TRACK 3: 4TH INDUSTRIAL REVOLUTION

"CONTEXT-DRIVEN FAILURE PREDICTION ALGORITHM FOR PREDICTIVE MAINTENANCE OF AIRCRAFT ENGINES"

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ABSTRACT

DA-STC has developed the Context-Driven Failure Prediction engine for predictive maintenance of CFM 56-7 engines from Boeing 737NG aircraft.

Information on engine condition was extracted from 2 years' worth of unstructured text data in maintenance logs for 182 engine serial numbers using Natural Language Processing, before being combined with the time-series sensor data from the same engines to provide time-based contextual labelling of sensor behavior. Using the time of occurrences of defects (as recorded in the maintenance log) as the reference points, sensor data preceding the defects were sliced in order to identify the trends and patterns that can be used to predict a future occurrence of the same defects.

Using the data slices, machine learning models were trained for time-series regression and to classify and predict various failure modes simultaneously. Decision Trees, Adaptive Boosting, and multiple neural network-based models were used to construct the context-driven prediction-detection engine, while ensemble techniques were used to predict future sensor behavior for the time-series regression model.

This Context-Driven Failure Prediction engine can predict the engine condition and possible failures 5-85 flight cycles in advance, at 70-85% precision and recall accuracy, with the potential to save significant operational costs for airlines and MRO providers.

BIOGRAPHY OF SPEAKER

Dr Lee Saeil is a Principal Data Scientist at Data Analytic Strategic Technology Center (DA STC) of ST Engineering. He has a Ph. D in Mechanical and Aerospace Engineering from Seoul National University, researching on design optimization of axial compressor blade using artificial neural network to enhance the aerodynamic and structural performance. After completing his Ph. D, he joined National University of Singapore (NUS) as a research fellow, working on aeroelastic optimization of aircraft wings. He is now applying data science and analytics on several projects in the areas of predictive maintenance, anomaly detection, and optimization.

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