World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:15, No:01, 2021

Feature Analysis of Predictive Maintenance Models

Authors : Zhaoan Wang

Abstract : Research in predictive maintenance modeling has improved in the recent years to predict failures and needed maintenance with high accuracy, saving cost and improving manufacturing efficiency. However, classic prediction models provide little valuable insight towards the most important features contributing to the failure. By analyzing and quantifying feature importance in predictive maintenance models, cost saving can be optimized based on business goals. First, multiple classifiers are evaluated with cross-validation to predict the multi-class of failures. Second, predictive performance with features provided by different feature selection algorithms are further analyzed. Third, features selected by different algorithms are ranked and combined based on their predictive power. Finally, linear explainer SHAP (SHapley Additive exPlanations) is applied to interpret classifier behavior and provide further insight towards the specific roles of features in both local predictions and global model behavior. The results of the experiments suggest that certain features play dominant roles in predictive models while others have significantly less impact on the overall performance. Moreover, for multi-class prediction of machine failures, the most important features vary with type of machine failures. The results may lead to improved productivity and cost saving by prioritizing sensor deployment, data collection, and data processing of more important features over less importance features.

Keywords : automated supply chain, intelligent manufacturing, predictive maintenance machine learning, feature engineering, model interpretation
Conference Title : ICMDM 2021 : International Conference on Mechanical and Digital Manufacturing
Conference Location : New York, United States
Conference Dates : January 28-29, 2021