Predictive Maintenance with MATLAB

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.

Predictive Maintenance with MATLAB

This two-day course focuses on data analytics, signal processing, and machine learning techniques needed for predictive maintenance and condition monitoring workflows. You will learn how to use MATLAB to import data, extract features, and estimate the condition and remaining useful life of equipment.

Prerequisites

MATLAB Fundamentals

DURATION	LEVEL
2 days	Medium
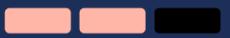
TOPICS

Day 1

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

Day 2

- Exploring and Analyzing Signals
- Preprocessing Signals to Improve Data Set Quality and Generate Features
- Estimating Time to Failure

Importing Data and Processing Data

Finding Natural Patterns in Data

Building Classification Models

OBJECTIVE: Bring data into MATLAB and organize it for analysis, including handling missing values. Process raw imported data by extracting and manipulating portions of data.

OBJECTIVE: Use unsupervised learning techniques to group observations based on a set of condition indicators and discover natural patterns in a data set.

OBJECTIVE: Use supervised learning techniques to perform predictive modelling for classification problems. Evaluate the accuracy of a predictive model.

- Store data using MATLAB data types
- Import with datastores
- Process data with missing elements
- Process big data with tall arrays

- Find natural clusters within data
- Perform dimensionality reduction
- Evaluate and interpret clusters within data

- Classify with the Classification Learner app
- Train classification models from labeled data
- Validate trained classification models
- Improve performance with hyperparameter optimization

Exploring and Analyzing Signals

Estimating Time to Failure

Preprocessing Signals to Improve Data Set Quality and Generate Features

OBJECTIVE: Interactively explore and visualize signal processing features in data.

OBJECTIVE: Explore data to identify features and train decision models to predict remaining useful life.

OBJECTIVE: Learn techniques to clean signal sets with operations such as resampling, removing outliers, and filling gaps. Interactively generate and rank features.

- Import, visualize, and browse signals to gain insights
- Make measurements on signals
- Compare multiple signals in the time and frequency domains
- Perform interactive spectral analysis
- Extract regions of interest
- Generate MATLAB scripts for automation

- Select condition indicators
- Use lifespan data to estimate remaining useful life using survival models
- Use run-to-threshold data to estimate remaining useful life using degradation models
- Use run-to-failure data to estimate remaining useful life using similarity models

- Use resampling to handle nonuniformly sampled signals
- Fill gaps in uniformly sampled signals
- Perform resampling to ensure common time base across signals
- Use the Signal Analyzer app to design and apply filters
- Use File Ensemble Datastore to import data
- Use the Diagnostic Feature Designer app to automatically generate and rank features
- Perform machinery diagnosis using envelope spectrum
- Locate outliers and replace with acceptable samples
- Detect changepoints and perform automatic signal segmentation