Project Report for ME 504

RUL Prediction of TurboFan Engine

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❖ Objective

To avoid the dreadful consequences of an engine failure, we need to build up a predictive maintenance model that can optimize the maintenance strategies by predicting an engine's **remaining useful life**. For better performance, machine learning algorithms will be used to predict the **RUL** of an aircraft's turbofan engine. Datasets for this model can be acquired from the **Prognostics Data Repository of NASA.** Test data set will also be used to compare with the actual results and improve accordingly.

❖ Results & Conclusion:

Final result (test data of engine-5):

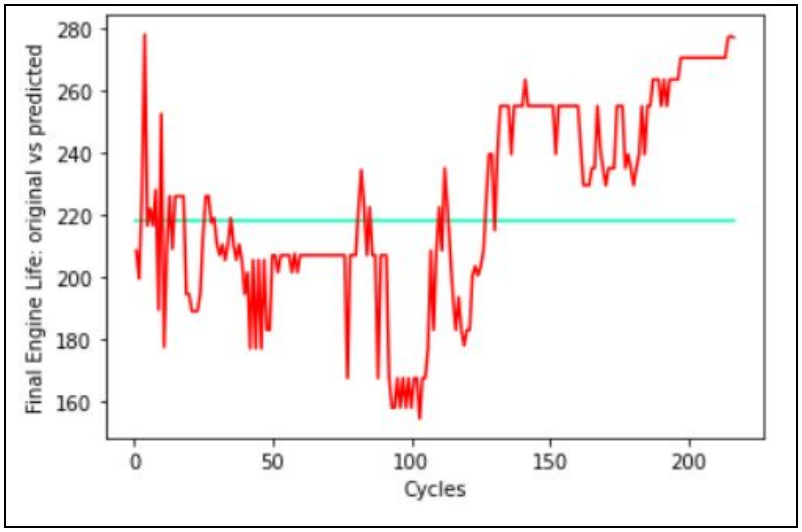

Figure 1: Red graph indicates the predicted total life of the engine

Mean Predicted Engine life = 223 cycles	Original Engine life = 218 cycles

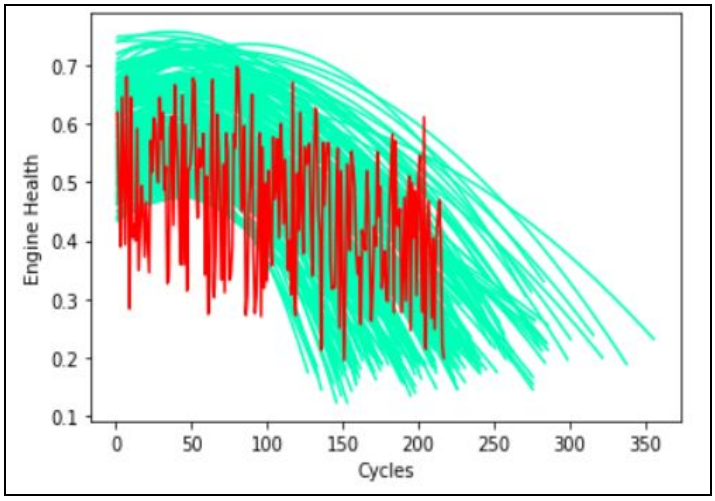

Figure 2: Red graph indicates the test data for engine-5

The key aim of our model is to define a new variable - Engine Health, using the given feature space in training data. Once we modeled the engine health, by weight prediction, of training data (as shown in green curves, in figure 2), we plot the test data (red graph). Then, we target the nearest 10 neighbours from training data, and compute their total engine life. Medians of these 10 engine lives will be our predicted engine life. This **similarity model** helps us to find resemblance between test data and training data, and hence computes the answer.

❖ Novelty

- **Time Series Data:** Instead of predefined values, time-variant data have been used in this model.
- **Unique Algorithm:** Linear Regression and KNN, which are usually used for predictions on discrete points were used to fit for time series data, in our model.
- **Cost:** Less computational cost, and easy to visualise solution.
- **Data Size**: With increasing input data, performance of our model enhances considerably.

❖ References:

- A. Saxena and K. Goebel (2008). "PHM08 Challenge Data Set", NASA Ames Prognostics Data Repository (http://ti.arc.nasa.gov/project/prognostic-data-repository), NASA Ames Research Center, Moffett Field, CA
- https://data.nasa.gov/dataset/Turbofan-engine-degradation-simulation-data-set/vrks-gjie
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