Machine Learning-Based Predictive Analytics For Aircraft Engine

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LITERATURE SURVEY

TITLE	Failure Prediction of Aircraft Equipment Using Machine Learning with a Hybrid Data Preparation Method
AUTHORS	Kadir Celikmih, Onur Inan , and Harun Uguz
YEAR OF PUBLICATION	12 January 2020
ABSTRACT	Reliability and availability of aircraft components have always been an important consideration in aviation. Accurate prediction of possible failures will increase the reliability of aircraft components and systems.)e scheduling of maintenance operations help determine the overall maintenance and overhaul costs of aircraft components. Maintenance costs constitute a significant portion of the total operating expenditure of aircraft systems.
METHODOLOGY	Data Mining
MERITS	Accuracy - 0.9316 while using LR and SVR, Comparing multiple models to select the best.
DEMERITS	Consume more time using ReliefF and K - means in data preparation.
OVERCOME DEMERITS	Manually delete the fields which are less contributed.
LINK	https://pdfs.semanticscholar.org/1462/685c83d65bc9d99d9227c435e8035a902e7b.pdf

TITLE	Aircraft Engine Remaining Useful Life Prediction Framework for Industry.
AUTHORS	Hussein A. Taha, Ahmed H. Sakr, Soumaya Yacout.
YEAR OF PUBLICATION	October 23-25, 2019
ABSTRACT	The proposed model considers continuous learning and improvement to account for any further operational changes that affect the model prediction ability. This is reached by ingesting the model with the actual RUL during the maintenance of the engine unit, and by comparing it to the predicted one.
METHODOLOGY	Data Analysis and Data Mining
MERITS	Accuracy - 94% Comparing multiple algorithms.
DEMERITS	Need more DownTime.
OVERCOME DEMERITS	Use View which contains data stored before training, which leads to use the bw system while training and downtime required.
LINK	https://www.researchgate.net/publication/337311736_Aircraft_Engine_Remaining_Useful_Life_Prediction_Framework_for_Industry_40

TITLE	Predictive Maintenance of Aircraft Engine using Deep Learning Technique.
AUTHORS	Ade Pitra Hermawan, Dong-Seong Kim, Jae-Min Lee.
YEAR OF PUBLICATION	21 December 2020
ABSTRACT	In this paper, an accurate algorithm to estimate remaining useful life of aircraft engine is proposed. Since the aircraft engine has a low fault tolerant, meaning that a little faulty in the system can lead to catastrophic conditions, an accurate and real-time information about the engine condition is required. This paper utilizes the combination of CNN and LSTM algorithms in learning the behavior of the historical data and providing the accurate information about the time to failure of the system. The simulation results demonstrate that the proposed system is able to achieve improved performance in terms of accuracy rate and computing time compared to the previous works.
METHODOLOGY	Machine Learning
MERITS	Using Deep learning Increases the Accuracy and computing time.
DEMERITS	Didn't compare many algorithm to get the best.
OVERCOME DEMERITS	Compare more models with the same data.
LINK	https://ieeexplore.ieee.org/document/9289466/authors#authors

TITLE	A rare failure detection model for aircraft predictive maintenance using a deep hybrid learning approach.
AUTHORS	Maren David Dangut, Ian K. Jennions, Steve King & Zakwan Skaf.
YEAR OF PUBLICATION	Published: 26 March 2022
ABSTRACT	The use of aircraft operation logs to develop a data-driven model to predict probable failures that could cause interruption poses many challenges and has yet to be fully explored. Given that aircraft is high-integrity assets, failures are exceedingly rare. Hence, the distribution of relevant log data containing prior signs will be heavily skewed towards the typical (healthy) scenario. Thus, this study presents a novel deep learning technique based on the auto-encoder and bidirectional gated recurrent unit networks to handle extremely rare failure predictions in aircraft predictive maintenance modelling. The auto-encoder is modified and trained to detect rare failures, and the result from the auto-encoder is fed into the convolutional bidirectional gated recurrent unit network to predict the next occurrence of failure.
METHODOLOGY	Machine Learning and IOT
MERITS	High Accuracy, good recall and G-means.
DEMERITS	Didn't compare many algorithm to get the best.
OVERCOME DEMERITS	Compare more models with the same data.
LINK	https://link.springer.com/article/10.1007/s00521-022-07167-8

TITLE	Predictive Maintenance of the Aircraft Engine Bleed Air System Component
AUTHORS	Savitha Ramasamy, Yang Xue, Royston Phoon, Richard Han, Nelson Low and Chee Siang Lim.
YEAR OF PUBLICATION	September 2018.
ABSTRACT	This paper presents a predictive maintenance solution of an aircraft engine bleed air system component using machine learning approaches on aircraft Quick Access Recorder (QAR) data. However, when the QAR parameters are not sufficiently representative of the component health, it has been highlighted that there is a need to leverage on more data sources such as Smart Access Recorder (SAR) data.
METHODOLOGY	Analysis and Classification
MERITS	Good Accuracy in both training and Validating dataset.
DEMERITS	Using only one algorithm.
OVERCOME DEMERITS	Compare more models with the same data.
LINK	https://www.researchgate.net/publication/330357379_Predictive_Maintenance_of_the_Aircraft_Engine_Bleed_Air_System_Component