# Introduction to MATLAB: Low Code Data Analysis

Armando Garcia

*Academic Success Engineer*

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- What is MATLAB
- Learning Resources
- Classify EMG Signals Demo

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MathWorks®

**5 million+ users**

in more than 180 countries

**6500+**

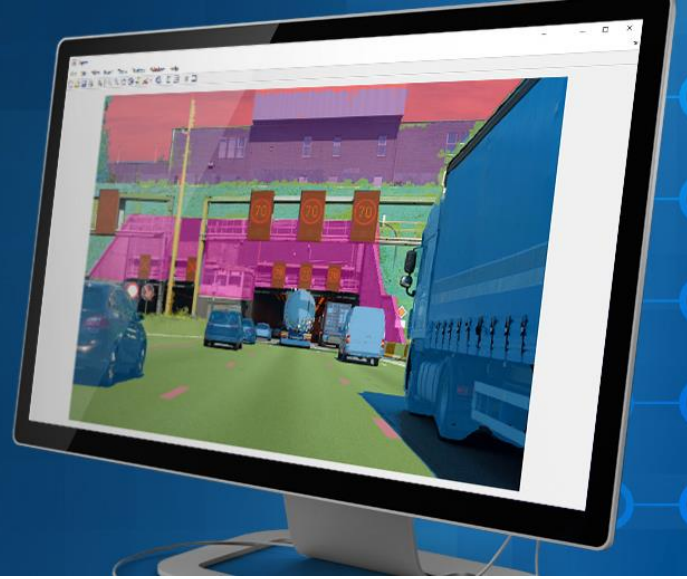
academic institutions

**100,000+**

businesses, governments, and universities

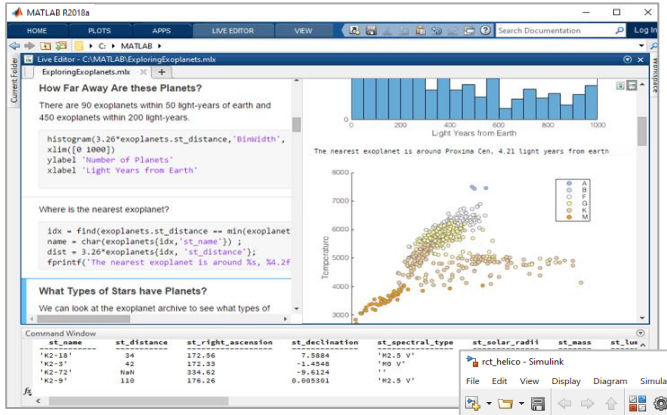
all the top 10 pharma and medical device companies

# MATLAB® & SIMULINK®

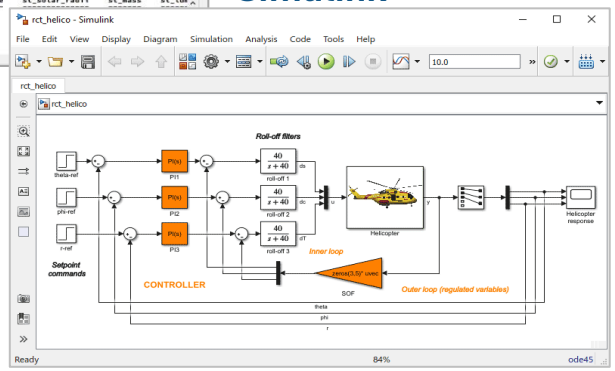


- **MATLAB** – Create algorithms and AI models for data analysis
- **Simulink** – Model and simulate complex medical devices with sensors and software
- **120+ products** for specialized R&D tasks

**MATLAB**




**Simulink**



# MATLAB

- Analyze data, develop algorithms, and create models
- Community-developed tools
- Leverage interoperability

Data Analysis

Graphics

Programming

App Building

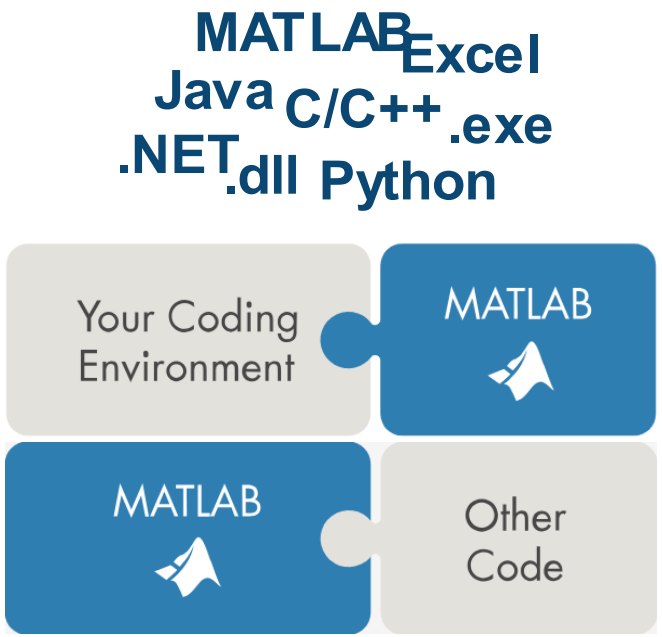
External Language Interfaces

Hardware

Parallel Computing

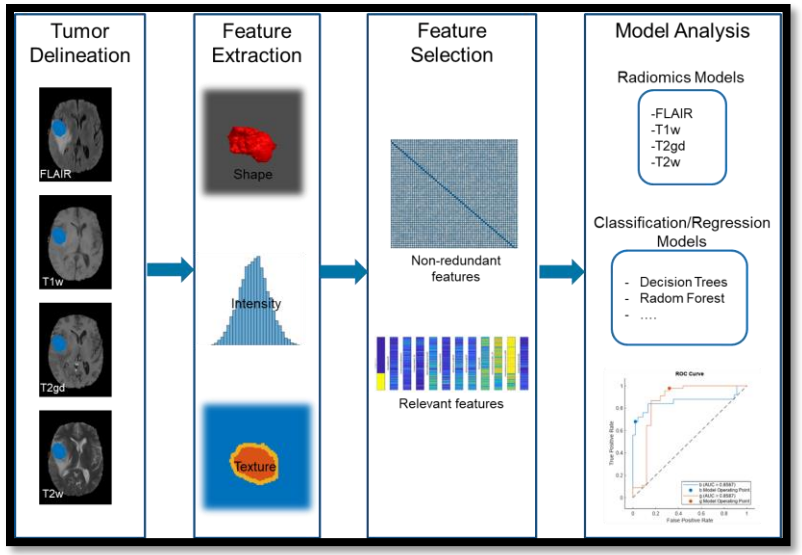
Web and Desktop Deployment

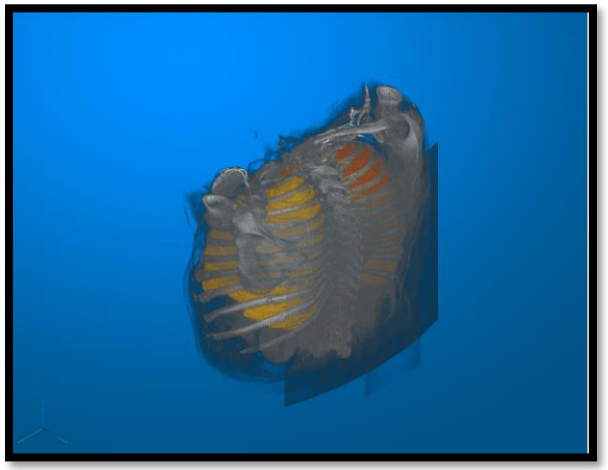
MATLAB in the Cloud

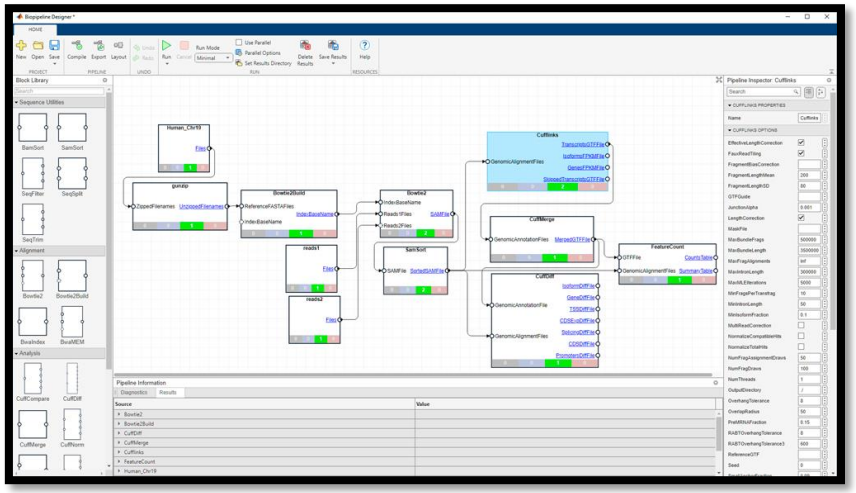


# MATLAB for biomed

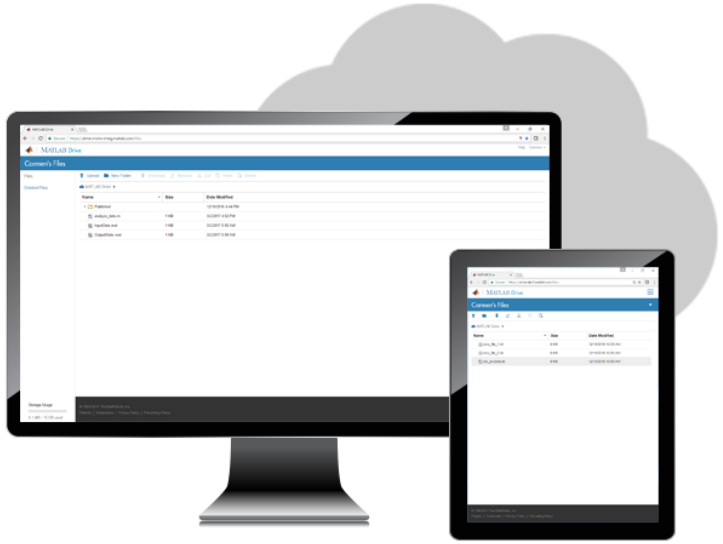
- Create **classification and predictive** models
- Automate **image and signal analysis**
- Develop **bioinformatics analysis** workflows
- **Access data** where it lives, including live data from instruments, cards, sensors, or IoT





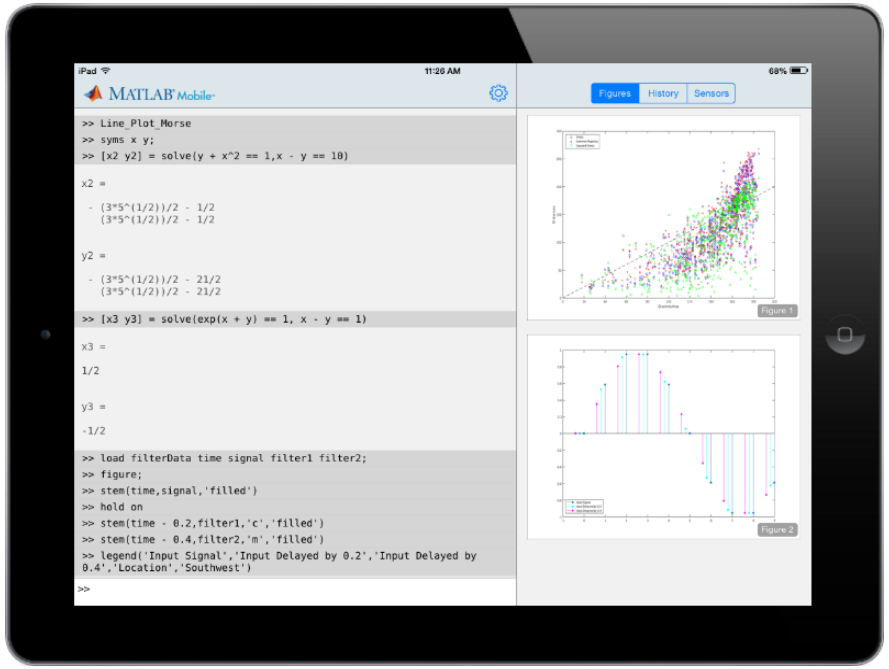
# MATLAB Online



# MATLAB Drive

- No installation required
- Most recent version of MATLAB always
- No minimum device specs required – only an internet browser

# MATLAB Mobile



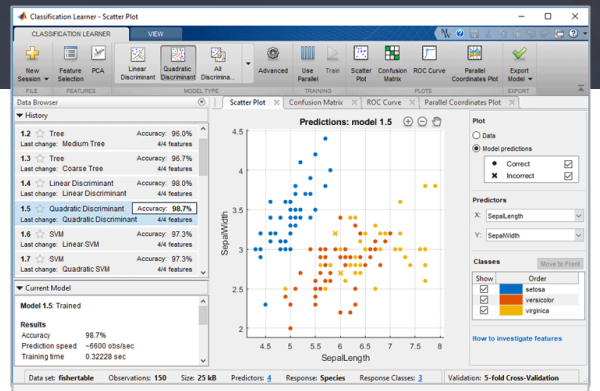

Connect to MATLAB Mobile

Acquire Sensor Data

Capture Images, Video, and Audio

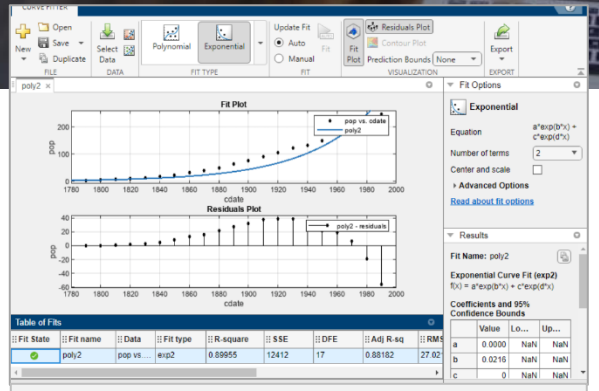
Learn and Teach

# Built-in apps to tackle complex workflows



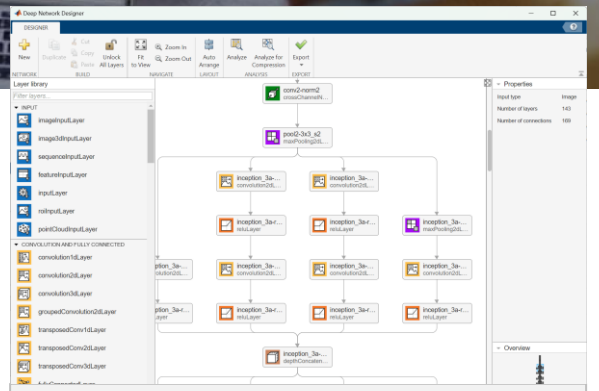

## Classification Learner

Train common classification models interactively and choose the best one for your application




## Curve Fitter App

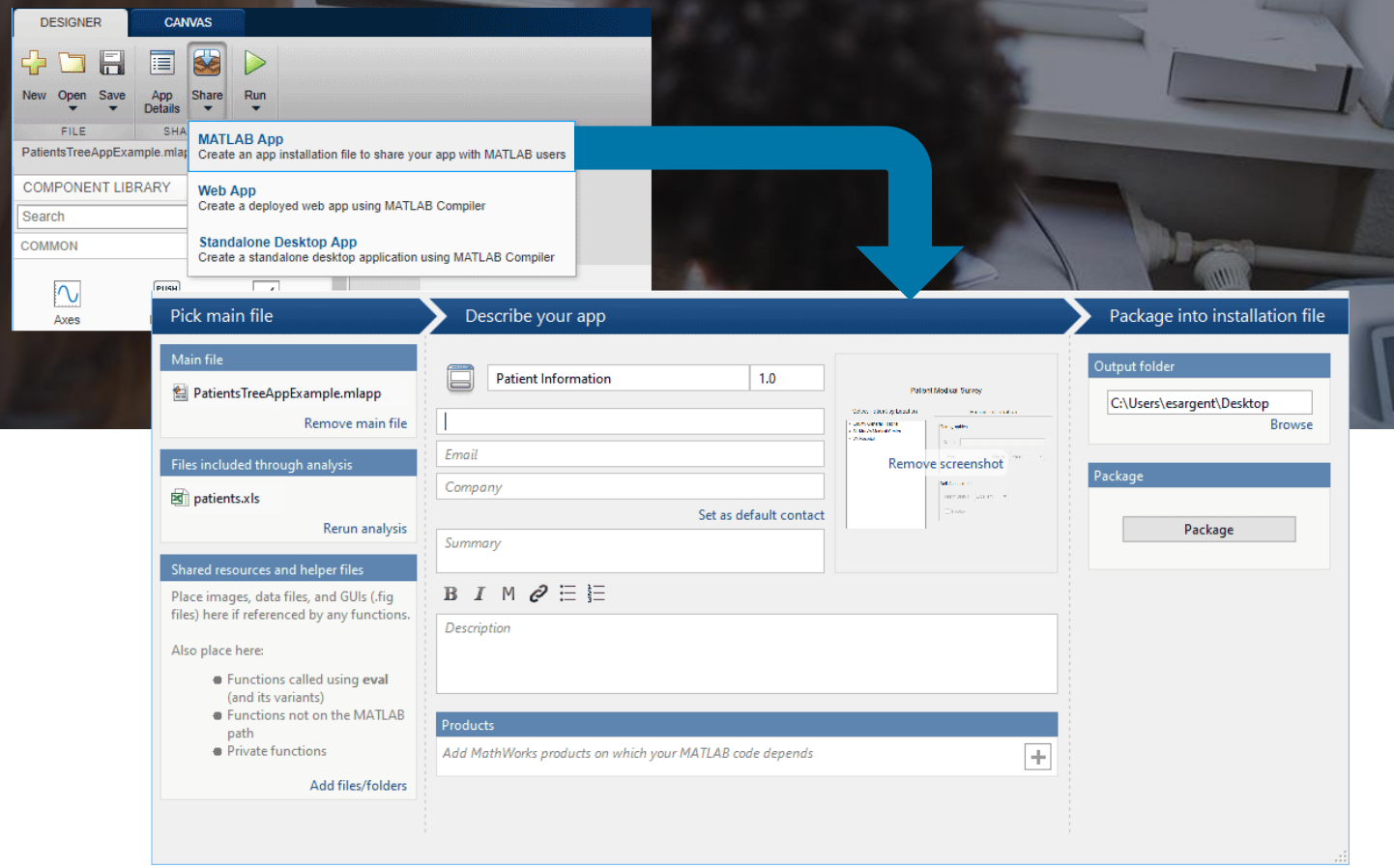
Fit models to your data, including custom equations and obtain good of fit metrics

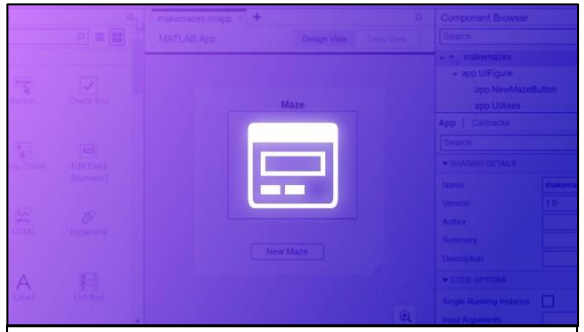



## Deep Network Designer

Import, build, visualize, and edit deep learning networks.

# Or build you own and share them

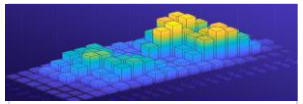


App Building Onramp

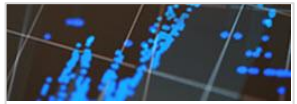
mathworks.com/discovery/matlab-apps.html

# 100+ hours of Online Training

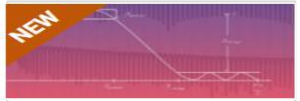


MATLAB Fundamentals

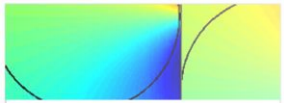
Simulink Fundamentals



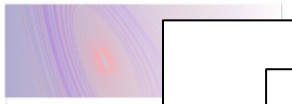
MATLAB for Data Processing and Visualization




Signal Processing with MATLAB



Solving Nonlinear Equations with MATLAB



Solving Or Differen Equations MATL

Deep Learning with MATLAB

Machine Learning with MATLAB

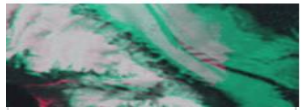
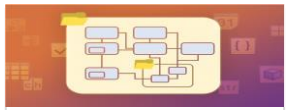


Image Processing with MATLAB



MATLAB Programming Techniques

Introduction to Statistical Methods with MATLAB

Introduct Symbolic with MA

MathWorks | Training Services

Course Completion Certificate

John Smith

has successfully completed 100% of the self-paced training course

Deep Learning with MATLAB

DIRECTOR, TRAINING SERVICES

02 March 2021

# MATLAB

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mathworks.com and 5 more links

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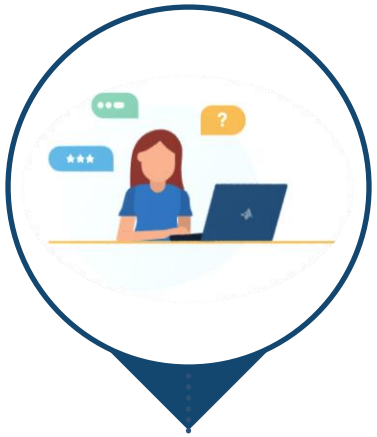
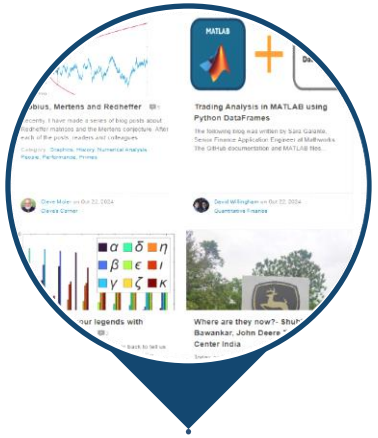
## Find Answers, Learn and Share your Knowledge

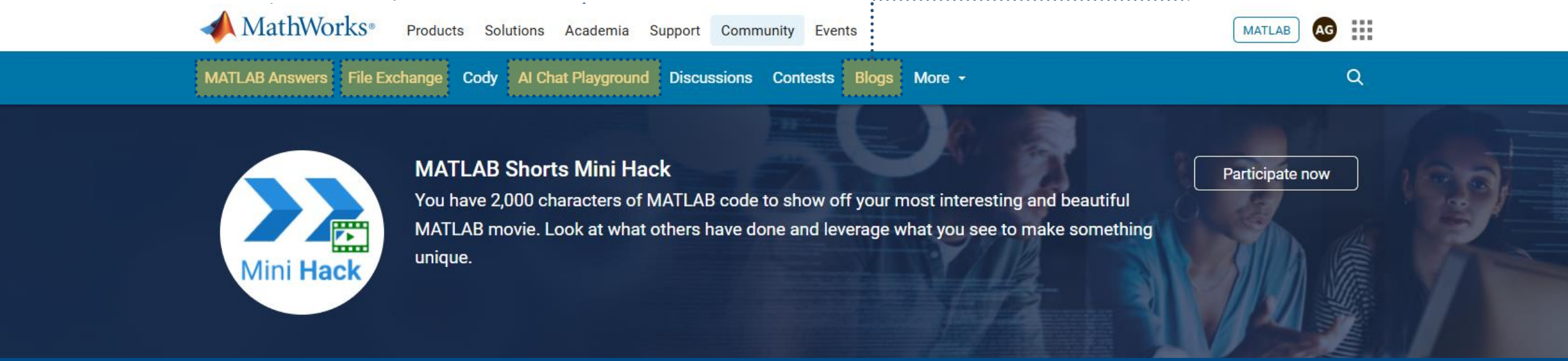


## Open-source MATLAB code Publish yours to help others

## Experiment, generate draft code, answer questions

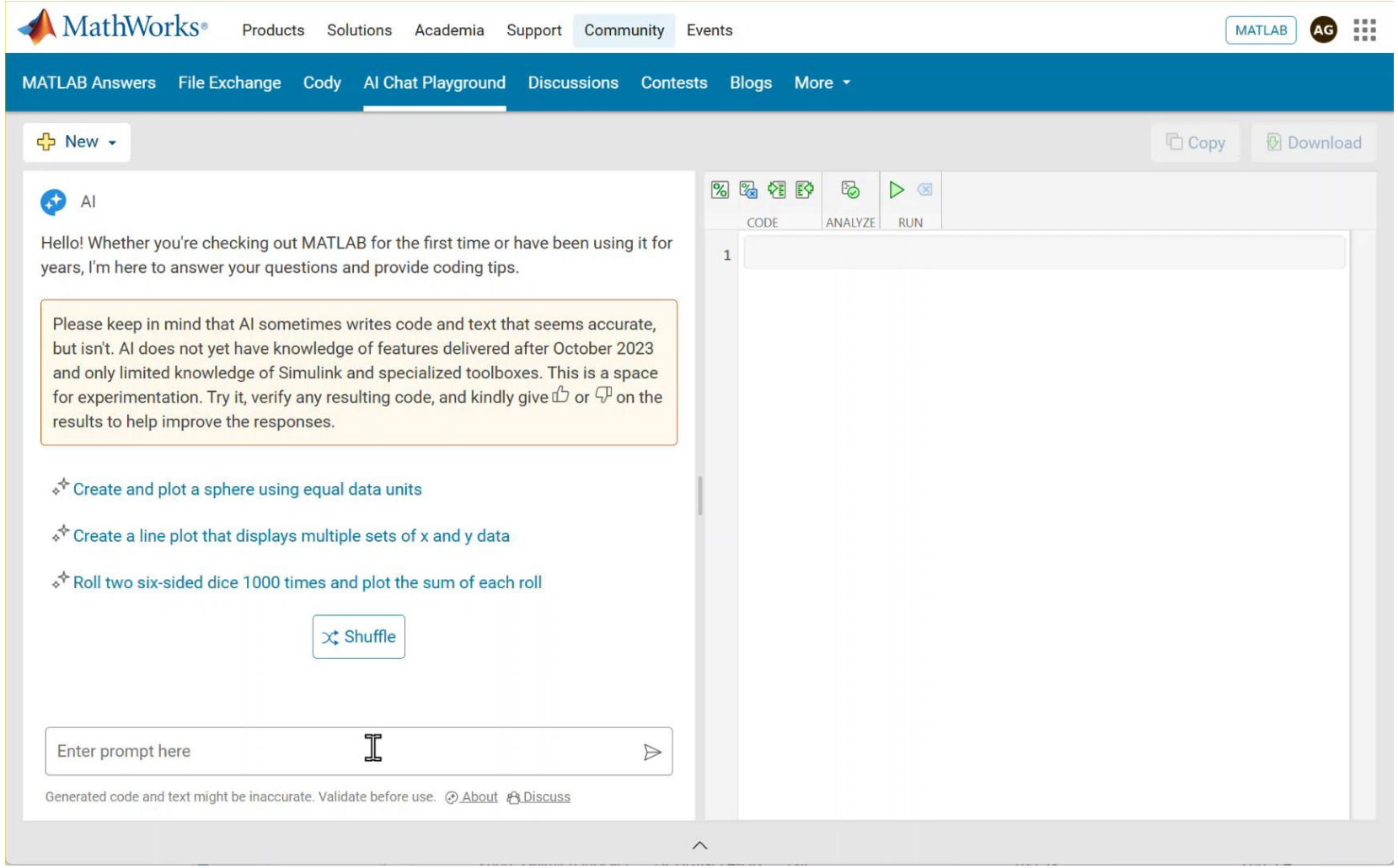
## Get the inside view on MATLAB and Simulink






mathworks.com/matlabcentral

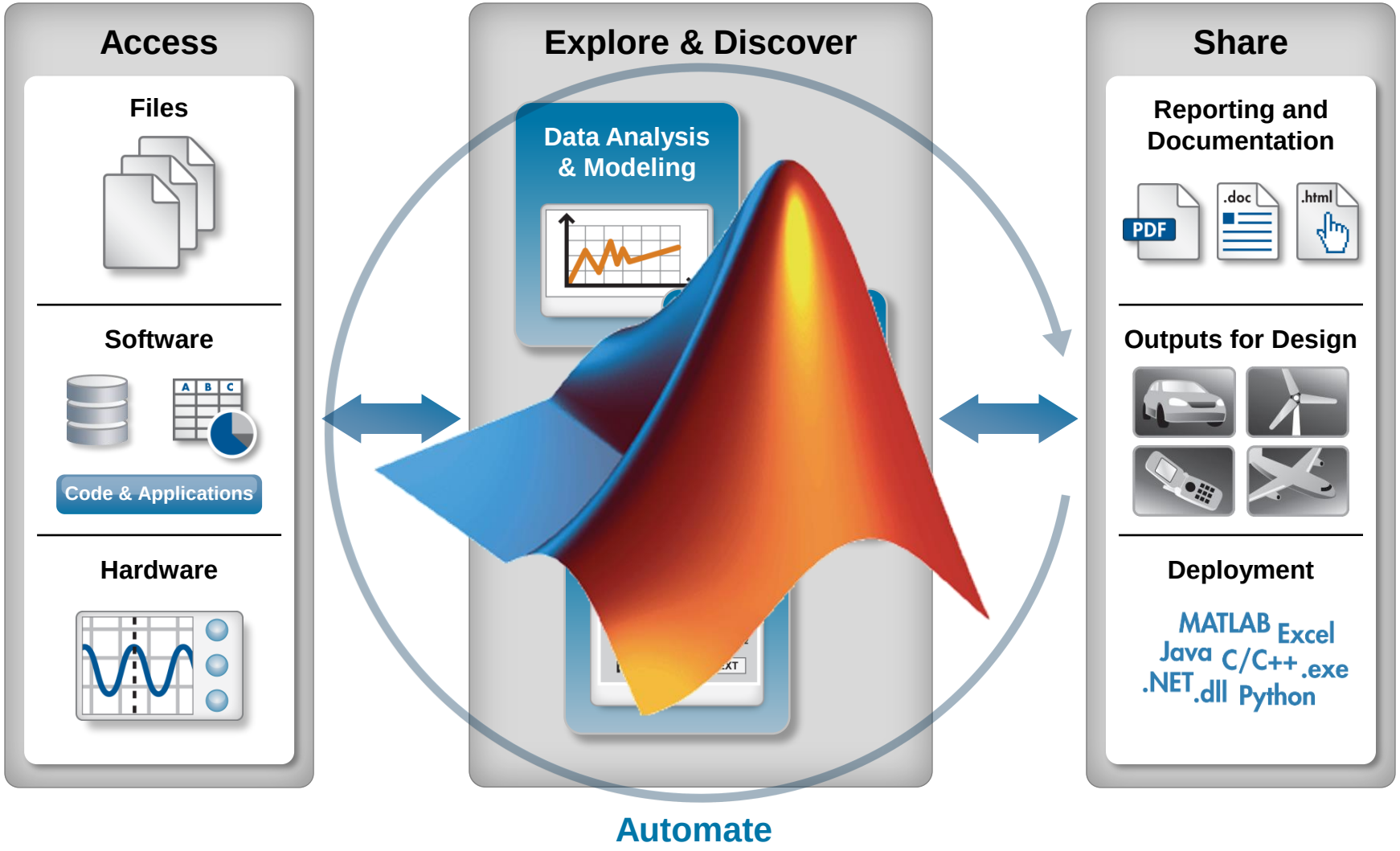
# Leverage Gen AI



**The MATLAB Blog**
Practical Advice for People on the Leading Edge

4 ways of using MATLAB with LLMs
tinyurl.com/4z6k2p86

# MATLAB simplifies the data analysis workflow with low-code tools



# What are “low-code” tools?

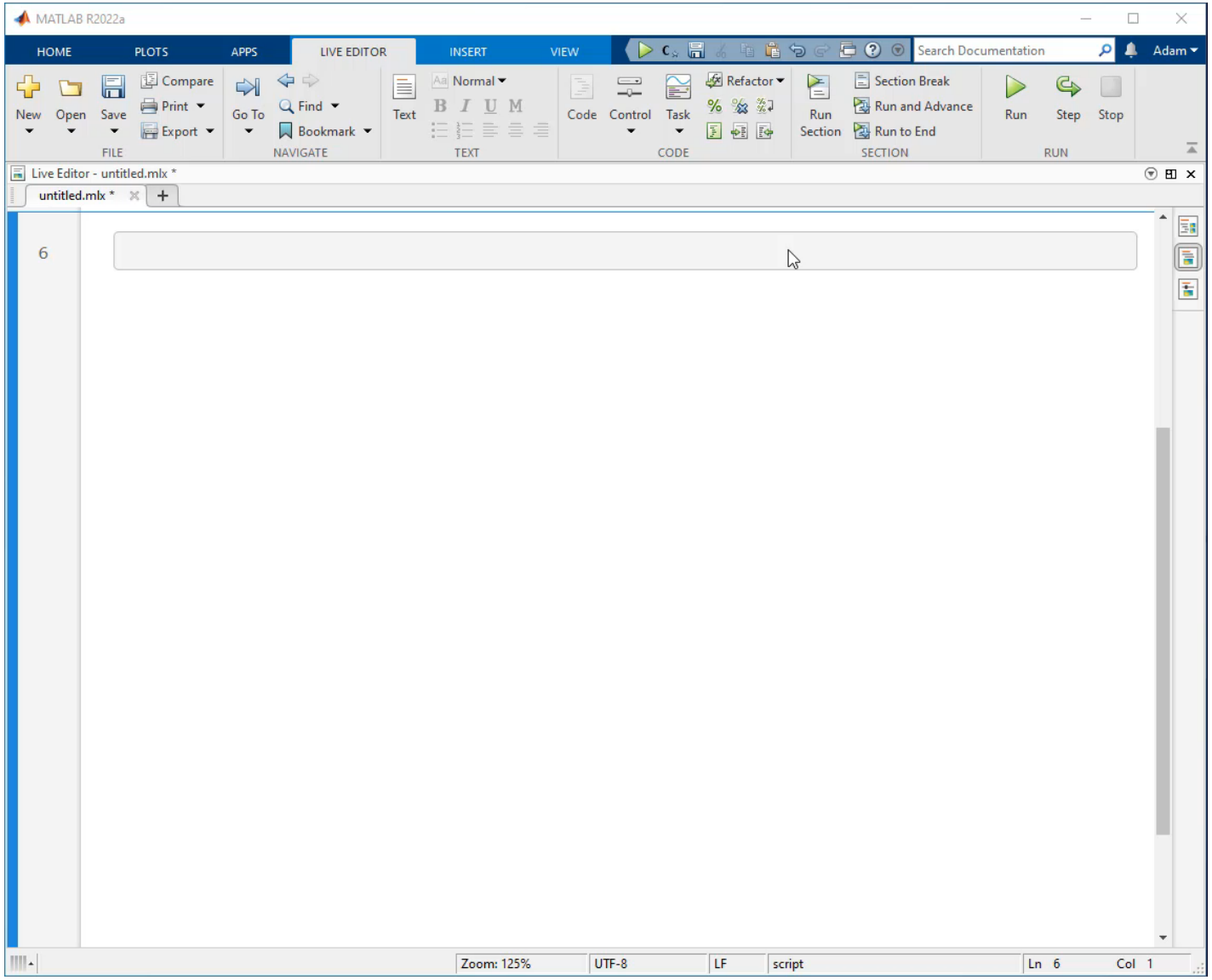
**Low-code** tools enable:

- rapid software development
- minimal manual coding

**Benefits of low code tools:**

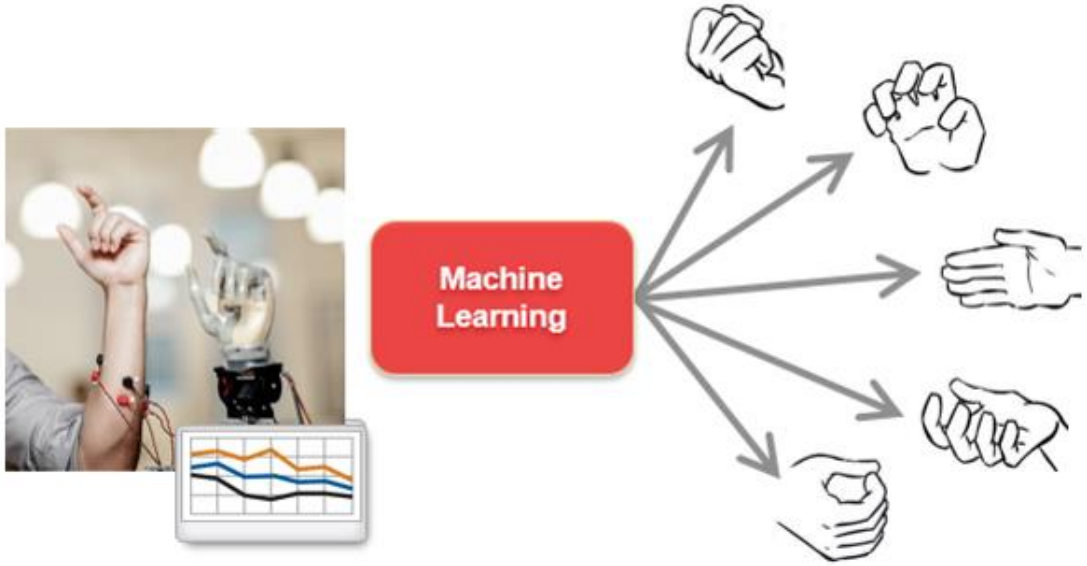
- Easier
- Teaches you *how* to code
- Solve task first, code later

***Not just for beginners***



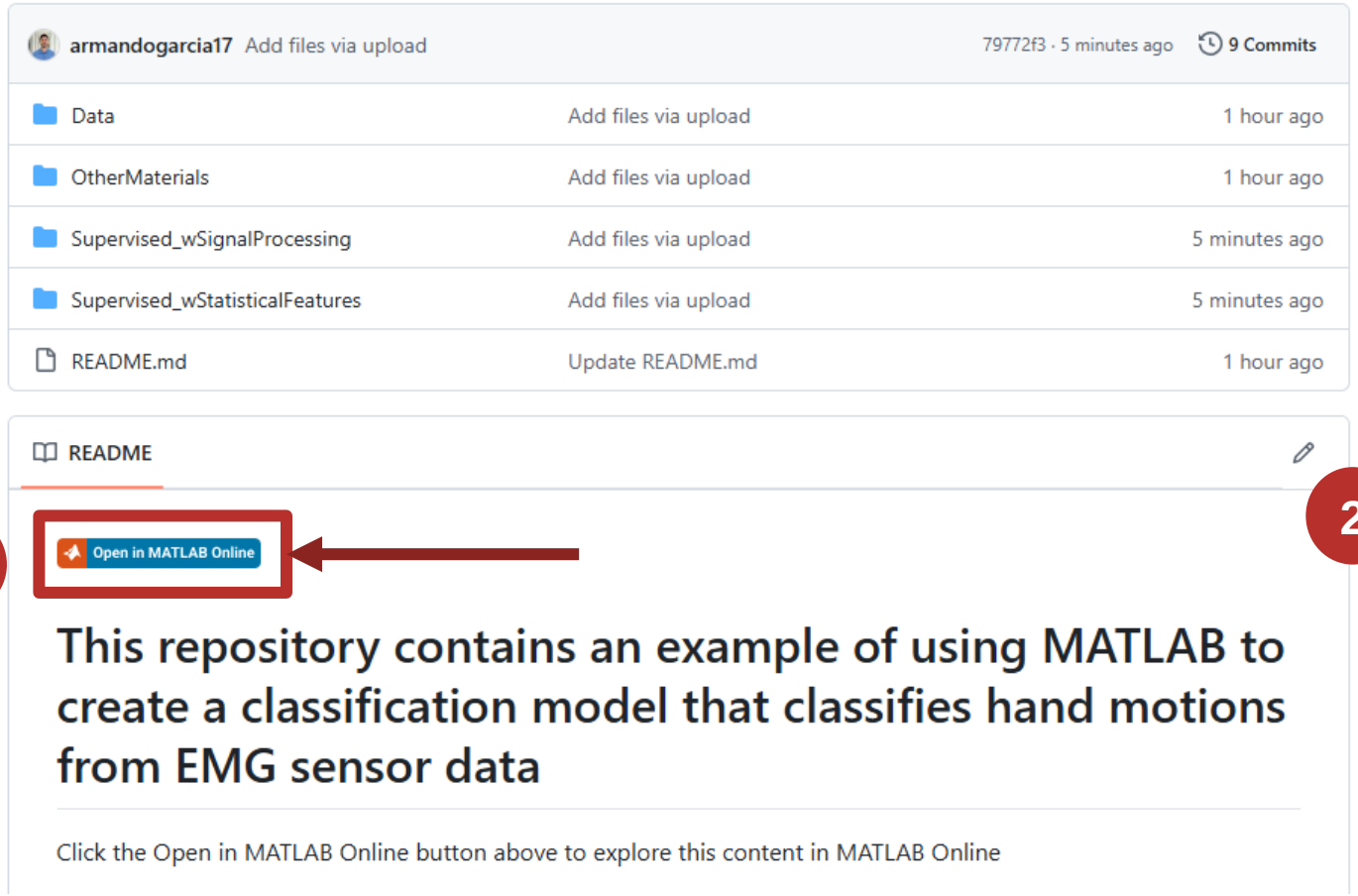
# Demo: Signal processing for electrophysiology data

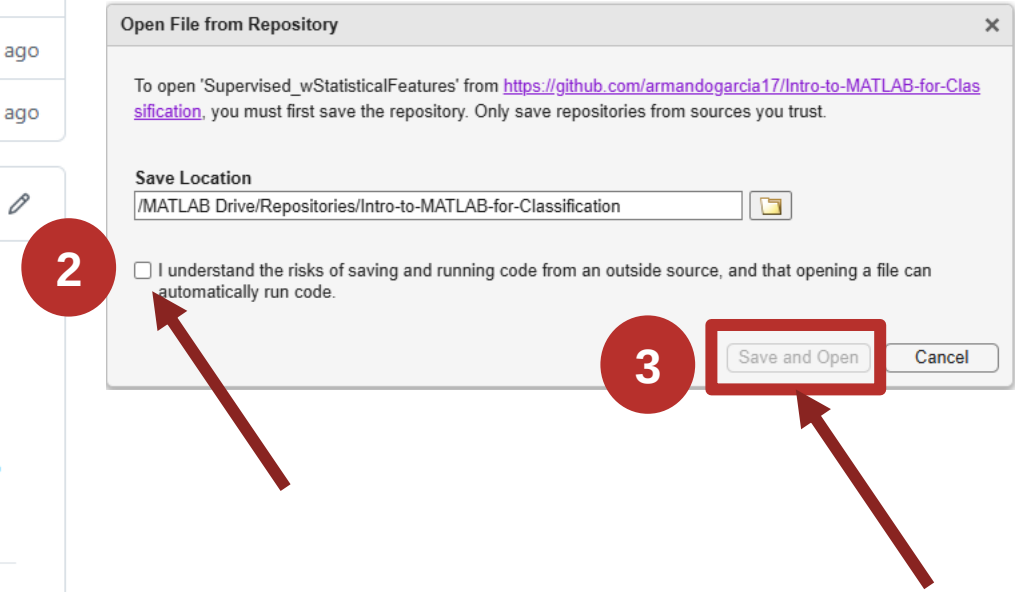
- **Objective:**
  - Train a classification model to predict limb movement from (electromyography) EMG data for prosthetic development
- **Inputs:**
  - Data from 8 EMG sensors
- **Approach:**
  - Import, visualize and preprocess data
  - Extraction features
  - Train classifier
  - Automate and report our work



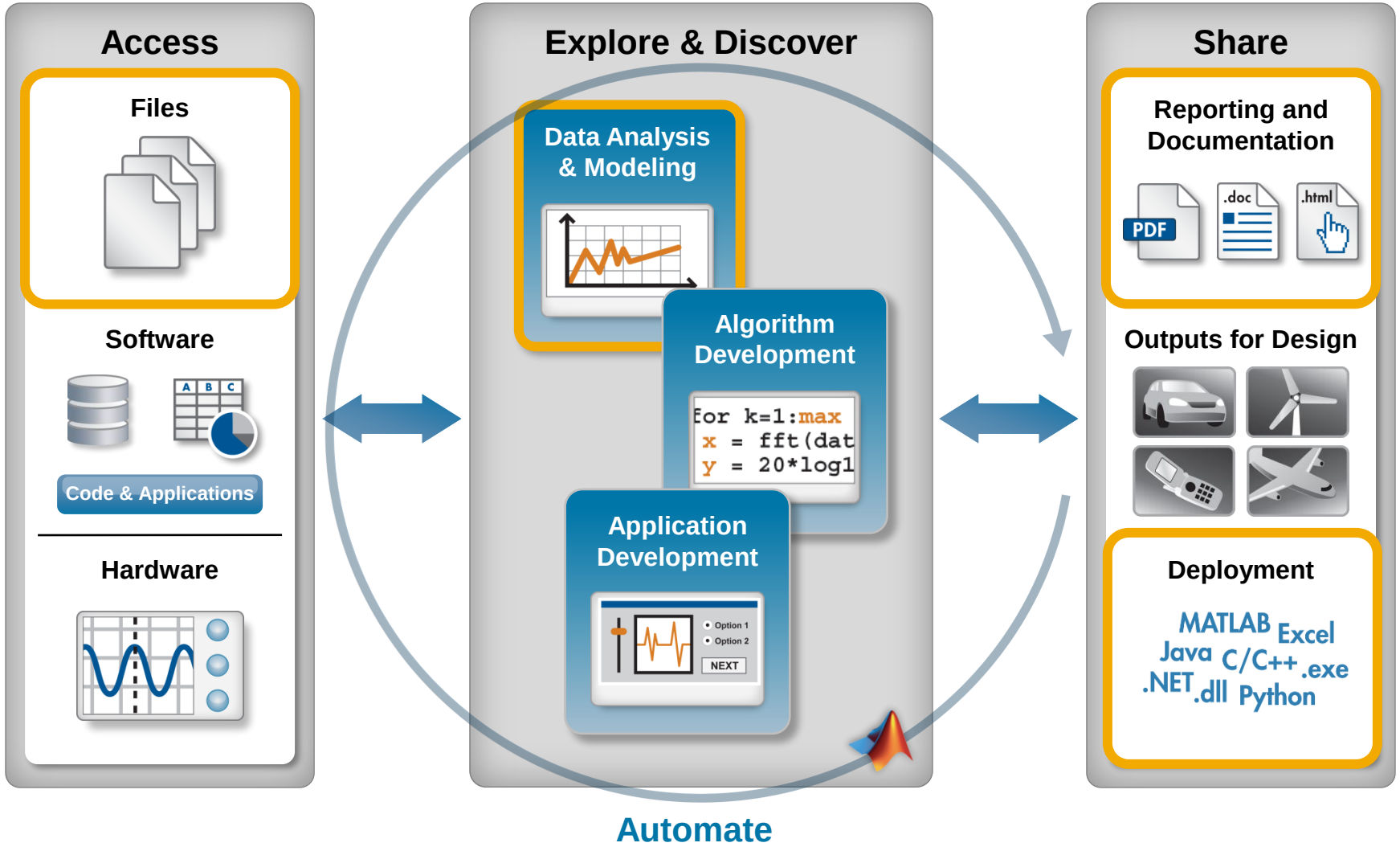
# QR to GitHub repo for follow along

Navigate to: **github.com/armandogarcia17/Intro-to-MATLAB-for-Classification**



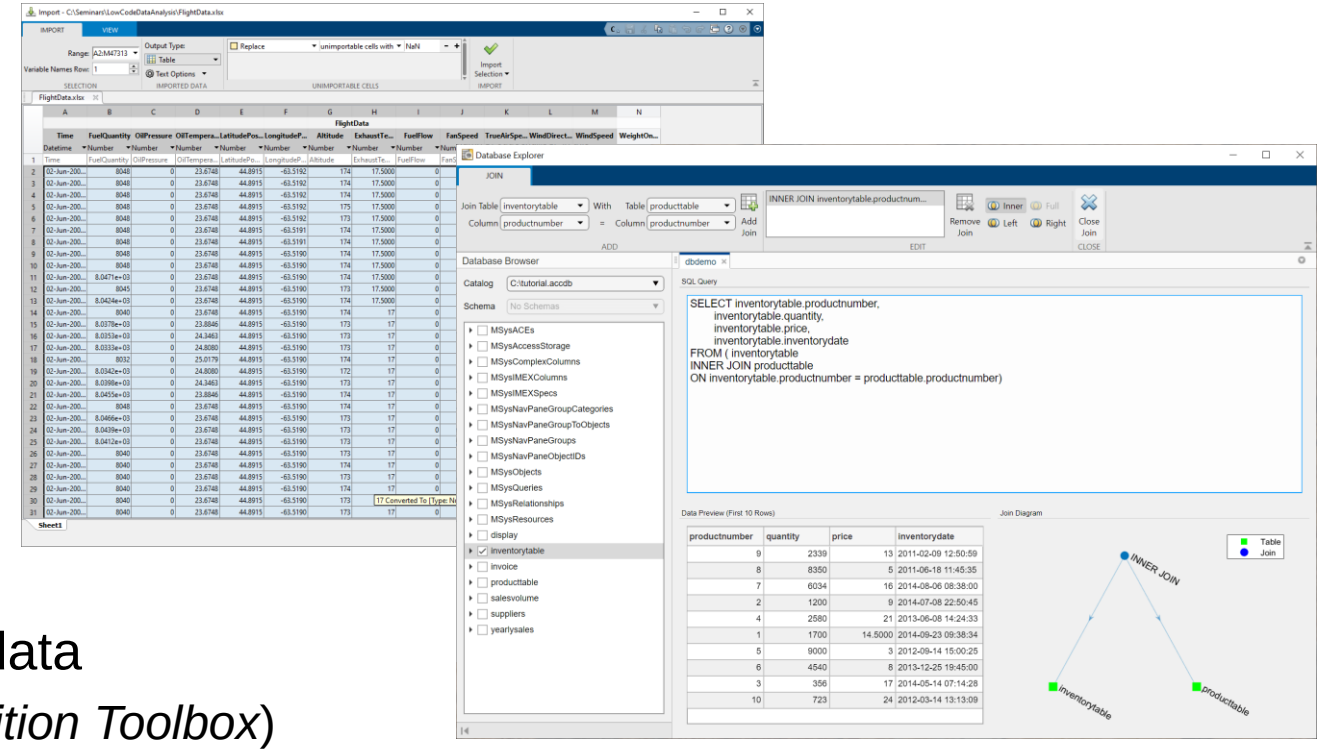
# MATLAB simplifies the data analysis workflow with low code tools



# Use low code tools for easy access to files, databases, and hardware

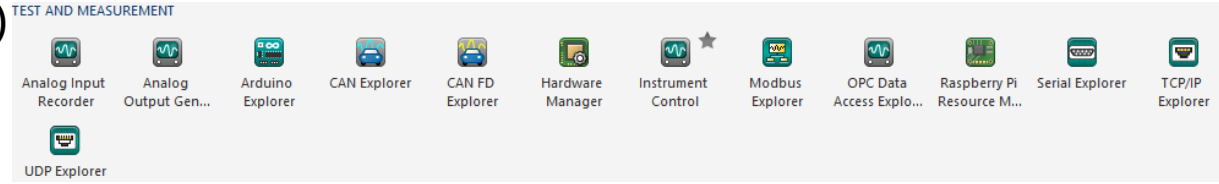
**Access** | Explore & Discover | Share

- Import Tool
  - Text, CSV, and Excel files



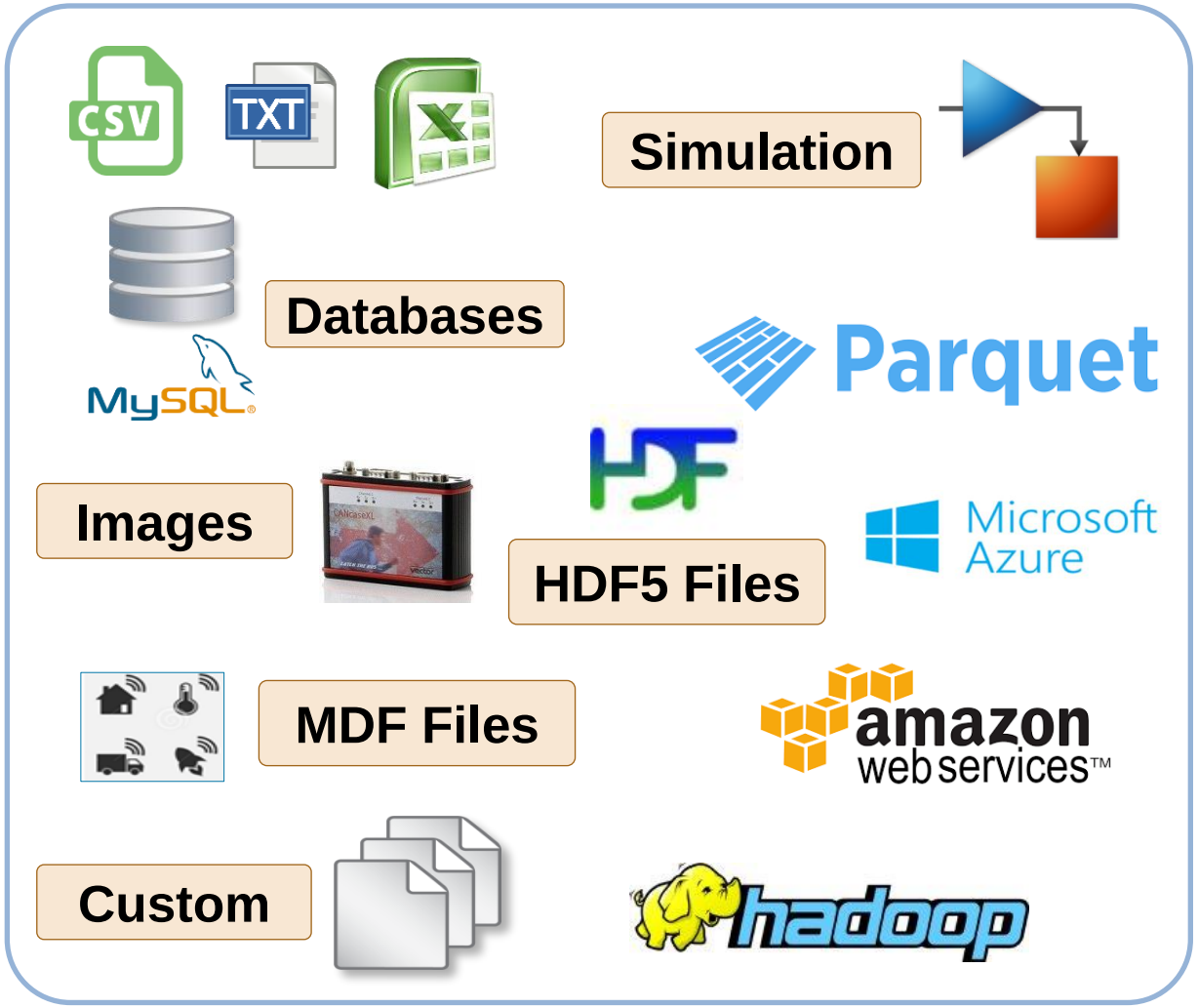

- Database Explorer (*Database Toolbox*)
  - ODBC & JDBC SQL Databases

- Measurement hardware and industrial data
  - Data acquisition hardware (*Data Acquisition Toolbox*)
  - Stand-alone instruments and hardware (*Instrument Control Toolbox*)
  - OPC UA and Aveva PI Server, Modbus devices (*Industrial Communication Toolbox*)
  - CAN, J1939, and XCP (*Vehicle Network Toolbox*)



# Access data in many formats from many locations

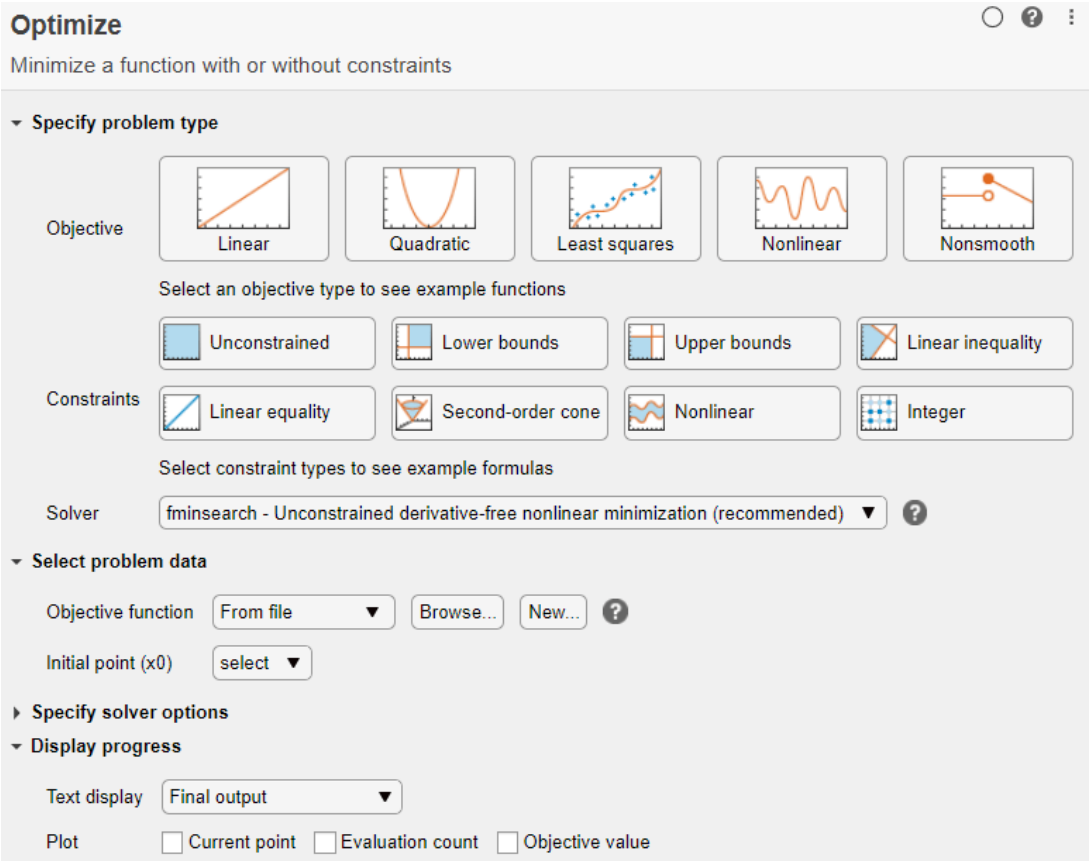
- Type of data
  - Observational
  - Timeseries
  - Image & video
  - N-D
- Location of data
  - SQL & NoSQL databases
  - HDFS
  - AWS S3
  - Azure Blob Storage



# Over 100 low code tools for data analysis, engineering, and AI

Access | **Explore & Discover** | Share

- Data Analysis
  - Visualize, manipulate, and preprocess
  - Math, statistics, and optimization



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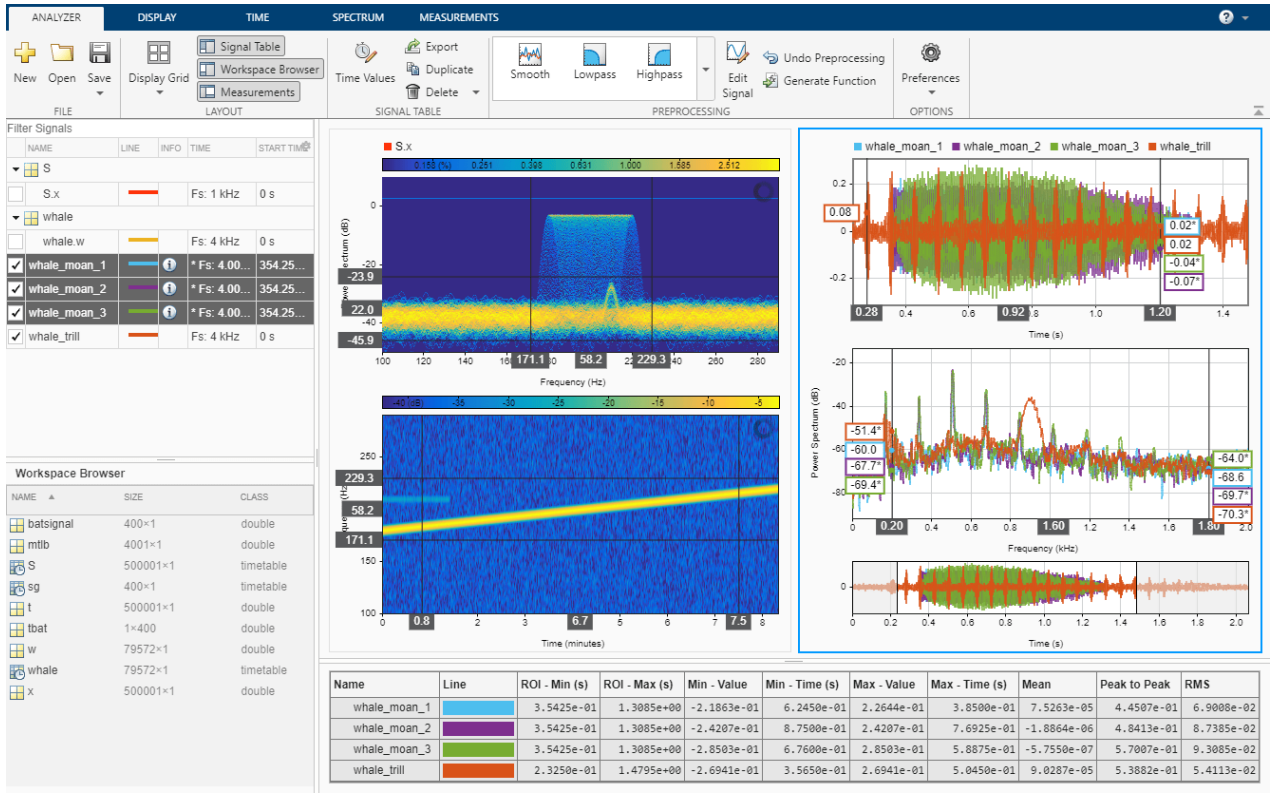
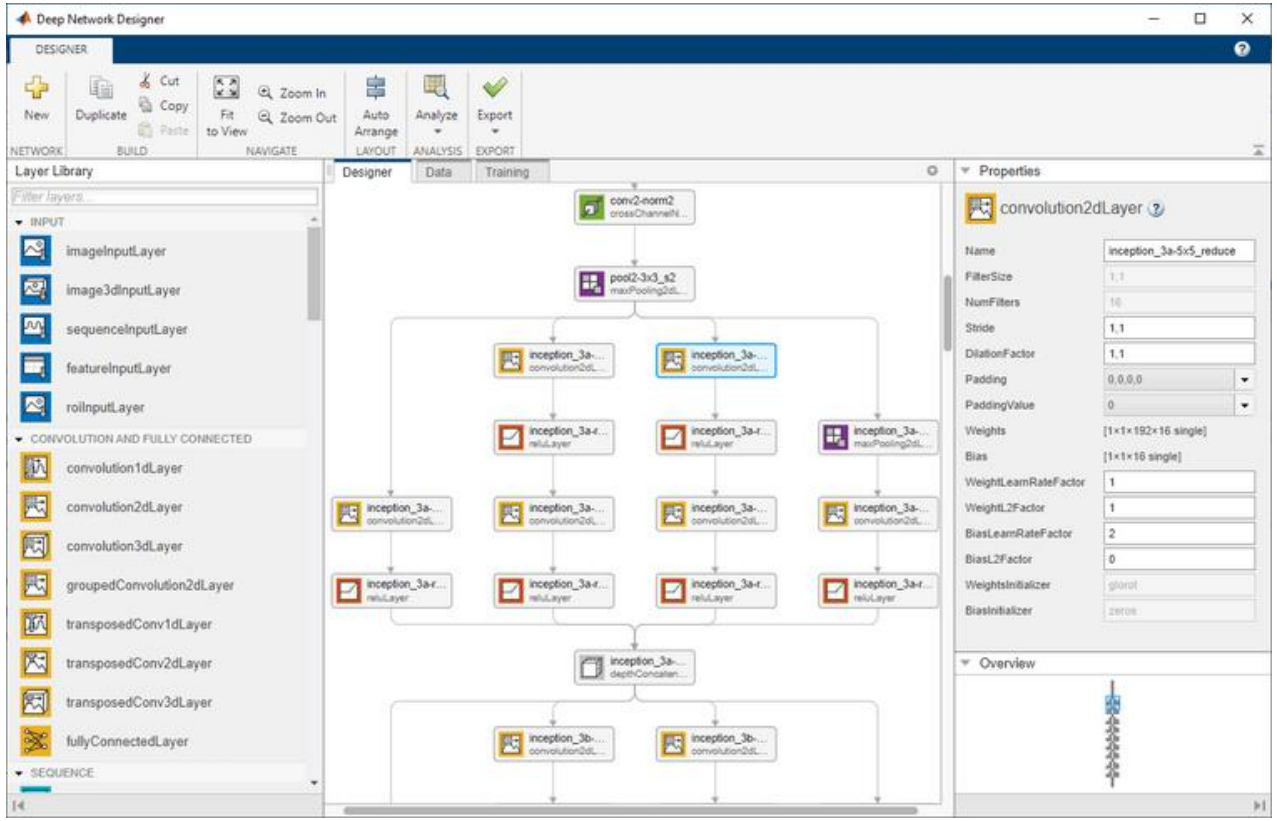
  - Visualize, manipulate, and preprocess
  - Math, statistics, and optimization
- Engineering
  - Control system design and analysis
  - Signal processing and communications
  - Image processing and computer vision



# Over 100 low code tools for data analysis, engineering, and AI

Access | **Explore & Discover** | Share

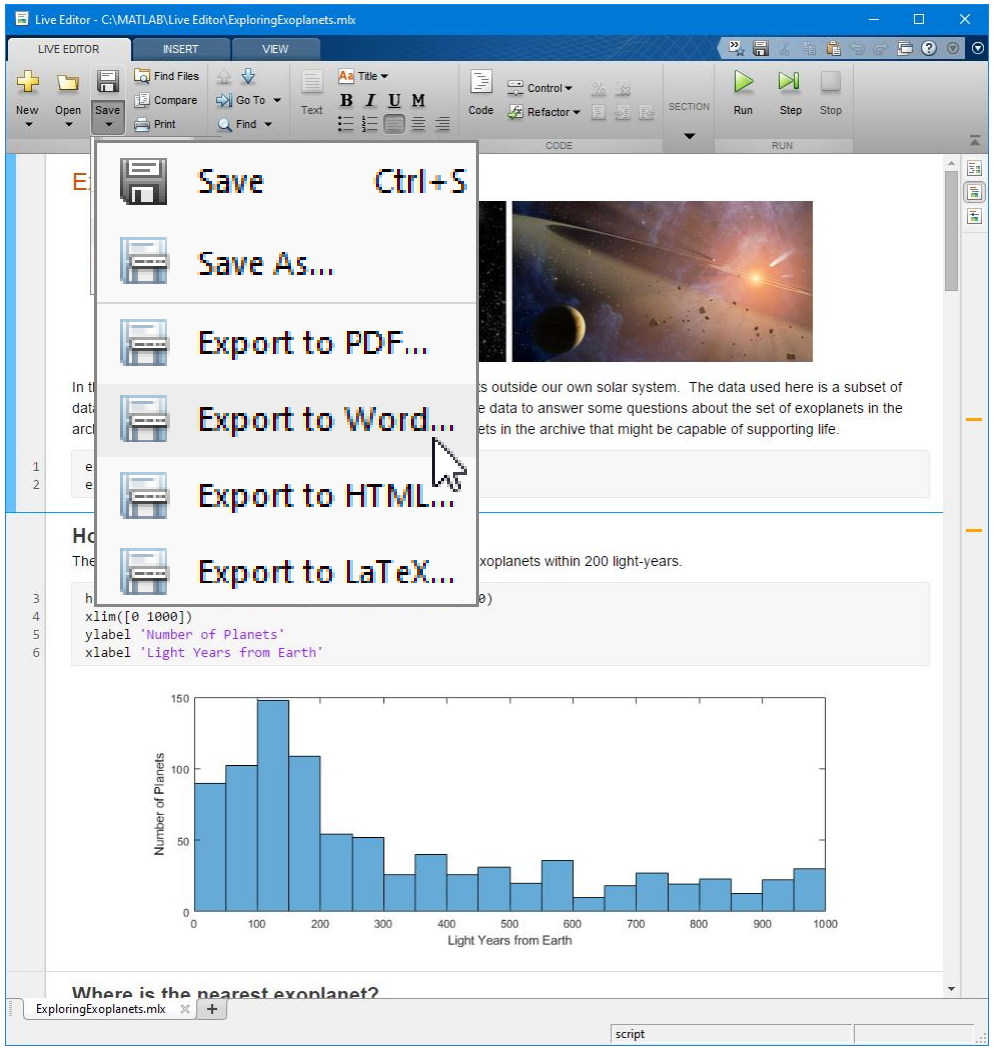
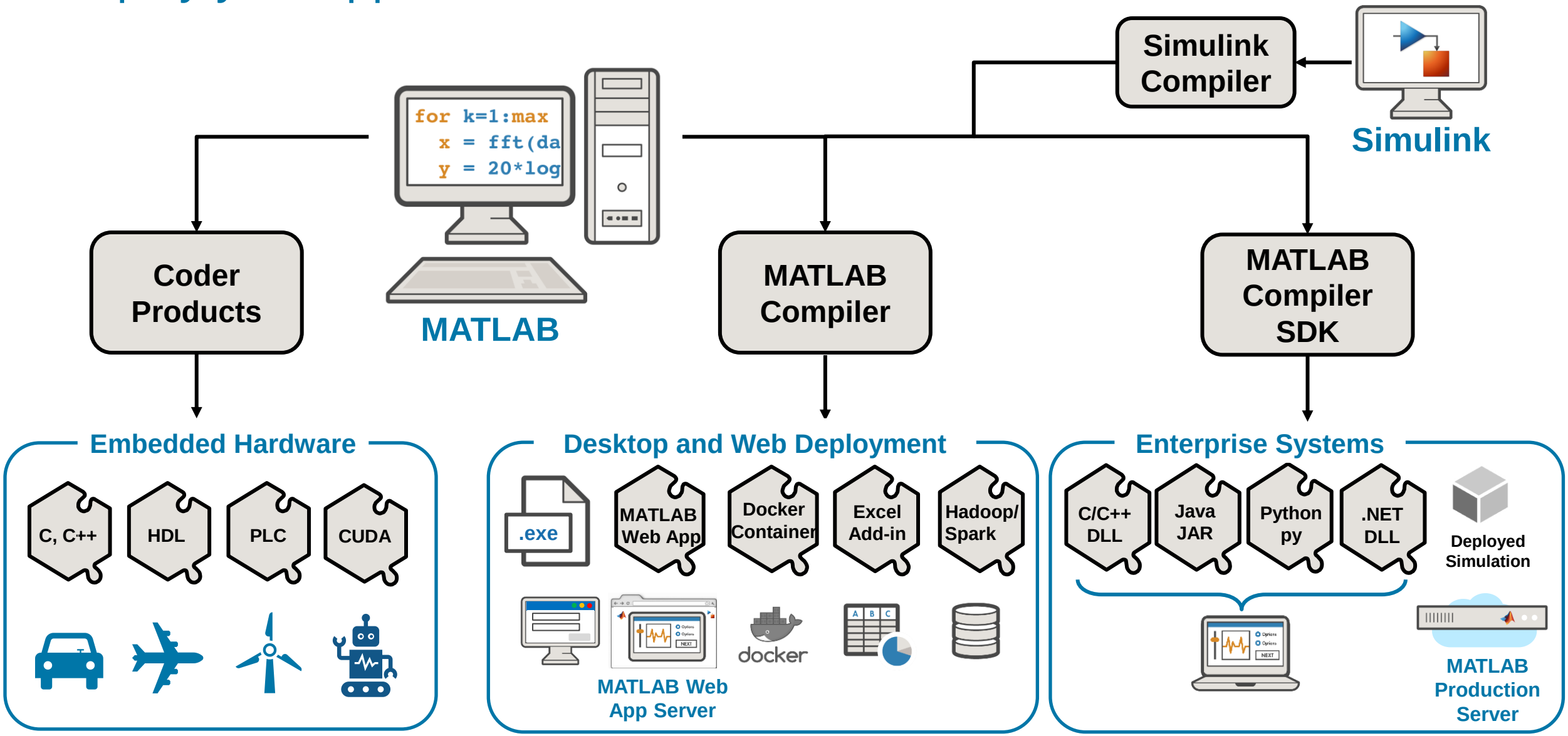
- Data Analysis
  - Visualize, manipulate, and preprocess
  - Math, statistics, and optimization
- Engineering
  - Control system design and analysis
  - Signal processing and communications
  - Image processing and computer vision
- Artificial Intelligence
  - Ground truth labeling
  - Network design, training, and validation
  - Quantization and deployment



# Document as you go – *your script is your report*

Access | Explore & Discover | **Share**

- Divide code into sections
- Embed outputs next to the code
- Add rich text formatting, equations, images, and hyperlinks
- Include animations with embedded controls, and export
- Programmatically control fonts
- Save directly to PDF, HTML, Word, and LaTeX



# Deploy your applications to non-MATLAB users