To,

IITD-AIA Foundation of Smart Manufacturing

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

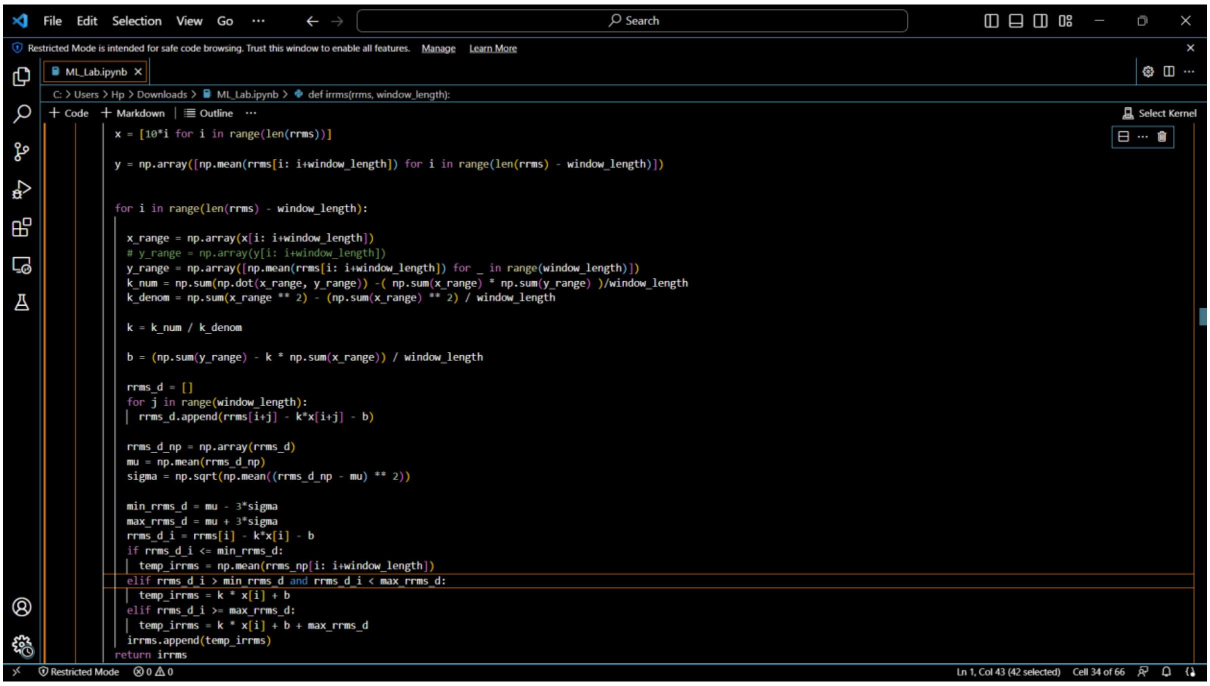
Dear Sir,

Based on my understanding and the topics covered, I have prepared the following progress report that addresses the relevant objectives of the project.

WEEK-3

19th Jun 2023

Continued my study on the SVM model and implemented some code that will help me to finding the RUL using bearing dataset.



20th Jun 2023

Learning:

Studied about principal component analysis(PCA) which will help me in dimensionality reduction technique. Its primary goal is to reduce the number of variables in a dataset while preserving the essential information contained in the original variables.

PCA will help me in the following :

- **Dimensionality reduction: PCA is commonly used to reduce the dimensionality of high-dimensional datasets, allowing for easier visualization, computational efficiency, and potential improvement in predictive modeling performance.**
- **Data visualization: PCA can be used to visualize complex datasets by projecting them onto a lower-dimensional space while retaining the most important information.**
- **Feature extraction: In some cases, the principal components themselves can be used as new features in a machine learning model, rather than using the original variables.**
- **Noise reduction: By discarding principal components that explain a small amount of variance, PCA can help reduce the impact of noisy or irrelevant variables in the data.**

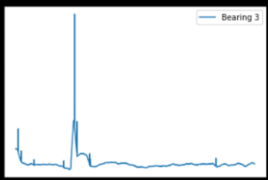
21th Jun 2023

Implemented some code and got some graph based on the bearing acceleration and movement.

Continued my study about predictive maintenance.

Here some images shown below about my work:

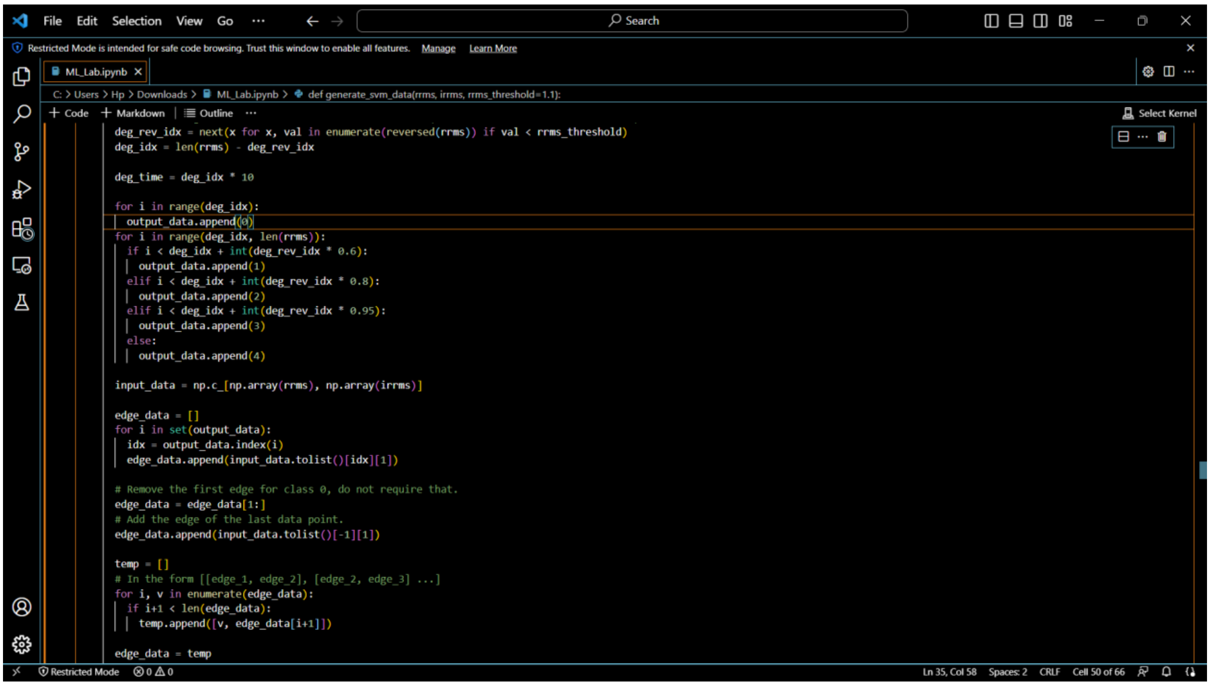
```python
plt.figure()
temp3, = plt.plot([i for i in range(len(irrms_3[:2000]))], list(irrms_3[:2000]))
plt.xlabel('Time')
plt.ylabel('IRRMS Horizontal acceleration')
plt.legend([ temp3], [ "Bearing 3"])
plt.show()
```




```python
plt.figure()
temp, = plt.plot([i for i in range(len(irrms_2[:2000]))], list(irrms_2[:2000]))
plt.xlabel('Time')
plt.ylabel('IRRMS Horizontal acceleration')
plt.legend([ temp], [ "Bearing 2"])
plt.show()
```

```python
y_rrms_array_1, x = fit_values(2.31e-5, 0.99, 1.10, 1.68e-93, 28.58, rrms_1)
temp1, = plt.plot(x, y_rrms_array_1)
y_irrms_array_1, x = fit_values(2.41e-5, 1.01, 1.08, 3.22e-86, 26.30, irrms_1)
temp2, = plt.plot(x, y_irrms_array_1)
plt.xlabel('Time')
plt.ylabel('RRMS and IRRMS Horizontal acceleration')
plt.title("Bearing 1")
plt.legend([temp1, temp2], [
        "RRMS", "IRRMS"])
plt.show()
```

```python
y_rrms_array_2, x = fit_values(2.31e-5, 0.99, 1.10, 1.68e-93, 28.58, rrms_2)
temp1, = plt.plot(x, y_rrms_array_2)
y_irrms_array_2, x = fit_values(2.41e-5, 1.01, 1.08, 3.22e-86, 26.30, irrms_2)
temp2, = plt.plot(x, y_irrms_array_2)
plt.xlabel('Time')
plt.ylabel('RRMS and IRRMS Horizontal acceleration')
plt.title("Bearing 2")
plt.legend([temp1, temp2], [
        "RRMS", "IRRMS"])
plt.show()
```



22nd Jun 2023

Learning:

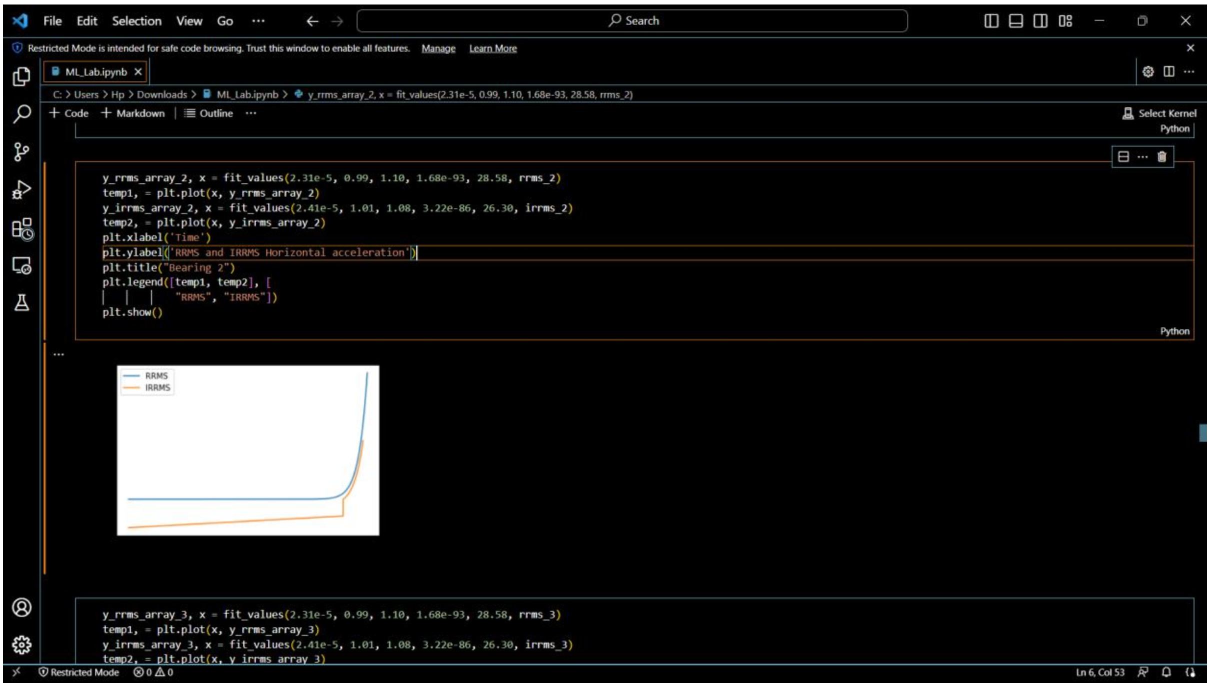
Learned about different types of bearings and their functions.

Ball Bearings

Roller Bearings

Plain Bearings
Ceramic Bearings
Spherical Roller Bearings
Tapered Roller Bearings
Needle Bearings etc.

And continued my practice based on the visualization of horizontal acceleration and vibration of bearings.



23 Jun 2023

Learning:

Model Evaluation and Validation: Perform rigorous testing and validation of your model. Apply appropriate cross-validation techniques to ensure its generalizability. Assess the model's accuracy, precision, recall, and F1-score to determine its performance and reliability.

24 Jun 2023

Learning:

Learned about KNN algorithm. It is a supervised machine learning algorithm used for classification and regression tasks. It is a non-parametric algorithm, meaning it does not make any assumptions about the underlying data distribution. Also KNN is a simple and intuitive algorithm that can be effective in certain scenarios, especially when the decision boundaries are nonlinear or the data distribution is not well-defined.

Date: 25 June 2023

Learnings

Learned about Tenosrflow Data Input Pipeline.Also explored about Image classification using CNN.

Work Done / Learning Implementation

Before applying my knowledge to the actual dataset, I gained hands-on experience by practicing what I had learned on a similar dataset.