



# What's MATLAB&Simulink

17<sup>th</sup> Nov 2020

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# R2020b

Southeast Asia's sole distributor of

**MATLAB®**  
&  
**SIMULINK®**

# Learn about us



As the sole distributor in Southeast Asia for MathWorks Inc, developer of the MATLAB® and Simulink® family of products, we provide organizations and businesses with a variety of the best tools, products and services to facilitate innovations. Our clients include many research and development institutes as well as multinational companies operating in this region.



TechSource Systems currently has offices in Singapore, Malaysia, Thailand, Vietnam and Philippines, with its headquarters based in Singapore. We are an ISO 9001:2008 certified company and has been awarded the Singapore's Outstanding Enterprise 2013 Award.

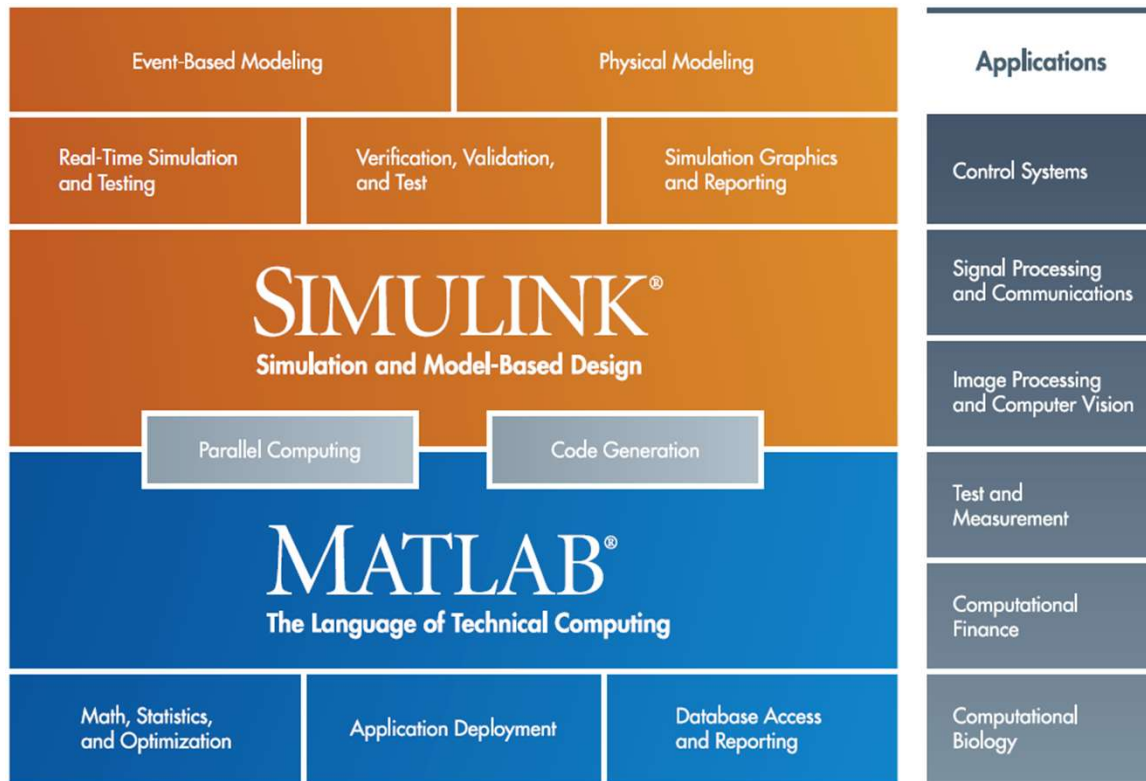


Ascendas Systems Co., Ltd. Born on 2018. 100% Subsidiary of Techsource Systems Pte Ltd (Singapore). Sole Distributor of Mathworks Products including Training & Services since 1996. Ascendas Systems Thailand Authorized by Mathworks

# Agenda

<b>10.00 - 10.30</b>	<b>What's MATLAB &amp; Simulink</b>
<b>10.30 - 11.00</b>	<b>Campus Wide Onboarding Program</b>
<b>11.00 - 12.00</b>	<b>Accelerate E-Learning Online with MATLAB</b>
<b>12.00 - 13.00</b>	Lunch break
<b>13.00 – 14.00</b>	<b>MATLAB Campus Wide Installation guideline</b>
<b>14.00 – 14.30</b>	Q&A

# What's MATLAB & Simulink



MathWorks offers nearly 100 products for [Technical computing](#) and [Model-Based Design](#). Widely used throughout industry, government and academia, these products are accelerating the pace of discovery, innovation, development, and learning in engineering and science

Figure 1. Magic Quadrant for Data Science and Machine Learning Platforms

# MathWorks Is a Leader in the Gartner Magic Quadrant for Data Science and Machine Learning Platforms 2020



MATLAB® is the enterprise engineering platform for AI.

We believe that our recognition as a 2020 Leader in Gartner’s Magic Quadrant for Data Science and Machine Learning demonstrates that MATLAB enables you to:

- Empower your team, including those with limited AI or data science experience
- Apply complete workflows for data preparation, AI modeling, system design, and production
- Deploy AI models on embedded devices, edge, enterprise systems, and the cloud
- Tackle integration challenges and reduce risk in designing AI-driven systems with Simulink®

Source: Gartner (February 2020)



# New LinkedIn Research: Upskill Your Employees with the Skills Companies Need Most in 2020



Amanda Van Nuys December 28, 2019



# The Skills Companies Need Most in 2020



## Top 5 Soft Skills

- 1 Creativity -
- 2 Persuasion -
- 3 Collaboration -
- 4 Adaptability -
- 5 Emotional intelligence new



## Top 10 Hard Skills

- 1 Blockchain new
- 2 Cloud computing -1
- 3 Analytical reasoning -
- 4 Artificial intelligence -2
- 5 UX design -
- 6 Business analysis +10
- 7 Affiliate marketing new
- 8 Sales -
- 9 Scientific computing +3
- 10 Video production -3

## #9 Scientific Computing - up 3

Scientific computing skills are held by data science professionals, engineers, and software architects. Companies need more professionals that can develop machine learning models and apply statistical and analytical approaches to large data sets using programs like Python, MATLAB, and others.

Recommended Courses:

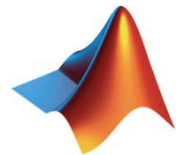
- [Parallel and Concurrent Programming with Python 1](#) with Barron Stone and Olivia Chiu Stone
- [Learning MATLAB](#) with Steven Moser
- [Introduction to Quantum Computing](#) with Jonathan Reichental

# MATLAB & Simulink Products family

MATLAB  
Simulink  
5G Toolbox  
Aerospace Blockset  
Aerospace Toolbox  
Antenna Toolbox  
Audio Toolbox  
Automated Driving Toolbox  
AUTOSAR Blockset  
Bioinformatics Toolbox  
Communications Toolbox  
Computer Vision Toolbox  
Control System Toolbox  
Curve Fitting Toolbox  
Data Acquisition Toolbox  
Database Toolbox  
Datafeed Toolbox  
Deep Learning Toolbox  
DSP System Toolbox  
Econometrics Toolbox  
Embedded Coder  
Filter Design HDL Coder  
Financial Instruments Toolbox  
Financial Toolbox  
Fixed-Point Designer  
Fuzzy Logic Toolbox  
Global Optimization Toolbox  
GPU Coder  
HDL Coder  
HDL Verifier  
Image Acquisition Toolbox  
Image Processing Toolbox  
Instrument Control Toolbox  
LTE HDL Toolbox  
LTE Toolbox

Mapping Toolbox  
MATLAB Coder  
MATLAB Compiler  
MATLAB Compiler SDK  
MATLAB Parallel Server  
MATLAB Report Generator  
Mixed-Signal Blockset  
Model Predictive Control Toolbox  
Model-Based Calibration Toolbox  
Navigation Toolbox  
OPC Toolbox  
Optimization Toolbox  
Parallel Computing Toolbox  
Partial Differential Equation Toolbox  
Phased Array System Toolbox  
Polyspace Bug Finder  
Polyspace Code Prover  
Powertrain Blockset  
Predictive Maintenance Blockset  
Reinforcement Learning Toolbox  
RF Blockset  
RF Toolbox  
Risk Management Toolbox  
Robotics System Toolbox  
Robust Control Toolbox  
ROS Toolbox  
Sensor Fusion and Tracking Toolbox  
SerDes Toolbox  
Signal Processing Toolbox  
SimBiology  
SimEvents  
Simscape  
Simscape Driveline

Simscape Electrical  
Simscape Fluids  
Simscape Multibody  
Simulink 3D Animation  
Simulink Check  
Simulink Code Inspector  
Simulink Coder  
Simulink Control Design  
Simulink Coverage  
Simulink Design Optimization  
Simulink Design Verifier  
Simulink Desktop Real-Time  
Simulink PLC Coder  
Simulink Real-Time  
Simulink Report Generator  
Simulink Requirements  
Simulink Test  
SoC Blockset  
Spreadsheet Link  
Stateflow  
Statistics and Machine Learning Toolbox  
Symbolic Math Toolbox  
System Composer  
System Identification Toolbox  
Text Analytics Toolbox  
Trading Toolbox  
Vehicle Dynamics Blockset  
Vehicle Network Toolbox  
Vision HDL Toolbox  
Wavelet Toolbox  
WLAN Toolbox



Ref : <https://www.mathworks.com/products.html>

# Key Industries

- Aerospace and defense
- Automotive
- Biological sciences
- Biotech and pharmaceutical
- Communications
- Electronics
- Energy production
- Financial services
- Industrial automation and machinery
- Medical devices
- Metals, materials, and mining
- Neuroscience
- Railway systems
- Semiconductors
- Software and internet



# Lot of Solutions working with MATLAB



Computation Biology



Enterprise and  
IT Systems



Mechatronics



Control Systems



FPGA ,ASIC and  
SoC Development



Mixed-signal Systems



Data Science



Image Processing  
Computer vision



Power Electronics  
Control Design



Deep Learning



IoT



Predictive Maintenance



Embedded System



Machine Learning



Robotics



Wireless Communication



Test & Measurement



Signal Processing

# Solutions



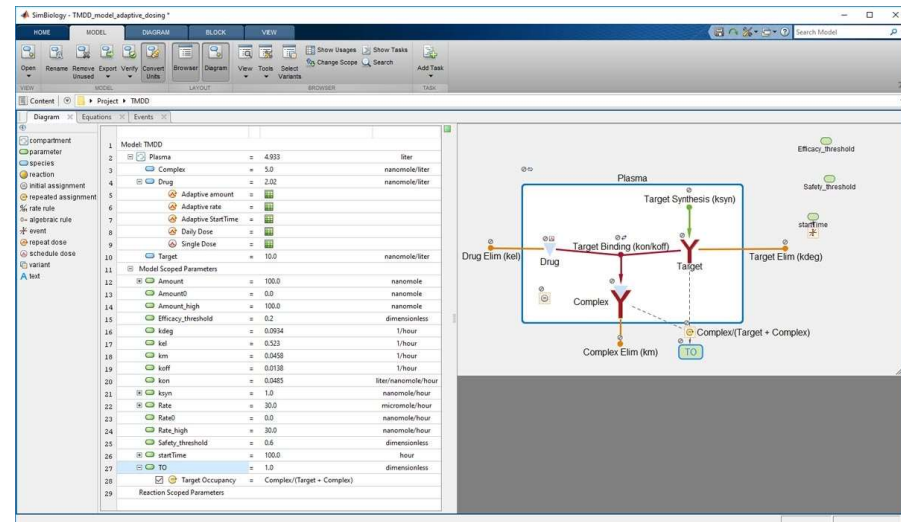
## Computational Biology

Analyze, visualize, and model biological data and systems

Computational biologist to understand and predict biological behavior using data analysis and mathematical modeling

### Support

- Bioimage processing



# Solutions



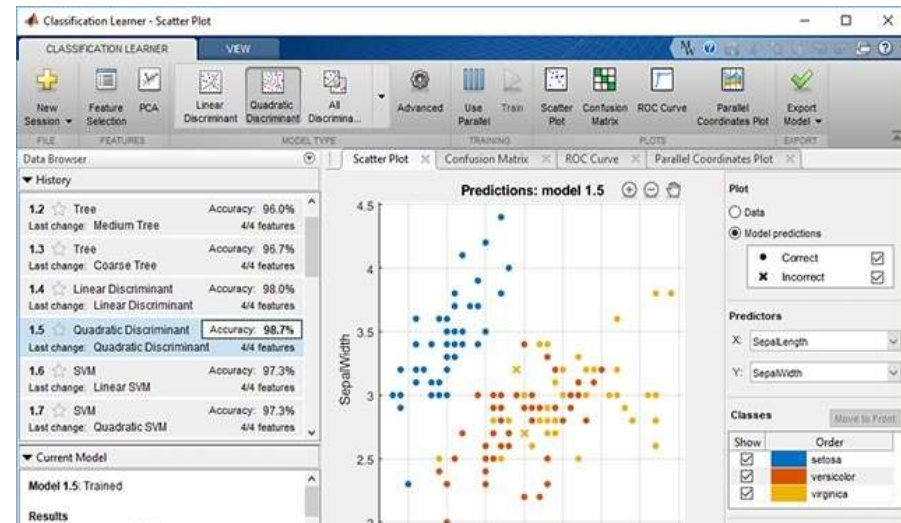
## Data Science

Explore data; build machine learning models; do predictive analytics

Tools to access and preprocess data, build machine learning and predictive models, and deploy models to enterprise IT systems

### Support

- Machine learning
- Deep learning
- Data acquisition
- Financial data feeds
- Databases



# Solutions



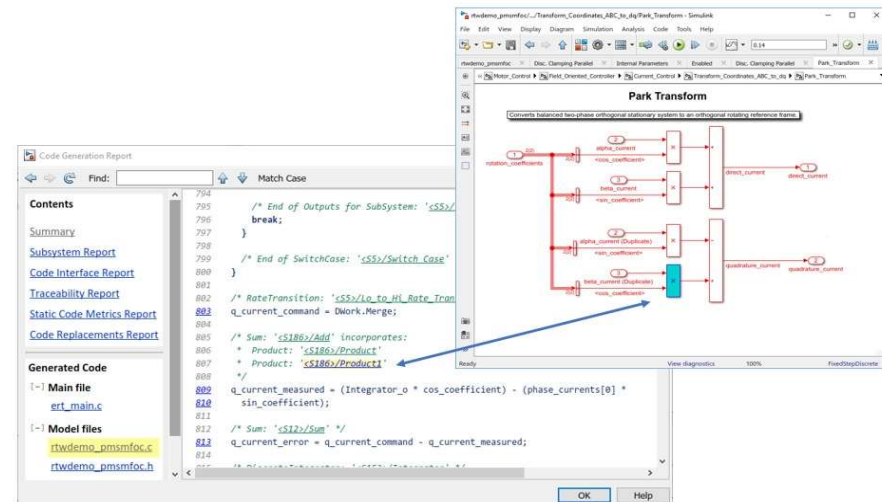
## Control Systems

Design, test, and implement control systems

Designing and tuning control algorithms and supervisory logic to deployment with automatic code generation

### Support

- Closed-loop control
- System identification or physical modeling
- Root locus, Bode diagrams, LQR, LQG, Robust control
- PID tuning
- Model predictive control



# Solutions



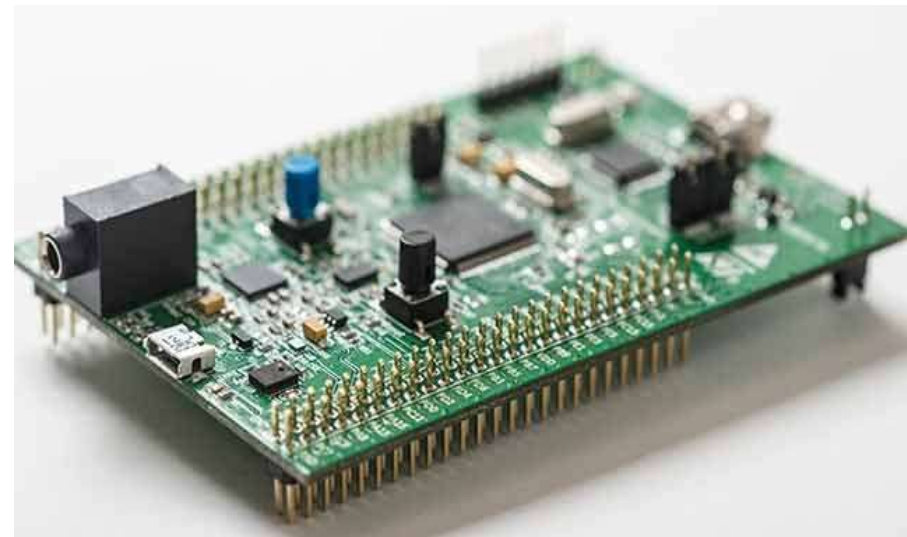
## Embedded Systems

Design, code, and verify embedded systems

Generating code from designed model and run on actual hardware from prototyping to production

### Support

- C, C++, CUDA, Verilog, VHDL
- Floating-point design
- Fixed-point design
- In-the-loop testing
- Standard (AUTOSAR, ISO, DO, MISRA C)



# Solutions



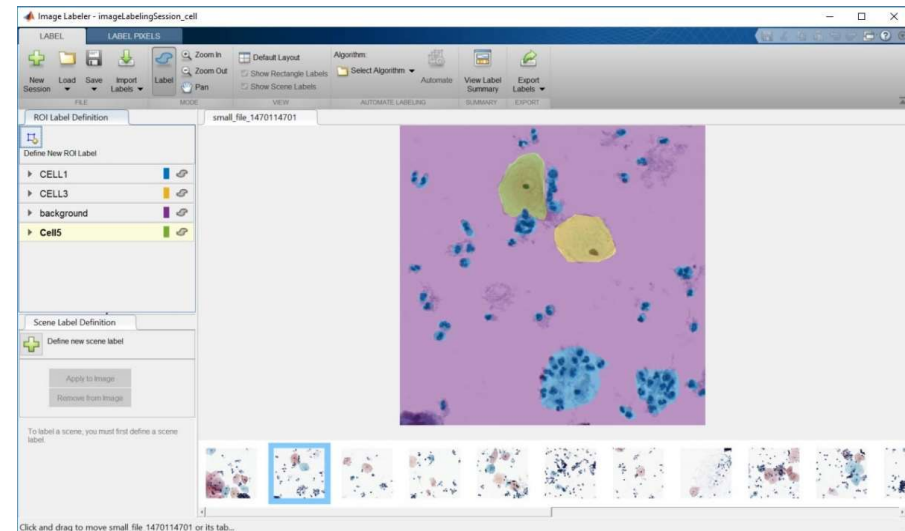
## Image Processing and Computer Vision

Acquire, process, and analyze images  
and video for algorithm development and  
system design

Gain insight into your image and video data,  
develop algorithms, and explore implementation tradeoffs

### Support

- Camera calibration
- Image and video labeling
- Image segmentation
- Volume visualization
- Video viewer



# Solutions



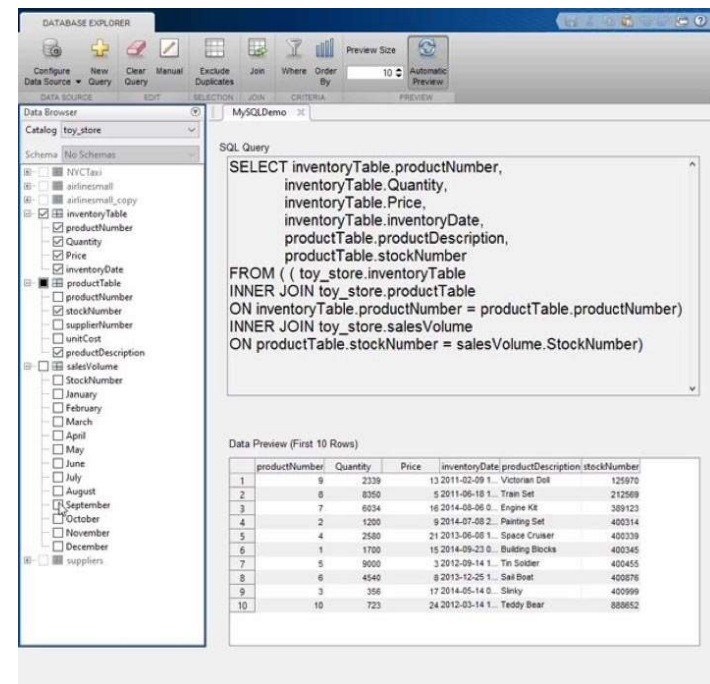
## Internet of Things

Connect embedded devices to the Internet and gain insight from your data

Design, prototype and deploy IoT application  
such as operation optimization

### Support

- REST, MQTT protocols
- Custom IoT analytics
- Physics-based models
- Deploy on asset, edge or cloud



The screenshot shows a database management interface with a 'Data Explorer' on the left, a 'SQL Query' editor in the center, and a 'Data Preview' table at the bottom right.

**SQL Query:**

```
SELECT inventoryTable.productNumber,
inventoryTable.Quantity,
inventoryTable.Price,
inventoryTable.inventoryDate,
productTable.productDescription,
productTable.stockNumber
FROM ( ( toy_store.inventoryTable
INNER JOIN toy_store.productTable
ON inventoryTable.productNumber = productTable.productNumber)
INNER JOIN toy_store.salesVolume
ON productTable.stockNumber = salesVolume.StockNumber)
```

**Data Preview (First 10 Rows):**

	productNumber	Quantity	Price	inventoryDate	productDescription	stockNumber
1	9	2239	13	2011-02-09 1..	Victorian Doll	125970
2	8	8360	5	2011-06-16 1..	Train Set	212568
3	7	6034	16	2014-08-06 0..	Engine Kit	389123
4	2	1200	9	2014-07-08 2..	Painting Set	400314
5	4	2580	21	2013-06-06 1..	Space Cruiser	400339
6	1	1700	15	2014-09-23 0..	Building Blocks	400345
7	5	9000	3	2012-09-14 1..	Tin Soldier	400455
8	6	4540	9	2013-12-25 1..	Sail Boat	400576
9	3	356	17	2014-05-14 0..	Slinky	400599
10	10	723	24	2012-03-14 1..	Teddy Bear	888652

# Solutions



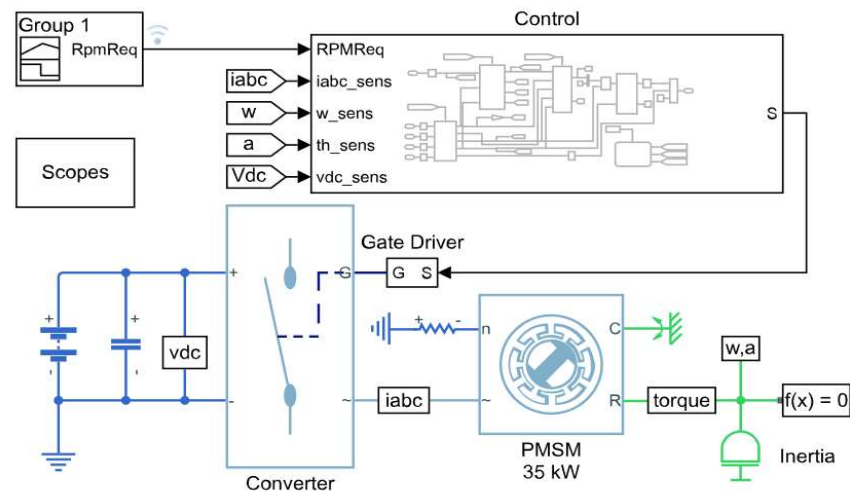
## Power Electronics Control Design

Design and implement digital control for motors, power converters, and battery systems

Developing digital control system on machine or electronic circuit

### Support

- Motor control
- Power converters
- Battery system



# Solutions



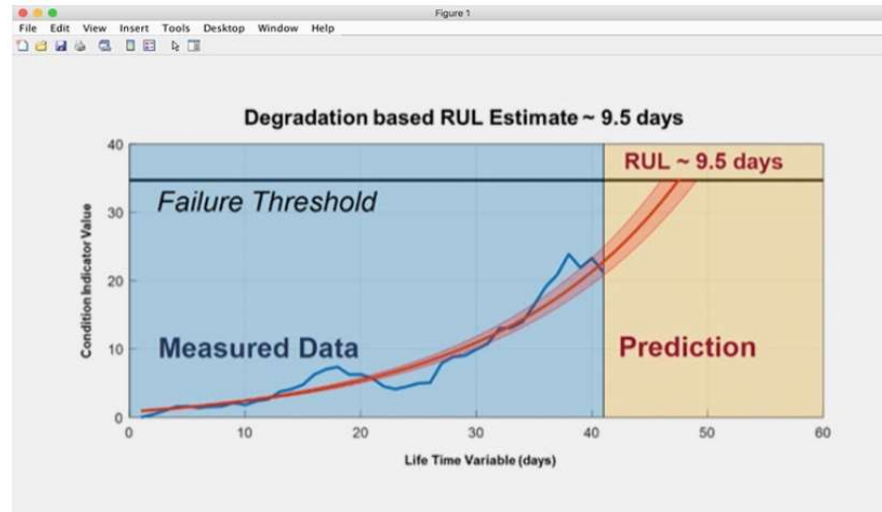
## Predictive Maintenance

Develop and deploy condition monitoring and predictive maintenance software

Developing and deploy condition monitoring and predictive maintenance software to enterprise IT and OT systems

### Support

- Root cause of failures
- Predict time-to-failure
- Remaining useful life



# Solutions



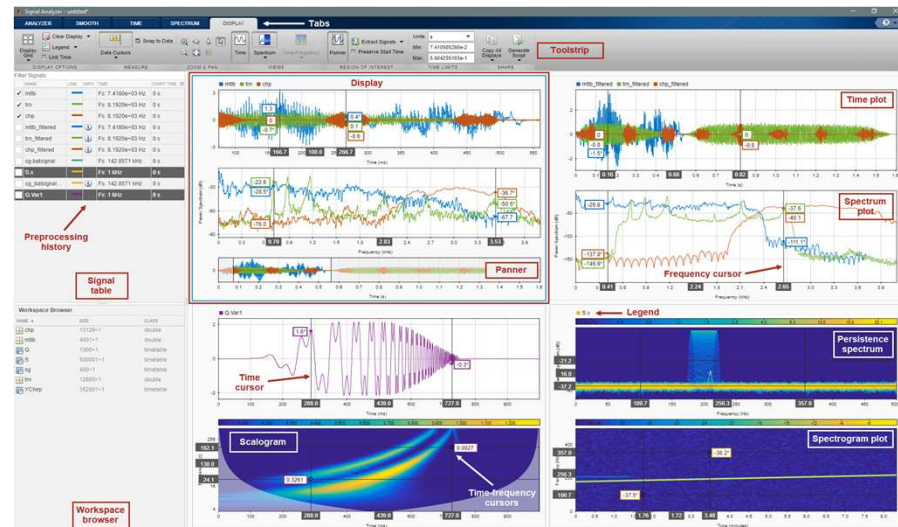
## Signal Processing

Analyze signals and time-series data.  
Model, design, and simulate signal processing systems

Analyzing signals and exploring algorithms to evaluating design implementation tradeoffs for building real-time signal processing systems

### Support

- Time-series data
- Spectral
- Time-frequency analysis
- Signal measurement



# Solutions



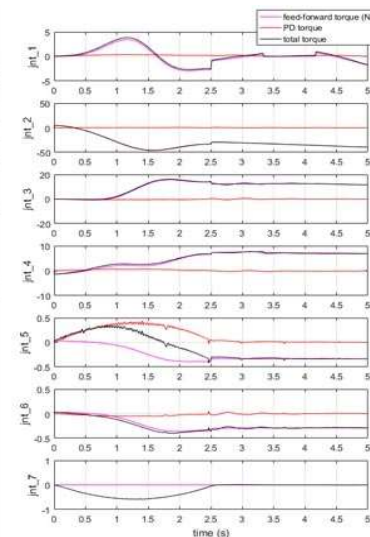
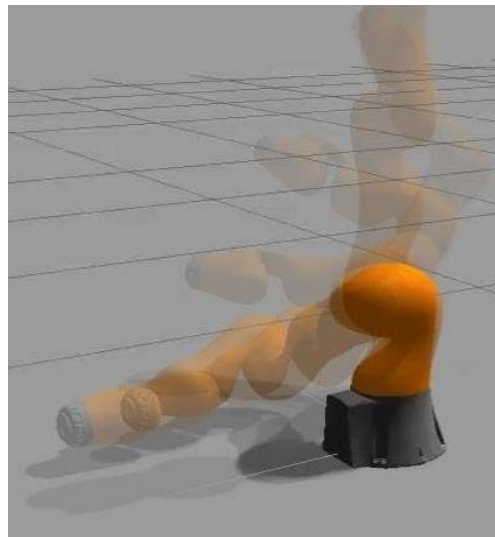
## Robotics

Convert your robotics ideas and concepts into autonomous systems that work seamlessly in real-world environments

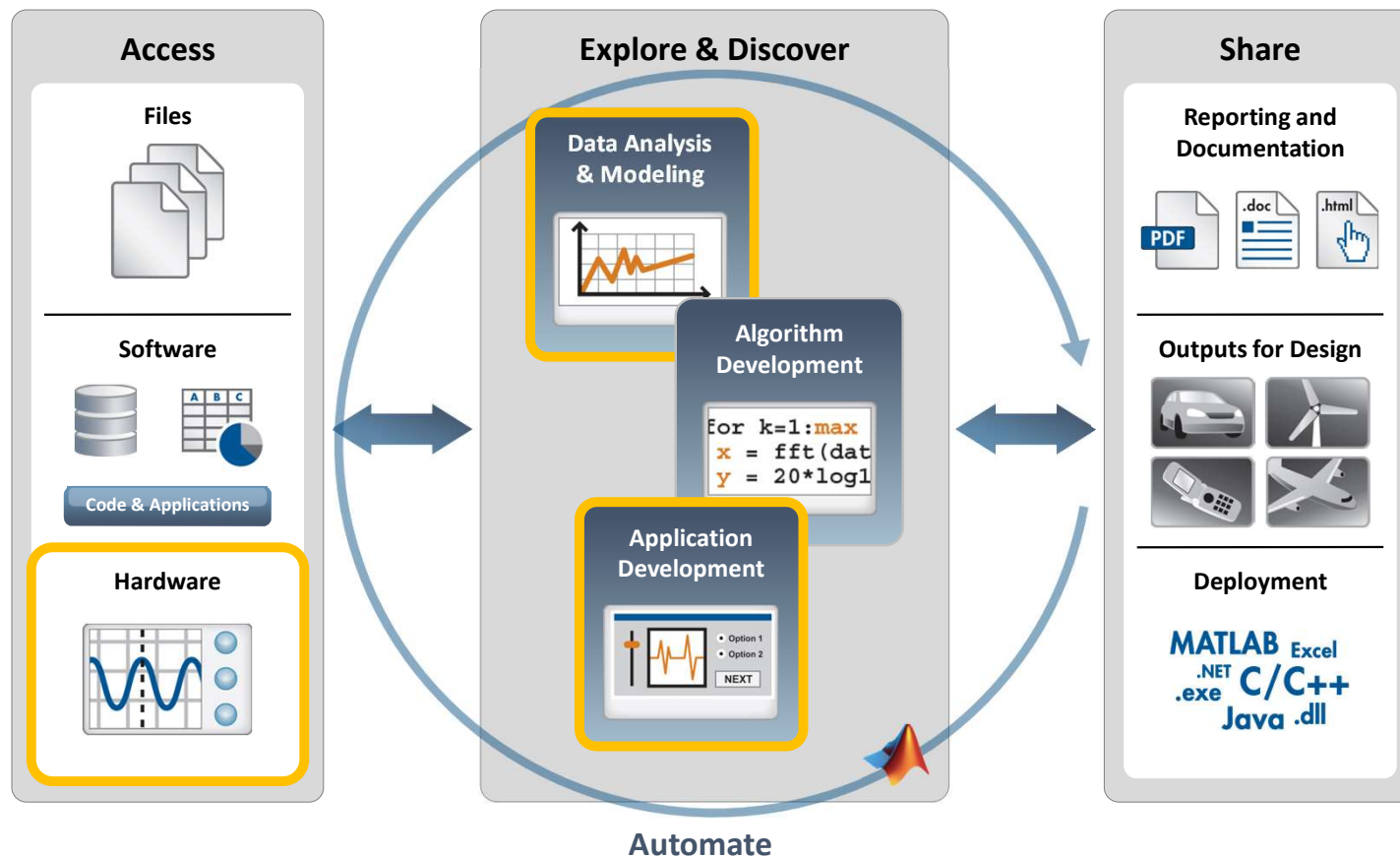
Tuning algorithms for model real-world systems, mechatronic systems and control systems

### Support

- Supervisory logic
- Hardware-in-the-loop testing
- Rapid control prototyping
- Robot operation system



# Technical Computing Workflow



## Data Access: Data Sources and Locations

- Sensors
  - Cameras
  - IMU, Altimeters
  - GPS
  - Microphones
  - Satellites, ...
- Businesses
  - Transactions
  - Customers
- Web
  - Social Media
  - Web Forms

### File I/O

- Text
- Spreadsheet
- XML
- HDF5, netCDF, FITS
- Image
- Audio
- Video
- Geospatial
- Web content
- MDF



### Database Access

- Financial Data
- ODBC
- JDBC
- HDFS (Hadoop)



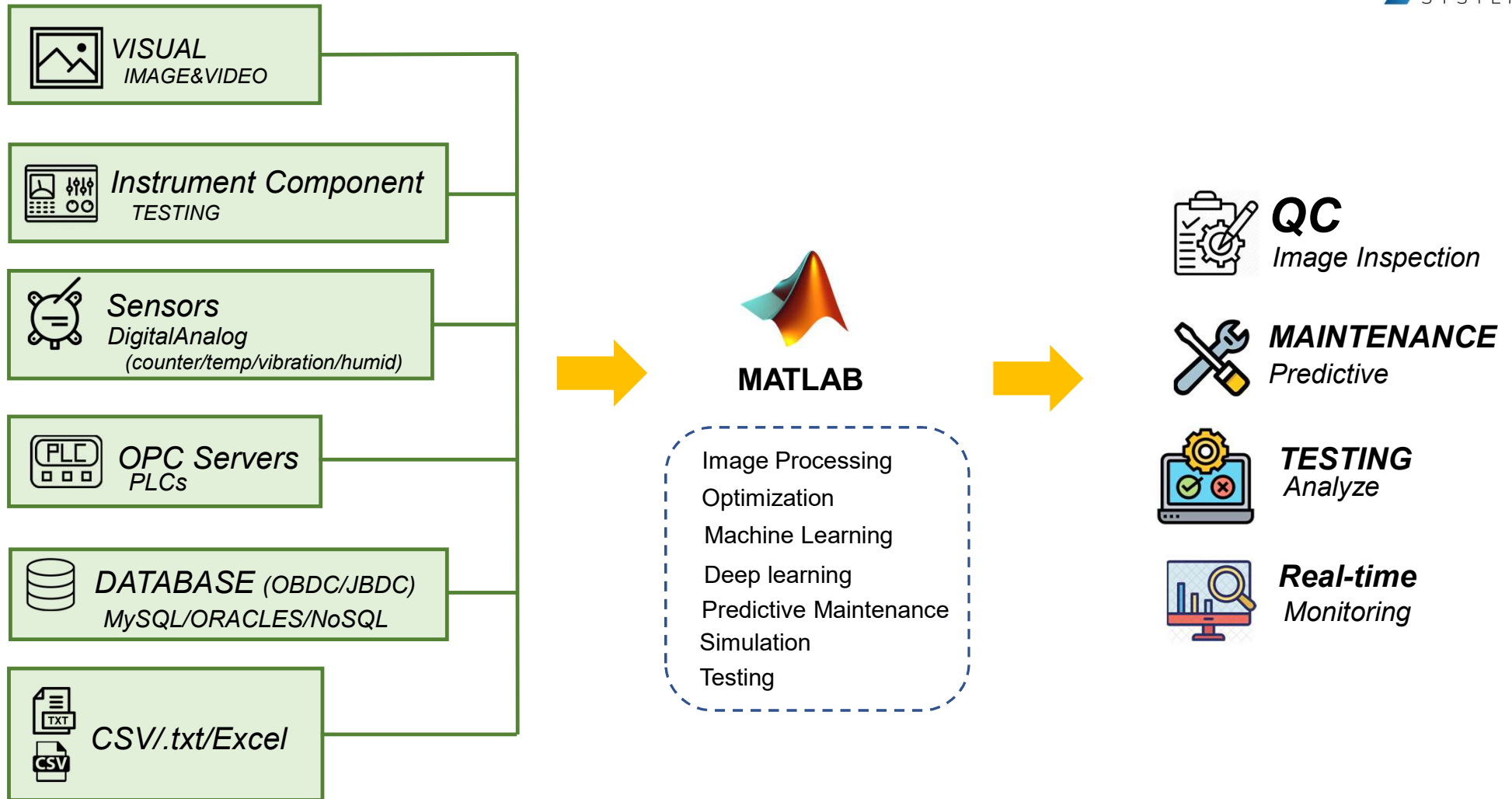
### Hardware Access

- Data acquisition
- Image capture
- GPU
- Lab instruments

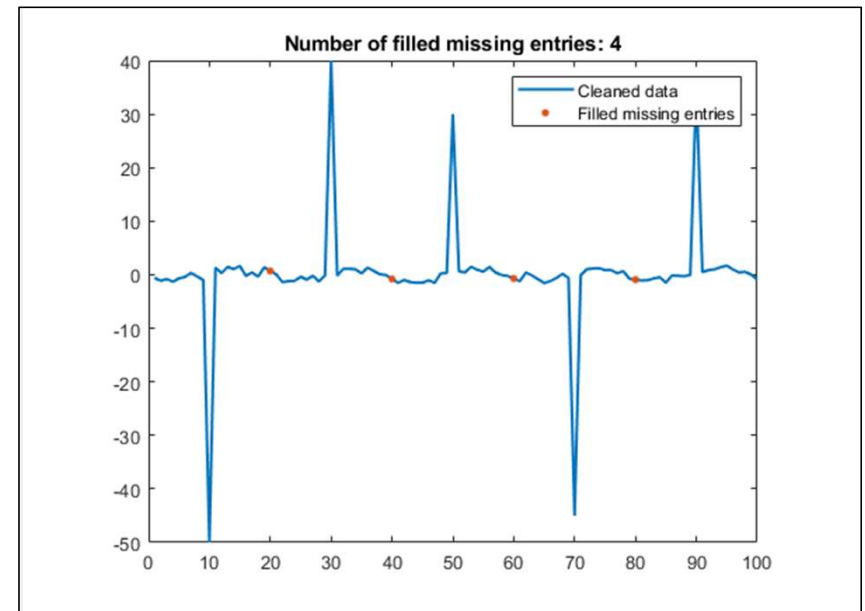
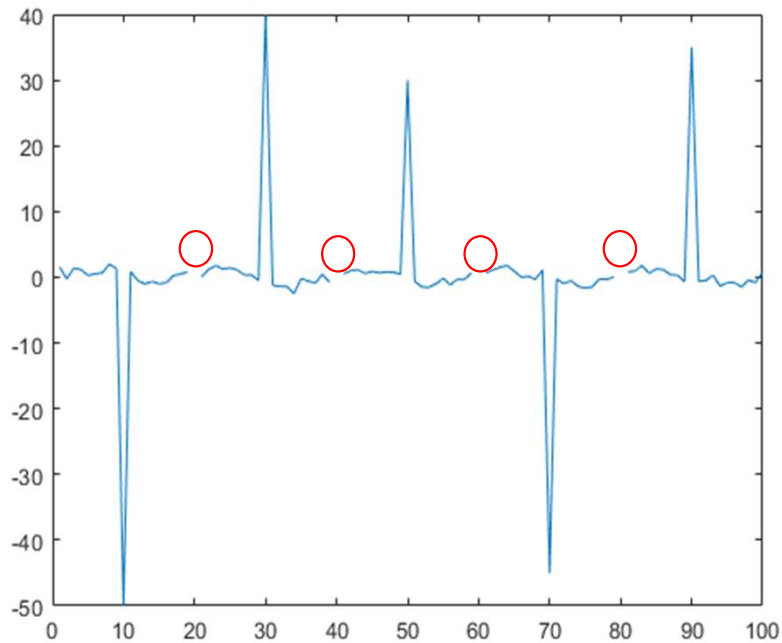


### Communication Protocols

- **CAN** (Controller Area Network)
- **DDS** (Data Distribution Service)
- **OPC** (OLE for Process Control)
- **XCP** (eXplicit Control Protocol)

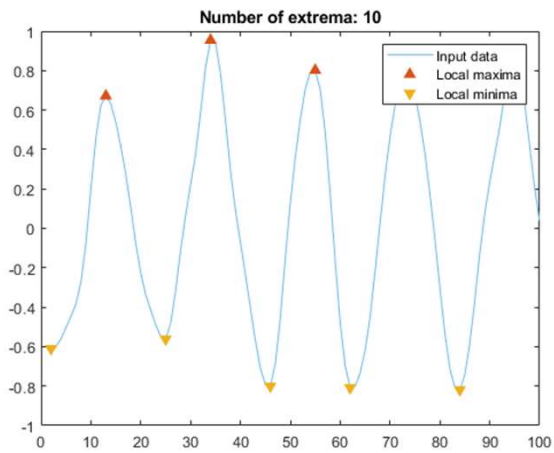


# Pre-processing Data

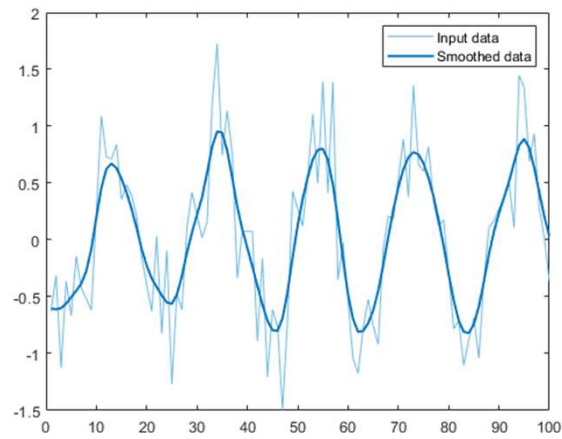


## Fill Missing

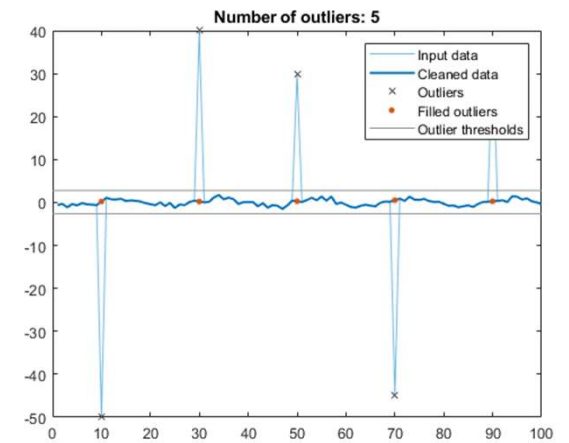
# Pre-processing Data



**LOCATE EXTREMA**



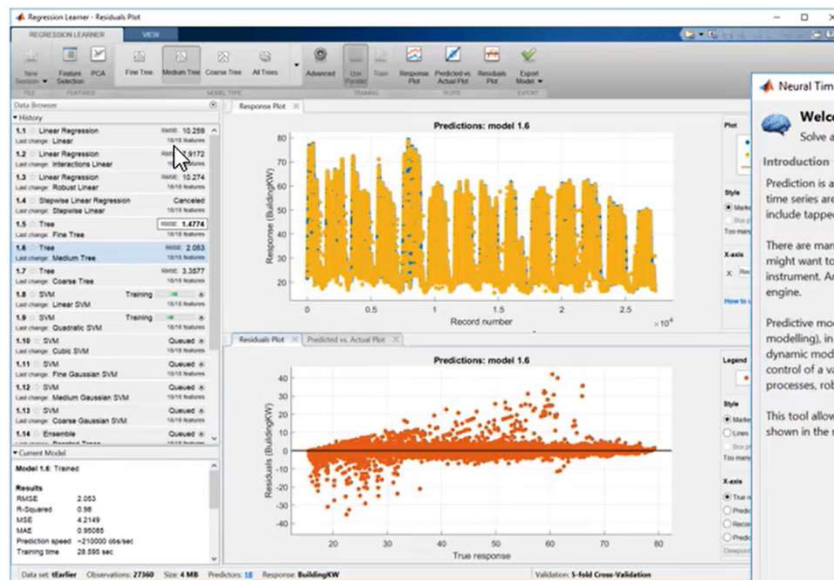
**SMOOTH DATA**



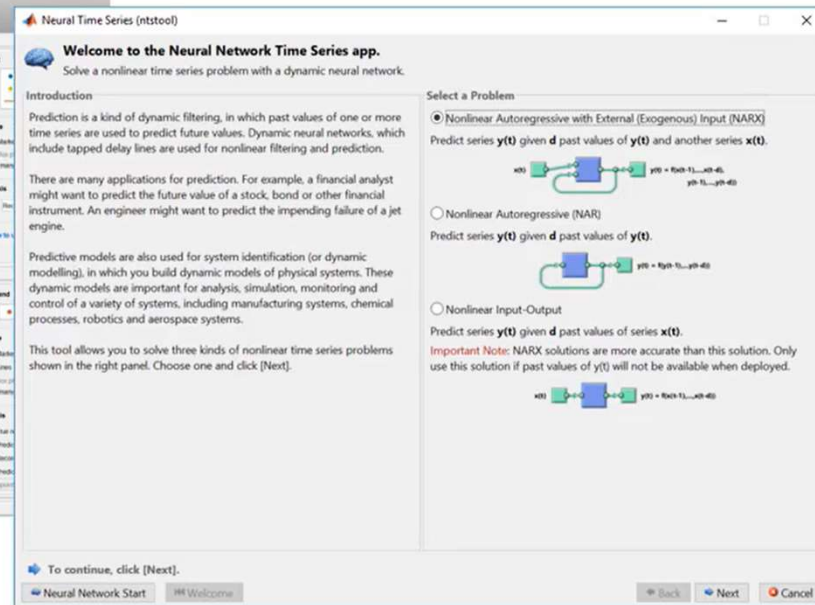
**FILL OUTLINE**

# Algorithm development

## Machine Learning



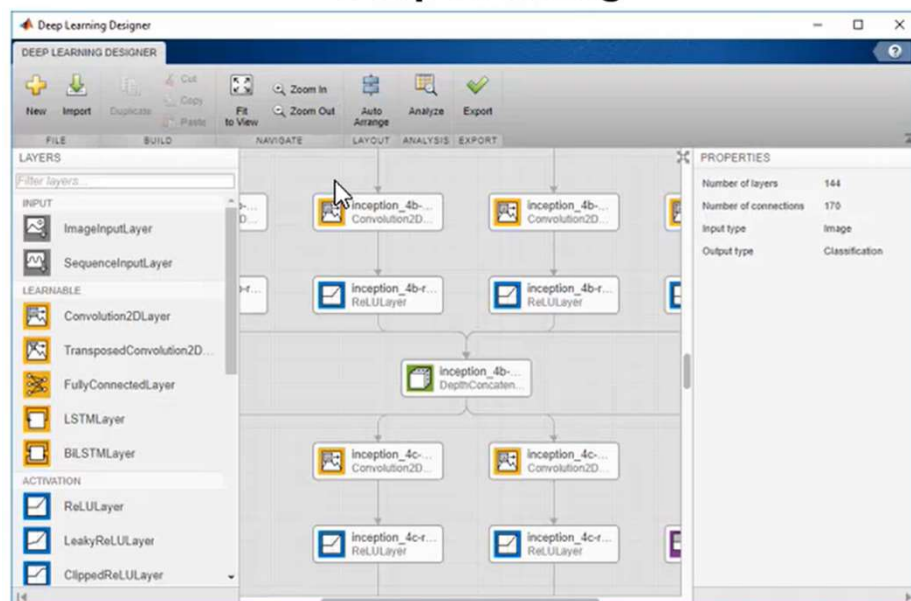
## Neural Networks



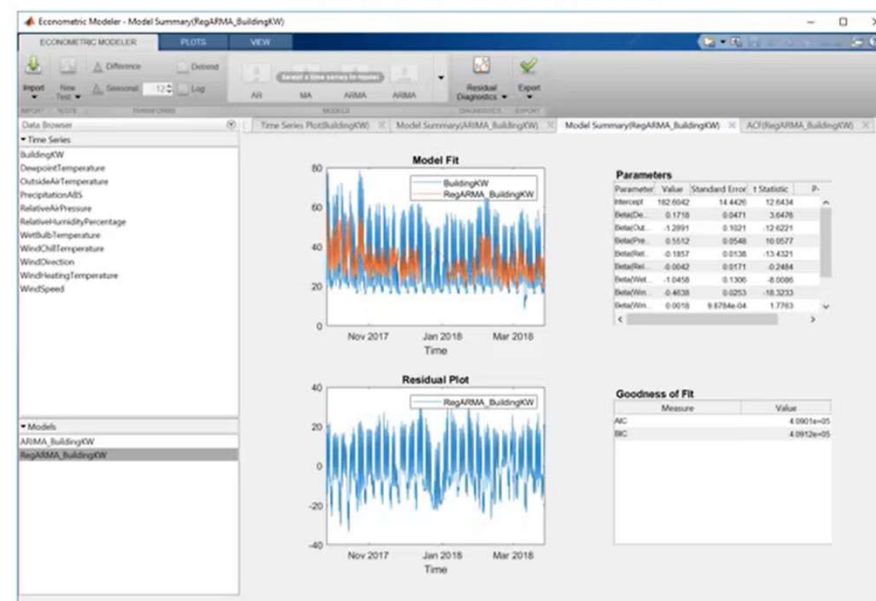
The screenshot shows the 'Neural Time Series (ntstool)' application. The window title is 'Neural Time Series (ntstool)'. The main content area is titled 'Welcome to the Neural Network Time Series app.' and 'Solve a nonlinear time series problem with a dynamic neural network.' It includes an 'Introduction' section explaining prediction and system identification. On the right, there is a 'Select a Problem' section with three options: 'Nonlinear Autoregressive with External (Exogenous) Input (NARX)', 'Nonlinear Autoregressive (NAR)', and 'Nonlinear Input-Output'. Each option has a corresponding block diagram and a brief description. The 'NARX' option is selected. At the bottom, there are navigation buttons: 'Neural Network Start', 'Welcome', 'Back', 'Next', and 'Cancel'.

# Algorithm development

## Deep Learning

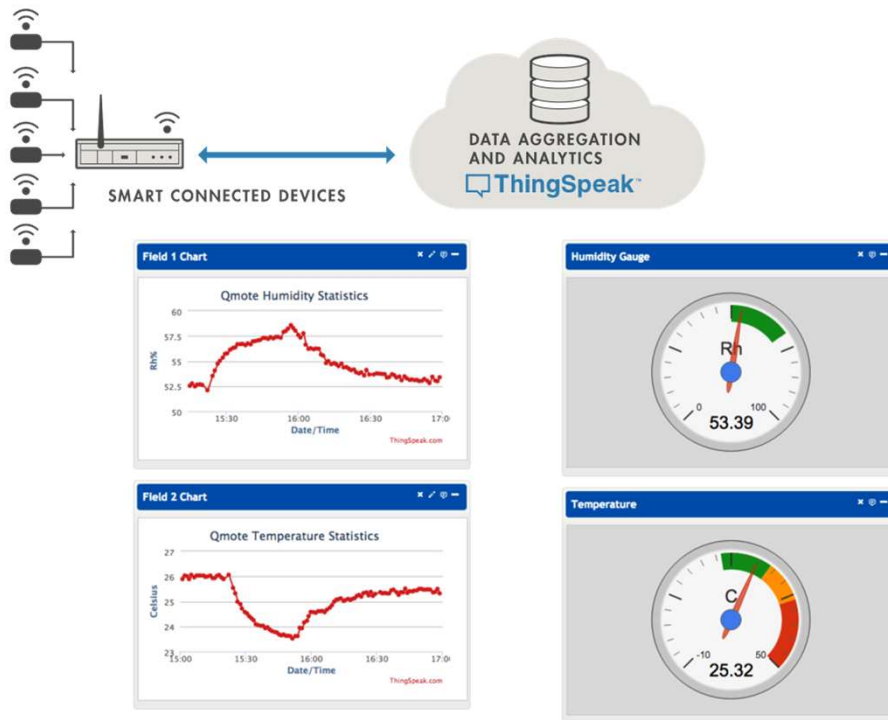


## Time Series Models

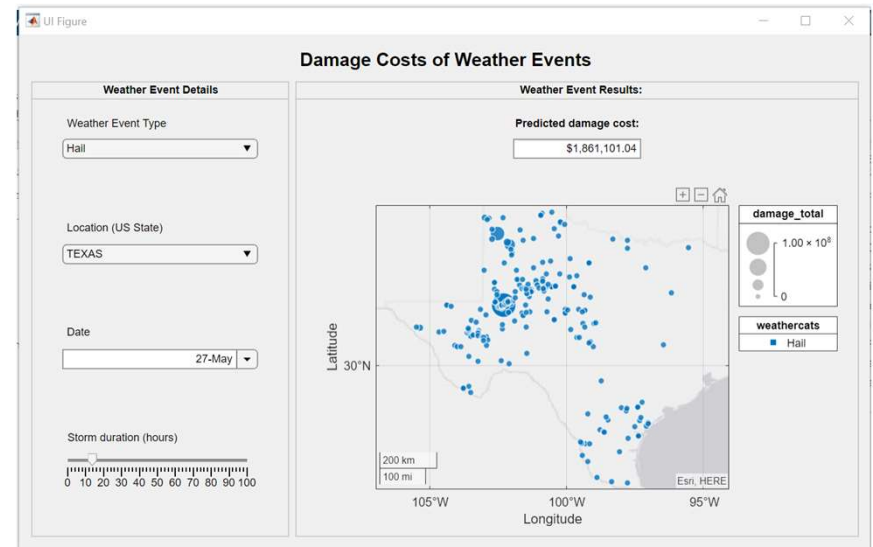


# Share

## Thingspeak IoT dashboard

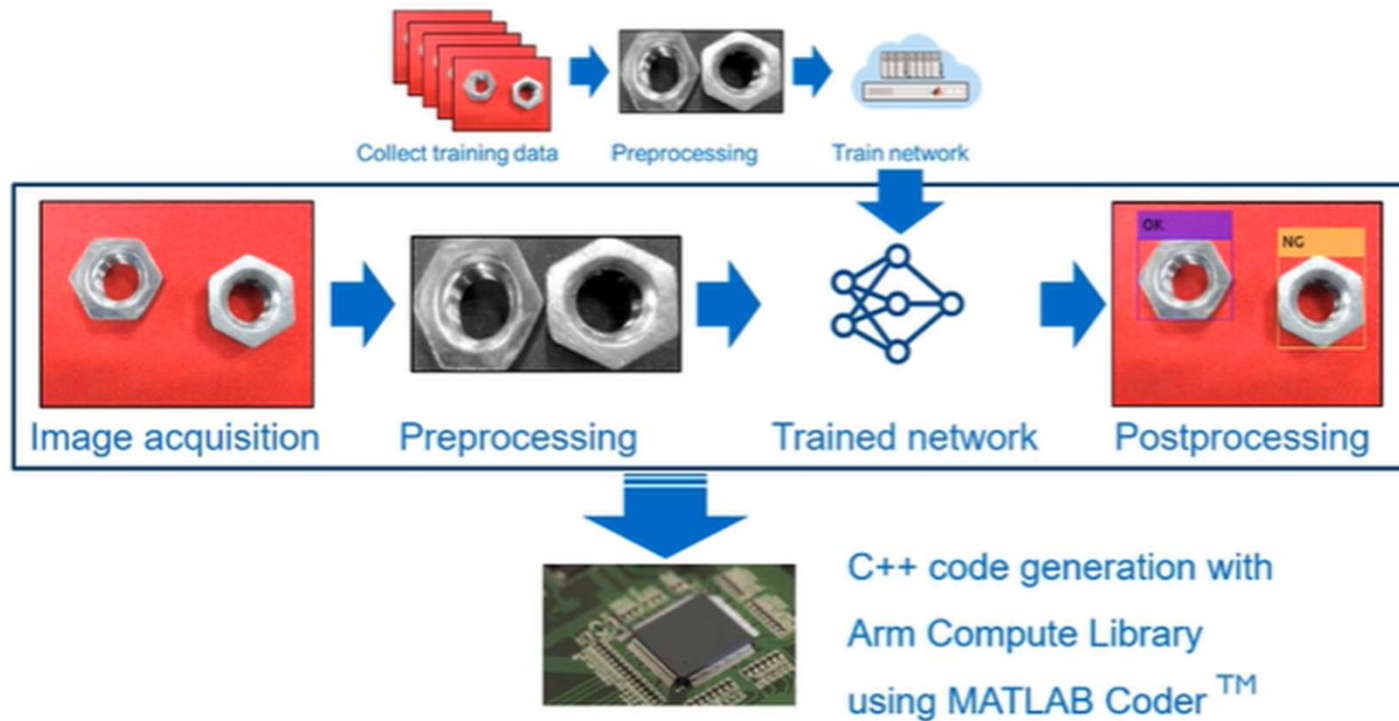


## Web application

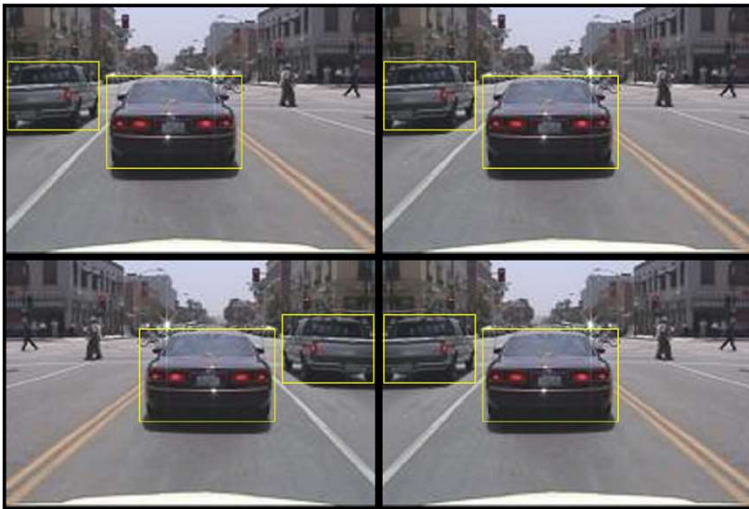


# AI Application example

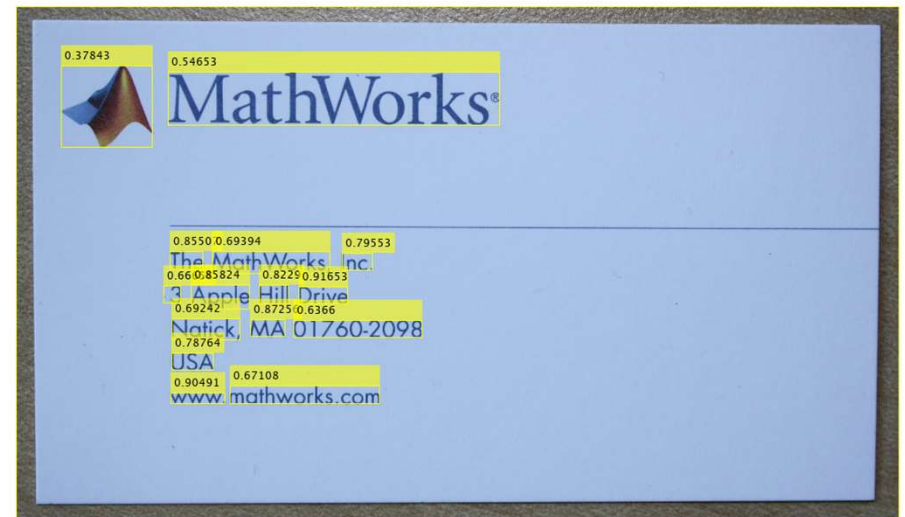
## Deep Learning Inference pipeline



# AI Application example



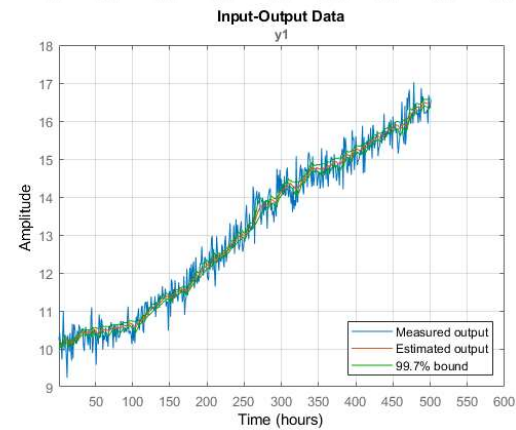
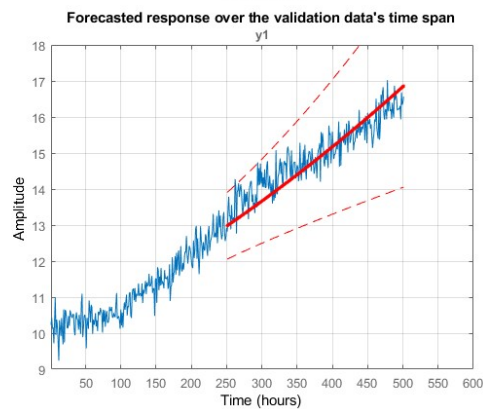
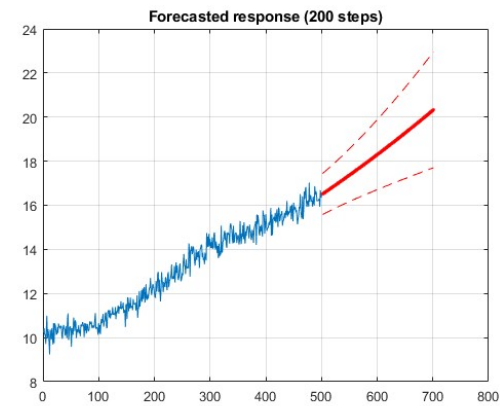
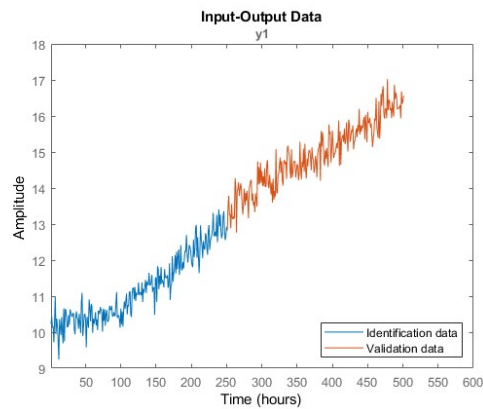
Object detection



Text / OCR

# AI Application example

## Predictive Maintenance : Forecasting



# Millions of Engineers and Scientists Trust MATLAB

**MATLAB®** combines a desktop environment tuned for **iterative analysis** and **design processes** with a programming language that expresses matrix and array mathematics directly

## 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](#).

```
1 exoplanets = readtable('exoplanets.xlsx', 'TextType', 'string');
2 head(exoplanets)
```

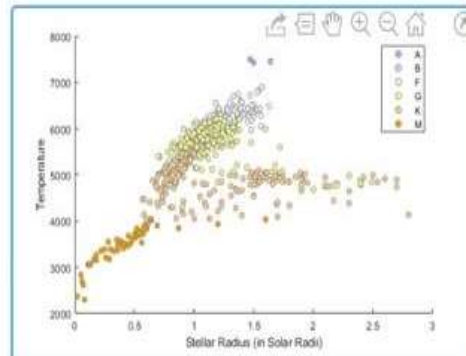
## What Types of Stars have Planets?

We can look at the exoplanet archive to see what types of stars have been found to have at least one exoplanet. We can get a sense of the distribution of star types from a scatter plot.

```
3 star_types = {'A' 'B' 'F' 'G' 'K' 'M'};
4
5 T = exoplanets(~cellfun(@isempty, exoplanets.st_spectral_type), :);
6 data = {};
7 for i = 1:numel(star_types)
8     data{i} = T(startsWith(T.st_spectral_type, star_types{i}), :);
9 end
10 plot_star_types(data, star_types)
```

ans = 8x16 table

	st_name	st_distance	st_right_ascension
1	"11 Com"	110.6200	185.1790
2	"11 UMi"	119.4700	229.2740
3	"14 And"	76.3900	352.8220
4	"14 Her"	18.1500	242.6010
5	"16 Cyg B"	21.4100	295.4660
6	"18 Del"	73.1000	314.6080
7	"1RXS J16...	145.0000	242.3760
8	"24 Sex"	74.7900	155.8680



## Professionally Built

**MATLAB toolboxes** are professionally developed, rigorously tested, and fully documented.

## With Interactive Apps

**MATLAB apps** let you see how different algorithms work with your data. Iterate until you've got the results you want, then automatically generate a MATLAB program to reproduce or automate your work.

## And the Ability to Scale

Scale your analyses to **run on clusters, GPUs, and clouds** with only minor code changes. There's no need to rewrite your code or learn big data programming and out-of-memory techniques.