Predictive Maintenance Toolbox™ Release Notes

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The MathWorks, Inc.
3 Apple Hill Drive
Natick, MA 01760-2098

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Contents

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New Features

Survival, similarity, and time-series models for remaining useful life (RUL) estimation

Remaining useful life (RUL) is the expected value of time to failure conditional on the history of the component known by sensor measurements and auxiliary output information.Predictive Maintenance Toolbox™ provides similarity models, degradation models, and survival models for RUL estimation. For more information on these types of RUL estimation, see “Models for Predicting Remaining Useful Life”.

Time, frequency, and time-frequency domain feature extraction methods for designing condition indicators

A condition indicator is a feature of system data whose behavior changes in a predictable way as the system degrades or operates in different operational modes. Such features are useful for distinguishing normal from faulty operation or for predicting remaining useful life.Predictive Maintenance Toolbox supplements existing functionality in MATLAB® and Signal Processing Toolbox™with additional functions that can be useful for designing condition indicators. For more information, see “Condition Indicators for Monitoring, Fault Detection, and Prediction”.

Managing and labeling of sensor data imported from local files, Amazon S3, Windows Azure Blob Storage, and Hadoop Distributed File System

You may have collected measurements on systems using sensors for healthy operation or faulty condition and stored them in local files, cloud storage platforms or in distributed file systems. You can organize, read, and manage such measured data using the `fileEnsembleDatastore` object and use it for designing your predictive maintenance algorithms. For more information, see “File Ensemble Datastore With Measured Data”.

Managing and labeling of simulated machine data from Simulink models

Instead of data from physical systems, you may have a Simulink® model that represents a range of healthy and faulty operating conditions. The `generateSimulationEnsemble` function helps you generate such data from your model. Then use the `simulationEnsembleDatastore` object to organize, read, and manage the data for designing your predictive maintenance algorithms. For more information, see “Generate and Use Simulated Data Ensemble”.

Examples for developing predictive maintenance algorithms for motors, gearboxes, batteries, and other machines

This release includes the following examples on data generation, fault detection and diagnosis, and RUL prediction:

- Data Generation
  - “Using Simulink to Generate Fault Data”
  - “Multi-Class Fault Detection Using Simulated Data”
- Fault Detection and Diagnosis
  - “Rolling Element Bearing Fault Diagnosis”
  - “Fault Diagnosis of Centrifugal Pumps using Steady State Experiments”
  - “Fault Diagnosis of Centrifugal Pumps using Residual Analysis”
  - “Fault Detection Using an Extended Kalman Filter”
  - “Fault Detection Using Data Based Models”
  - “Detect Abrupt System Changes Using Identification Techniques”
- Prediction
  - “Similarity-Based Remaining Useful Life Estimation”
  - “Wind Turbine High-Speed Bearing Prognosis”
  - “Condition Monitoring and Prognostics Using Vibration Signals”
  - “Nonlinear State Estimation of a Degrading Battery System”