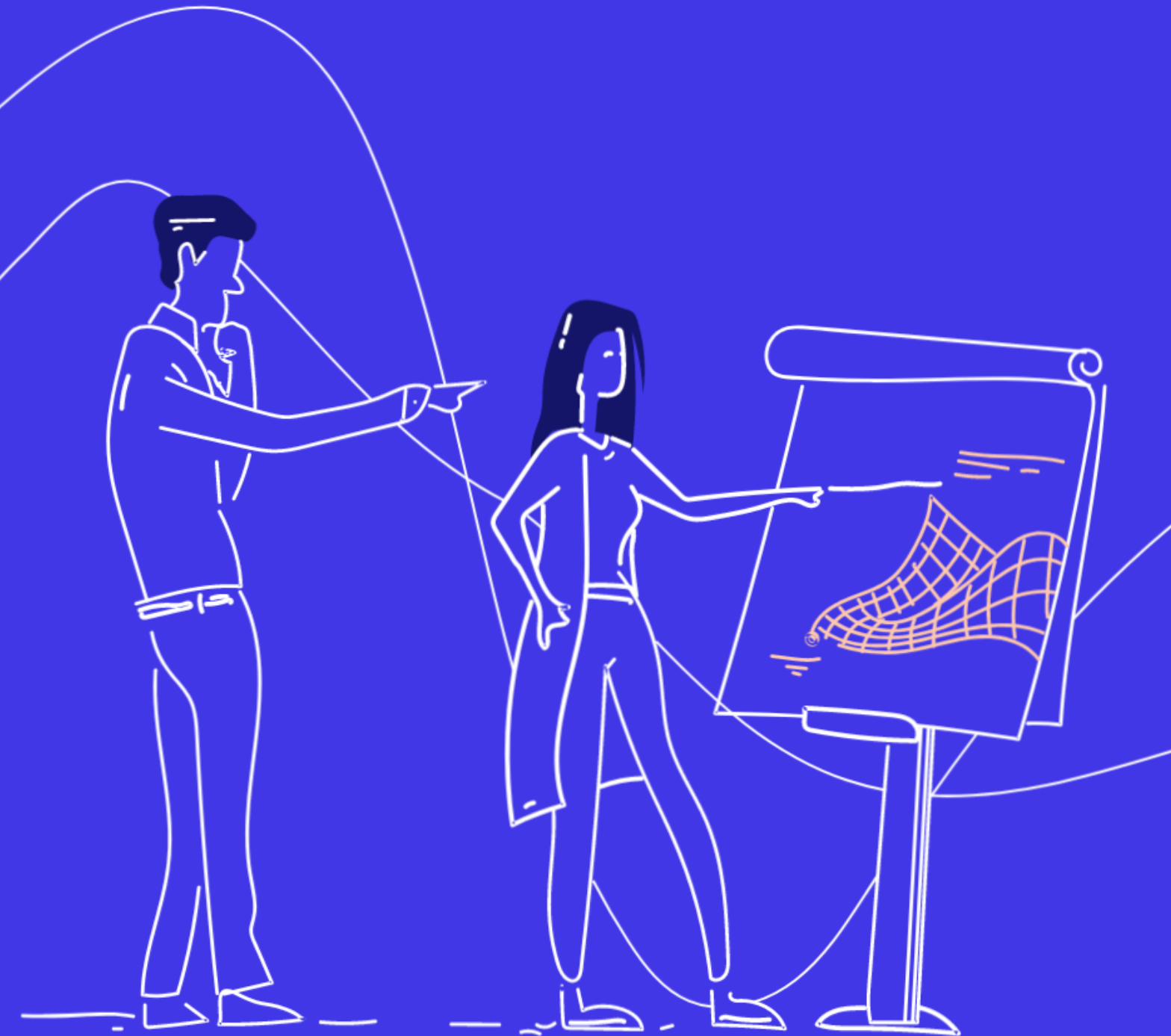# AI and Data Science Curriculum

SciEngineer's training courses are designed to help organizations and individuals close skills gaps, keep up-to-date with the industry-accepted best practices and achieve the greatest value from MathWorks® and COMSOL® Products.

Foundation / Core MATLAB

MATLAB Fundamentals
(3 Days)

MATLAB for Data Processing and Visualization
(1 Day)

Processing Big Data with MATLAB
(1 Day)

Building Interactive Applications in MATLAB
(1 Day)

Code Efficiency

MATLAB Programming Techniques
(2 Days)

Accelerating and Parallelizing MATLAB Code
(2 Days)

Object-Oriented Design with MATLAB
(2 Days)

Image & Video Processing

Image Processing with MATLAB
(2 Days)

Computer Vision with MATLAB
(1 Day)

Statistics, Machine, and Deep Learning

Machine Learning with MATLAB
(2 Days)

Deep Learning with MATLAB
(2 Days)

Statistical Methods in MATLAB
(2 Days)

Wavelet Analysis with MATLAB
(1 Day)

Signal Preprocessing and Feature Extraction for Data Analytics with MATLAB
(1 Day)

MATLAB Fundamentals

This three-day course provides a comprehensive introduction to the MATLAB technical computing environment. Themes of data analysis, visualization, modeling, and programming are explored throughout the course. This course is intended for beginning users and those looking for a review.

Prerequisites

Undergraduate-level mathematics and experience with basic computer operations.

Detailed course outline »

DURATION

3 Days

LEVEL

Basic

TOPICS

Day 1

- Working with the MATLAB User Interface
- Variables and Commands
- Analysis and Visualization with Vectors

Day 2

- Analysis and Visualization with Matrices
- Tables of Data
- Conditional Data Selection
- Organizing Data

Day 3

- Analyzing Data
- Increasing Automation with Programming Constructs
- Increasing Automation with Functions

MATLAB for Data Processing and Visualization

This one-day course focuses on importing and preparing data for data analytics applications. Topics discussed include importing data from multiple sources, processing data, producing informative customized graphics and working with irregular data.

Prerequisites

MATLAB Fundamentals

Detailed course outline »

DURATION | LEVEL
1 day | Medium

TOPICS

Day 1

- Importing Data
- Processing Data
- Customizing Visualizations
- Working with Irregular Data

Processing Big Data with MATLAB

This one-day course focuses on adapting existing algorithms to work with a dataset that is too big to fit in memory. You will learn represent big data in MATLAB, adjust existing code to work efficiently with it, and scale up the analysis to take advantage of your own computing resources or a cloud.

Prerequisites

MATLAB for Data Processing and Visualization, or equivalent experience using MATLAB

Detailed course outline »

DURATION

1 day

LEVEL

Medium

TOPICS

Day 1

- Prototyping Big Data Algorithms
- Handling Custom Data and Algorithms
- Working with Clusters and Clouds

Building Interactive Applications in MATLAB

Prerequisites

This one-day course demonstrates how to create an interactive user interface for your applications in the App Designer environment. You will learn about user interface controls, responsive components, extra dialog windows and how to use them to create a robust and user-friendly interface for your MATLAB app. No prior experience of programming graphical interfaces is required.

MATLAB Fundamentals

Detailed course outline »

DURATION

1 Day

LEVEL

Medium

TOPICS

Day 1

- Using the App Designer Environment
- Creating and Updating Plots
- Creating Responsive Components
- Managing Multiple Windows and Apps

MATLAB Programming Techniques

This two-day course provides hands-on experience using the features in the MATLAB language to write efficient, robust, and well-organized code. These concepts form the foundation for writing full applications, developing algorithms, and extending built-in MATLAB capabilities. Details of performance optimization, as well as tools for writing, debugging, and profiling code are covered.

Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB

Detailed course outline »

DURATION | LEVEL

2 Days | Medium

TOPICS

Day 1

- Structuring Data
- Managing Data Efficiently
- Utilizing Development Tools

Day 2

- Creating Robust Applications
- Structuring Code
- Verifying Application Behavior

Accelerating and Parallelizing MATLAB Code

This two-day course covers a variety of techniques for making your MATLAB code run faster. You will identify and remove computational bottlenecks using techniques like pre-allocation and vectorization. In addition, you will compile MATLAB code into MEX-files using MATLAB Coder. On top of that, you will take advantage of multiple cores on your computer by parallelizing for-loops with Parallel Computing Toolbox and scale up across multiple computers using MATLAB Parallel Server.

Prerequisites

MATLAB Fundamentals, or equivalent experience using MATLAB

Detailed course outline »

DURATION

2 Days

LEVEL

Medium

TOPICS

Day 1

- Improving Performance
- Generating MEX-Files
- Parallelizing Computations

Day 2

- Parallel for-Loops
- Offloading Execution
- Working with Clusters
- GPU Computing

Object-Oriented Programming with MATLAB

This two-day course focuses on using object-oriented programming techniques to develop and maintain complex MATLAB applications. The main topics are creating custom data types, desingining a MATLAB class, building class hierarchies, facilitating multiple references, writing unit tests and syncronizing objects.

Prerequisites

MATLAB Programming Techniques or equivalent experience using MATLAB

Detailed course outline »

DURATION

2 Days

LEVEL

Medium

TOPICS

Day 1

- Creating Custom Data Types
- Designing a MATLAB Class
- Building Class Hierarchies

Day 2

- Facilitating Multiple References
- Writing Unit Tests
- Synchronizing Objects

Image Processing with MATLAB

This two-day course provides a comprehensive introduction of reference-standard algorithms and workflow for image processing, analysis, visualization and algorithm development. Examples and exercises demonstrate the use of appropriate MATLAB and Image Processing Toolbox functionality throughout the analysis process.

Prerequisites

- MATLAB Fundamentals or equivalent experience using MATLAB.
- Basic knowledge of image processing concepts is strongly recommended.

Detailed course outline »

DURATION

2 Days

LEVEL

Medium

TOPICS

Day 1

- Importing and Visualizing Images
- Preprocessing Images
- Color and Texture Segmentation
- Improving Segmentation

Day 2

- Finding and Analyzing Objects
- Detecting Edges and Shapes
- Spatial Transformation and Image Registration
- Automating Image Registration with Image Features

Computer Vision with MATLAB

This one-day course provides hands-on experience with performing computer vision tasks with MATLAB and Computer Vision System Toolbox.

Topics included: importing, displaying and annotating videos, detecting objects, estimating direction and strength of motion, tracking objects, removing lens distortion and measuring planar objects.

Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB. Image Processing with MATLAB and basic knowledge of image processing and computer vision concepts.

Detailed course outline »

DURATION

1 Day

LEVEL

Medium

TOPICS

Day 1

- Importing, Visualizing, and Annotating Videos
- Detecting Objects
- Estimating Motion
- Tracking Objects
- Camera Calibration

Statistical Methods in MATLAB

This two-day course focuses on performing statistical data analysis with MATLAB and Statistics and Machine Learning Toolbox. Examples and exercises demonstrate the use of appropriate MATLAB and Statistics and Machine Learning Toolbox functionality throughout the analysis process; from importing and organizing data, to exploratory analysis, to confirmatory analysis and simulation.

Prerequisites

MATLAB Fundamentals and knowledge of basic Statistics and Machine Learning Toolbox.

Detailed course outline »

DURATION

2 Days

LEVEL

Medium

TOPICS

Day 1

- Importing and Organizing Data
- Exploring Data
- Distributions
- Hypothesis Tests

Day 2

- Analysis of Variance
- Regression
- Working with Multiple Dimensions
- Random Numbers and Simulation

Wavelet Analysis with MATLAB®

This one-day course shows how to use Wavelet Toolbox™ to perform wavelet analysis on signals. After motivating time-frequency analysis of time-varying signals using wavelets, both continuous and discrete wavelet-based techniques are covered. A background in signal processing is highly recommended for this course.

Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB®; signal processing background is highly recommended.

Detailed course outline »

DURATION

1 Day

LEVEL

Medium

TOPICS

Day 1

- Continuous Wavelet Analysi
- Discrete Wavelet Analysis

Signal Preprocessing and Feature Extraction for Data Analytics with MATLAB

This one-day course shows how to preprocess time-based signals and extract key features in the time and frequency domains. This course focuses on creating, importing, visualizing signals, preprocessing to improve data quality and extracting features in the time and frequency domains. No prior knowledge on signal processing is needed for this course.

Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB

Detailed course outline »

DURATION

1 day

LEVEL

Medium

TOPICS

Day 1

- Explore and Analyze Signals (Time Series) in MATLAB
- Preprocess Signals to Improve Data Set Quality
- Extract Features from Signals

Machine Learning with MATLAB

This two-day course focuses on data analytics and machine learning techniques in MATLAB using functionality within Statistics and Machine Learning Toolbox and Deep Learning Toolbox. The course demonstrates the use of unsupervised learning to discover features in large data sets and supervised learning to build classification, predictive and regressive models and neural networks.

Prerequisites

MATLAB Fundamentals

Detailed course outline »

DURATION | LEVEL
2 Days | Medium

TOPICS

Day 1

- Importing and Organizing Data
- Finding Natural Patterns in Data
- Building Classification Models

Day 2

- Improving Predictive Models
- Building Regression Models
- Creating Neural Networks

Deep Learning with MATLAB

This two-day course provides a comprehensive introduction to create, train, and evaluate different kinds of deep neural networks. This course focuses on convolutional neural networks and long short-term memory networks to perform classification, regression, forecasting, solving custom problems and improving the performance.

Prerequisites

MATLAB Fundamentals and Deep Learning with Onramp

Detailed course outline »

DURATION

2 Days

LEVEL

Medium

TOPICS

Day 1

- Transfer Learning for Image Classification
- Interpreting Network Behavior
- Creating Networks
- Training a Network

Day 2

- Improving Network Performance
- Performing Image Regression
- Using Deep Learning for Computer Vision
- Classifying Sequence Data
- Generating Sequences of Output

The Value of an Experienced Training Expert

Our training courses are developed by MathWorks' team of training engineers with exclusive product knowledge gained from working closely with product developers. They acquire significant hands-on experience by using new products months before they are released and are always current on new capabilities.

Learn Relevant Skills

Each course contains a set of learning objectives designed to help participants quickly master necessary skills. Our hands-on approach allows participants to practice, apply, and evaluate their knowledge in the classroom.

Receive Expert Instruction

Our training employs industry-accepted best practices for adult learning and technical instruction, and has developed course content that facilitates a "Presentation, Practice, Test" approach to learning. All training engineers have been selected based on their theoretical knowledge, technical education, experience, and teaching ability.

Increase Team Success Rates

According to post-training surveys, teams who receive 40 hours of training meet project objectives three times as often as those who receive 30 hours or less. This increase in training time raises the likelihood of meeting objectives by 90%.

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