To,
IITD-AIA Foundation of Smart Manufacturing

Subject: **Weekly Progress Report**

Dear sir,

Following is the required progress report to the best of my knowledge considering relevant topics to be covered.

What happened last week:

- Time Complexities and model efficiency in Machine learning
- AutoML and tools to understand the decision-making process of machines.
- Ensemble learning
- Time-Series Analysis
- Pre-processing the data

What's happening this week:

Weekly Progress:

Following are the topics I've brushed upon and intend to learn deeper with upcoming days.

June 26:

- Explored data and started pre-processing.
- Exploring the features which can be extracted meaningfully from the dataset.

June 27:

- Shortlisted the features to be extracted from the data.
- Features to be extracted can broadly be classified into:
    - Central tendency features
    - Dispersion
    - Spectrum
    - Multivariate

June 28:

- Learning in-depth about the transformation of the time domain charts.
- Fournier Transformation.
- Techniques used in Fourier Transformation.
- Power Spectral density

June 29:

- Performed Fourier Transformation of the given dataset.
- Plotted the time-domain and frequency-domain (PSD) charts of the data.
- Examined the Frequency plots and interpreting the results.

June 30:

- Learned about the how to improve the PSD interpretations as per the requirements of a particular use-case.
- Learned about the Welch's Method.
- Plotted the PSD using Welchs' method once again.
- It is more effective against the noice in data.

July 1:

- Learned about Hilbert-Huang transformation.
  It is another operation which can be used to analyze the instantaneous amplitude, frequency and phase of the data
- HTT is a technique which is more appropriate for the data which is Stationary.
  As it can be prone to noises in the data.
- Based on the Stats from our data, it appears to be non-stationary in the window applied in the Welch's method.

July 2:

- Dived a littler more into time-frequency analysis.
- Learned about the Morlet Wavelet.

Weekly Progress:

This week, I delved into realms of data pre-processing and analysis.
Learned a great deal about the measures which are taken to analyze the time-domain, frequency-domain and time-frequency domain charts. And how those charts are plotted using various techniques including Fourier Transformation, FFT, STFFT, Welch's method, etc.

This week's learning was focused on expanding my knowledge in machine learning, deep learning, and web development. I am excited about the progress made and look forward to applying these learnings in upcoming tasks.