

To,
IITD-AIA Foundation of Smart Manufacturing

Subject: **Weekly Progress Report for Week 3**

Dear Sir,

Following is the weekly progress report dating from 19th to 15th of June, 2023. I went ahead and researched on shearing machine and practiced on Datasets for a clearer understanding of the things.

My Understanding of the Project: INTP23-ML-5: Equipment Failure Prediction for Predictive Maintenance

Predictive Maintenance is the procedure of using already existing data of various factors which might cause equipment failure and using those data available to us to predict when an equipment might fail in the future. It basically works on the principle of Condition Monitoring. Condition-monitoring tools combined with artificial intelligence and machine learning techniques forecast expected machine failure.

Predictive maintenance helps in:

- reducing maintenance costs
- maintenance scheduling and planning
- improving reliability.

With the help of such technologies, we can predict and perform maintenance activities without disrupting normal machine activities.

Weekly Progress:

19th June 2023:

Practiced on Mushroom Dataset and Boosting Algorithms.

- I went through the different types of Boosting Algorithms particularly XGBoost and AdaBoost
- I practiced via the Kaggle dataset on XGBoost since it's the simplest among the both and it has amazing functionalities.
- AdaBoost was a little difficult for me but since XGBoost comes in majority applications, hence I went ahead with that itself.

20th June 2023:

Read articles on how to focus and work on predictive maintenance

- I went through various articles to understand which model should be applied to which dataset and I understood the key values we need to look for to understand at how the data has been provided. We also need to understand if there is any relation between the different values when the equipment failed.
- I also understood the three main machine learning models for such predictive maintenance cases such as regression models, classification model, or flagging anomalies.

21st June 2023:

Read on FSM Shearing Machine PDF.

- Learned about the various sensors in use mainly Ferrous, Level, Proximity.
- I learned about Work Sequence of the Shearing Machine and Data Communication.
- I also explored Common Tags, Performance Tags, Process Tags, Maintenance Tags.
- I also went through its application and benefits.

22nd June 2023:

Explored and learned more about shearing machines

- I went through types of shearing machines like air shearing machine, hydraulic, mechanical, servo driven etc.
- I went through various videos about shearing machines and found some videos and learned about it.
- I also found an interesting Facebook video explaining how the shearing machine works.
- <https://www.youtube.com/watch?v=BrvwLVpwD6o&t=5s>

23rd June 2023:

Worked on the Largest University Dataset from Kaggle

- I went through the data columns and cleaned the data and looked for the various data types.
- Utilized Matplotlib functionalities to compare data parameters.
- Worked on the dataset using the Seaborn module to compare major parameters of the dataset.
- This dataset was used to form various comparison modules which were of significant help.

24th June 2023:

Learned on the basics of machine learning and the various models behind it.

- I went through the the various libraries like numpy, pandas, seaborn, matplotlib etc.
- Went through various other resources mentioned on the page.
- I also went through the notes for Regression, Classification, Decision Tree, Random Forest, KNN, SVM, Naive Bayes.
- <https://medium.com/analytics-vidhya/a-beginners-guide-for-getting-started-with-machine-learning-7ba2cd5796ae>

25th June 2023:

Practiced on Taxi Fare Prediction Dataset from Kaggle

- Implemented numpy, pandas, matplotlib, seaborn, sklearn etc.
- Implemented model using lightgbm and KFold.

GitHub Repository: <https://github.com/JehanPatel/FSM-INT-2023>

Universities Dataset

JehanPatel Add files via upload a90d359 · 19 minutes ago History

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```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
In [2]: data = pd.read_csv("C:\\Users\\91923\\Downloads\\Top-Largest-Universities.csv")
data.sample(5)
```

Out[2]:

	Rank	Institution	Location	Continent	Founded	Affiliation	Distance / In-Person	Enrollment	
	9	10	National Technological Institute of Mexico	Mexico	North America	1948 and 2014	Public	In-Person	620000
	4	5	Allama Iqbal Open University	Islamabad, Pakistan	Asia	1974	Public	Distance/In-Person	1027000
	33	34	Rajiv Gandhi Technical University	Bhopal, Madhya Pradesh, India	Asia	1998	Public	In-Person	260000
	17	18	California State University system	California, United States	North America	1857	Public	In-Person	479000
	69	70	National University of Córdoba	Córdoba, Argentina	South America	1613	Public	In-Person	113558

```
In [3]: data.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 84 entries, 0 to 83
Data columns (total 8 columns):
#   Column              Non-Null Count  Dtype
---
```

Taxi Fare Dataset

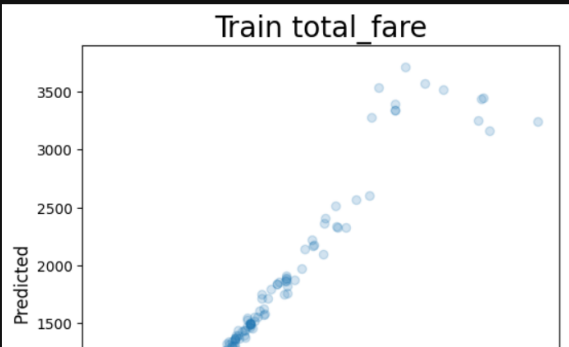
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```
c:\Users\91923\AppData\Local\Programs\Python\Python39\lib\site-packages\lightgbm\sklearn.py:736: UserWarning: 'verbose' argument is deprecated and will be removed in a future release of LightGBM. Pass 'log_evaluation()' callback via 'callbacks' argument instead.
_log_warning("'verbose' argument is deprecated and will be removed in a future release of LightGBM. ")
[500] valid_0's rmse: 4.99753
fit fold=4 12.619[s]
Fold 4 RMSLE: 4.8484

-----
FINISHED | Whole RMSLE: 7.0674
```


```
In [7]: for i in range(1):
fig, ax = plt.subplots(figsize=(6,6))
ax.set_title('Train ' + target[i], fontsize=20)
ax.set_ylabel('Predicted', fontsize=12)
ax.set_xlabel('Actual', fontsize=12)
ax.scatter(y, oof, alpha=0.2)
```



Shearing Machine


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