Weekly Progress Report

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Project Title: INTP22-ML-2 Remaining Usable Life Estimation (NASA Turbine dataset)

Obectives:

1. Understand the components and working of Turbo Engine.
2. Understand the dataset and analyze dataset
3. To learn about different Python libraries and their implementation.
4. To develop model for remaining usable life estimation.

Tasks done in this week:

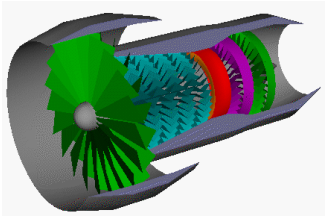
1. Background study (understood what is turbofan engine and its components)
2. Reading research papers on remaining usable life.
3. Gone through Damage propagation Models.
4. Started exploring Dataset.

With this project we will be trying to implement a machine learning model to estimate remaining usable life of a turbofan engine using Python and some libraries in Python.

In the starting of his I came to know about project allocation and internship selection. After knowing the project I started doing research about the problem statement. After spending some time on exploring problem statement I came to know that we will given one data set which consist of some information regarding the engine condition taken from different sensors.

Learning about Turbofan engine:

After searching about turbofan engine I came to know that it is the most modern variation of basic gas turbine engine. In the turbofan engine, the core engine is surrounded by a fan in the front and an additional turbine at the rear. The fan and fan turbine are composed of many blades, like the core compressor and core turbine, and are connected to an additional shaft.



Reading research papers on remaining usable life.

I have completed reading a research paper titled "Damage Propagation Modeling for Aircraft Engine Run-to-Failure Simulation" by Abhinav Saxena, Don Simon, and Neil Eklund . After reading this paper, I came to know that end-of-life can be subjectively determined as a function of operational threshold. Through this paper, I understood what is C-MAPSS and DAMAGE PROPAGATION MODELING . After that, I went through the models such as the Arrhenius model, the Coffin-Mason Mechanical Crack Growth Model, and the Eyring Model.

Understanding dataset:

Given dataset contains simulated data produced by a model-based simulation program, i.e. Commercial Modular Aero-Propulsion System Simulation (C-MAPSS), which was developed by NASA. The C-MAPSS dataset includes 4 sub-datasets that are composed of multi-viriate temporal data obtained from 20 sensors. Each sub-dataset contains one training set and one test set. The
Training datasets include run-to-failure sensor records of multiple aero-engines collected under different operational conditions and fault modes. Each engine unit starts with different degrees of initial wear and manufacturing variation that is unknown and considered to be healthy. As time progresses, the engine units begin to degrade until they reach the system failures, i.e. the last data entry corresponds to the time cycle that the engine unit is declared unhealthy. On the other hand, the sensor records in the testing datasets terminate at some time before system failure, and the goal of this task is to estimate the remaining useful life of each engine in the test dataset. For verification, the actual RUL values for the testing engine units are also provided.