# HIGH LEVEL DOCUMENT

## Predictive Maintenance

### Domain: Aerospace

**Rajesh Gottoju**

# Contents

# Abstract

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In industry, prognostics and health management are key topics for anticipating asset state and avoiding downtime and breakdowns. Run-to-Failure simulation data from turbofan jet engines is included. The C-MAPSS software was used to simulate engine degradation. Four separate sets of operational conditions and fault modes were simulated in four different ways. To characterize fault progression, record numerous sensor channels. The Prognostics CoE at NASA Ames provided the data set. The main goal is to predict the remaining useful life (RUL) of each engine. RUL is equivalent of number of flights remained for the engine after the last data point in the test dataset.

# 1.Introduction

## Why these high-level Documentation

The purpose of High-level Documentation is to add the necessary detail to the current project description to represent a suitable model for coding. This document is also intended to help detect contradictions prior coding, and can be used as reference manual for how the modules interact at a high level.

### The HLD will:

- Present all of the design aspects and define them in detail
- Describe the user interface being implemented
- Describe the hardware and software interfaces
- Describe the performance requirements
- Include design features and the architecture of the project
- List and describe the non-functional attributes like:
    - o Security o Reliability
    - o Maintainability
    - o Portability
    - o Reusability
    - o Application compatibility
    - o Resource utilization
    - o Serviceability

## Scope

This software system will be a web application, this system will be designed to predict the RUL based on user's input.

# 2.General Description

## Product Prescriptive

This Predictive Maintenance is a Machine Learning model which will predict RUL

## Problem Statement

In industry, prognostics and health management are key topics for anticipating asset state and avoiding downtime and breakdowns. Run-to-Failure simulation data from turbofan jet engines is included. The C-MAPSS software was used to simulate engine degradation. Four separate sets of operational conditions and fault modes were simulated in four different ways. To characterize fault progression, record numerous sensor channels. The Prognostics CoE at NASA Ames provided the data set. The main goal is to predict the remaining useful life (RUL) of each engine. RUL is equivalent of number of flights remained for the engine after the last data point in the test dataset.

# Proposed Solution

This system requires like feature provided by the system like sensor_01, sensor_14, sensor_12, sensor13.etc

## Further Improvements

AS the data is not very huge our main is to complete this use case with deep learning algorithm as a best optimized solution, In future if we are expected to get more data and different categories, if needed we might use deep learning algorithm to get best solution.

## Data Requirements

Data requirements completely depend on our problem statement.

# Tools Used

- Python
- Stream lit
- Pandas

# Constraints

This project is based on Aero space domain, this system can get excepted results.

## Assumptions

The main objective of the project is to implement the use case as previously mentioned (2.2 problem statement). This system will help us to predict the

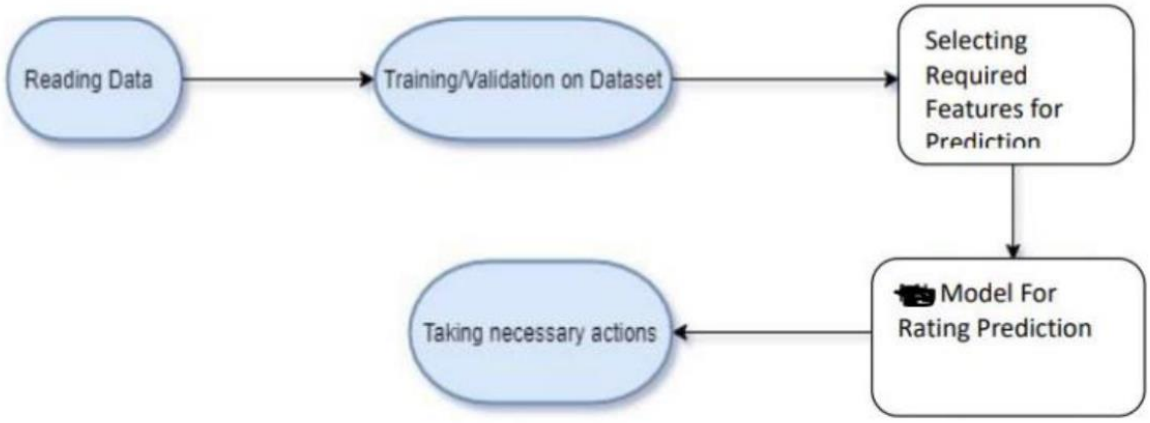
RUL

# 3.Design Details

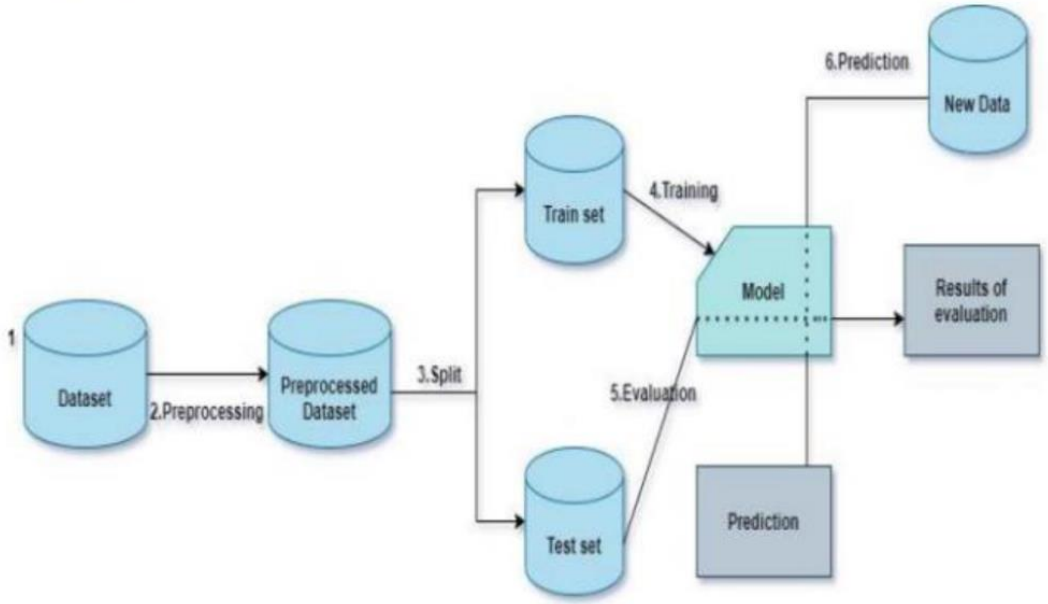
## Process Flow

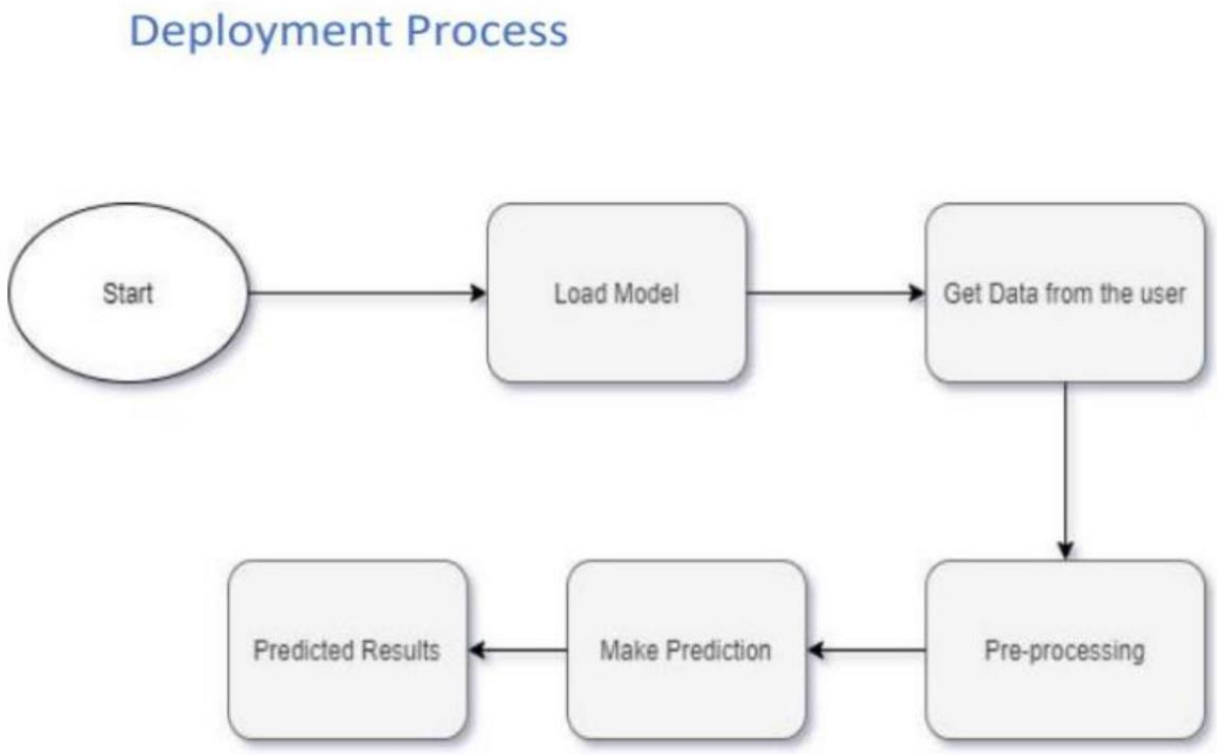
Based on the use-case, we will use a machine learning base model. Below the Process flow .

## Proposed Methodology




## Model Training and Evaluation






## Event Log

The system should log every event so that the user will know what process is running internally.

**Initial Step-step description:**

- The system identifies at what step logging required
- The system should be able to log each and every system flow.
- Developer can choose logging method. We chose File logging.
- System should not hang as we have used file logging. Logging just because we can easily debug issues so logging is mandatory to do.

## 4 Performance

### Reusability

The code written and the components used has the ability to be reused with no problems if there is similar problem statement.

### Application Compatibility

The different components for this project will be using Python as an interface between them. Each component will have its own task to perform, and it is the job of the Python to ensure proper transfer of information.

### Resource Utilization

When any task is performed, it will likely use all the processing power available until that function is finished.

## Deployment

- Stream lit

## Conclusion

This system predicts the RUL life time of an engine.