Contribution ID: **83** Type: **not specified**

Comparing statistical and machine learning models for predictive maintenance in solar power plants

Tuesday, June 28, 2022 4:50 PM (20 minutes)

In solar power plants, high reliability of critical assets must be ensured—these include inverters, which combine the power from all solar cell modules. While avoiding unexpected failures and downtimes, maintenance schedules aim to take advantage of the full equipment lifetimes. So-called predictive maintenance schedules trigger maintenance actions by modelling the current equipment condition and the time until a particular failure type occurs, known as residual useful lifetime (RUL). However, predicting the RUL of an equipment is complex since numerous error types and influencing factors are involved. This work compares statistical and machine learning models to predict inverter RULs using sensor and weather data. Our methods provide relevant information to perform maintenance before the failure occurs and hence, contribute to maximising reliability.

We present two distinct data handling and analysis pipelines for predictive maintenance: The first method is based on a Hidden Markov model, which estimates the degree of degradation on a discrete scale of latent states. The multivariate input time series is transformed using PCA to reduce dimensionality. After extracting features from time series data, the second method pursues a machine learning approach by using regression algorithms, such as random forest regressors. Both methods are assessed by their abilities to predict the RUL from a random point in time prior to failure. Further, we discuss qualitative aspects, such as the ability to interpret results. We conclude that both approaches have practical merits and may contribute to an optimised decision on maintenance actions.

Keywords

Predictive maintenance, Machine Learning, Feature Extraction, Hidden Markov Model, Time series data

Primary authors: GEDDE-DAHL, Gøran Sildnes (NMBU); Mr BIRKHOLZ, Heiko (Scatec ASA)

Co-author: Dr SCHRUNNER, Stefan (Norwegian University of Life Science)

Presenter: GEDDE-DAHL, Gøran Sildnes (NMBU)

Session Classification: CONTRIBUTED Reliability 3 + Mining

Track Classification: Reliability