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's happening this week:

- Pandas:
- NumPy:
- Scikit-Learn:
- PyTorch:

My understanding about INTP23-ML-3**:**

Predicting tool wear and surface roughness for a lathe machine

Scope:
In the manufacturing industry, optimizing tool usage, improving product quality, and enhancing overall efficiency are key objectives. One critical aspect of achieving these goals is the ability to predict tool wear and surface roughness for workpieces produced by a lathe machine. By leveraging machine learning techniques, it is possible to develop predictive models that analyze various process parameters, tool characteristics, and historical data to estimate tool wear progression and surface roughness accurately.

- **Understanding Tool Wear and Surface Roughness:**
  Tool wear refers to the gradual deterioration of a cutting tool due to contact with the workpiece during machining operations. Surface roughness, on the other hand, refers to the irregularities or deviations present on the surface of the machined workpiece. Both tool wear and surface roughness are critical indicators of the manufacturing process's performance, product quality, and tool life.
- **Improved Product Quality:** Surface roughness plays a significant role in determining the quality and functionality of machined workpieces. By predicting surface roughness, manufacturers can make informed decisions to improve the quality of finished products, reduce rejects, and enhance customer satisfaction.

Weekly Progress:

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

June 01:

- Pandas:
  Pandas is a powerful and widely-used data manipulation library in Python. Its primary usage revolves around handling structured data, such as tabular data or time series data.
- Data Manipulation:
- Data Preparation:
- Data Analysis and Exploration:
- Time Series Analysis:

June 02:

- NumPy:
  NumPy is a fundamental library for numerical computing in Python. It provides efficient multi-dimensional array operations and mathematical functions.
- Numerical Operations:
- Array Manipulation:
- Memory Efficiency: NumPy arrays are memory-efficient compared to Python lists, as they store homogeneous data types.
- Integration with other Libraries:

June 03:

- Scikit-learn:
  Scikit-learn is a comprehensive machine learning library in Python. It provides a wide range of algorithms and tools for machine learning tasks.
- Machine Learning Algorithms:
- Data Preprocessing and Feature Engineering:
- Model Evaluation and Validation:
- Hyperparameter Tuning:
- Integration with Other Libraries:

June 04:

- PyTorch:
  PyTorch is a popular deep learning library that provides a flexible and efficient platform for building and training neural networks. Supervised: classification, regression | Unsupervised: clustering
- Neural Network Construction:
- GPU Acceleration: