

To,

IITD-AIA Foundation of Smart Manufacturing

Subject: **Weekly Progress Report**

INTP23-ML-05: Equipment Failure Prediction for Predictive Maintenance

What is happening this week:

- Continued Learning more about Deep Learning
- Practicing on NASA Turbofan Jet Engine Dataset
- Working on CNC Mill ware Dataset
- Learning about implementation of ANN, CNN and LSTM
- Implementing CNN, ANN and LSTM models
- Trying about hybrid models and implementing them
- Read research paper to learn about techniques used by other researchers in this domain to solve the similar problems.
- Exploring the Lazy Predict Library
- Learning about K-fold Cross validation technique and implementing it to validate accuracy of models.

Implementing my learnings on CNC mill ware dataset. Learning about CNN, ANN, LSTM implementation on the dataset, from research work done in this domain. Splitting the data into 50% to 90 % and training the model Comparing the performance of the implemented models. Trying to implement hybrid models and did comparative analysis to understand more about the results we get from the implemented algorithms. Exploring the Lazy Predict Library.

Week 6

10th July:

- Learning from the shared resources of Deep Learning
- Practicing on NASA turbofan jet engine dataset
- Working on CNC mill ware dataset
- Visualizing data and learning important features/ condition which affect working of the machine
- Implementing classification Algorithms: CNN, LSTM
- Trying to improve accuracy of model
- trying to implement ensemble methods to improve accuracy
- Gone through some research papers on Predictive maintenance

11th July:

- Learning from the shared resources of Deep Learning
- Practicing on NASA turbofan jet engine dataset
- Working on CNC mill ware dataset
- Implementing ML and DL models: Gradient Boosting (LGBM, XGB), CNN, LSTM
- Trying to improve accuracy of model and comparing implemented models
- Learning about ensemble methods
- trying to implement ensemble method and trying to improve accuracy
- Gone through some research papers on Predictive maintenance
- Learning from Research paper on real world dataset for equipment failure prediction.

12th July:

- Learning from the shared resources of Deep Learning
- Practicing on CNC mill ware dataset
- Implementing deep learning models: ANN, CNN, LSTM
- Did comparative analysis of implemented algorithms
- Learning about ensemble methods
- trying to implement ensemble methods to improve accuracy
- Learning more about how to implement CNN, ANN and hybrid model on the real-world dataset

13th July:

- Learning from the shared resources of Deep Learning
- Learnt about implementing hybrid model
- Practicing on Nasa turbofan engine dataset
- trying to implement hybrid models and comparing with accuracy of traditional models
- Practicing on CNC mill ware dataset
- Implementing deep learning models: ANN, CNN, LSTM
- implementing ensemble methods
- trying multiple hybrid models and analyzing their accuracy
- Learning about K-fold cross validation technique

14th July:

- Learning from the shared resources of Deep Learning
- Implemented hybrid models and comparing with accuracy of traditional models (Nasa turbofan engine dataset)
- Practicing on CNC mill ware dataset
- Implementing deep learning models: ANN, LSTM
- implementing hybrid models to increase accuracy
- implementing k fold cross validation on implementing models to find best model

- Reading research paper and trying to understand the previous work done in this domain and the techniques used.

15th July:

- Learning from the shared resources of Deep Learning
- Practicing on Nasa turbofan engine dataset and summarized my learning
- Practicing on CNC mill ware dataset
- Implementing deep learning models: ANN, CNN
- Learning and implementing hybrid models
- implementing k fold cross validation on implemented models and finding best suited model
- Reading research paper to gain more insight about recent techniques and traditional techniques to handle real world dataset
- exploring Lazy Predict library

16th July:

- Learning from the shared resources of Deep Learning
- Practicing on Nasa turbofan engine dataset
- Practicing on CNC mill ware dataset
- Implementing deep learning models: ANN, CNN
- Learning and implementing hybrid models
- doing comparative analysis of implemented models
- implementing k fold cross validation on implemented models and finding best suited model
- Reading research paper to gain more insight about techniques to handle real world dataset
- Exploring Lazy predict library

REFERENCES:

1. Nacchia, M., Fruggiero, F., Lambiase, A., & Bruton, K. (2021). A systematic mapping of the advancing use of machine learning techniques for predictive maintenance in the manufacturing sector. *Applied Sciences*, 11(6), 2546.
2. [A hybrid predictive maintenance approach for CNC machine tool driven by Digital Twin -ScienceDirect](#)
3. [Quick Guide to CNC Machine Maintenance | Limble CMMS](#)
4. [LSTM for Predictive Maintenance on Pump Sensor Data | by Jan Werth | Towards DataScience](#)
5. [Understanding Long Short-Term Memory Recurrent Neural Networks – a tutorial-like introduction \(arxiv.org\)](#)
6. [Lazy Predict: fit and evaluate all the models from scikit-learn with a single line of code | by Eryk Lewinson | Towards Data Science](#)
7. [Usage — Lazy Predict 0.2.12 documentation](#)
8. [Lazy Predict Library |Lazy Predict - Best Suitable Model for You \(analyticsvidhya.com\)](#)