MATLAB EXPO 2018

What's New in MATLAB and Simulink

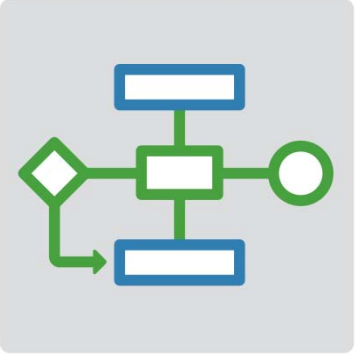
R2018a R2018b

Adam Sifounakis
Sr. Application Engineer

Platform Productivity

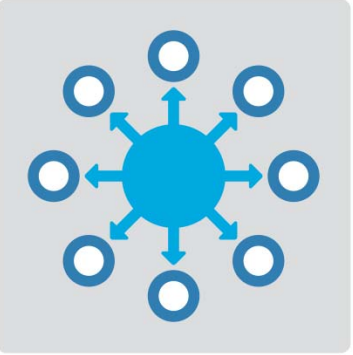
Getting your work done faster

Workflow Depth



Support for your entire workflow

Application Breadth



Products for the work you do

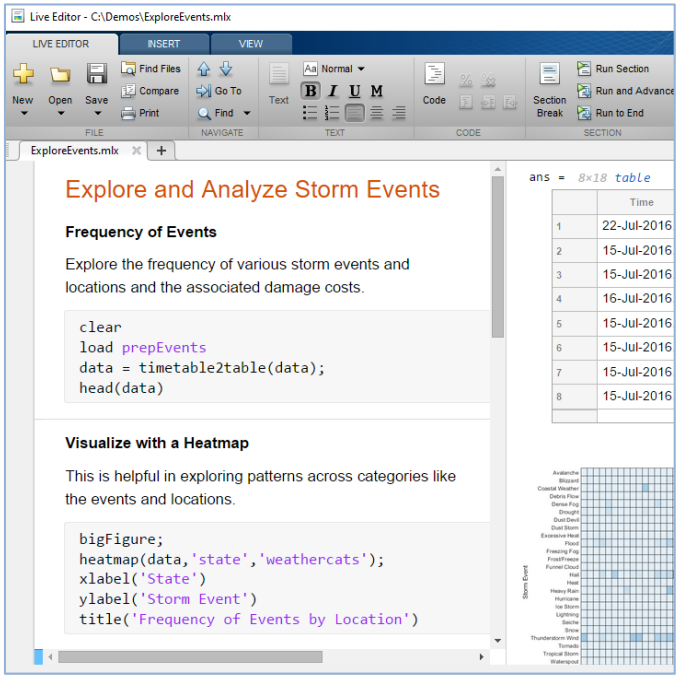
Platform Productivity

Workflow Depth

Application Breadth

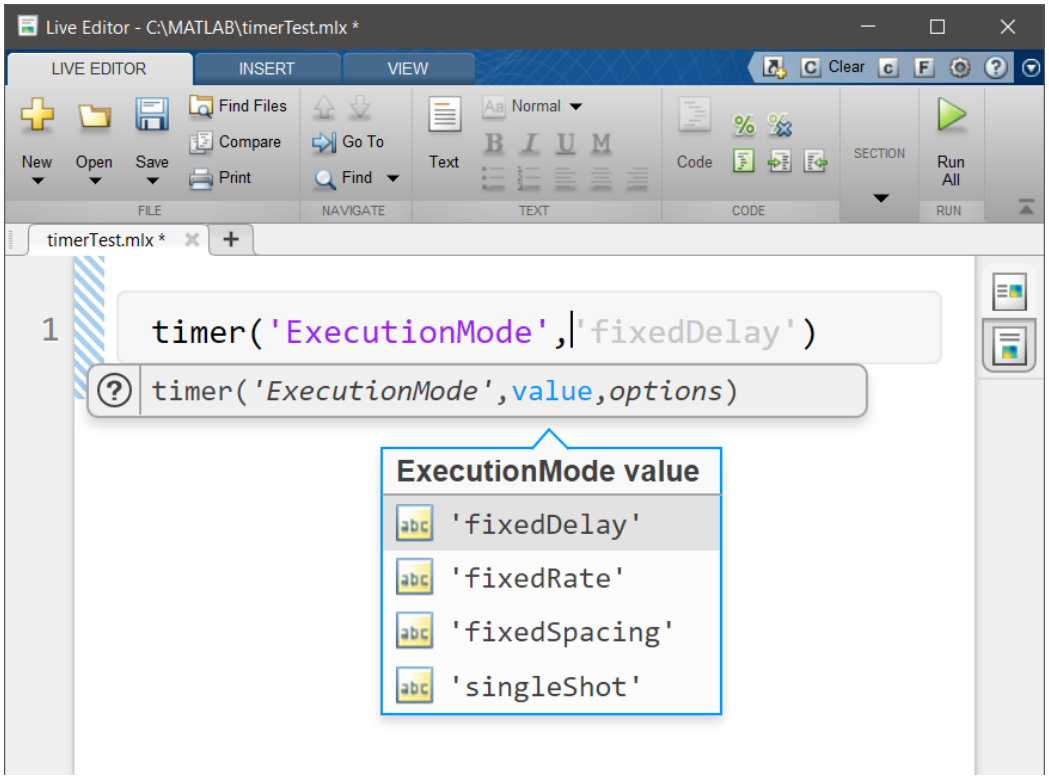
- **Create Your Designs Faster**
- **Simplify Analysis**
- **Simulate Faster and Scale Your Work**

Create Your Designs Faster – Live Editor

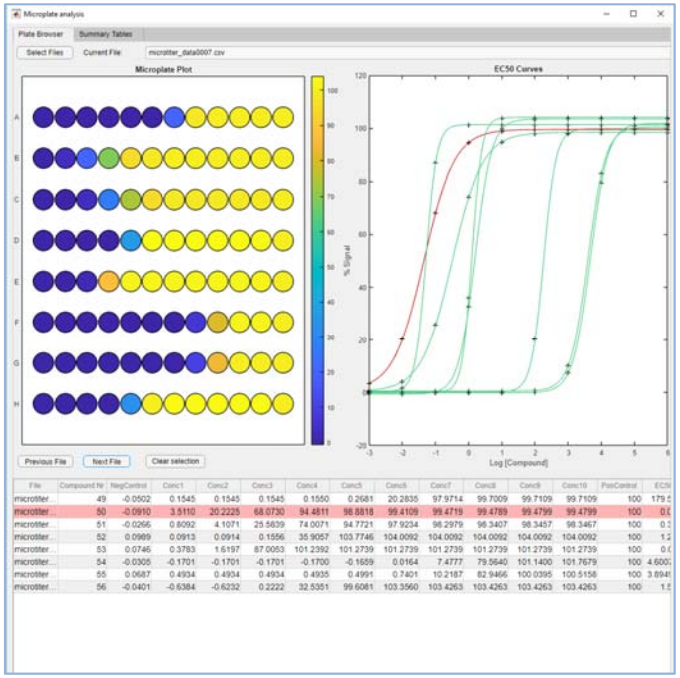


MATLAB

Live Editor

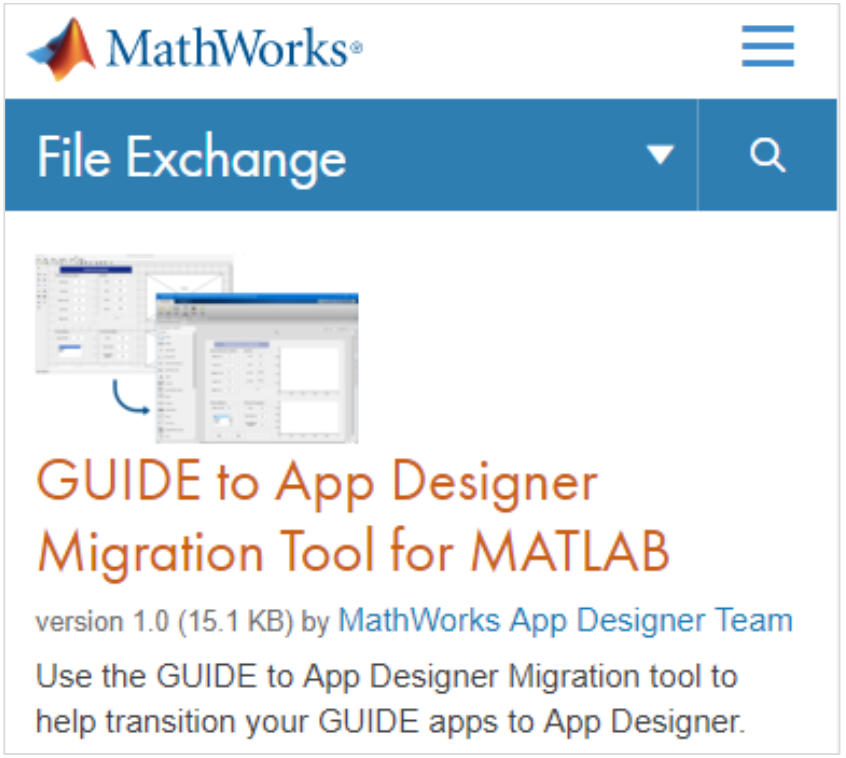


Create Your Designs Faster – App Designer

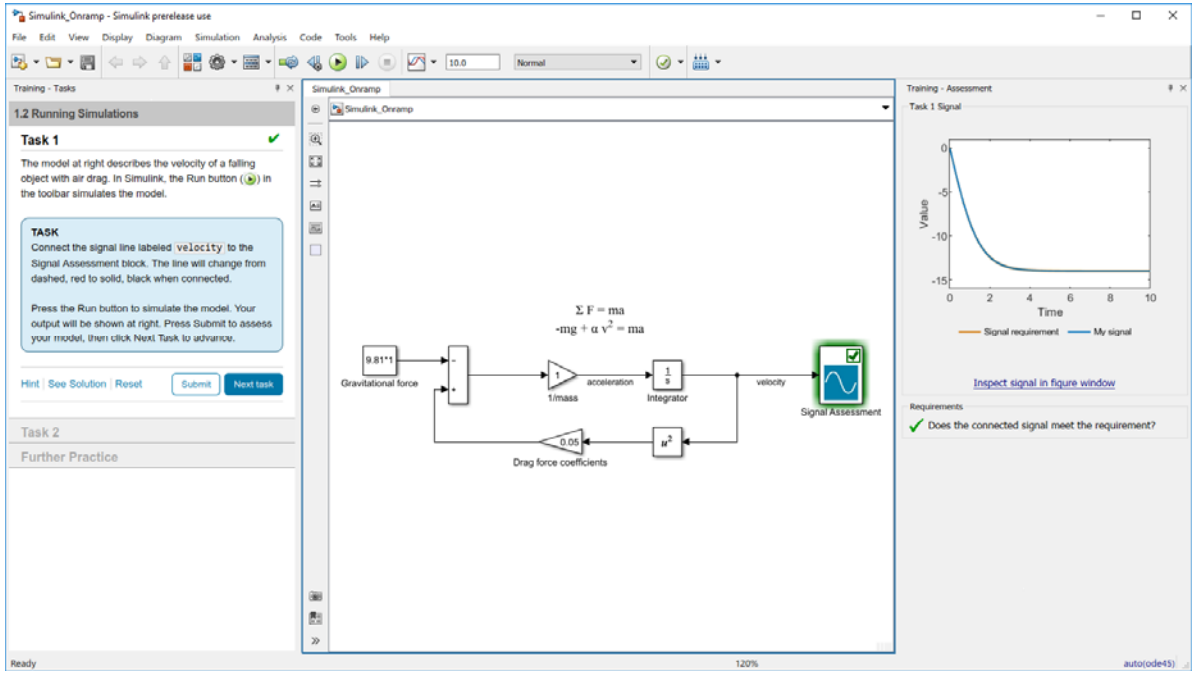


MATLAB

App Designer

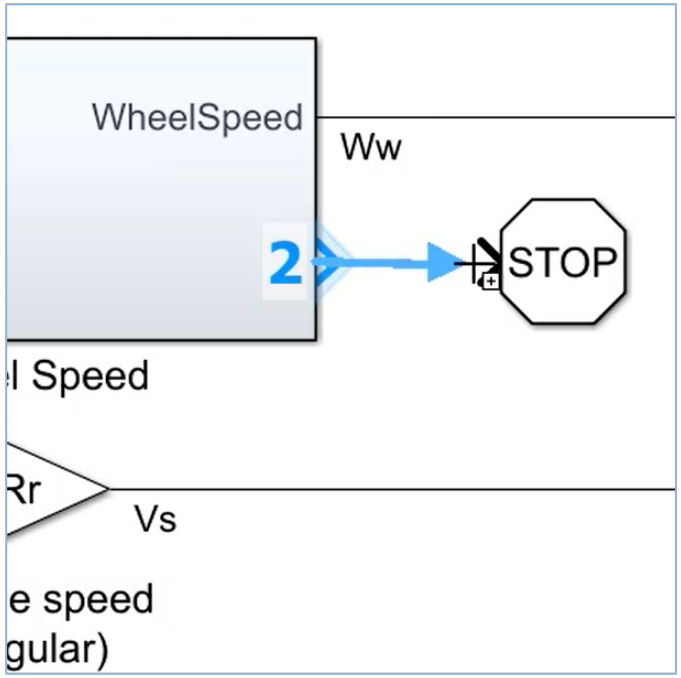


Create Your Designs Faster – Simulink Onramp



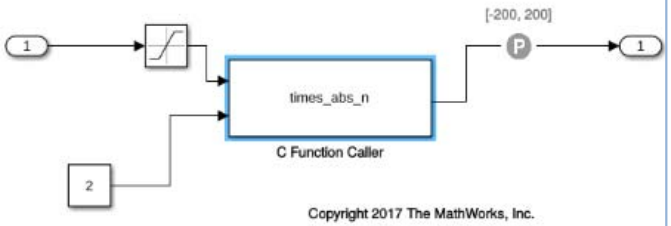
Simulink

Create Your Designs Faster – Smarter Editing



Simulink

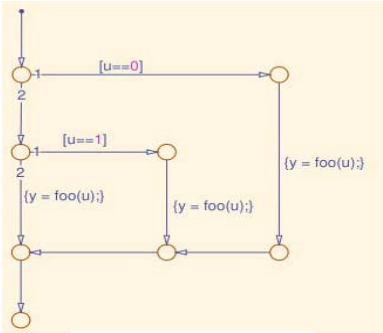
Create Your Designs Faster – C Caller Block




```c
#include "hTimesAbsN.h"
#include "hTimesN.h"

double times_abs_n(double val, double n)
{
    if(val > 0) {
        return times_n(val, n);
    } else {
        return times_n(-val, n);
    }
}
```

Simulink




```c
#include "hfoo.h"

int foo(int u1) {

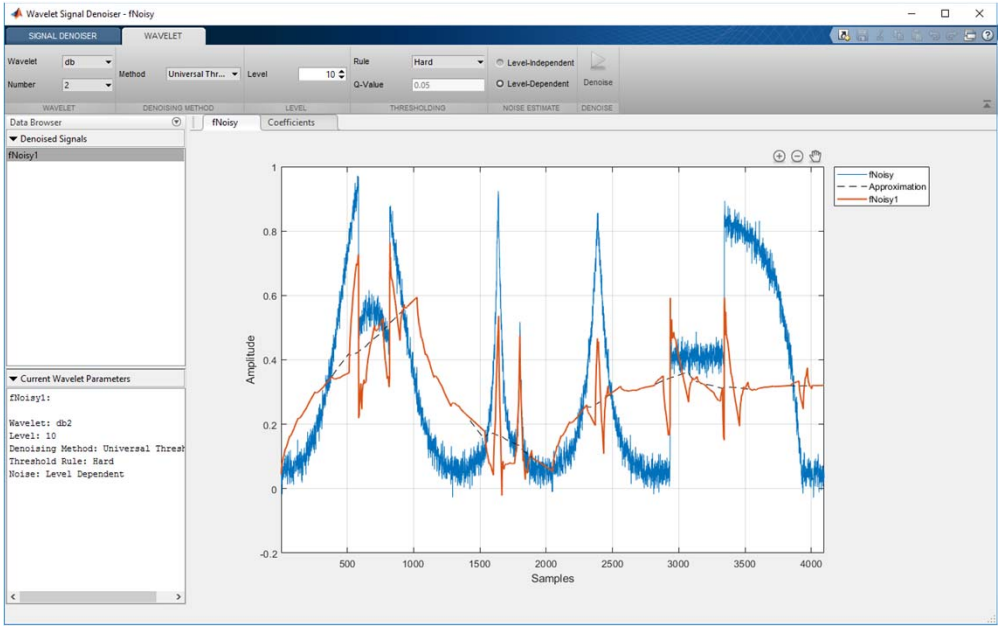
    switch(u1) {
        case 0:
            break;
        case 1:
            break;
        default:
            break;
    }
    return u1;
}
```

Stateflow

Simplify Analysis with Apps

Interactive applications automate common technical computing tasks

- Signal Analyzer app
  - Visualize, measure, analyze, and compare signals in the time domain, frequency domain, and time-frequency domain
- 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

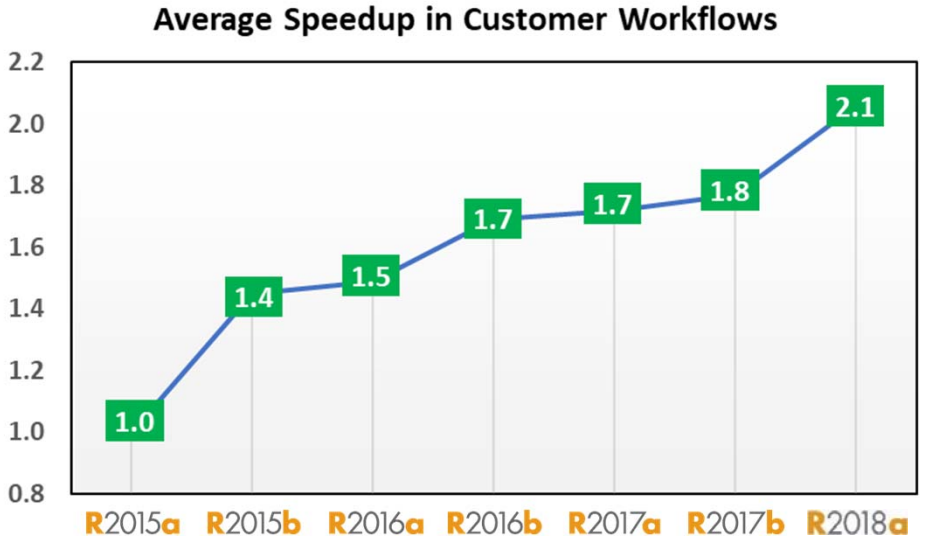


Signal Processing Toolbox
Econometrics Toolbox
Data Acquisition Toolbox
Wavelet Toolbox

Simulate Faster – Faster MATLAB Execution

Redesigned execution engine runs MATLAB code faster

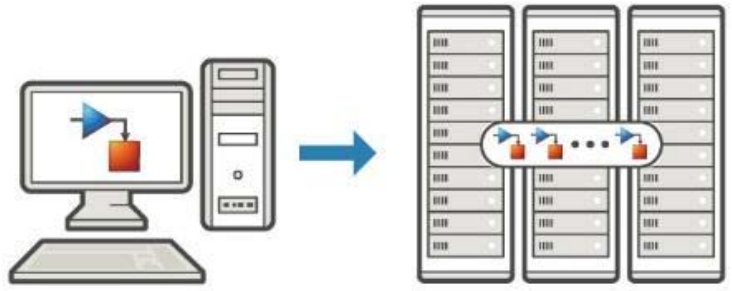
- All MATLAB code is now be JIT compiled
- MATLAB runs your code over twice as fast as it did just three years ago
- No need to change a single line of your code
- Increased speed of MATLAB startup in R2018a and R2018b

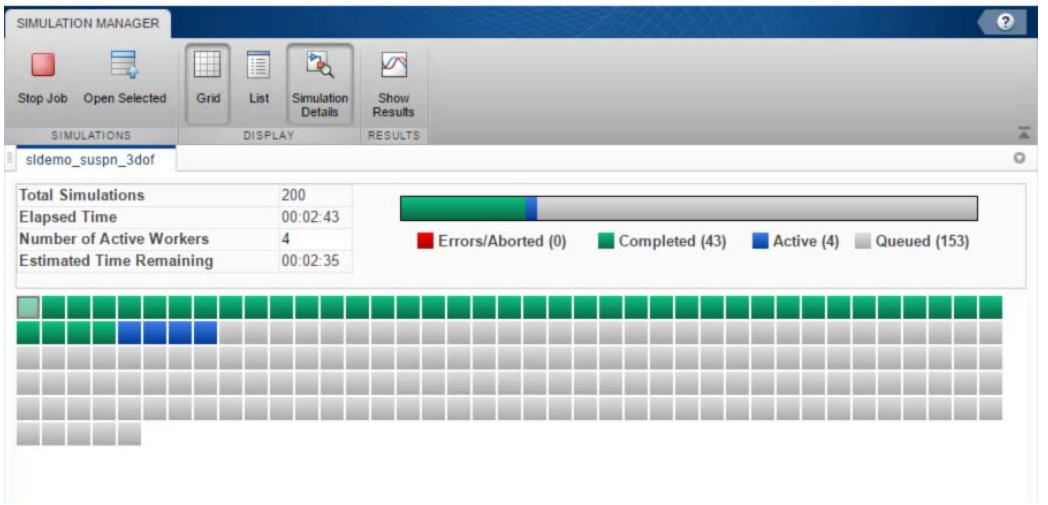


Scale Your Work – Simulate in Parallel

Use parallel computing to run multiple simulations faster

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



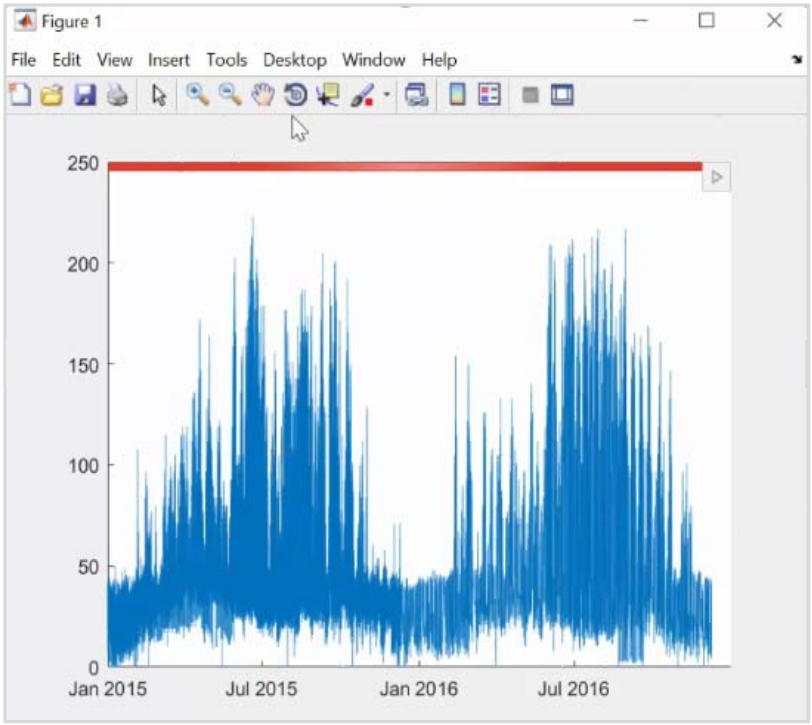


Parallel Computing Toolbox
MATLAB Distributed Computing Server

Scale Your Work – Easily Work with Big Data

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

- Use familiar MATLAB functions and syntax
- Built-in support for hundreds of functions
- Customization support for importing, processing, and exporting data
- Works with Spark + Hadoop clusters



Platform Productivity

Workflow Depth

Application Breadth

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Platform Productivity

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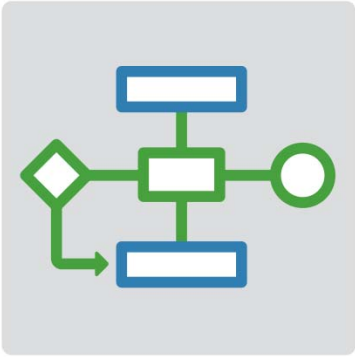


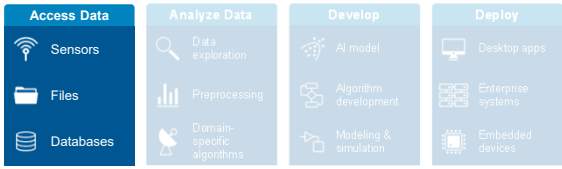
Application Breadth

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

Access Data / Deploy MATLAB Algorithms and Applications

Access Data	Analyze Data	Develop	Deploy
Sensors	Data exploration	AI model	Desktop apps
Files	Preprocessing	Algorithm development	Enterprise systems
Databases	Domain-specific algorithms	Modeling & simulation	Embedded devices

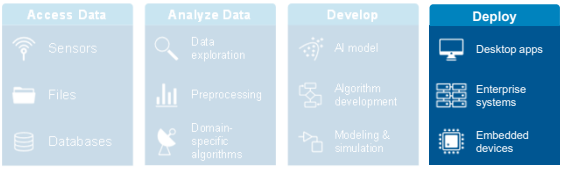
Access Remote Data



Read and write data to and from remote locations using datastore objects

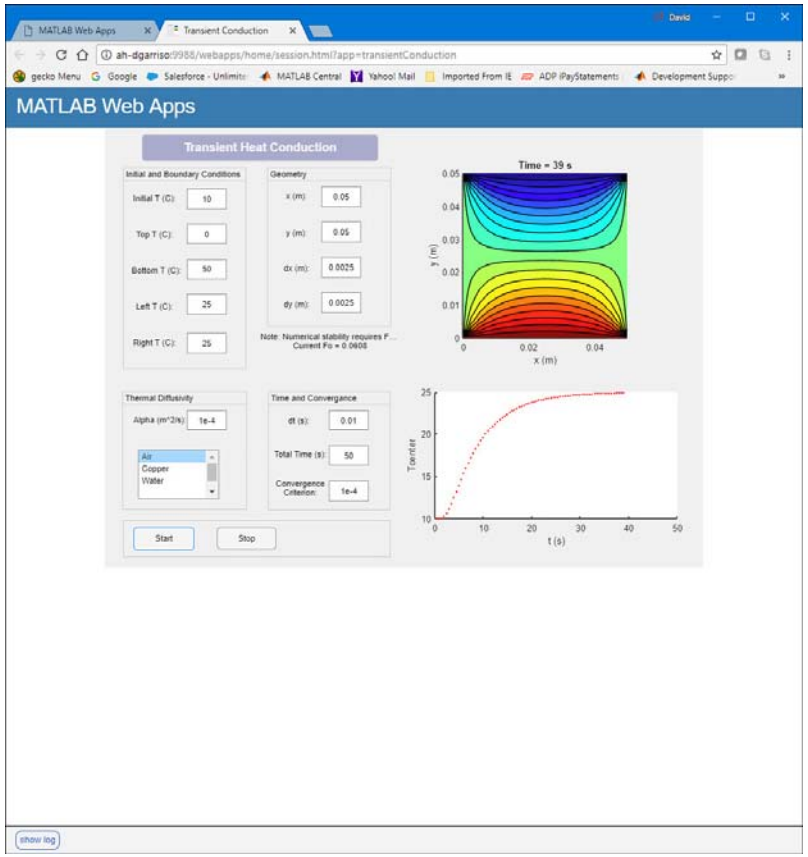
- Amazon S3
  (offered by Amazon Web Services)
- Windows Azure® Storage Blob
  (offered by Microsoft)
- Hadoop Distributed File System (HDFS)

Deploy MATLAB Web Apps

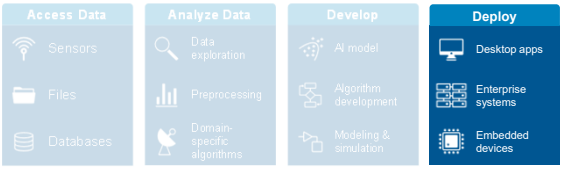


Share App Designer apps on the Web using MATLAB Compiler

- Package the app for deployment to the MATLAB App Server
- Add the app to the library of MATLAB Web Apps on the server
- Run the app in a browser from any machine with access to the 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

Intel MKL-DNN Library

NVIDIA TensorRT & cuDNN Libraries

ARM Compute Library

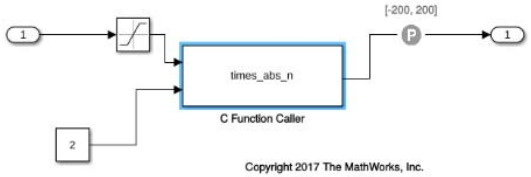
- Generate optimized CUDA code for deep learning, embedded vision, and autonomous systems

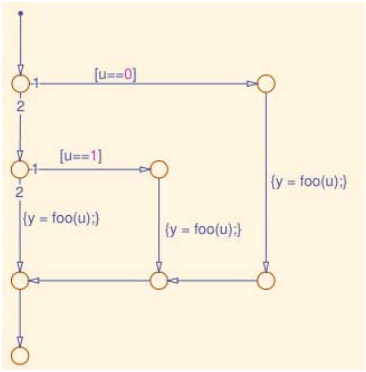
MATLAB Coder
GPU Coder

Verify models that include C/C++

Analyze and generate tests for Simulink and Stateflow models that use custom code

- Perform design error detection, property proving and test generation for the C/C++ code
- Works with C Caller blocks and Stateflow charts



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        case 0:
            break;
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        default:
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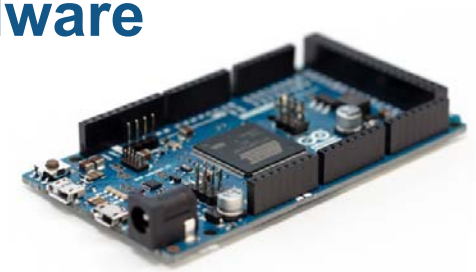
    }
    return u1;
}
```

Connecting Your Design to Hardware

Connect directly to hardware with support packages

- Live streaming to and from hardware
- Run Simulink models on low-cost hardware, such as Arduino, Raspberry Pi, and LEGO
- Automatically generate code and run it on microprocessors, FPGAs, and more

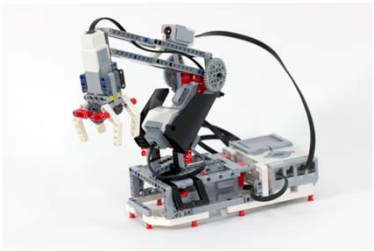


Arduino

Raspberry Pi Zero W

Raspberry Pi 3 Model B+

Microsemi FPGA



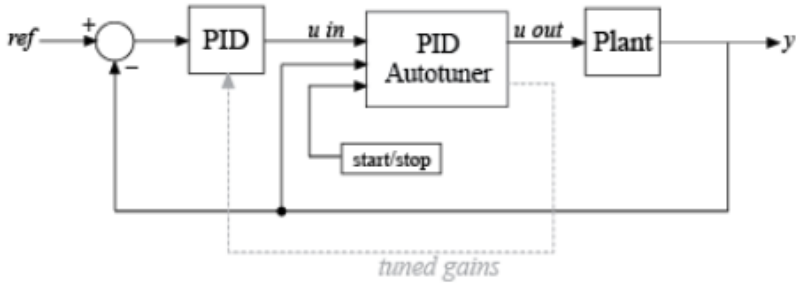
LEGO EV3

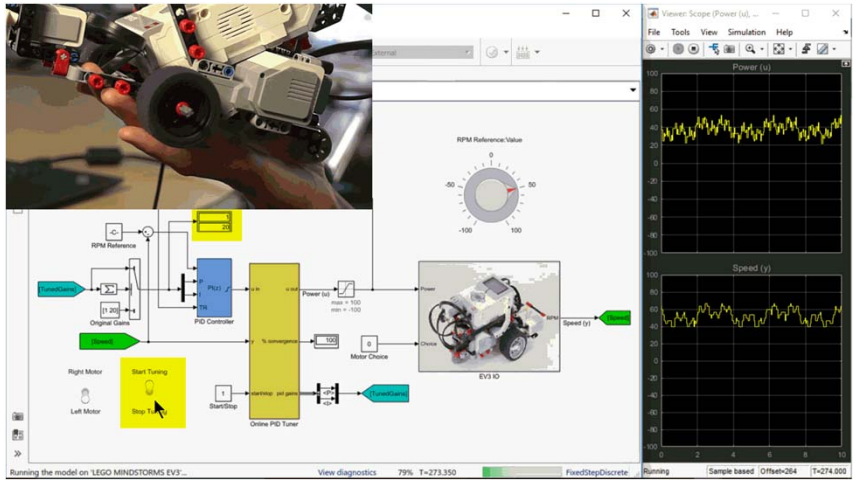
ADALM-PLUTO

Closed-Loop PID Autotuning

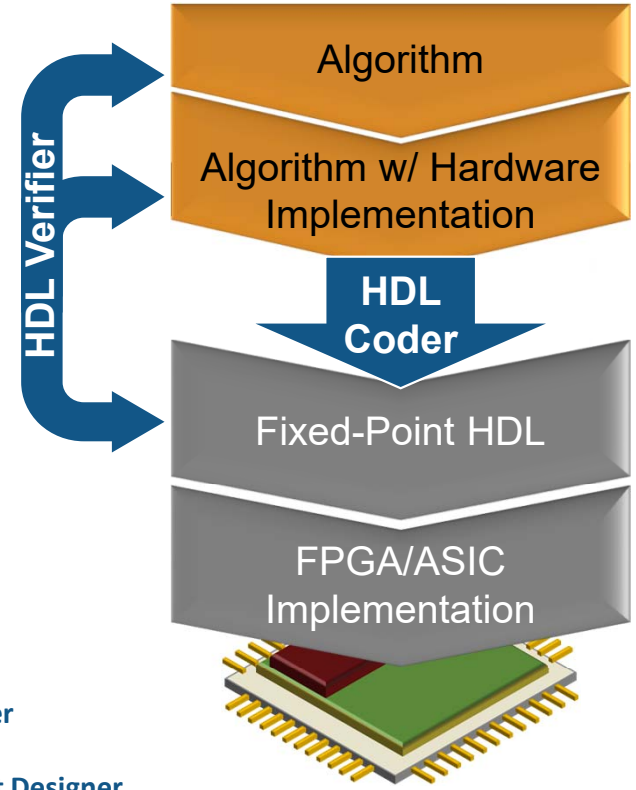
Deploy algorithm that performs PID autotuning without opening the feedback loop

- Use Closed-Loop PID Autotuner block to generate autotuning code and deploy to embedded software
- Estimation experiment is performed without opening the feedback loop
- Use to tune PID controller gains for a plant model in Simulink or for a physical plant



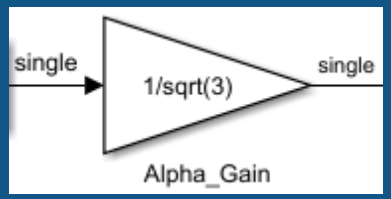


Deploying to FPGA or ASIC Hardware

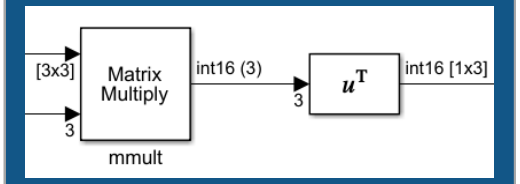


HDL Verifier
HDL Coder
Fixed-Point Designer
Vision HDL Toolbox
LTE HDL Toolbox

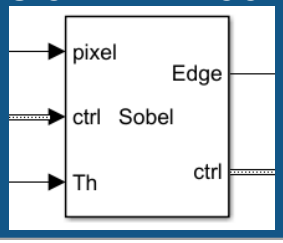
Native Floating Point



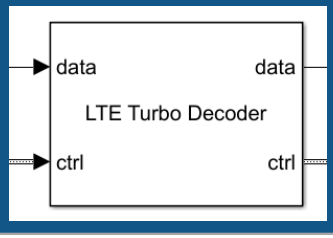
Matrix Support



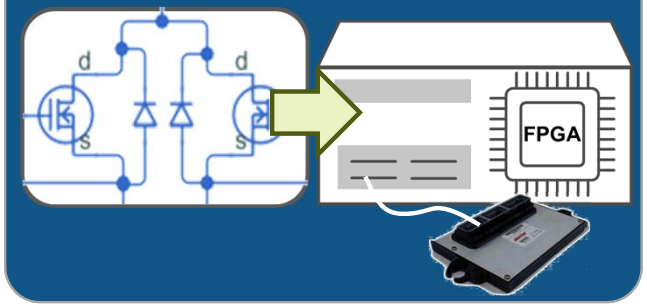
Vision HDL Toolbox



LTE HDL Toolbox



Generate HDL from Simscape

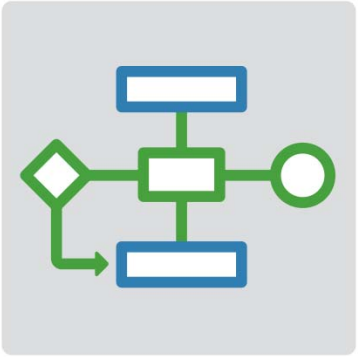


Import Verilog code

```
1  module bitselect(a,c);
2
3  input [1:0] a;
4  output [1:0] c;
5
6  assign c[0] = 0;
7  assign c[1] = a[2];
8
9  endmodule
```

Platform Productivity

Workflow Depth



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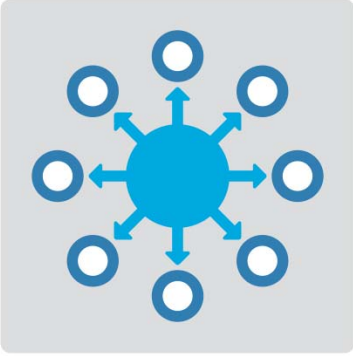
- Code Generation from Simulink Models
- Verification and Validation

Platform Productivity

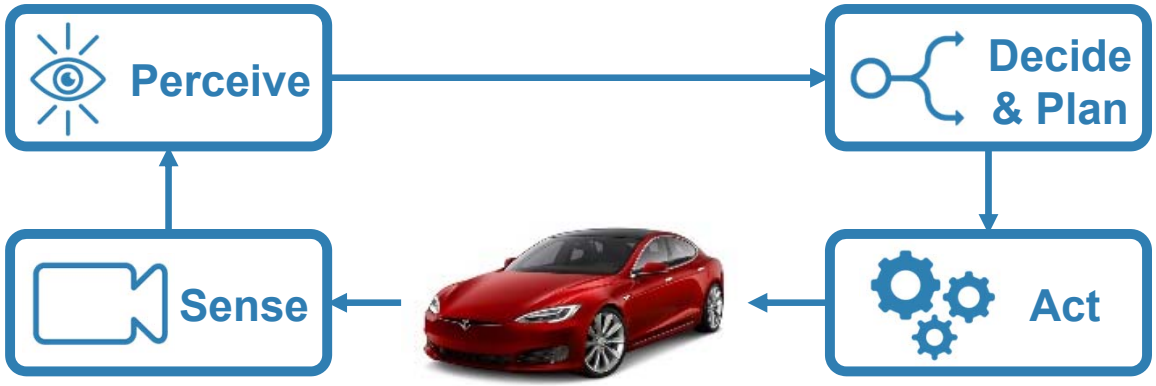
Workflow Depth

Application Breadth



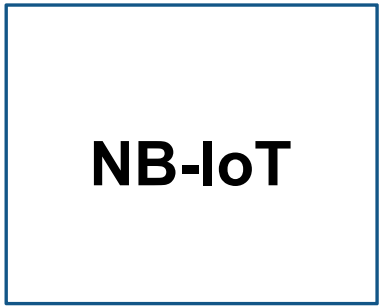
- Autonomous Systems
- Wireless Communications
- Artificial Intelligence (AI)

Designing Autonomous Systems



Computer Vision System Toolbox
Robotics System Toolbox
Deep Learning Toolbox
Computer Vision System Toolbox
Automated Driving System Toolbox
Sensor Tracking and Fusion Toolbox New Product
Model Predictive Control Toolbox
Vehicle Dynamics Blockset New Product

Design with the Latest Wireless Standards



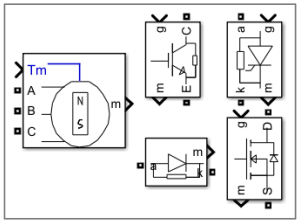
LTE Toolbox
5G Toolbox New Product
WLAN Toolbox
Communications System Toolbox

Model Physical Systems with Simscape

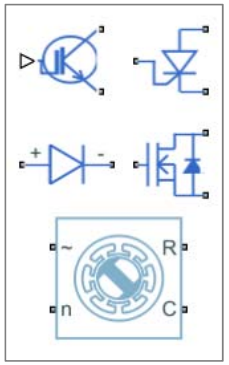
Model and simulate electronic, mechatronic, and electrical power systems

- Convert SPICE models to Simscape components
- Generate HDL code from Simscape models for faster simulation on FPGA's

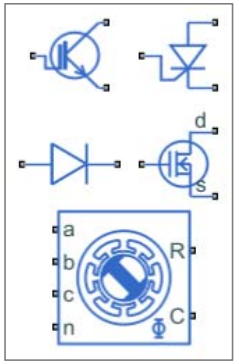
Specialized



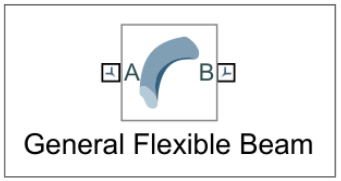
Fast

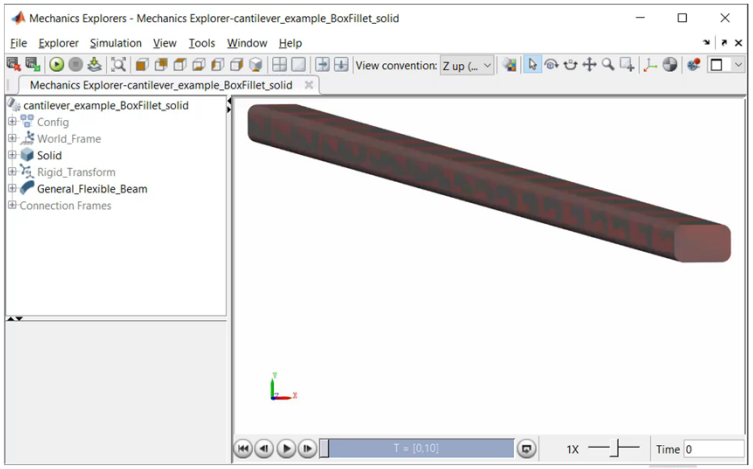


High Fidelity



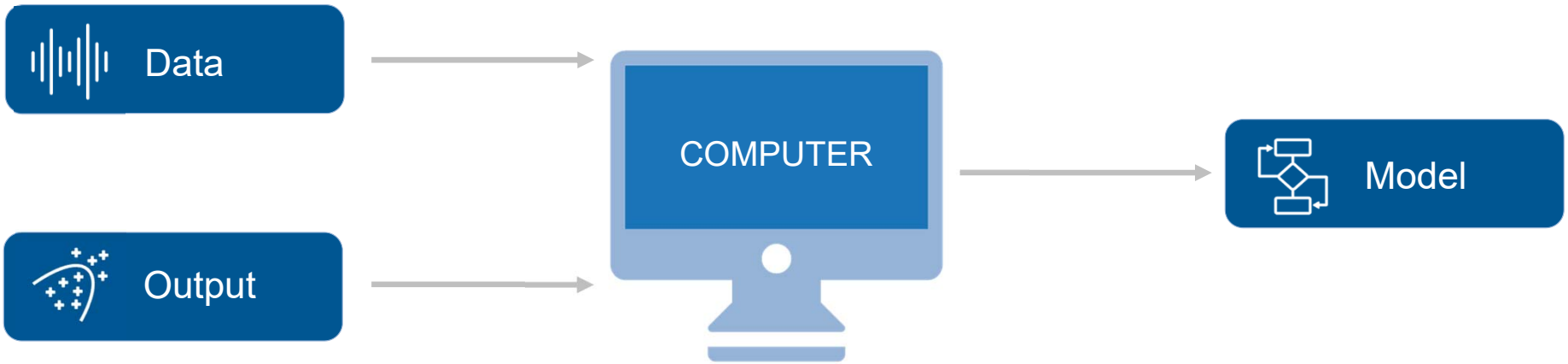
Model HVAC control systems and flexible beams





Simscape
Simscape Multibody
Simscape Electrical
HDL Coder

Artificial Intelligence



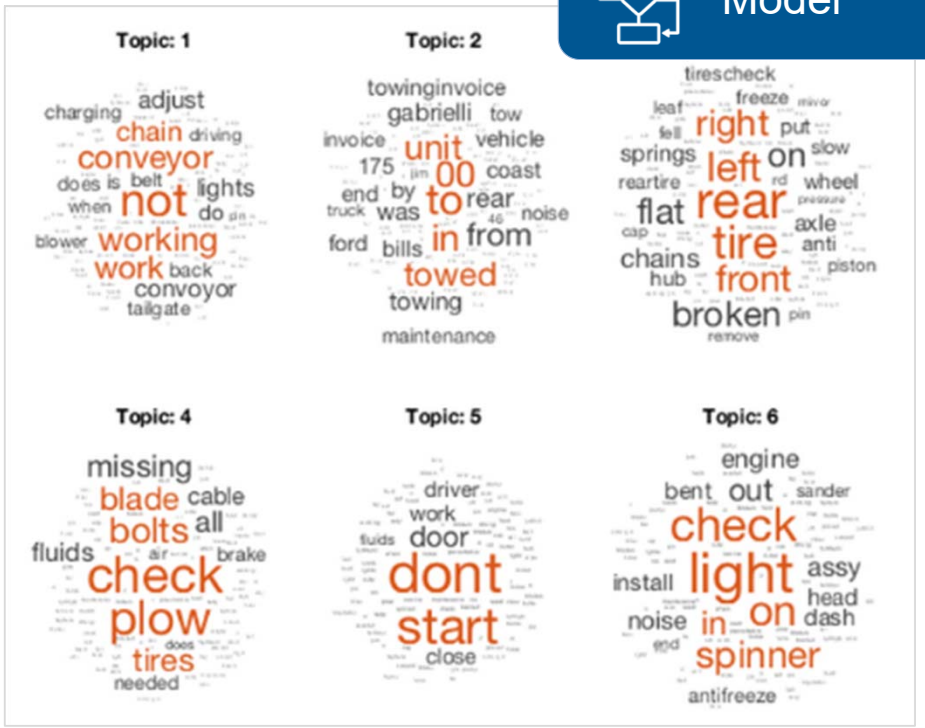
Text Analytics

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

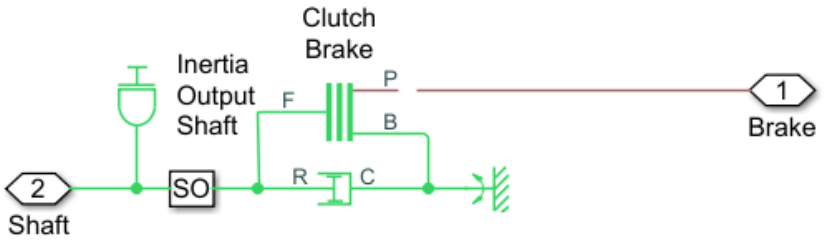
Model



Predictive Maintenance

Data

Sensors



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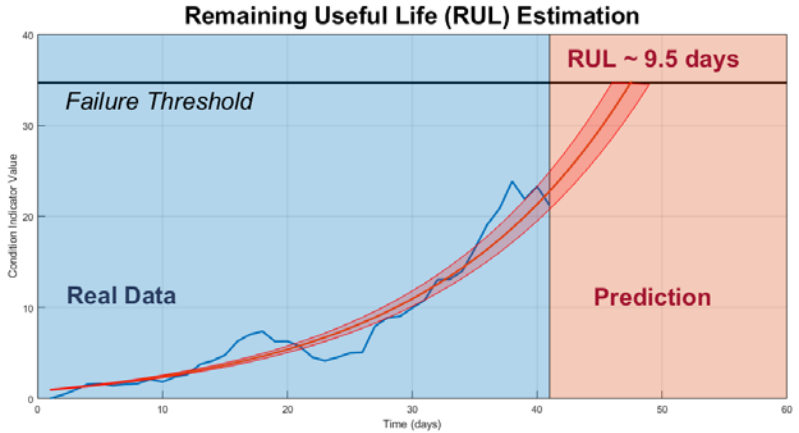
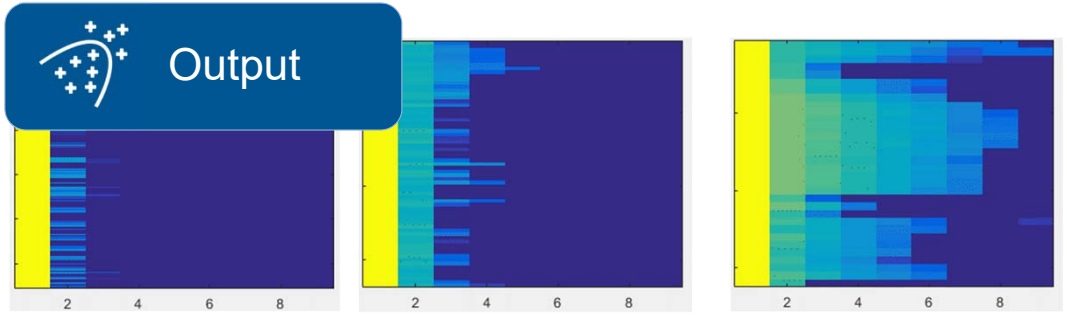


Output



Normal Operation | Monitor Closely | Maintenance Needed

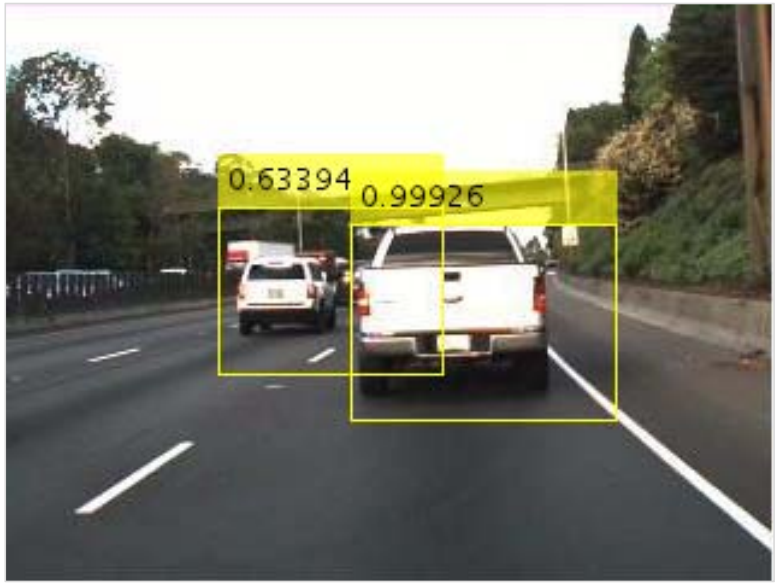
Predictive Maintenance Toolbox New Product

Deep Learning

Data

Output

Model

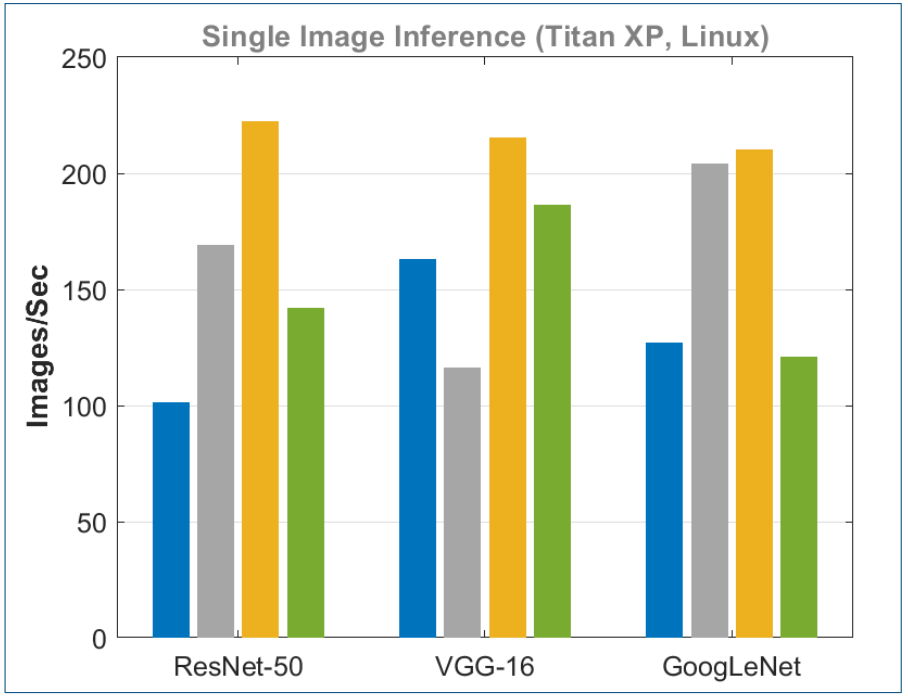


Deep Learning Toolbox
Computer Vision System Toolbox
GPU Coder
MATLAB Coder

Deep Learning

Design, build, and visualize convolutional neural networks

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



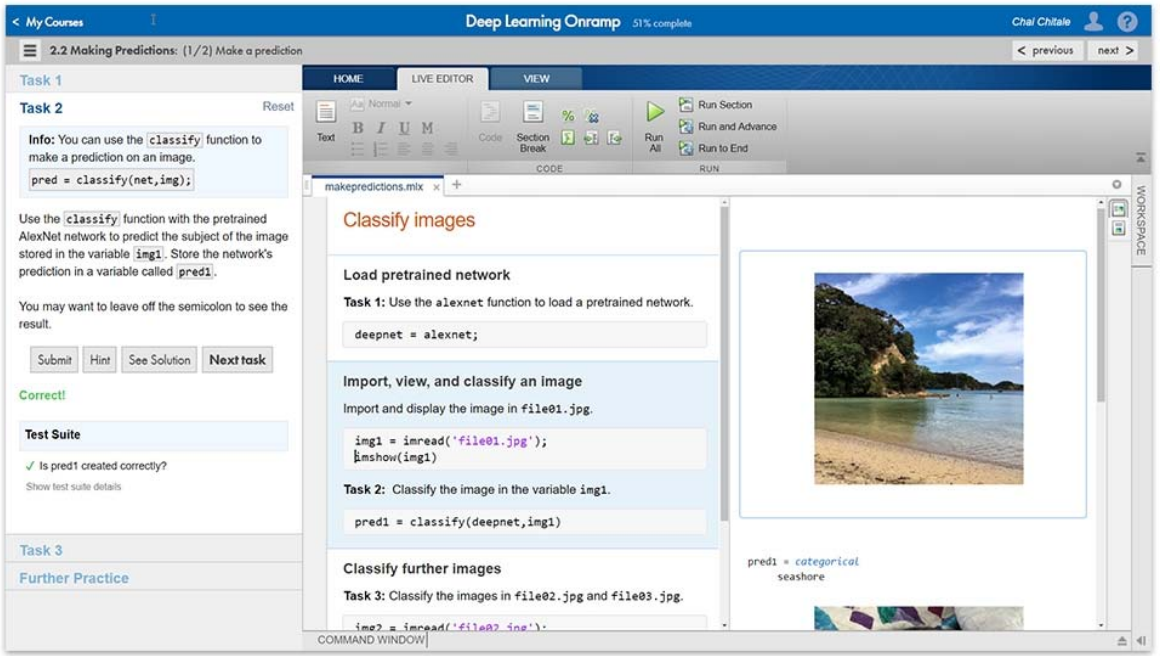
R2018b

Deep Learning Toolbox
Computer Vision System Toolbox
GPU Coder

FREE

Learn to Use MATLAB for Deep Learning in 2 Hours

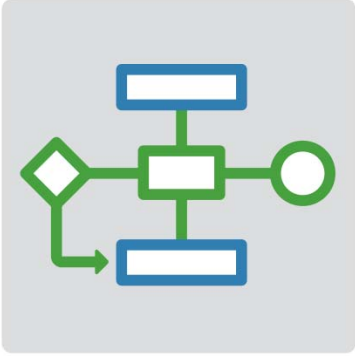
Launch Deep Learning Onramp



Platform Productivity

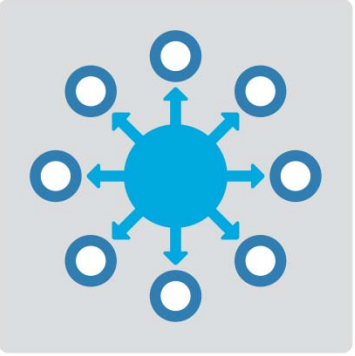
- Design Faster
- Simplify Analysis
- Simulate and Scale

Workflow Depth



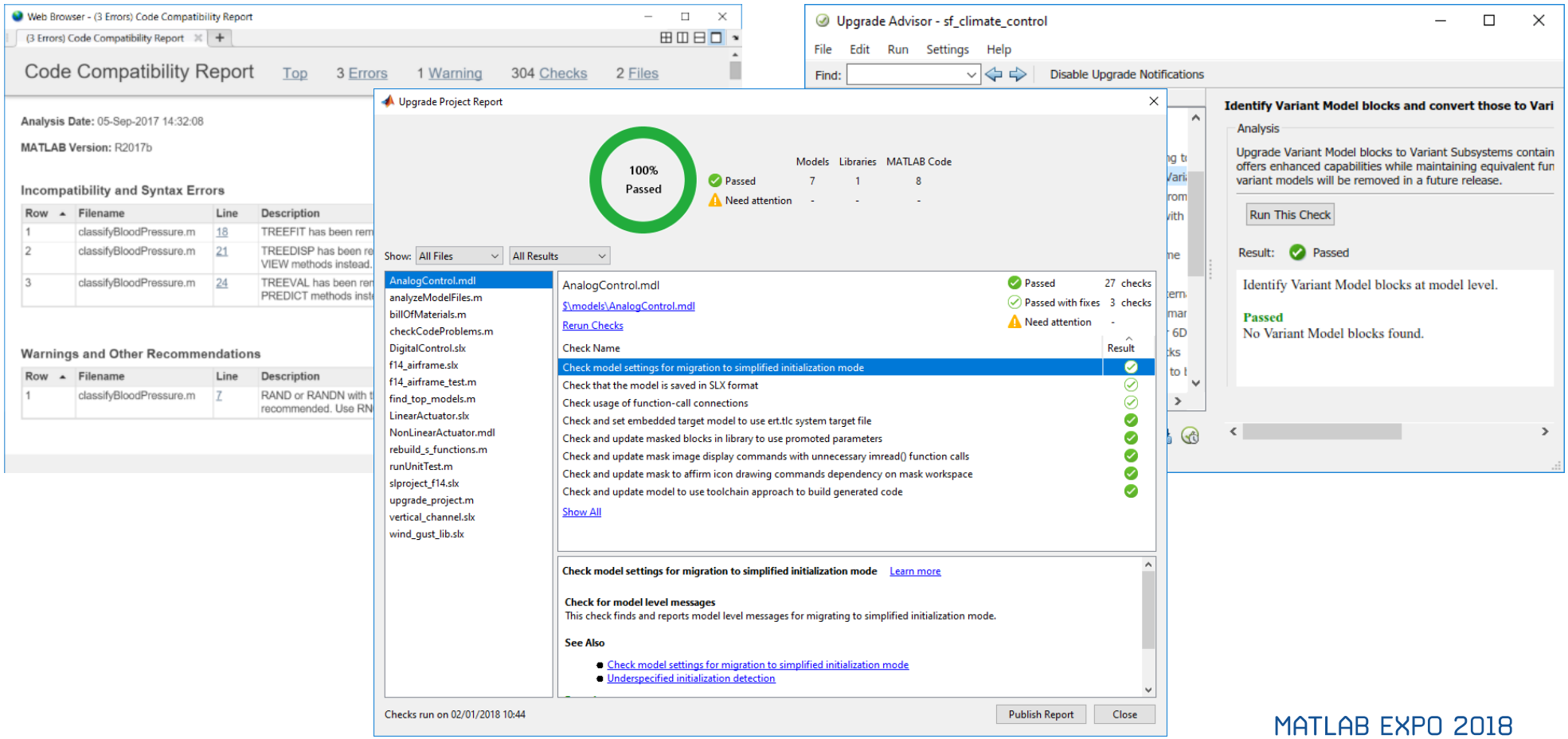
- Deploy Applications
- Code Generation
- Verification and Validation

Application Breadth



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

Upgrade your MATLAB Code and Simulink Models



MATLAB EXPO 2018