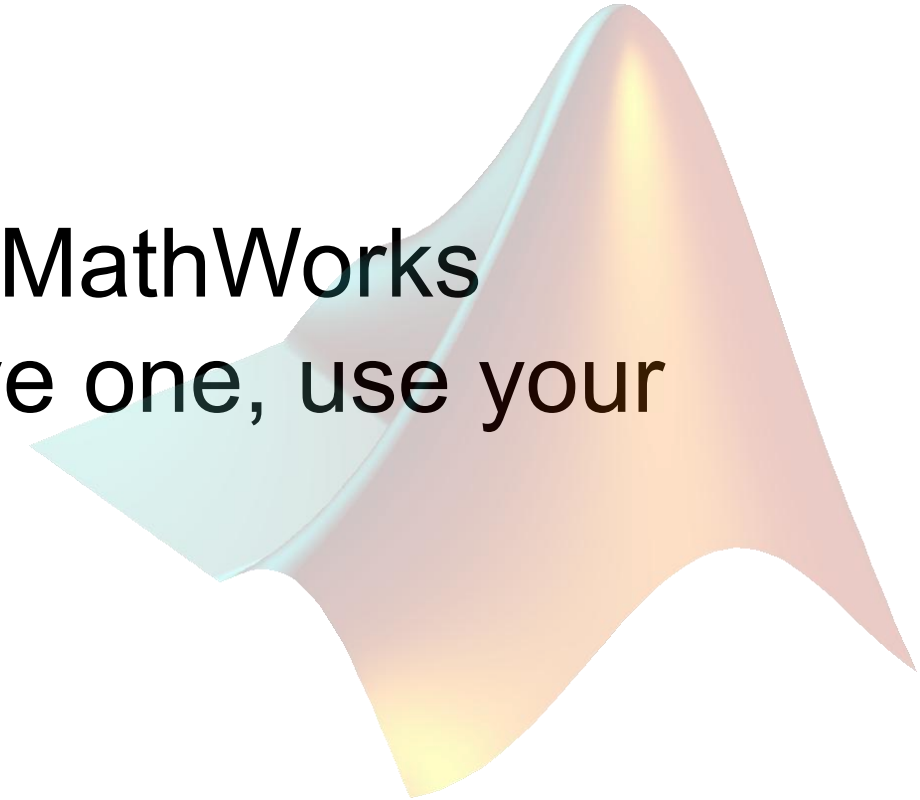
Get Started

- Access GitHub repository
  - https://github.com/nrobertsMW/intro-to-matlab/

- This may prompt you to create a MathWorks account if you do not already have one, use your university email address



Introduction to MATLAB

Noah Roberts

MathWorks®

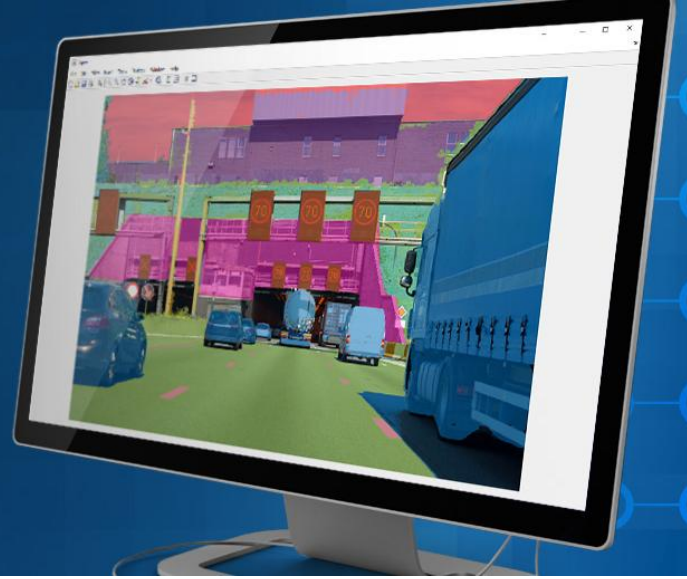
Agenda

I. Introduction
II. Basic Matrix Operations
III. Plots that Support Tables
IV. “What is Simulink”
V. Arduino Demo
VI. Resources

MathWorks®

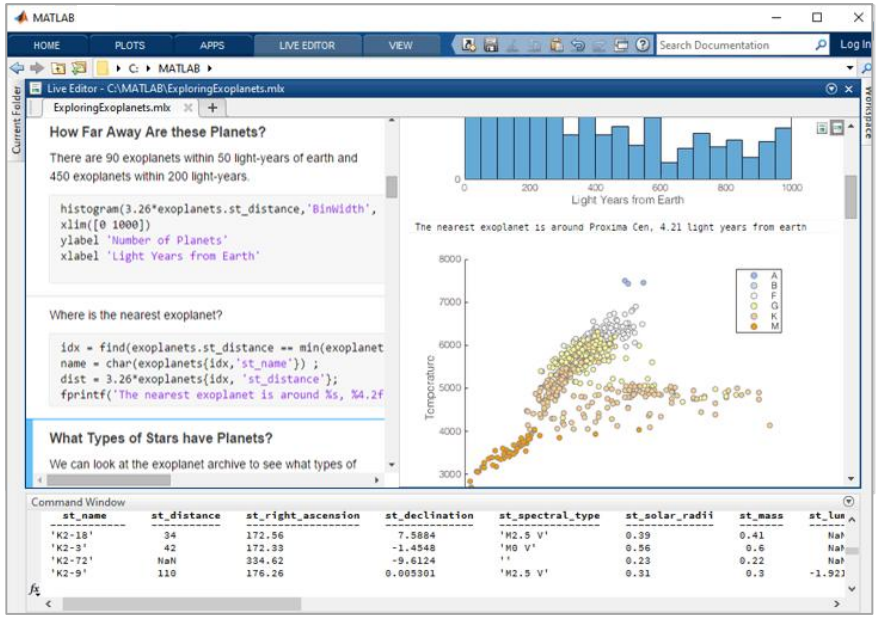
Our Products

MATLAB® & SIMULINK®



- **MATLAB** - Programming environment for algorithm development, data analysis, visualization, and numeric computation.
- **Simulink** - Block diagram environment for simulation and Model-Based Design of multidomain and embedded engineering systems.
- **130+ add-on products** for specialized tasks.

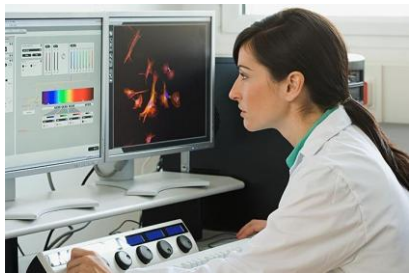
Computer Vision Toolbox



Our Customers / Key Industries


Aerospace and Defense


Automotive

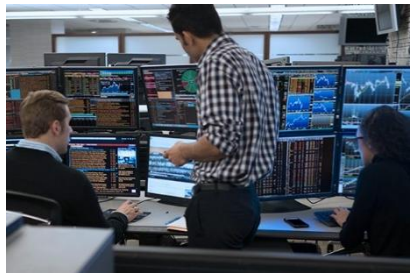

Biological Sciences


Biotech and Pharmaceutical


Communications


Electronics


Energy Production


Financial Services

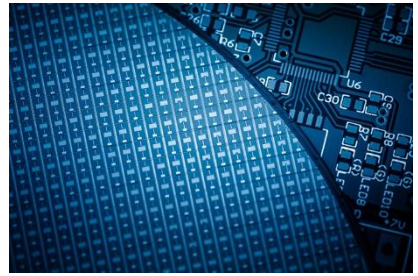

Industrial Machinery


Medical Devices


Process Industries


Neuroscience

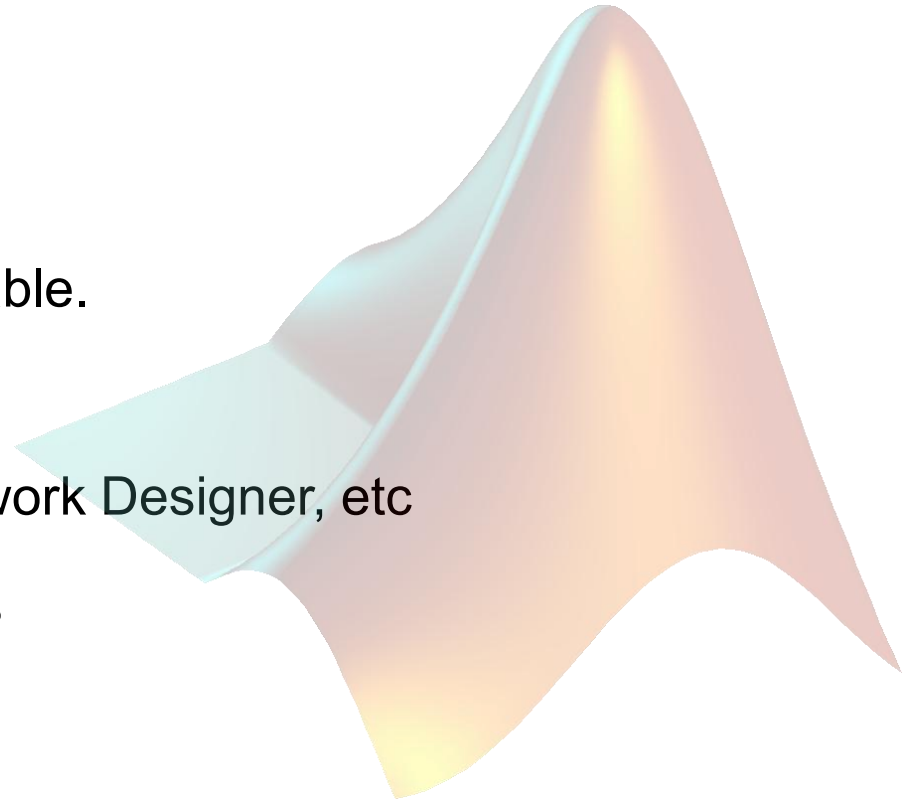

Railway Systems


Semiconductors


Software and Internet

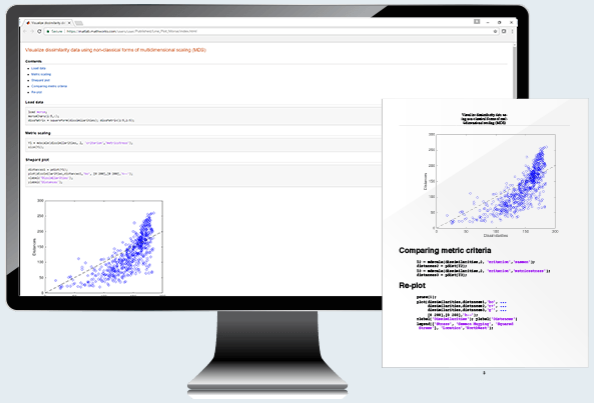
Why MATLAB?

- Extremely easy to code
  - Can be used for rapid prototyping and trying out ideas before production
- MATLAB speaks Math
  - Solve equations like you do on your book.
- Specially designed for scientists and engineers
  - Function names and signatures are familiar and memorable.
- Inbuilt apps
  - Filter designer, Signal analysis, Curve Fitting, Deep Network Designer, etc
- Interoperability with other programming languages
  - Python, C++ and many others



Campus Wide License

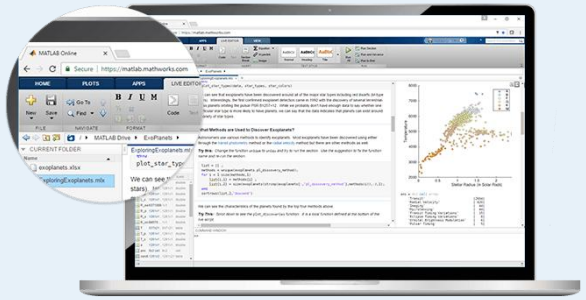
Anytime, Anywhere Access for Faculty, Staff, Students, and Visitors



MATLAB for Desktops

Access MATLAB on personal and university-owned machines

Visit your university MATLAB portal



MATLAB Online

Access MATLAB with a web browser

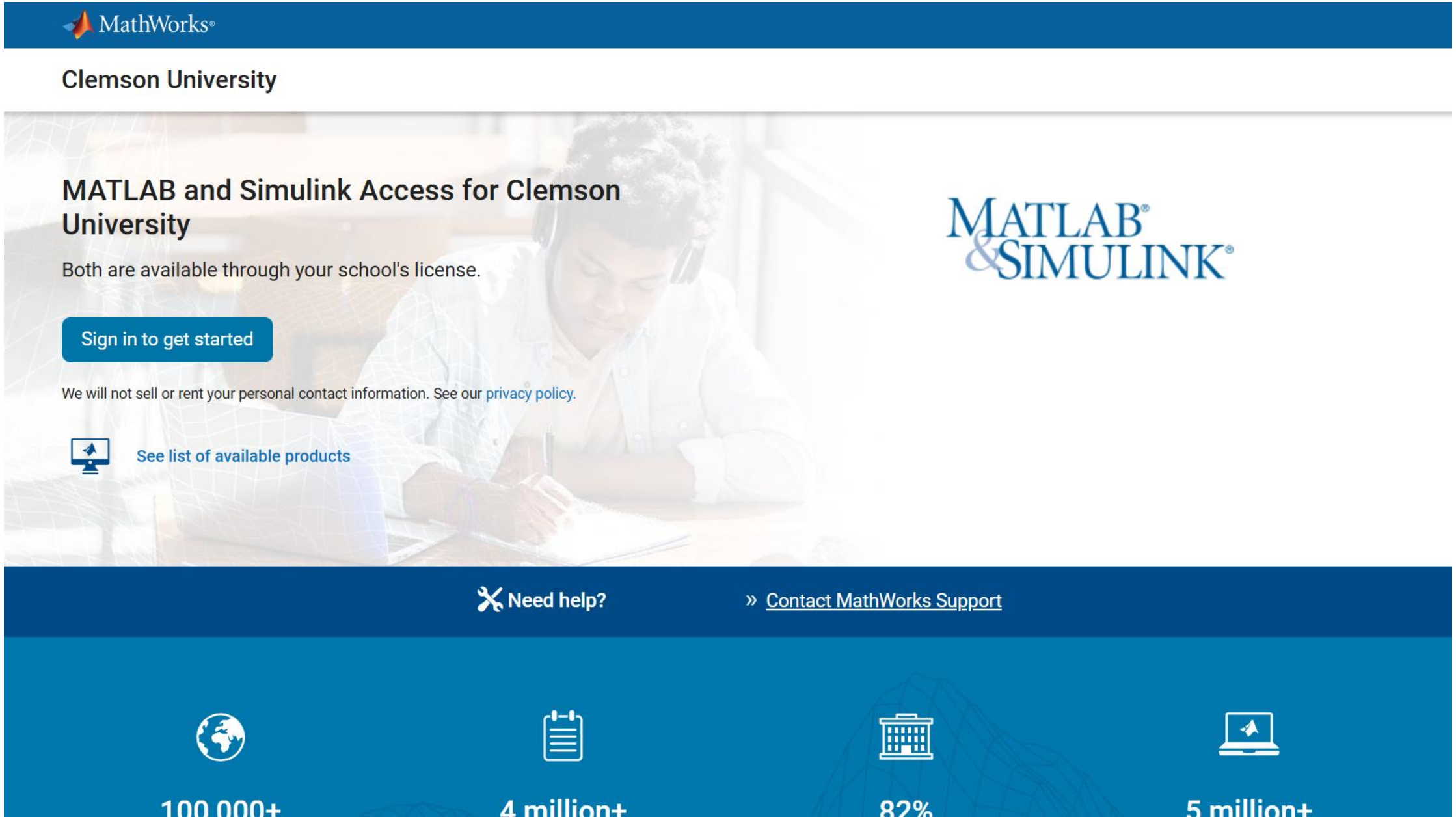
Visit matlab.mathworks.com

MATLAB Mobile

Access MATLAB on iOS/Android devices

GET IT ON Google Play

Download on the App Store


MathWorks
Clemson University
MATLAB and Simulink Access for Clemson University
Both are available through your school's license.
Sign in to get started
We will not sell or rent your personal contact information. See our privacy policy.
See list of available products
MATLAB & SIMULINK
Need help?
» Contact MathWorks Support
100,000+
4 million+
82%
5 million+

Get Started

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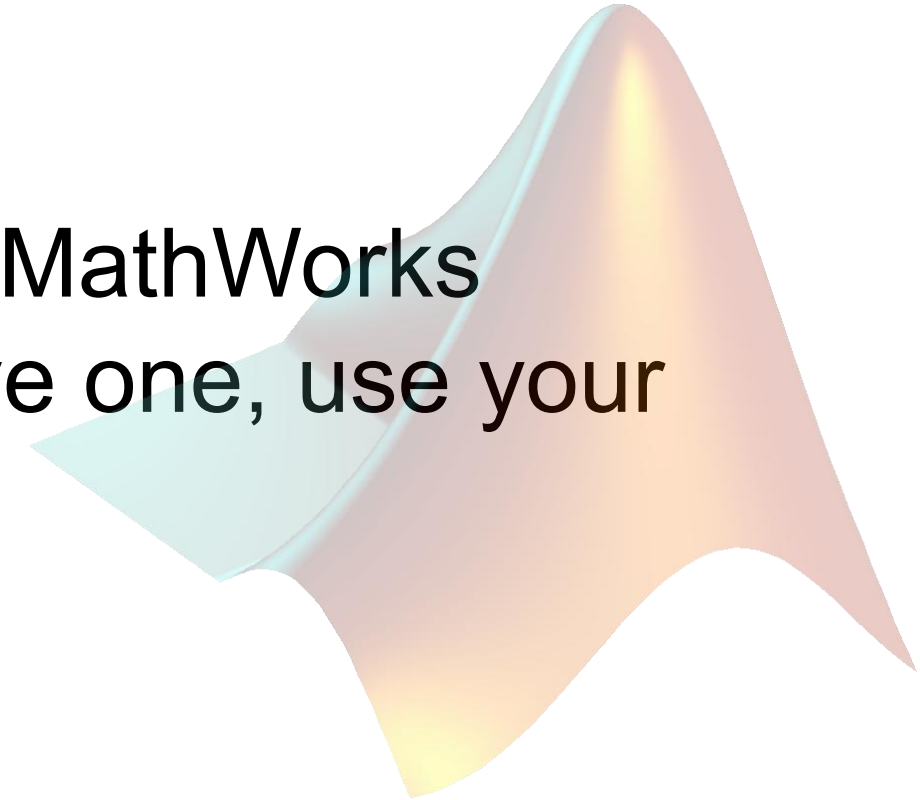
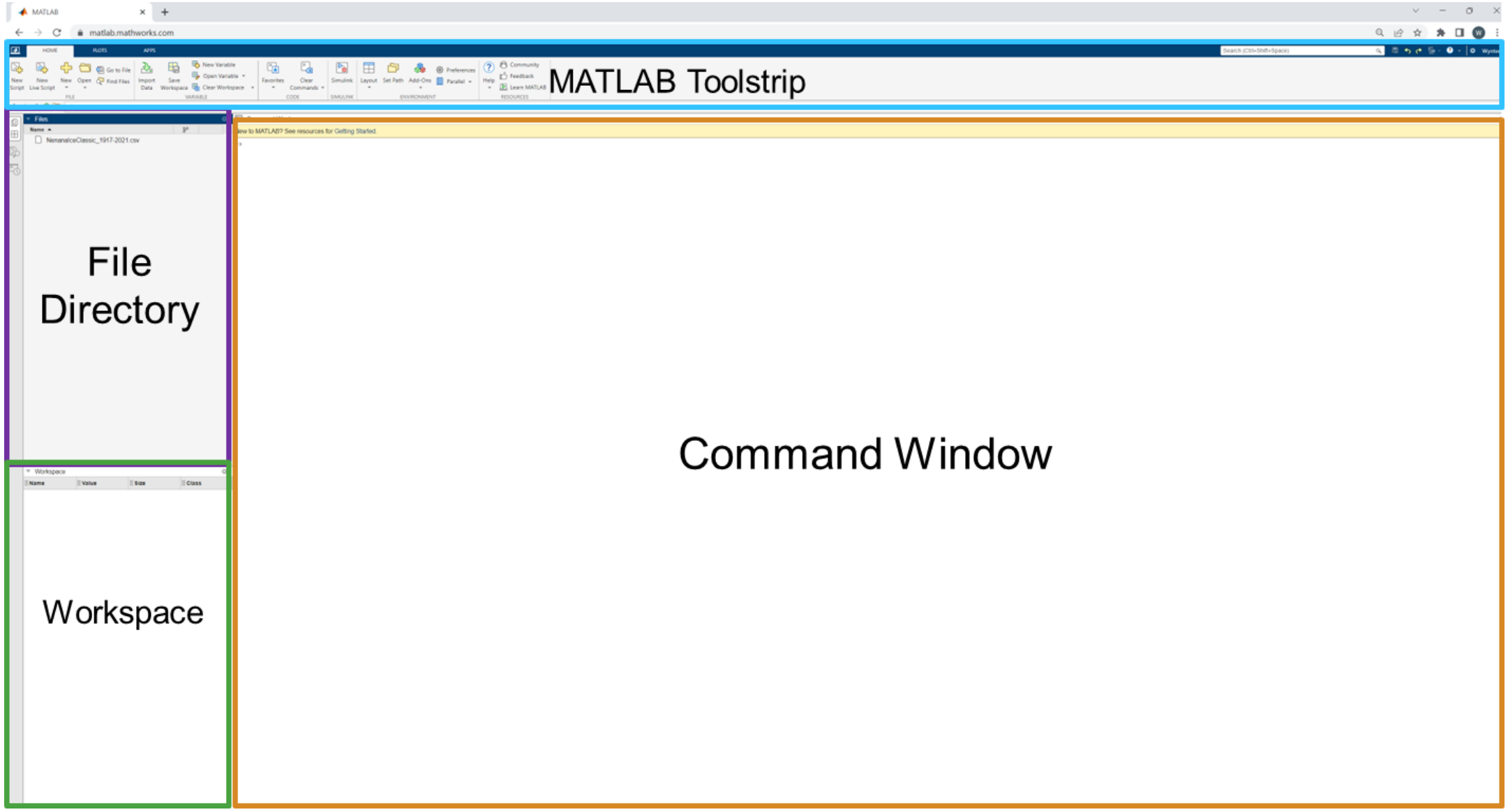


MATLAB Environment Introduction



Exercise 1: Basic Matrix Operations

Basic Matrix Operations

R2025b

This example shows basic techniques and functions for working with matrices in the MATLAB® language.

First, let's create a simple vector with 9 elements called a.

Open in MATLAB Online

Copy Command

```
a = [1 2 3 4 6 4 3 4 5]
```

Get

```
a = 1×9

     1     2     3     4     6     4     3     4     5
```

Now let's add 2 to each element of our vector, a, and store the result in a new vector.

Notice how MATLAB requires no special handling of vector or matrix math.

```
b = a + 2
```

Get

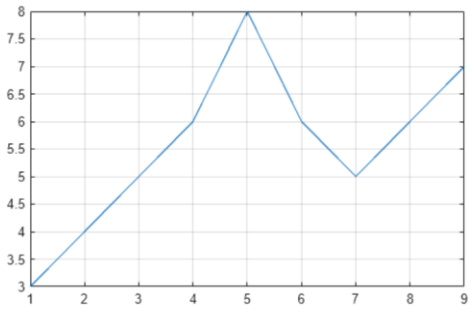
```
b = 1×9

     3     4     5     6     8     6     5     6     7
```

Creating graphs in MATLAB is as easy as one command. Let's plot the result of our vector addition with grid lines.

```
plot(b)
grid on
```

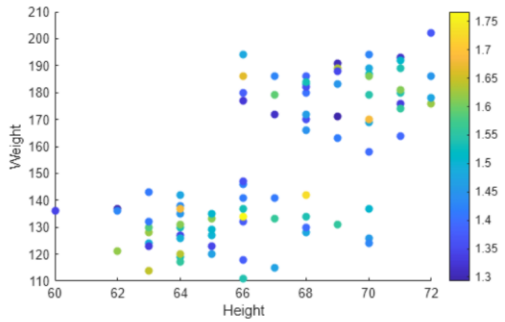
Get



Exercise 2: Plotting with Tabular Data

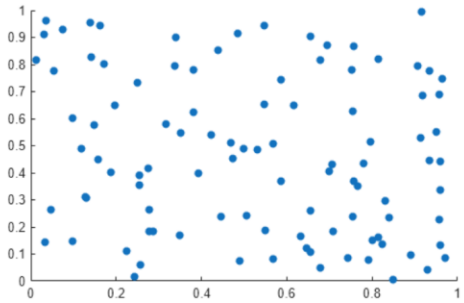
```
% Vary the color by blood pressure ratio
bpratio = tbl.Systolic./tbl.Diastolic;
s.CData = bpratio;

% Add a colorbar
colorbar
```



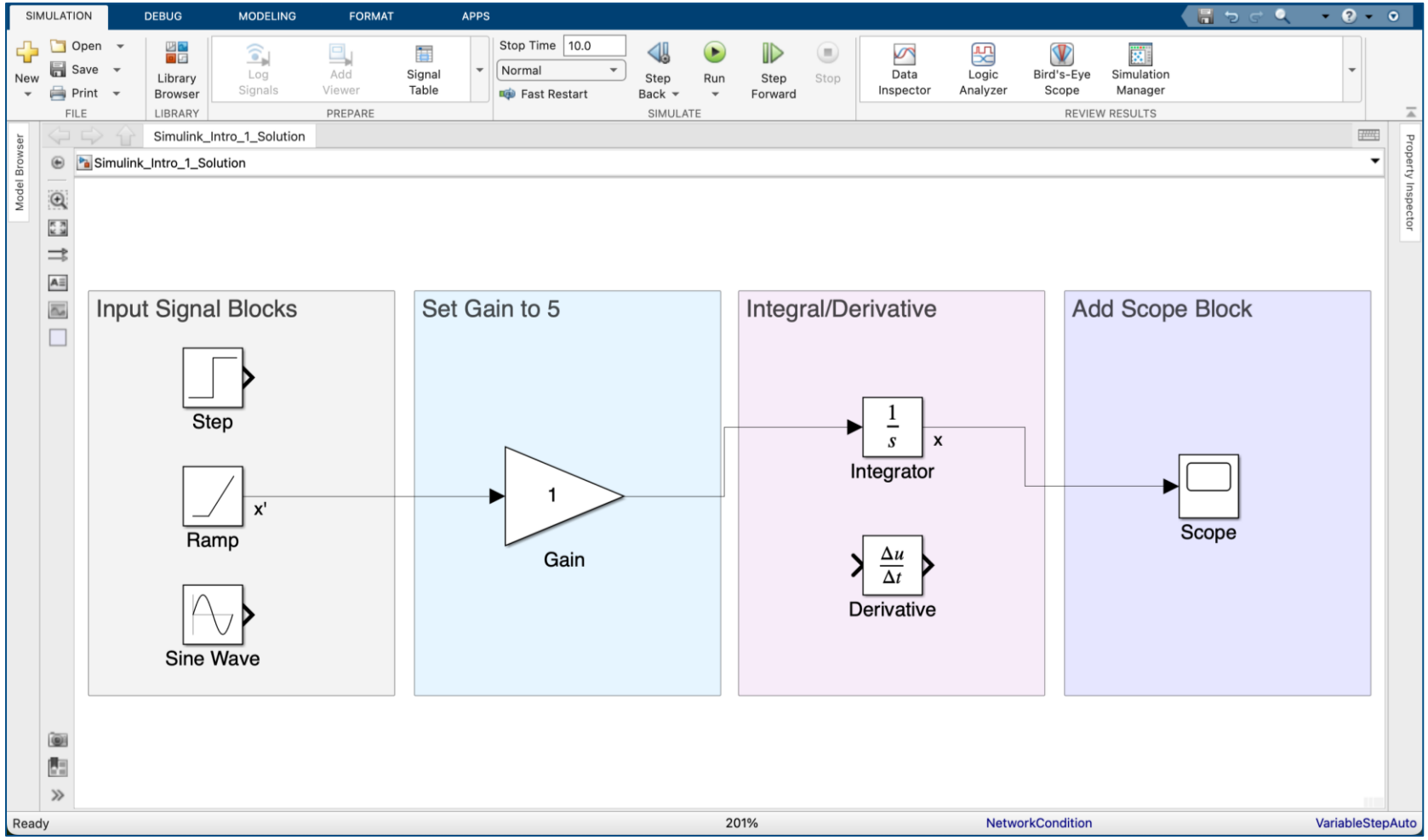
You can also plot vectors or matrices, and modify the plot using table variables. After you create the plot, set the `SourceTable` property, and then set the table-related properties that you want. Table-related properties typically have the word `Variable` in their names. For example, plot two vectors of 100 random numbers.

```
x = rand(100,1);
y = rand(100,1);
s = scatter(x,y,"filled");
```

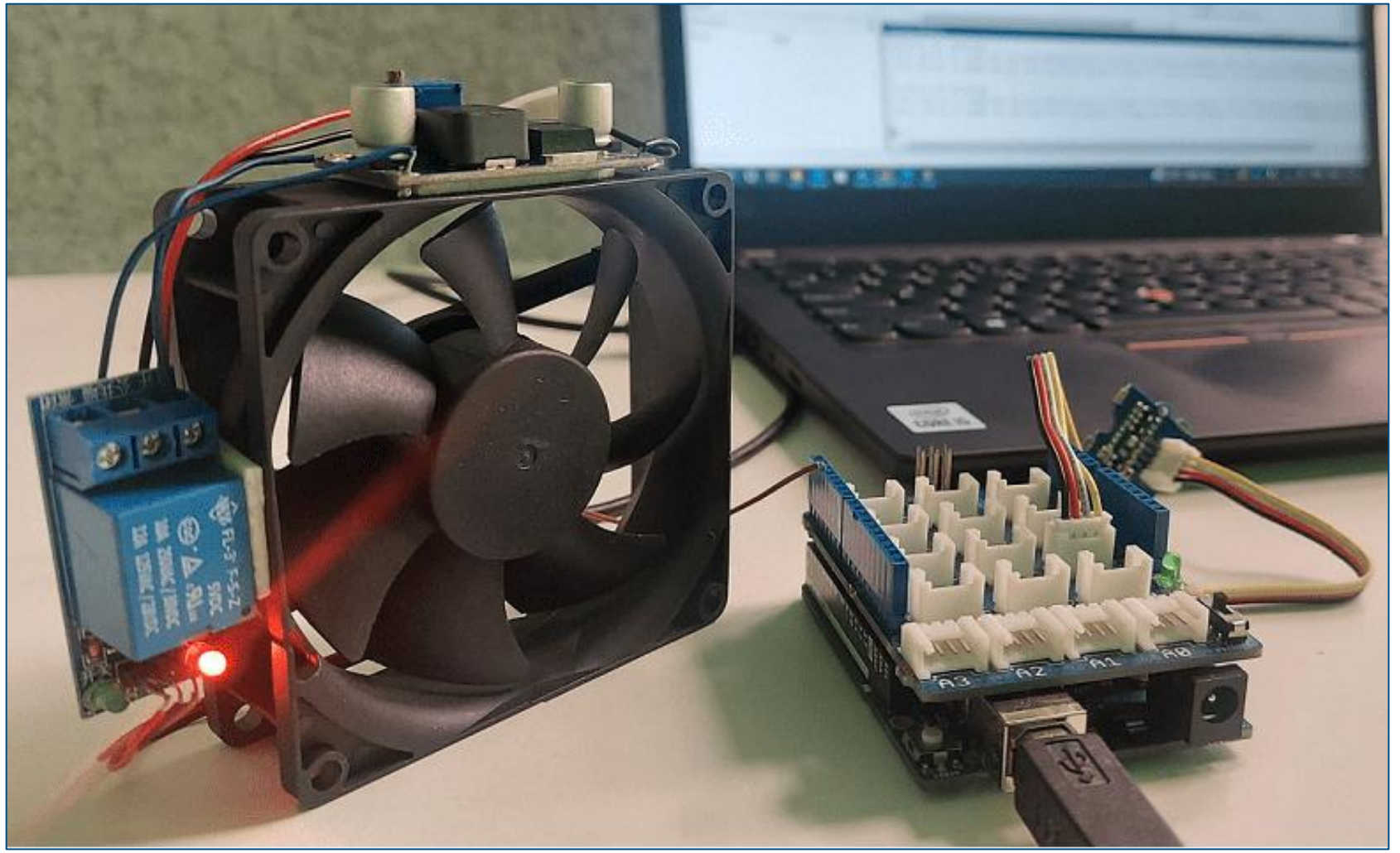


Change the marker colors so that they vary according to the values in a table variable. Read `patients.xls` as the table `tbl`. Set the `SourceTable` property and vary the marker colors according to the `Age` variable in the table. Because the table has 100 rows, and the plot has 100 points, the `Age` variable is compatible with the plot. Then, add a colorbar to the plot.

Exercise 3: What is Simulink?



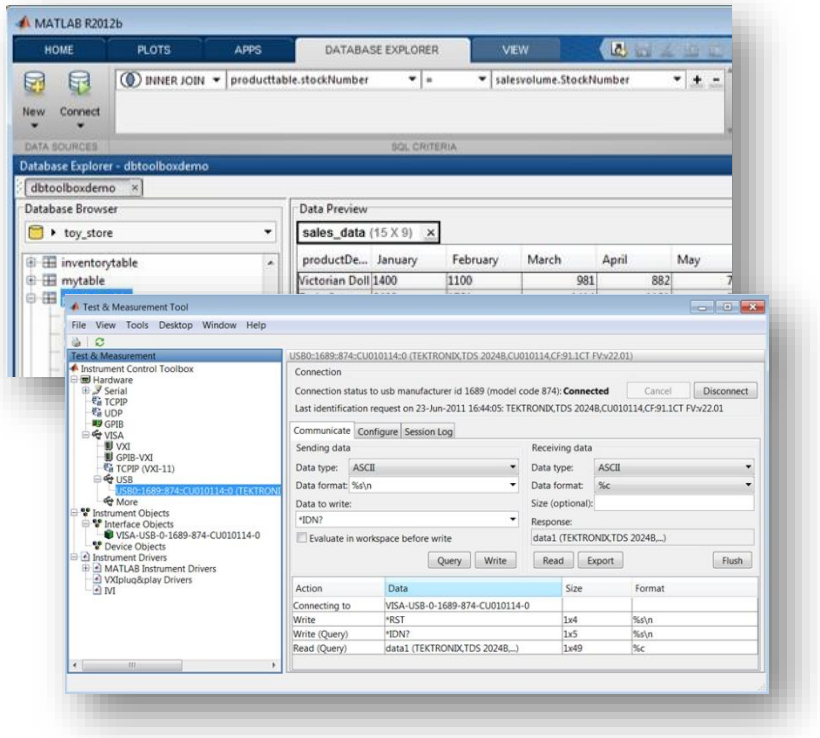
Demo: Arduino Control



Accessing Data from MATLAB

Access | Explore & Discover | Share

- Files
  - Excel, text, or binary
  - Audio and video, image
  - Scientific formats and XML
- Web Services
  - JSON, CSV, and image data
- Applications and languages
  - C/C++, Java, FORTRAN, Python
  - COM, .NET, shared libraries
  - Databases (*Database Toolbox*)
- Measurement hardware
  - Data acquisition hardware *(Data Acquisition Toolbox)*
  - Stand-alone instruments and devices *(Instrument Control Toolbox)*

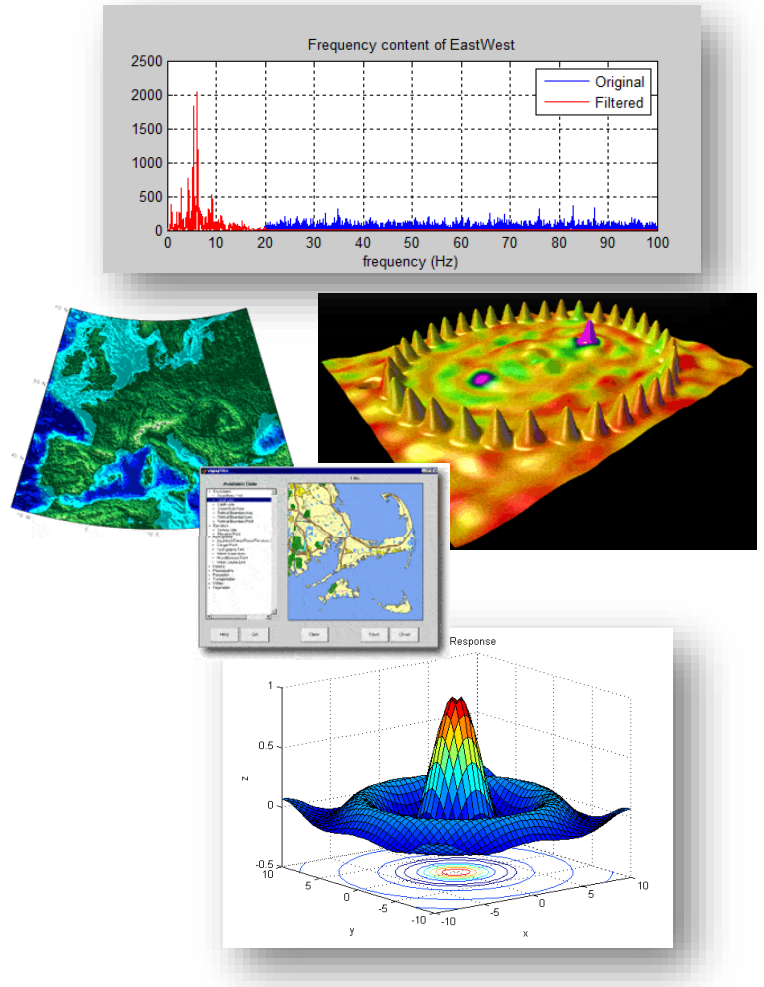


Data Analysis and Visualization in MATLAB

Access | **Explore & Discover** | Share

- Data analysis
  - Manipulate, preprocess, and manage data
  - Fast, accurate analysis with pre-built math and engineering functions

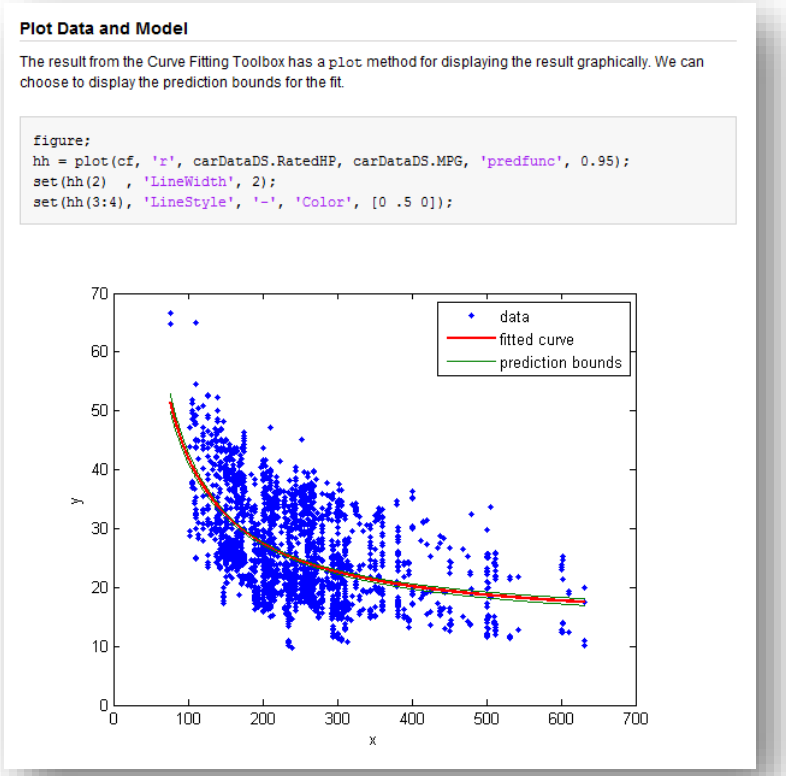
- Visualization
  - Built in graphics functions for engineering and science (2D, 3D, volume visualization)
  - Interactive tools to annotate and customize graphics



Sharing Results from MATLAB

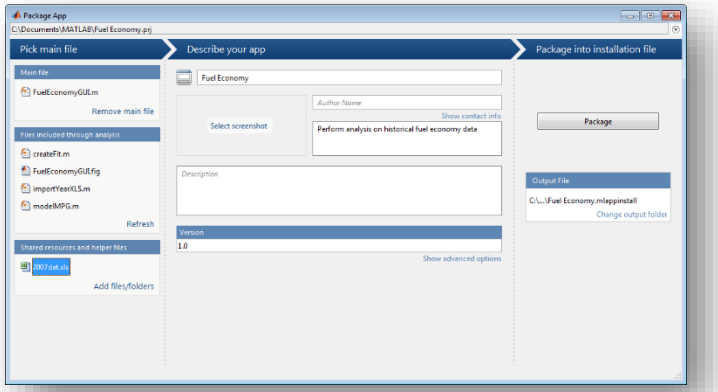
Access | Explore & Discover | **Share**

- Automatically generate reports
  - Publish MATLAB files
  - Customize reports using MATLAB Report Generator
- Package as an app
- Deploy applications to other environments



Packaging and Sharing MATLAB Apps

- MATLAB apps
  - Interactive applications to perform technical computing tasks
  - Displayed in apps gallery
- Included in many MATLAB products
- Package your own app
  - Create single file for distribution and installation into gallery
  - Packaging tool:
    - Automatically includes all necessary files
    - Documents required products



Examples of MathWorks Supported Hardware

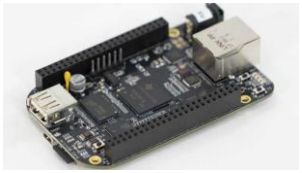
Arduino

Lego EV3

Raspberry Pi

Android/iOS Devices

Kinect for Windows



BeagleBone Black

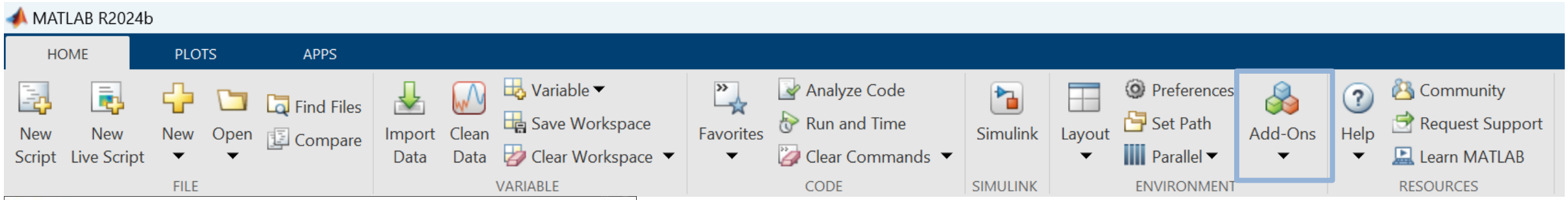
Texas Instruments

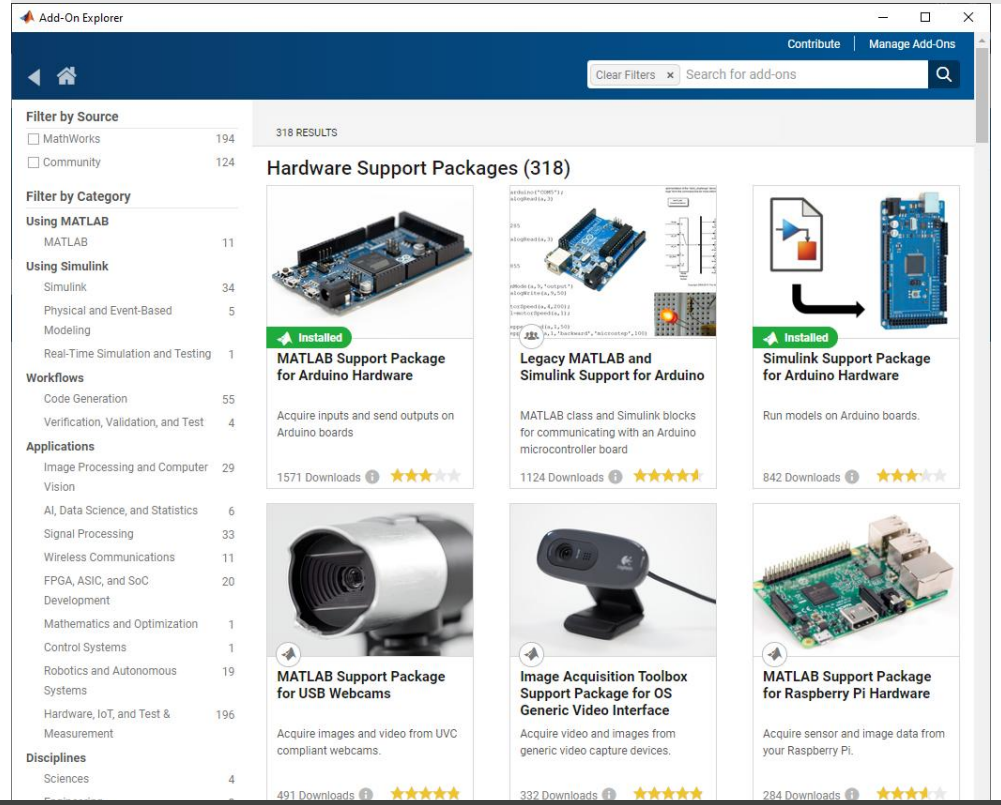
STM Electronics

Freescale

Zynq SDR

Hardware Support Packages





https://www.mathworks.com/hardware-support/home

Self-Paced Courses

FREE "getting started" content – available for everyone

MATLAB Onramp

Simulink Onramp

Machine Learning Onramp

Deep Learning Onramp

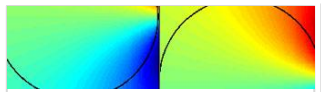
Image Processing Onramp

Stateflow Onramp

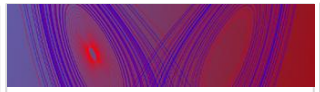
Control Design Onramp with Simulink

Computational Mathematics

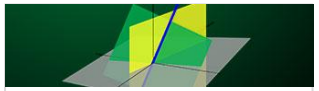
*Available only to users at universities that offer campus-wide training access.



Solving Nonlinear Equations with MATLAB



Solving Ordinary Differential Equations with MATLAB



Introduction to Linear Algebra with MATLAB

Introduction to Statistical Methods with MATLAB

Introduction to Symbolic Math with MATLAB

Other Resources:

- Introduction to Model-Based Design with Simulink
- Physical Modeling with Simscape
- Simulink Control Design
- Robotics and Autonomous Systems
- (NEW) Multibody Simulation
- (NEW) Battery Systems

Core MATLAB

MATLAB Fundamentals

MATLAB Programming Techniques

MATLAB for Financial Applications

Data Science

MATLAB for Data Processing and Visualization

Machine Learning with MATLAB

Deep Learning with MATLAB

Engineering Development Group (EDG)

Degrees Hired (BS, MS, PhD)

Computer Science

Electrical Engineering

Mechanical Engineering

Computer Engineering

Other Eng Disciplines

EDG Structure & Timeline

Training	Customer Interaction	Project Work
Build Product Knowledge	Learn about customer workflows	Develop your skills
Cohort Style: Built in Network	Help customers with MATLAB and Simulink	Find ideal team for you

3 Months

Variable time span
Typical = 12-14 months

The Hiring Process

The Path to a Full-Time EDG Role

1
Submit Application
Once we receive your application, we'll send a confirmation email with next steps.

2
Show Off Your Skills
Complete the Code Challenge and record your responses to initial video interview questions.

3
Talk with a Manager
Learn more about the position and the MathWorks team.

4
Impress the Hiring Team
Show off your technical skills and complete virtual interviews with the hiring manager and HR. Together these interviews take about 4 hours.

Got the Job?
Start contributing immediately by helping us to accelerate the pace of engineering and science.

Not a Match?
After gaining more experience and skills, feel free to reapply.

The Path to an EDG Internship

1
Submit Application
Once we receive your application, we'll send a confirmation email with details on your prework and next steps.

2
Show Off Your Skills
Complete the Code Challenge and record your responses to initial video interview questions.

3
Connect with an Engineer
Complete a technical assessment by phone.

4
Talk with a Manager
Hear more about the position and the MathWorks team.

5
Talk with a Recruiter
Learn about next steps.

Got the internship?
Start contributing immediately by helping us to accelerate the pace of engineering and science. Through your internship, you will be considered for full-time opportunities.

Not a Match?
After gaining more experience and skills, you can reapply for an internship or apply for a full-time opportunity closer to graduation.

Continue the conversation!

- **MathWorks Education Application Engineers**
- Noah Roberts
- nroberts@mathworks.com

- We consult with faculty and researchers to support them with their STEM initiatives, including integrating computational or systems thinking into their curriculum and research