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Predictive Maintenance in Aerospace Industry Using Convolutional Neural Network
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Abstract
Predictive maintenance offers many benefits compared to reactive and preventive maintenance. Reactive maintenance is often cosidered too late due to its characteristic to fix failure after the failures happened and preventive maintenance is considered too early in maintenance process due to its characteristic to substitute spareparts far before the failure happens. The benefit of predictive maintenance includes enhanced safety, reduced downtime, improved staff planning, reduced operational costs, enhanced asset management and improved regulatory compliances. This paper presents an approach of machine learning in predictive maintenance to improve the current corrective maintenance used in the aviation industry. The goal of this study is to develop a predictive failure model using Convolutional Neural Network (CNN) to provide an early detection of engine breakdown before its occurrence. The data used in the study is the data of the aircraft engine operation cycle measured by 21 sensors. The prediction of failure is made on the Remaining Useful Life (RUL) of the engine. The failure prediction results will be compared with Recurrent Neural Network (RNN) at the end of this paper to see whether the proposed approach could outperform the existing method being applied or not. The results showed that CNN achieved greater accuracy, precision, recall, and F1-score compared to Recurrent neural network (RNN) in failure prediction. The result shows that the proposed method accurately predicts the failures in the system with 98% of accuracy, 96% of precision and 96% of Recall. In conclusion, this study demonstrates that employing a Convolutional Neural Network (CNN) for predictive maintenance in the aviation industry significantly enhances failure prediction accuracy, thereby contributing to improved safety and operational efficiency. © 2024 IEEE.

Author Keywords
aircraft engine; convolution neural network; corrective maintenance; long short-term memory; machine learning; predictive maintenance; recurrent neural network

Index Keywords
Aerospace industry, Aircraft engine manufacture, Chemical plants, Convolutional neural networks, Cost reduction, Long short-term memory, Operating costs; Aviation industry, Convolution neural network, Convolutional neural network, Corrective maintenance, Failures prediction, Machine-learning, Neural-networks, Predictive maintenance, Reactive maintenance, Short term memory; Predictive maintenance

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