

MATLAB application in academic area



Frank Fu
Sep 24, 2024

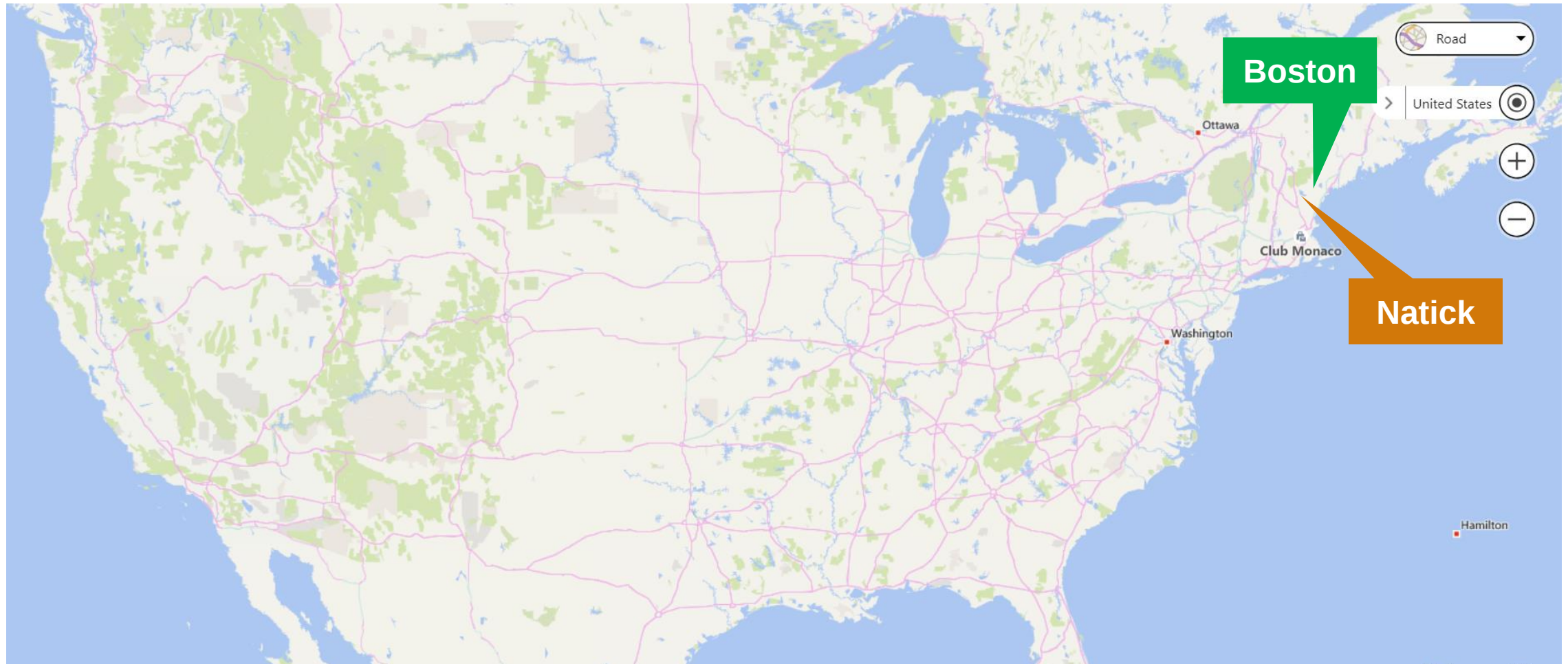
Agenda

- Brief Intro
- Low Code Data Analysis
- Demo – Modeling Flight Sensor Data
- Learning Resources

Natick, MA

US company established in 1984

Headquarter: Natick (near Boston)



Creator and founder



Cleve Moler



Jack Little



WW over **7.4 mio students** and over **2,400 universities** (including **Top 30**)
—— Use MATLAB and Simulink via
Campus-Wide License

- WW Millions of scientists, engineers and financial analysts are using MATLAB and Simulink



4 millions+

Users in 185 countries and territories WW



100,000+

Commercial customers, governmental orgs, and universities



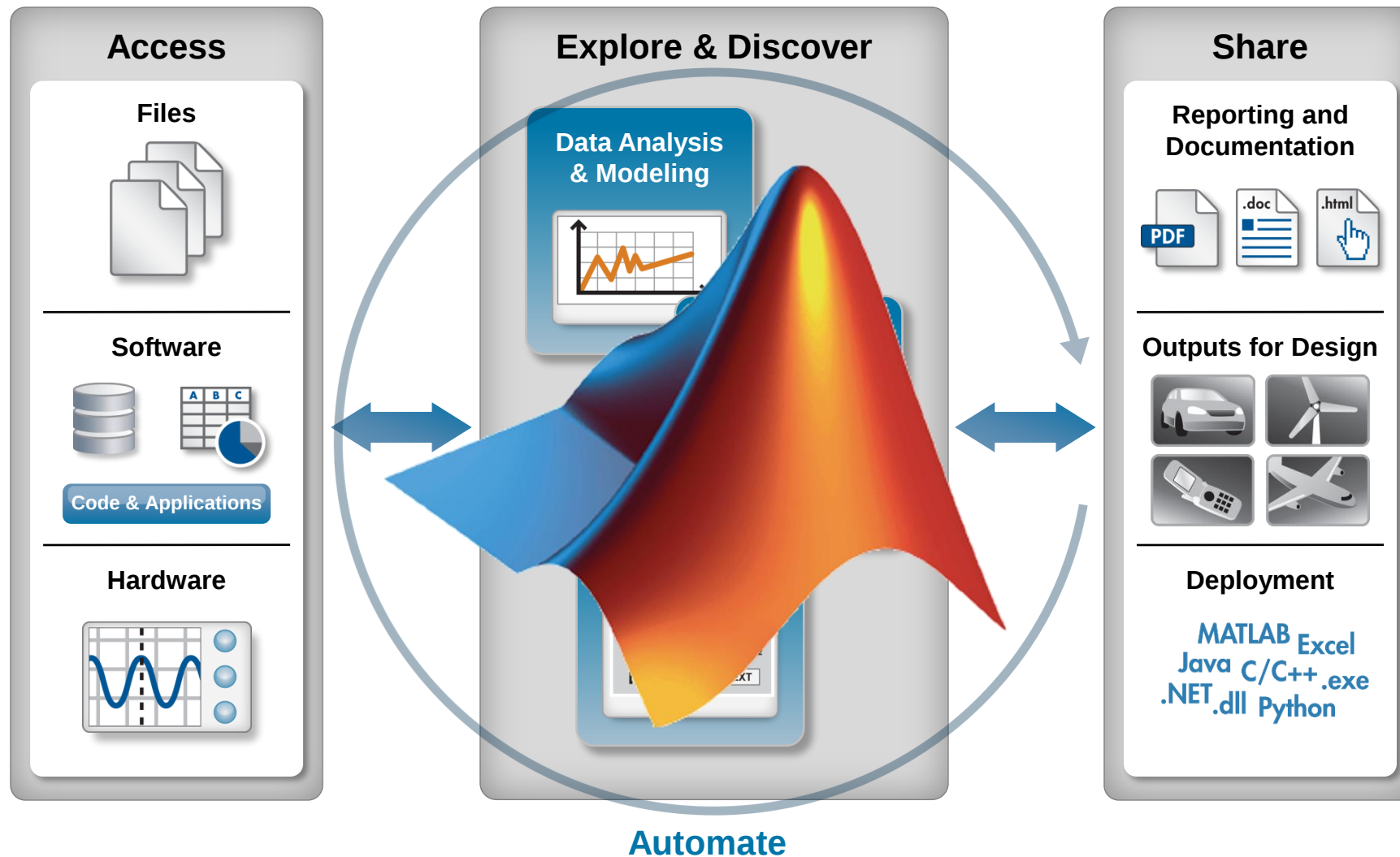
All the **top 10** auto, aerospace and national defense enterprises

OICA: 2017 World Motor Vehicle Production
PwC: Aerospace and Defense 2018 Year in Review



Financial institutions:
invest. Funds, securities
and central banks

MATLAB simplifies the data analysis workflow with low code tools



What are “low code” tools?

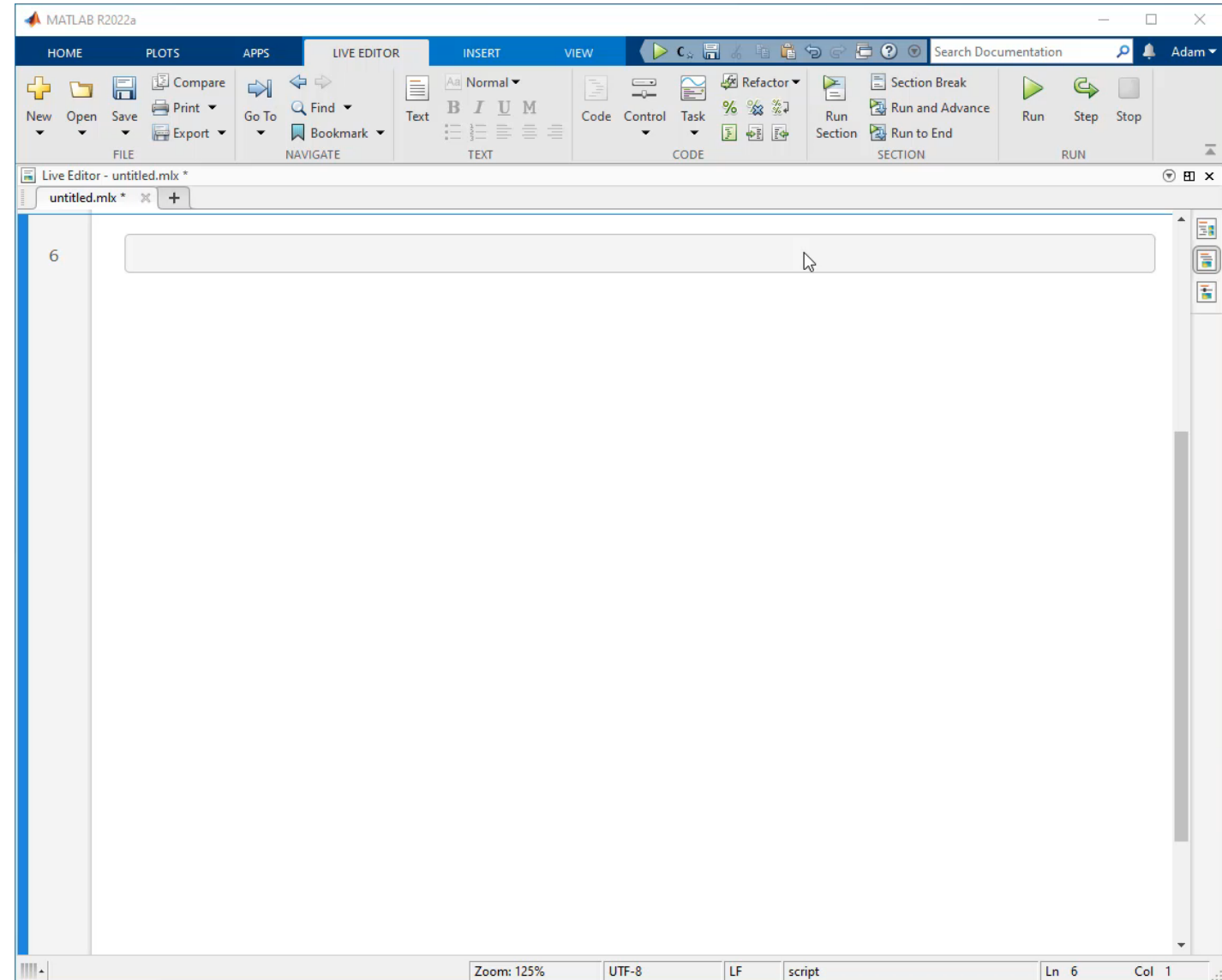
Low code tools enable:

- rapid software development
- minimal manual coding

Benefits of low code tools:

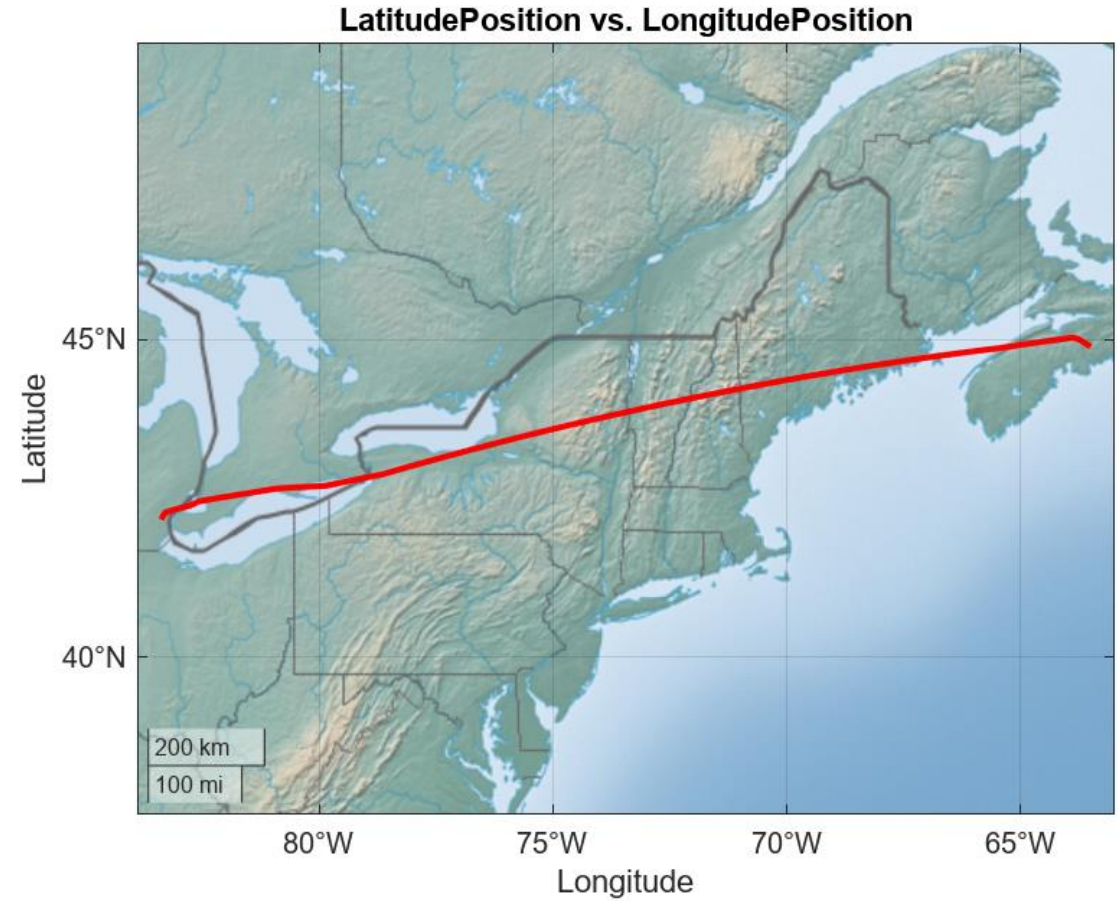
- Shallow learning curve
- Teach *how* to code
- Solve task first, code later

Not just for beginners



Case Study: Modeling Flight Sensor Data

- **Objective:**
 - Create a virtual sensor model for non-observable or costly-to-observe states
- **Inputs:**
 - Excel file with 13 sensors from 1 flight
- **Approach:**
 - Visualize and explore data
 - Clean sensor anomalies
 - Train regression model to predict state
 - Share results in a report
- **Source:**
 - [NASA Dash Link: Sample Flight Data](#)



Demo

- See attached MATLAB docs
- If you want to review the training content, go to online training video
 - <https://ww2.mathworks.cn/en/videos/low-code-data-analysis-with-matlab-1676562237481.html>

Using MATLAB in your research work

Google Scholar
fama french MATLAB

Articles
About 2,860 results (0.08 sec)

Any time

Since 2020

Since 2019

Since 2016

Custom range...

Sort by relevance

Sort by date

☒ include patents
☒ include citations

☒ Create alert

[HTML] A New **Fama-French** 5-Factor Model Based on SSAEPD Error and GARCH-Type Volatility

W Zhou, L Li - *Journal of Mathematical Finance*, 2016 - scirp.org

... The data we analyze are the monthly returns from the **Fama-French** 25 value-weighted portfolios for US stock market, which are the same as data used in **Fama** and **French** (2015). The descriptive statistics of sample data are calculated by **MatLab** and listed in Table 3. For each ...

☆ 99 Cited by 8 Related articles All 4 versions »

[HTML] Analysis of US Sector of Services with a New **Fama-French** 5-Factor Model

Q Yang, L Li, Q Zhu, B Mizrach - *Applied Mathematics*, 2017 - scirp.org

... 2) Can this new model explain services industry better than the 5 factor model in **Fama** and **French** (2015)? To answer these questions, we run simulation to test the validity of **MatLab** program used in this paper. Then, the industry of services in US are analyzed ...

☆ 99 Cited by 9 Related articles All 4 versions »

[HTML] Testing the CAPM theory based on a new model for **Fama-French** 25 portfolio returns

L Li, Q Gan, Z Zhuo, B Mizrach - *Theoretical Economics Letters*, 2014 - scirp.org

... Is the CAPM theory in Sharpe (1964), Lintner (1965) and Mossin (1966) still alive? Returns of **Fama-French** 25 stock portfolios (1926-2011) are analyzed ... Akaike Information Criterion (AIC) is used for model comparison. Simulation results show the **MatLab** program is valid ...

☆ 99 Cited by 3 Related articles All 4 versions »

The conditional relation between **Fama-French** betas and return

S Koch, C Westheide - *Schmalenbach Business Review*, 2013 - Springer

... FAMA-FRENCH BETA AND US RETURN ...

- Search your keywords + MATLAB
- You'll find the thesis of your topic and MATLAB is used

MATLAB Installation Guide

@ln.edu.hk

- Use your campus email address (****@***.edu.cn): Sign up for a MathWorks account
www.mathworks.com/mwaccount/register
- Download the installation package:
 - On-campus download
 - MathWorks website: <https://www.mathworks.com/downloads>
- Installation
 - Run the installation package
 - Select **MATLAB (Individual)** license
 - Select toolboxes products you need to install
 - Follow the prompts to continue the installation until the installation is complete



Scan the QR code to follow the
MATLAB official account for more
learning and technical resources



MATLAB Installation Video

You only install the toolboxes that are relevant to your study

- Go to MathWorks.com
- Under “Products”
- Scroll down to “Application Products”
- You can certainly search by key words if you know what you are looking for

The screenshot shows the MathWorks website navigation bar with the 'Products' link circled in red. Below the navigation bar, the 'Products and Services' section is visible, with 'Products by Category' selected. The 'MATLAB® PRODUCT FAMILY' and 'SIMULINK® PRODUCT FAMILY' are shown. The 'Products and Services' section is repeated, and the 'APPLICATION PRODUCTS' section is circled in red. Below this, the 'Signal Processing' and 'RF and Mixed Signal' categories are listed with their respective toolboxes.

MathWorks® Products Solutions Learn ▾ Comparisons

Products and Services

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Polyspace Test
Polyspace Access
Polyspace Code Prover Server
Polyspace Client for Ada
Polyspace Server for Ada

APPLICATION PRODUCTS

Signal Processing

Signal Processing Toolbox
DSP System Toolbox

RF and Mixed Signal

Antenna Toolbox
RF Toolbox

MATLAB Learning Resources

All Onramps – MATLAB Courses



MATLAB Onramp
2 hours



Object-Oriented Programming Onramp
2 hours



App Building Onramp
1 hour



Optimization Onramp
1 hour



Computer Vision Onramp
2 hours



Reinforcement Learning Onramp
2.5 hours



Curve Fitting Onramp
1.5 hours



Signal Processing Onramp
1.5 hours



Deep Learning Onramp
2 hours



Statistics Onramp
1.5 hours



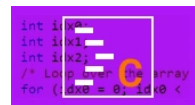
Image Processing Onramp
2 hours



Wireless Communications Onramp
1 hour



Machine Learning Onramp
2 hours



MATLAB Coder Onramp
1 hour

All Onramps – Simulink Courses



Simulink Onramp
2 hours



Circuit Simulation Onramp
2 hours



Control Design Onramp with Simulink
1 hour



Power Electronics Simulation Onramp
1 hour



Power Systems Simulation Onramp
1.5 hours



Simscape Battery Onramp
1 hour



Simscape Onramp
1.5 hours



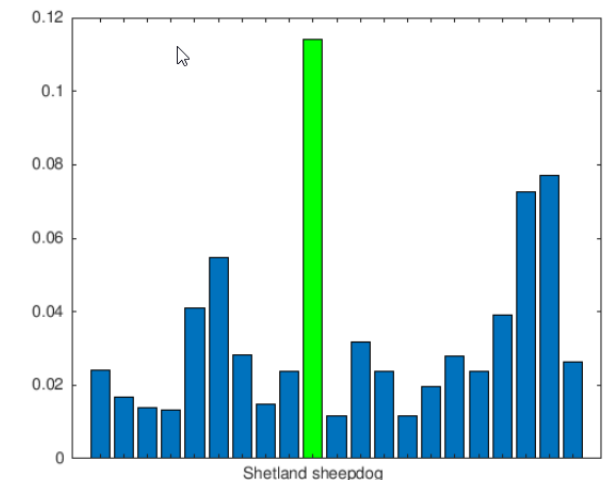
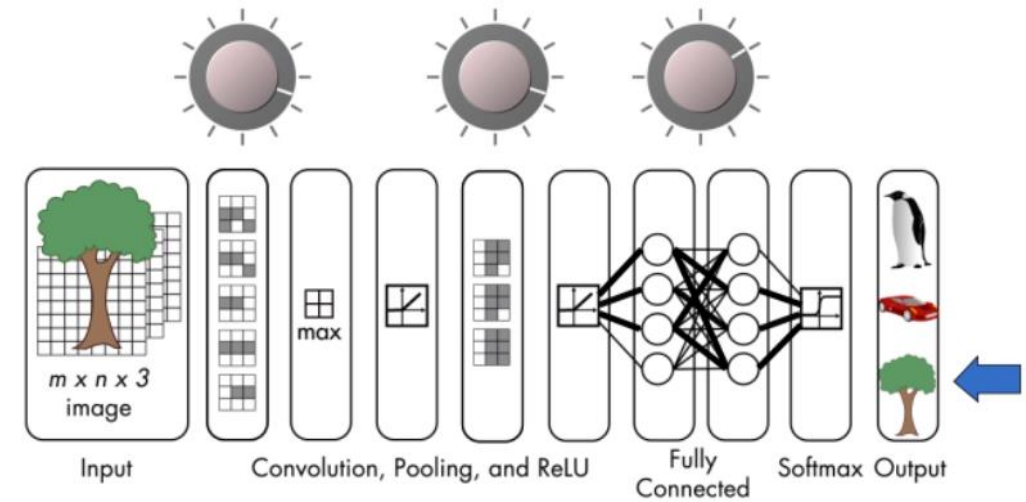
Stateflow Onramp
2 hours



System Composer Onramp
1 hour

Deep Learning Onramp

- Learn the basics of deep learning in 2 hours
- Free access to everyone
- Hands-on exercises and short video demonstrations
- Work on real life image recognition problems
- Topics include:
 - Convolutional neural networks
 - Working with pre-trained networks
 - Transfer learning
 - Evaluating network performance



MATLAB 入门之旅

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matlabacademy.mathworks.com/R2020a/cn/portal.html?course=gettingstarted#chapter=2&lesson=1§ion=1

☆

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📱 应用

📁 Life

📁 Windows

📁 MathWorks

📁 Resources

📁 Inside Links

📁 Student Competit...

📁 Outside Links

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📁 PDE

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📁 Temp

← 我的课程

MATLAB 入门之旅 (100% 完成)

Tim Chen 👤 ?

← 上一节 | 下一节 →

☰ 2.1 输入命令

任务 1

您可以通过在命令行窗口中 MATLAB 提示符 (>>) 后输入命令，然后按 **Enter** 键来执行命令。

任务

使用命令 `3*5` 将数值 3 和 5 相乘。

提示

答案

任务 2

任务 3

任务 4

任务 5

任务 6

任务 7

附加练习

HOME

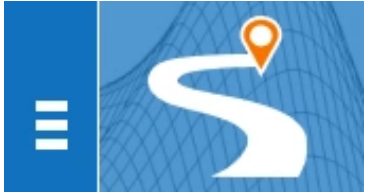
任务 1

>>

工作区

名称	值	大小
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Learning Paths

Included in OTS

- Curated content to support specific workflows and learning goals
- Provide a structured learning journey
- Courses are presented in a recommended order but can be taken in any order



Advanced MATLAB Programming Skills



Build MATLAB Proficiency



Core MATLAB Skills



Data Analysis in MATLAB



Handle Inconsistent and Unstructured Data Files



MATLAB for the MathWorks Certified MATLAB Associate Exam



MATLAB Skills for Simulink Modeling



Organize Tabular Data in MATLAB



Programming in MATLAB



Software Development in MATLAB



Visualization in MATLAB



Programming in MATLAB

LEARNING PATH

Increase the automation of your analysis, algorithm development, and modeling workflows.

Topics covered:

- Creating informative scripts
- Programming constructs for automation
- Custom functions for code organization

Recommended prerequisite:



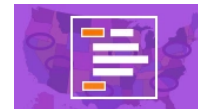
MATLAB Onramp
2 hours



MATLAB Desktop Tools and Troubleshooting Scripts
1 hour



Programming Constructs
2 hours



The How and Why of Writing Functions
1 hour



Long-Form Courses

Included in OTS

- Content goes beyond the basics
- Can take complete courses or shorter modules
- Good preparation for taking more advanced instructor-led training
- Equivalent in length to learning paths



Simulink Fundamentals
8 Hours



Image Processing with MATLAB
6 Hours



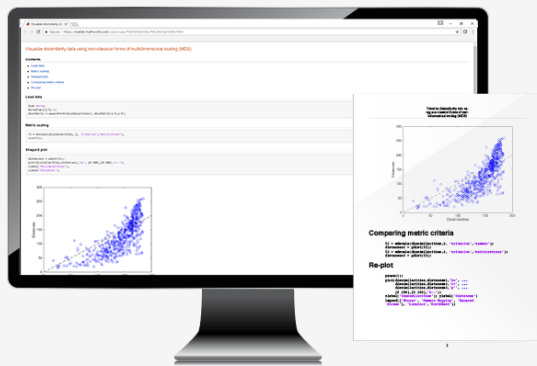
Signal Processing with MATLAB
11 Hours



Deep Learning with MATLAB
7 Hours

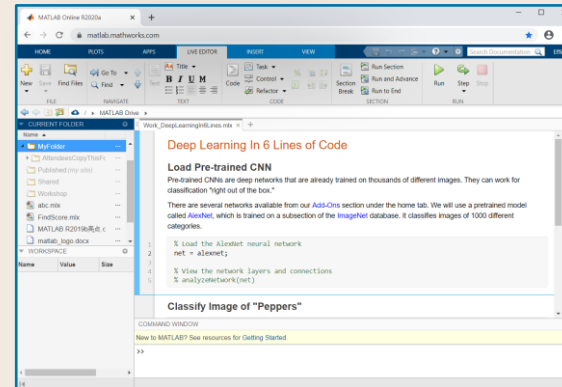
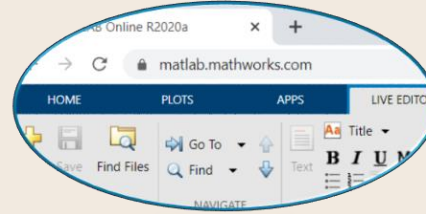


Machine Learning with MATLAB
11.5 Hours



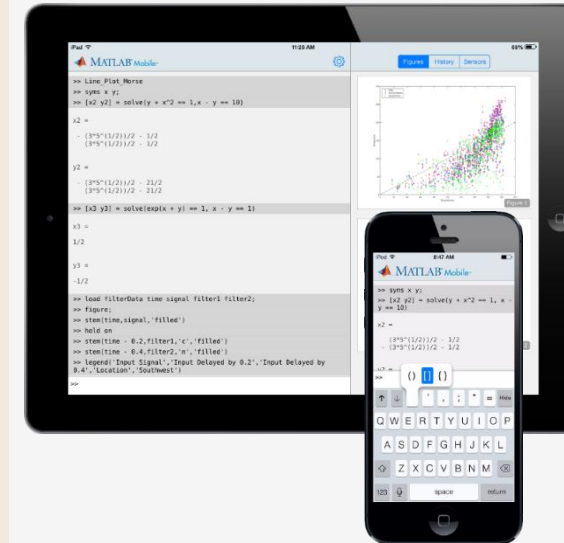
MATLAB
Desktop version

www.mathworks.com/downloads/



MATLAB Online
Browser version

matlab.mathworks.com



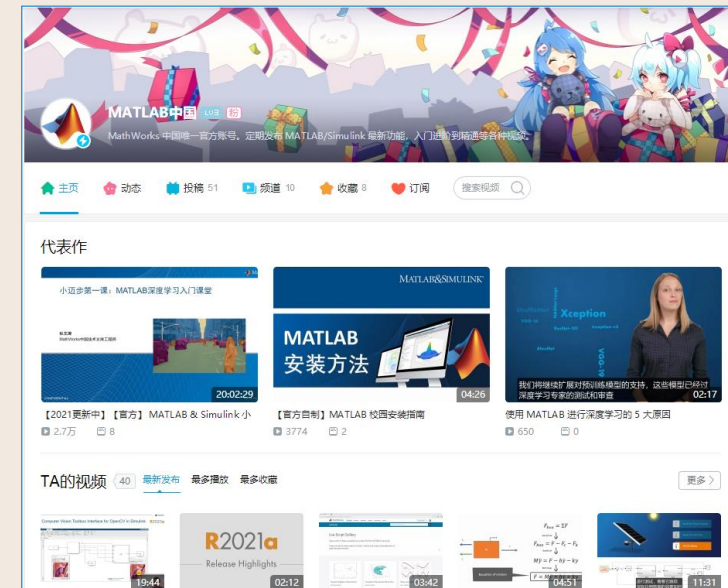
MATLAB Mobile
Mobile/Pad version





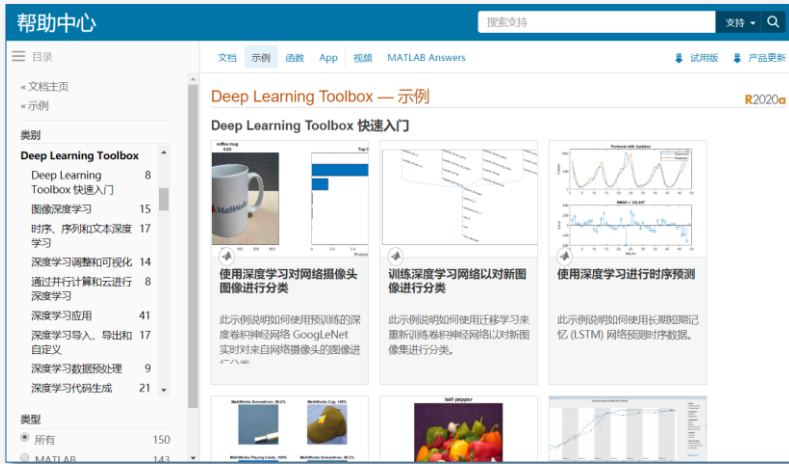
Official website video library
More than 2,800 technical video resources.

cn.mathworks.com/videos/search.html



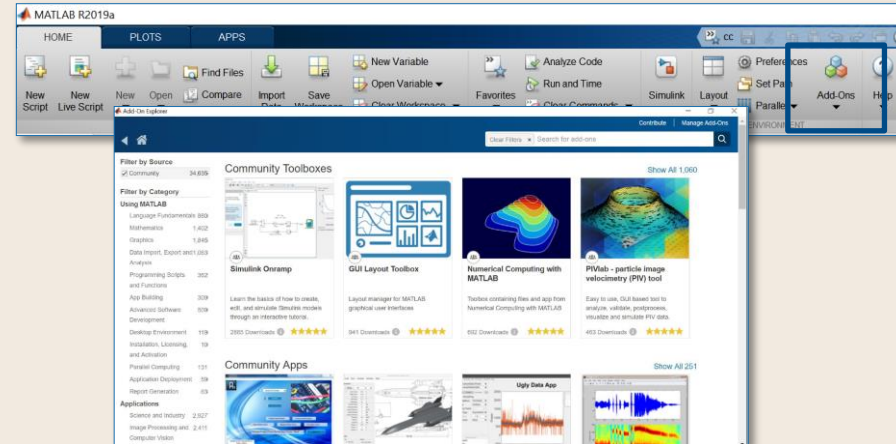
Bilibili
Popular technical short films, including
Chinese translation

<https://space.bilibili.com/1768836923>



MATLAB Help Examples

cn.mathworks.com/help/examples.html



MATLAB Add-Ons

MATLAB > Add-Ons

MATLAB Grader

<https://grader.mathworks.com/>



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