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Forecasting Fault Events for Predictive Maintenance using Data-driven Techniques and ARMA Modeling

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Abstract
Presently, airline maintenance scheduling does not take fault predictions into account, and happens at fixed time-intervals. This may result in unnecessary maintenance interventions and also in situations where components are not taken out of service despite exceeding their designed risk of failure. To address this issue we propose a framework that can predict when a component/system will be at risk of failure in the future, and therefore, systematically advise when maintenance actions should be taken. In order to facilitate such prediction, we employ an auto-regressive moving average (ARMA) model along with data-driven techniques, and compare the performance of multiple data-driven techniques. The ARMA model is intended to derive features that are used within the data-driven model to come up with the final prediction. The novelty of our work is the integration of the ARMA methodology with data-driven techniques to predict fault events. This study reports on a real industrial case of unscheduled removals of a critical valve of the aircraft engine. Results show that the proposed approach can outperform the Weibull life usage model on several evaluation measures such as absolute and percentage errors.

Keywords: Real Case Study; Aircraft Prognostics, Predictive Maintenance; Data-driven Techniques; ARMA Modelling; Life Usage Modelling;

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