Enhancing Aircraft Engine RUL Prediction: Interpretable Models and Bayesian Optimization

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Introduction

Maintenance scheduled by data analytics on historical data

- Enhance operational efficiency
- Sustainability and cost reduction by up to 40% [1]
- Competitive advantage
- **Safety at the forefront**

Figure: Turbine failure mid-flight [2]

Objectives

Develop a ML model to accurately estimate the Remaining Useful Life of a fleet of turbofan engines, applied to PHMAP 2021 dataset:

- **Efficient Modelling:** need for lower cost models
- **Model Interpretability:** understand predictions in critical scenarios
- **Confidence and prediction intervals:** provide measures of uncertainty

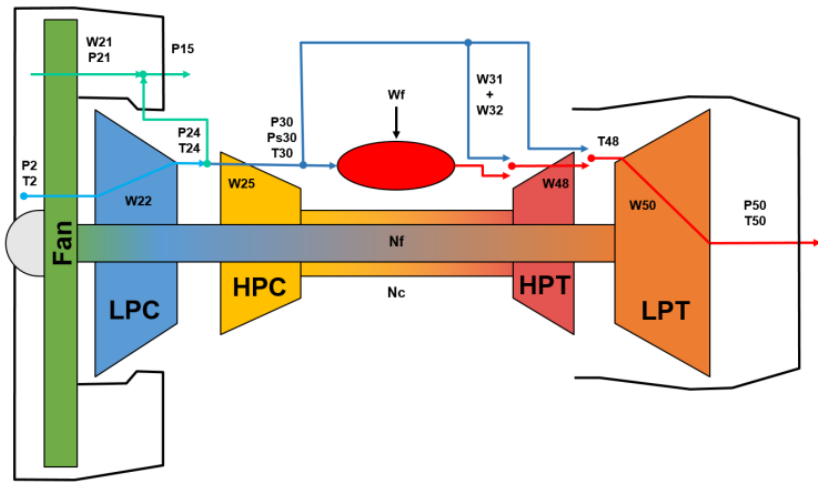

Figure: Schematics of a turbofan engine

Methodology

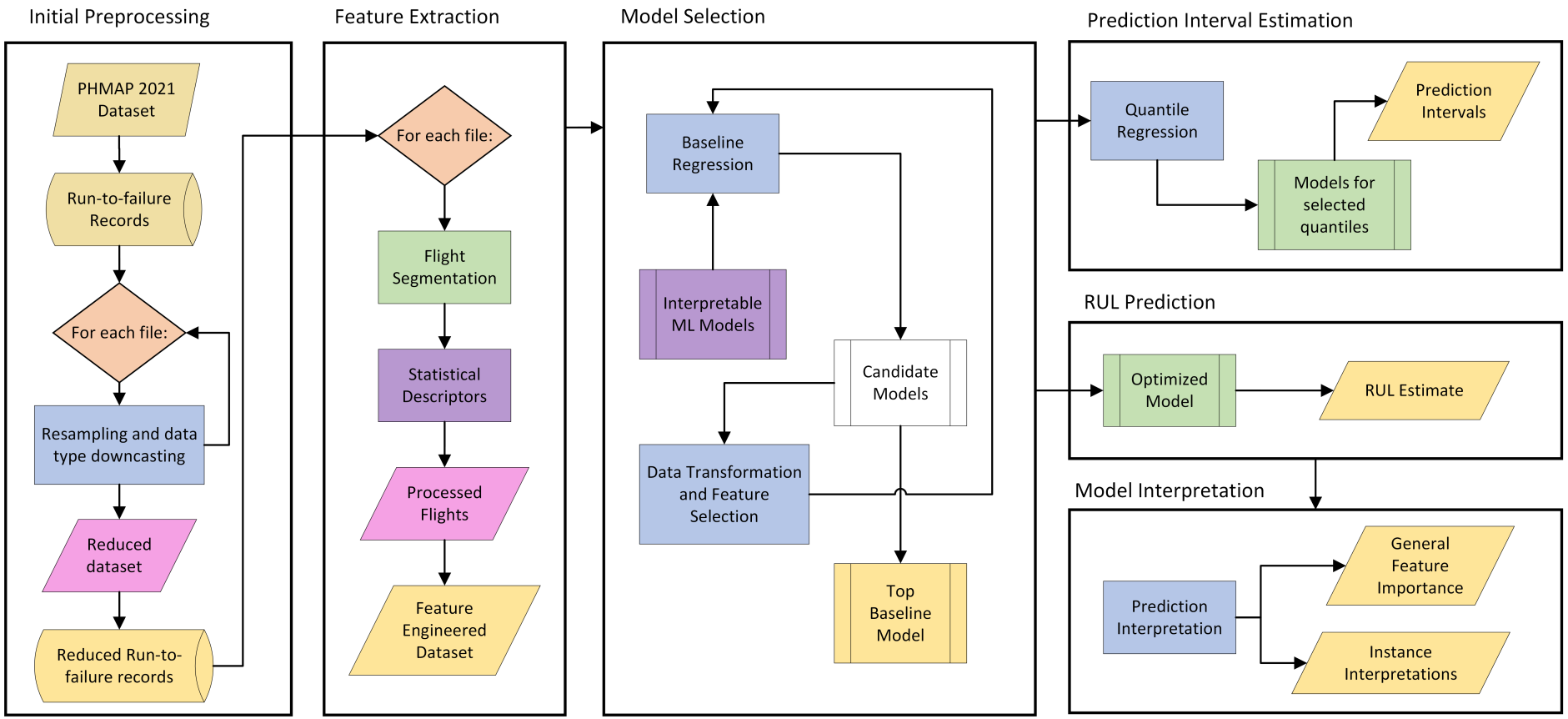

Figure: Proposed Methodology

Results

RUL / PI estimators

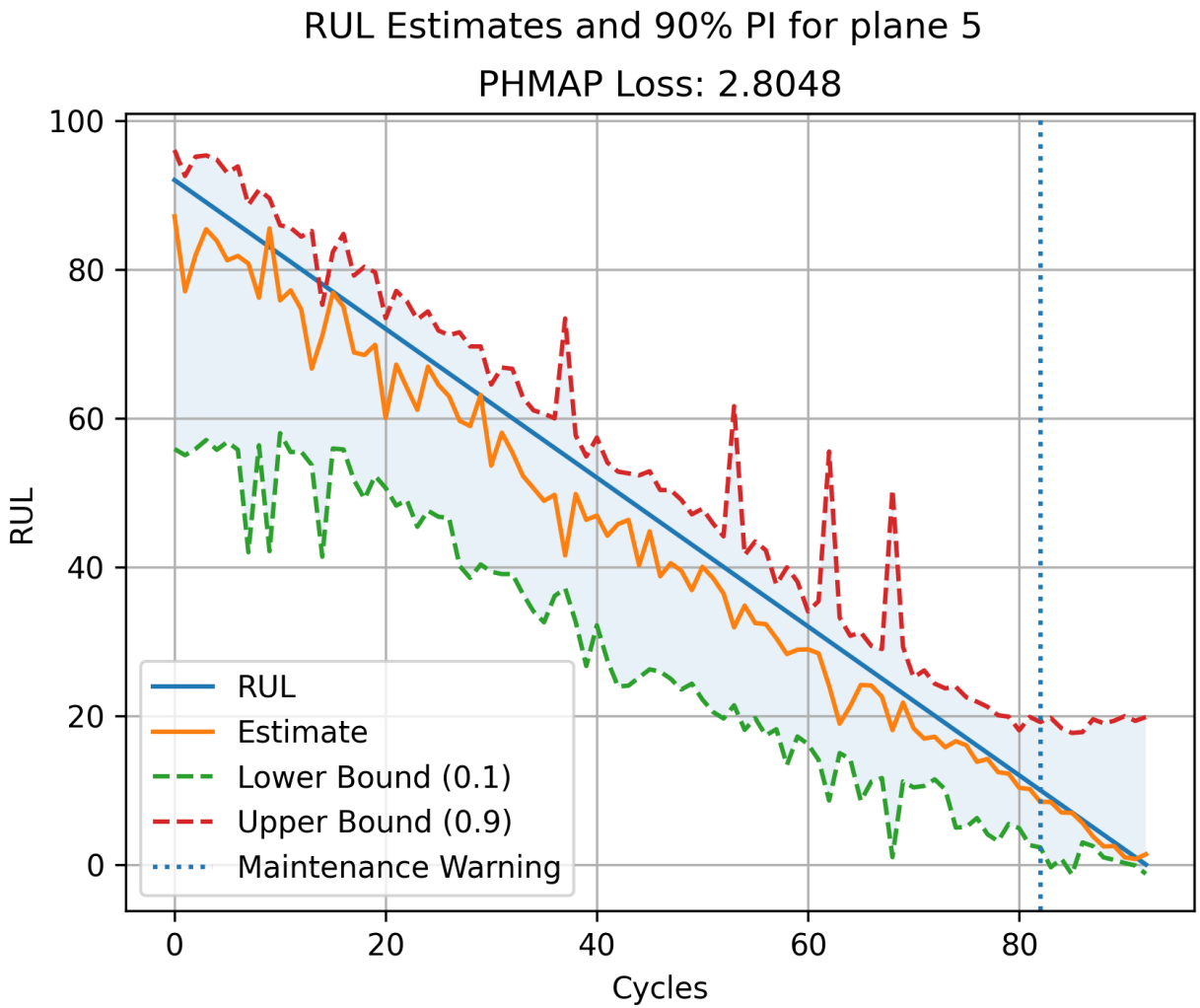

Figure: RUL estimates and PI for the operational life of a plane

Model Explainability

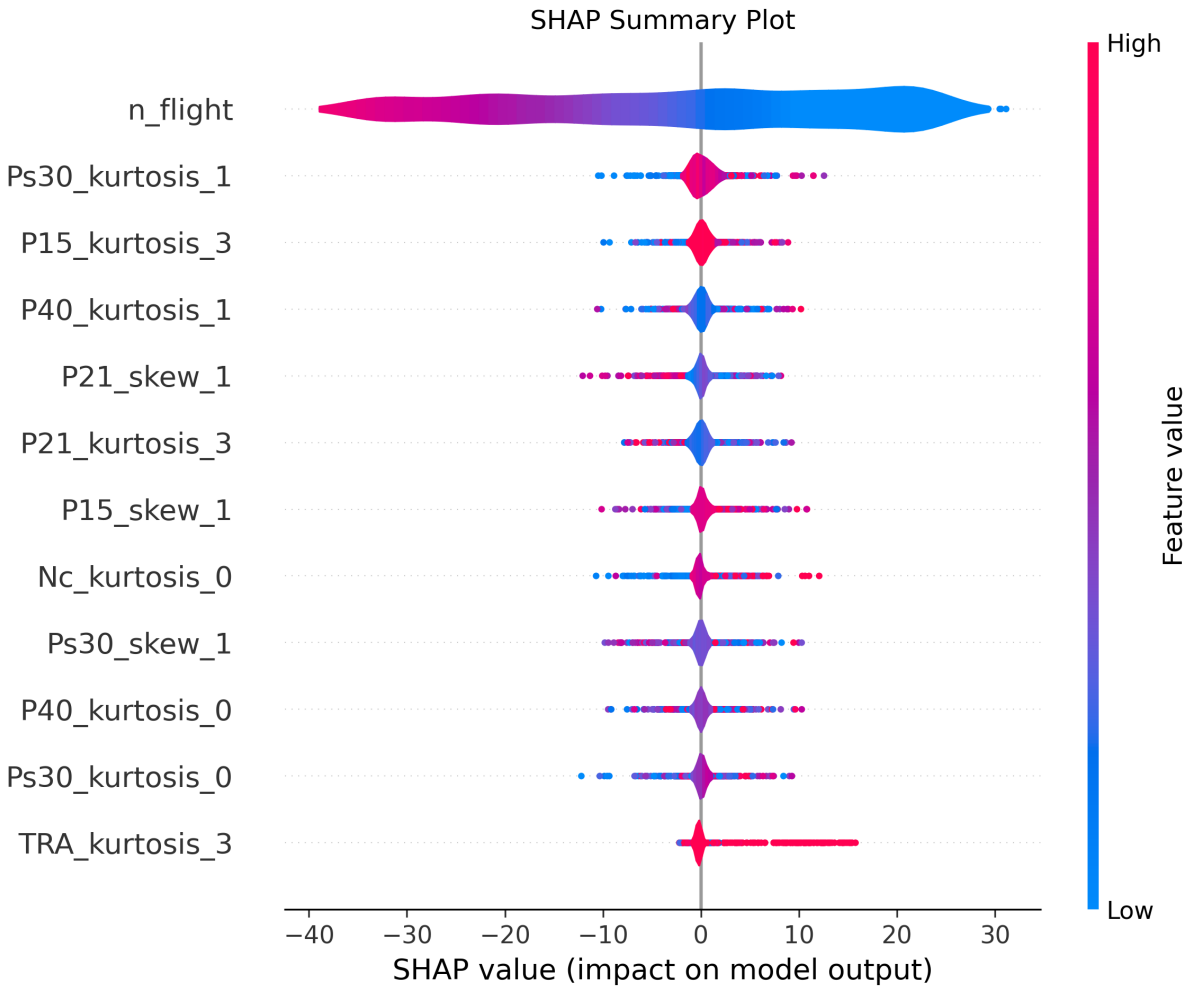

Figure: SHAP Summary Plot

References I

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