- **Visualize** text using word clouds and text scatter plots
- **Develop** predictive models using built-in machine learning algorithms (LDA, LSA, word2vec)

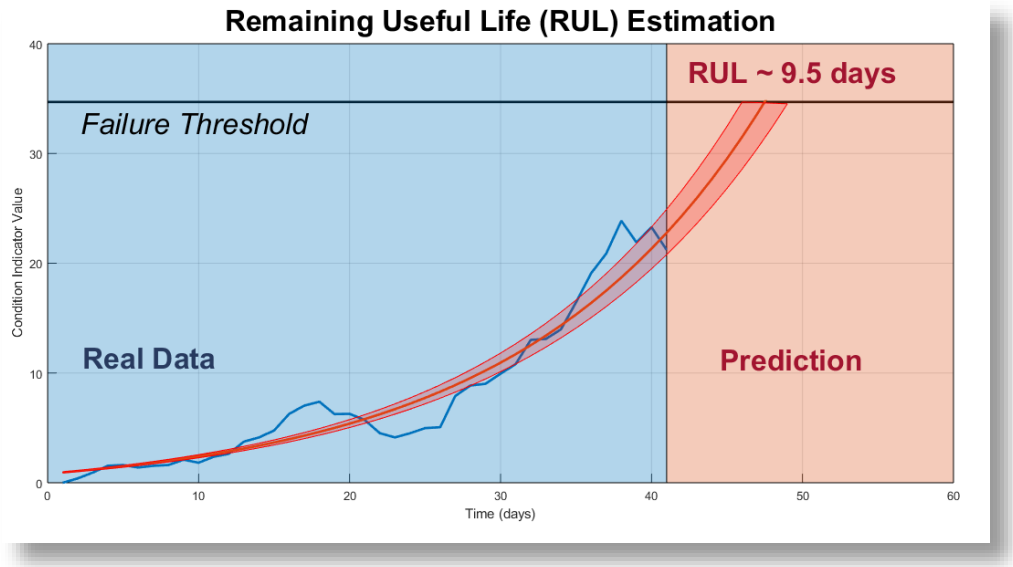
Predictive Maintenance

Data

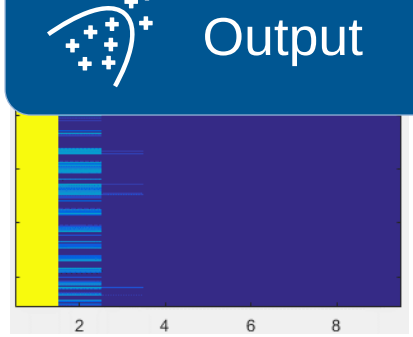
Sensors



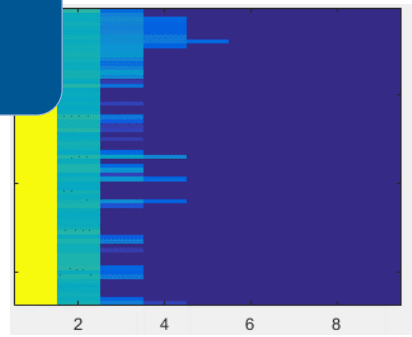
Model



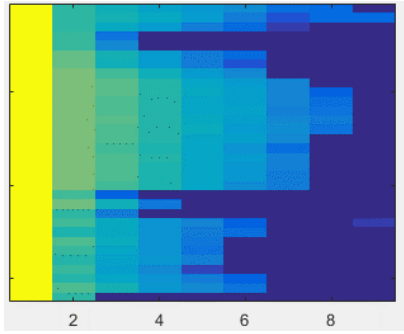
Output



Normal Operation



Monitor Closely



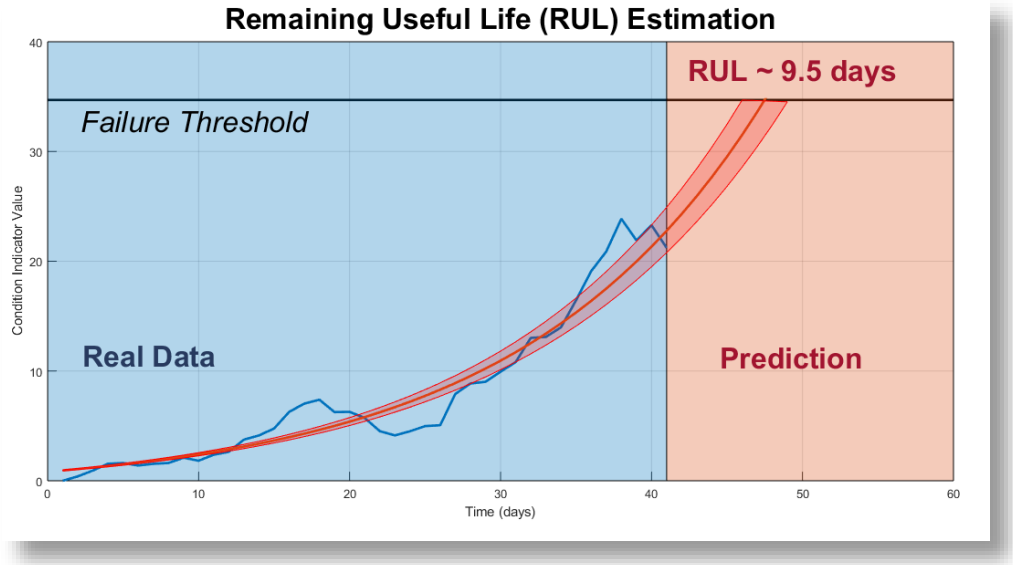
Maintenance Needed

Predictive Maintenance Toolbox New Product

Predictive Maintenance

Design and test condition monitoring and predictive maintenance algorithms

- Import sensor data from local files and cloud storage
  (Amazon S3, Windows Azure Blob Storage, and Hadoop HDFS)
- Use simulated failure data from Simulink models
- Estimate remaining useful life (RUL)
- Get started with examples
  (motors, gearboxes, batteries, and other machines)

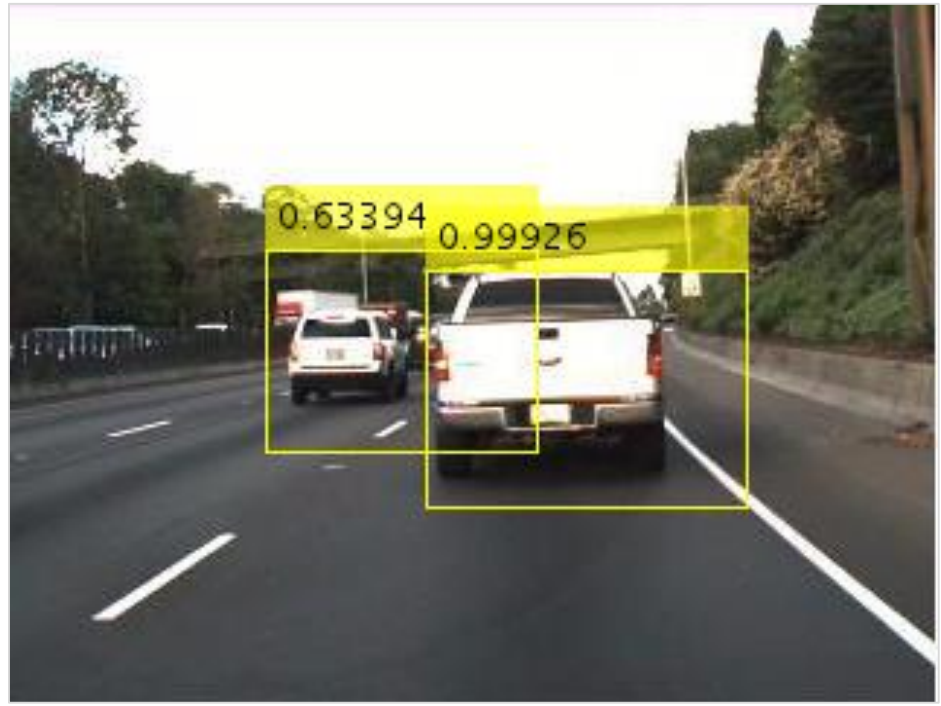


Predictive Maintenance Toolbox New Product

Deep Learning

Data

Model



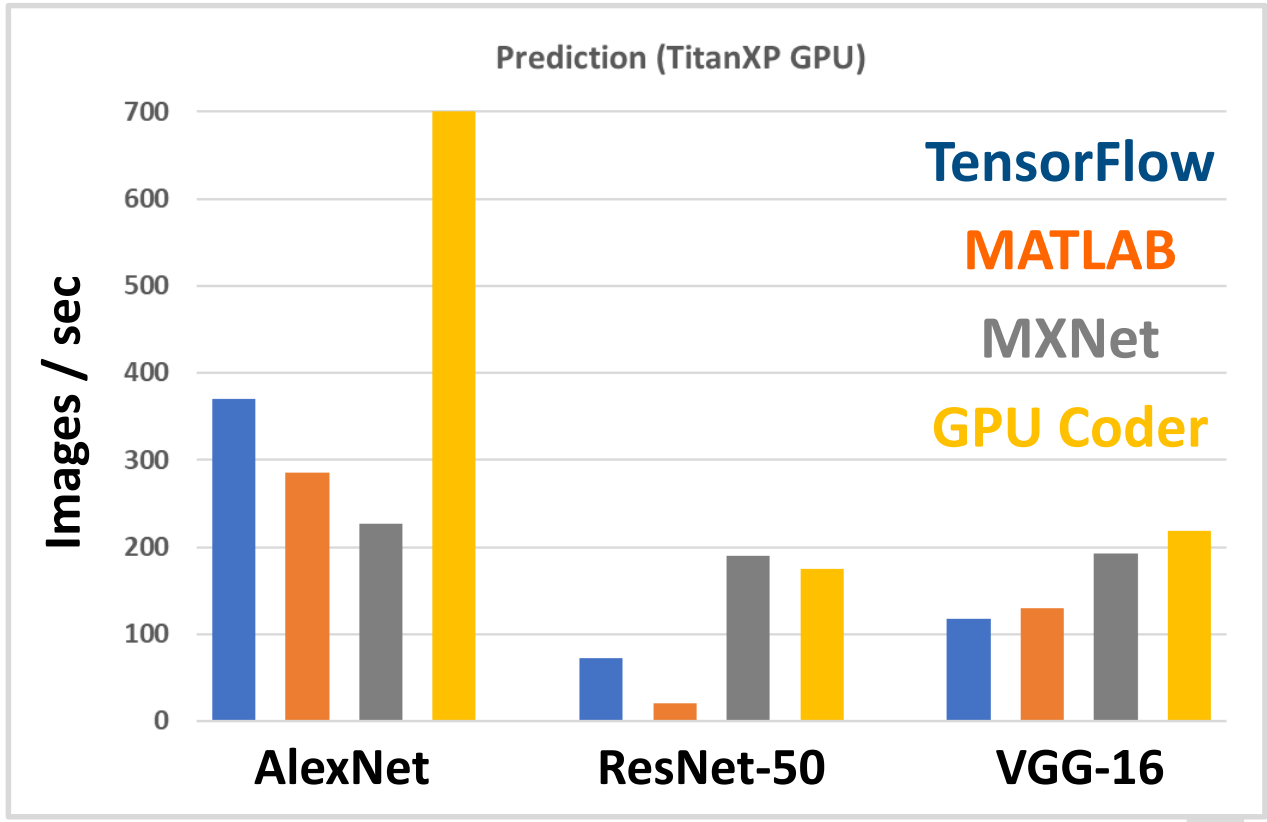
Output

Neural Network Toolbox
Computer Vision System Toolbox
GPU Coder

Deep Learning

Design, build, and visualize convolutional neural networks

- Access the latest models
- Import pretrained models and use transfer learning
- Automate ground-truth labeling using apps
- Design and build your own models
- Use NVIDIA GPUs to train your models
- Automatically generate high-performance CUDA code for embedded deployment

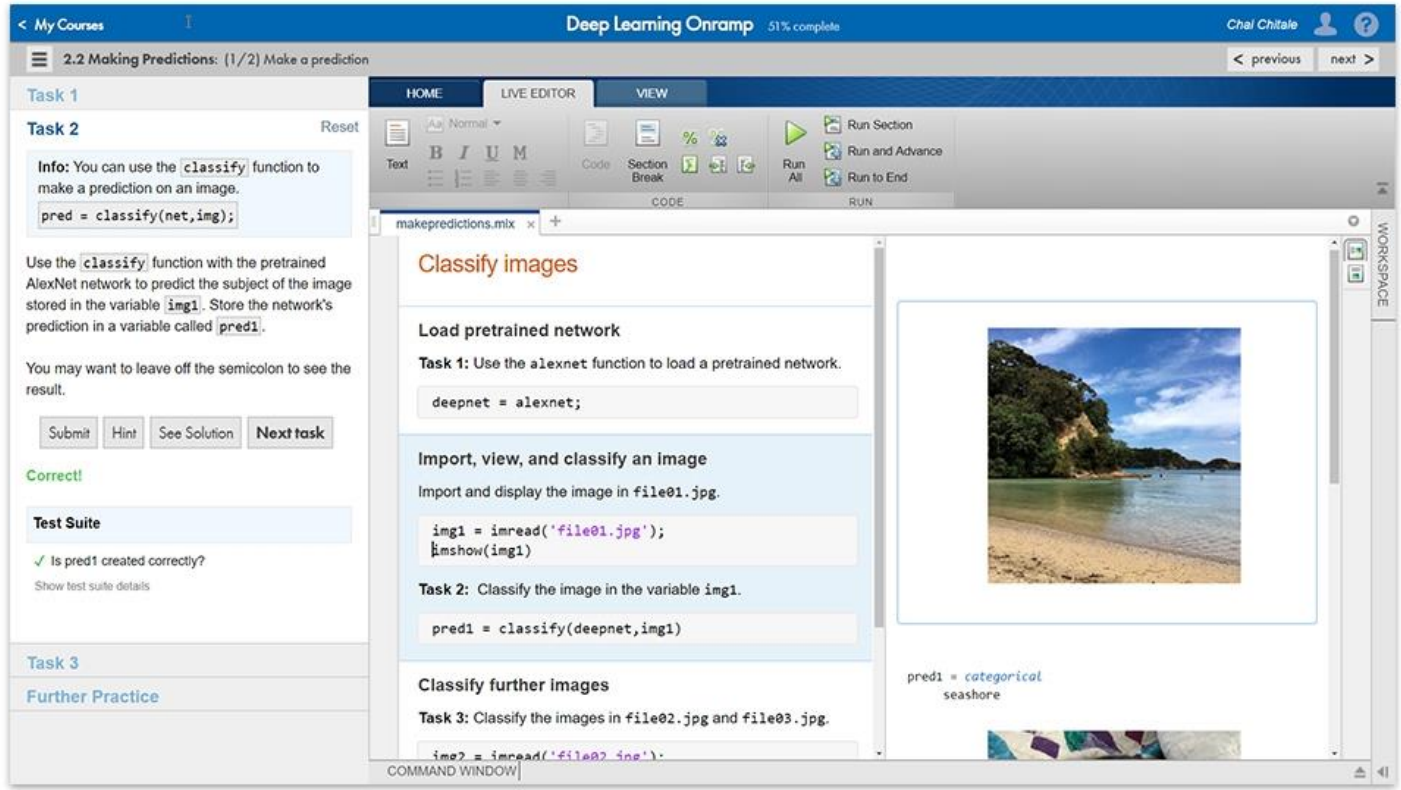


Neural Network Toolbox
Computer Vision System Toolbox
GPU Coder

FREE

Learn to Use MATLAB for Deep Learning in 2 Hours

Launch Deep Learning Onramp

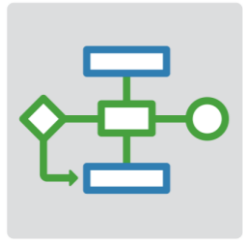


What's New in MATLAB and Simulink?

Platform Productivity

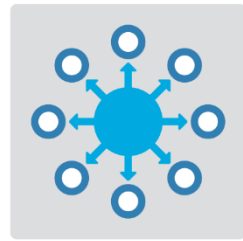
- Design Creation
- Analysis
- Simulation, Scaling
- Collaboration

Workflow Depth



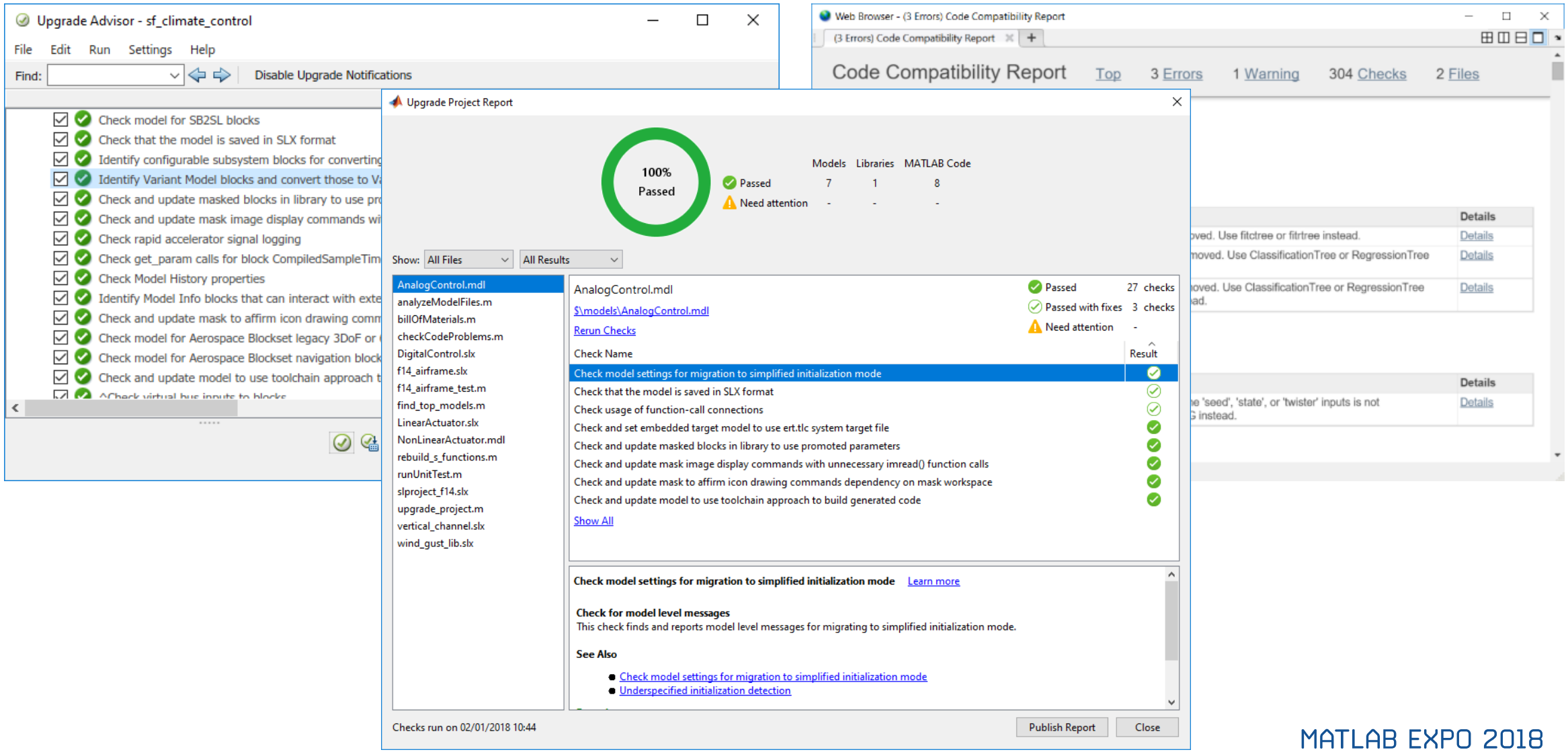
- Deployment
- Code Generation
- Verification and Validation

Application Breadth



- Autonomous Systems
- Wireless Communications
- Artificial Intelligence (AI)

Upgrade your MATLAB Code and Simulink Models



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