

To,

IITD-AIA Foundation of Smart Manufacturing

Subject: Weekly Progress Report for Week 8

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- 08

Date: 24 July 2023

Learnings:

Completed the dataset filtration and modification according to my usability.

Date: 25 July 2023

Learnings:

Started some implementation using the renewal dataset

Date: 26 July 2023

Learnings:

Started some plotting on the model for visualization purpose.

Date: 27 July 2023

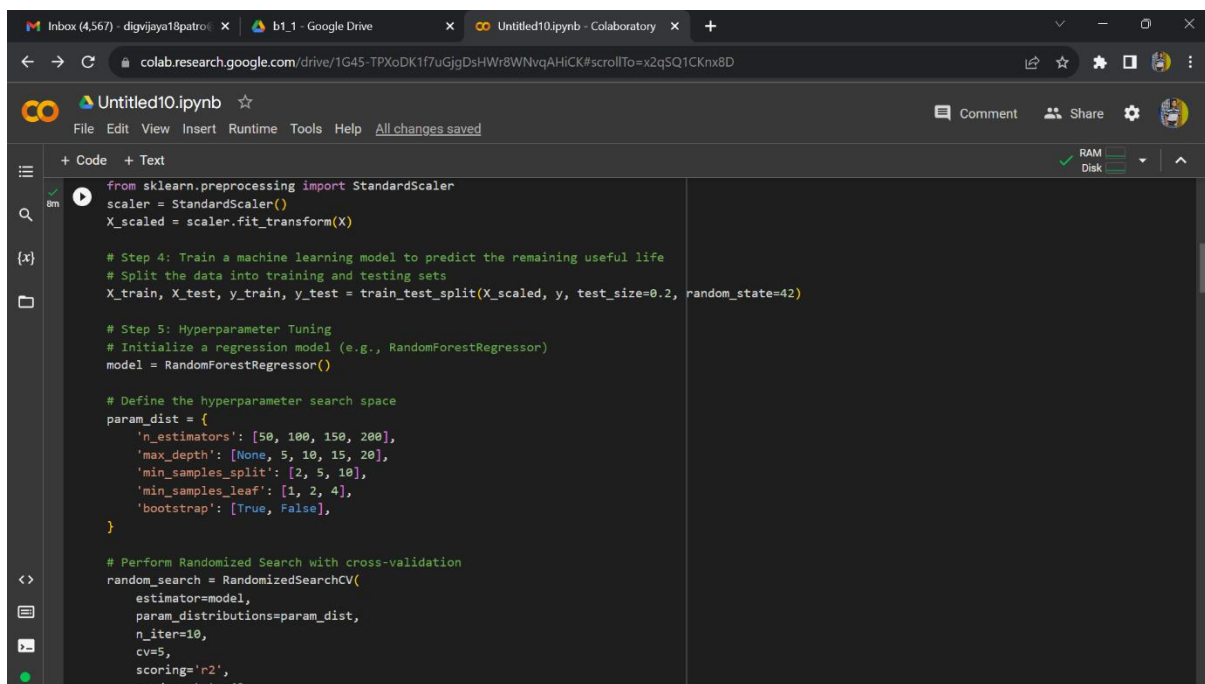
Work done:

Continued my implementation on the project and trying some plotting for data visualization.

Date: 28 July 2023

Work Done:

Continuing my model implementation. Here are some progress attached below:



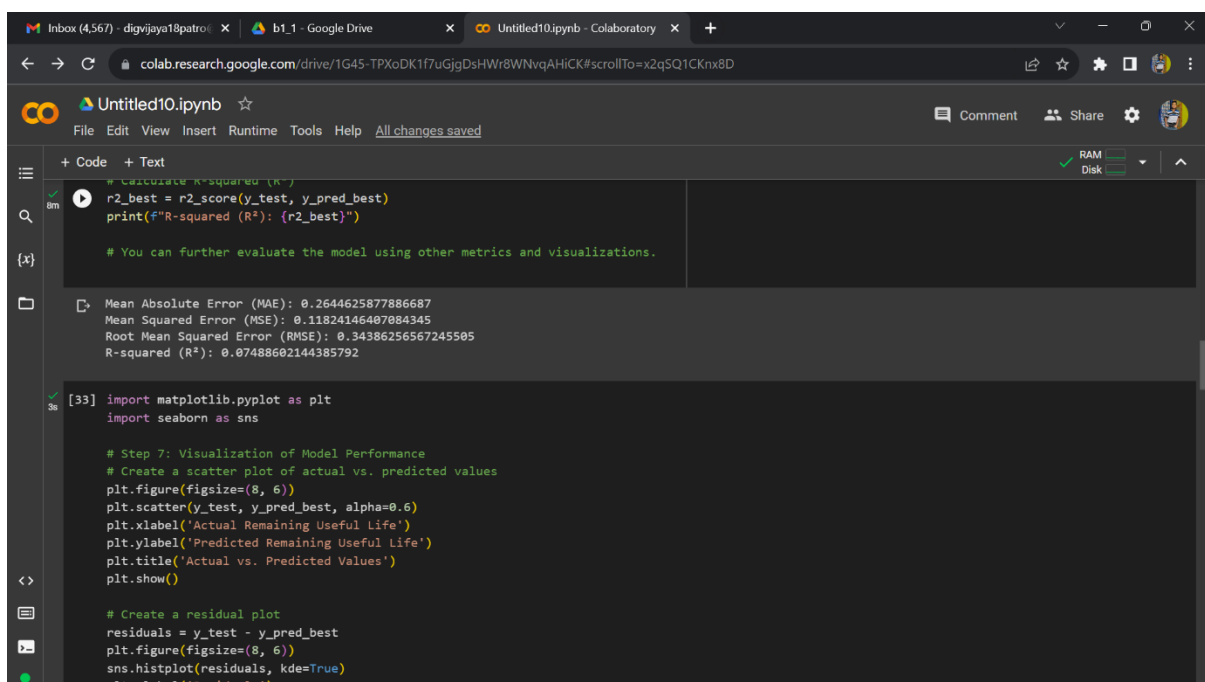
```
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)

# Step 4: Train a machine learning model to predict the remaining useful life
# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.2, random_state=42)

# Step 5: Hyperparameter Tuning
# Initialize a regression model (e.g., RandomForestRegressor)
model = RandomForestRegressor()

# Define the hyperparameter search space
param_dist = {
    'n_estimators': [50, 100, 150, 200],
    'max_depth': [None, 5, 10, 15, 20],
    'min_samples_split': [2, 5, 10],
    'min_samples_leaf': [1, 2, 4],
    'bootstrap': [True, False],
}

# Perform Randomized Search with cross-validation
random_search = RandomizedSearchCV(
    estimator=model,
    param_distributions=param_dist,
    n_iter=10,
    cv=5,
    scoring='r2',
    random_state=42)
```



```
# Calculate R-squared (R^2)
r2_best = r2_score(y_test, y_pred_best)
print(f"R-squared (R^2): {r2_best}")

# You can further evaluate the model using other metrics and visualizations.

Mean Absolute Error (MAE): 0.2644625877886687
Mean Squared Error (MSE): 0.11824146407084345
Root Mean Squared Error (RMSE): 0.34386256567245505
R-squared (R^2): 0.07488602144385792

[33] import matplotlib.pyplot as plt
import seaborn as sns

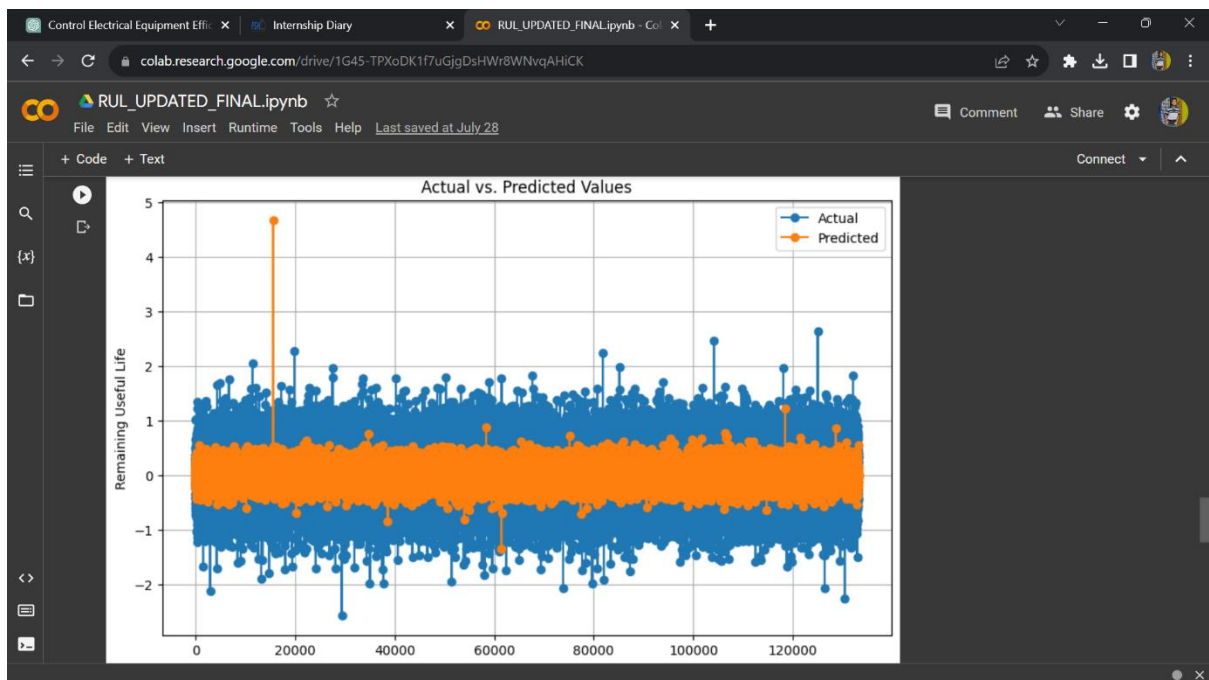
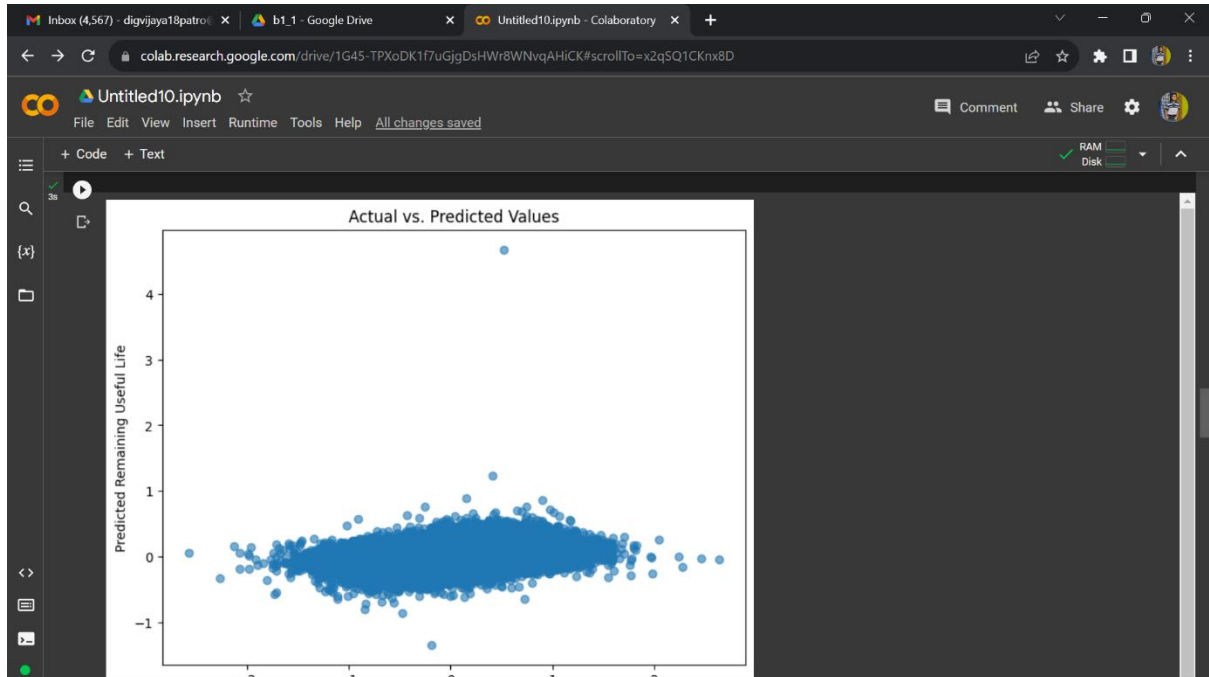
# Step 7: Visualization of Model Performance
# Create a scatter plot of actual vs. predicted values
plt.figure(figsize=(8, 6))
plt.scatter(y_test, y_pred_best, alpha=0.6)
plt.xlabel('Actual Remaining Useful Life')
plt.ylabel('Predicted Remaining Useful Life')
plt.title('Actual vs. Predicted Values')
plt.show()

# Create a residual plot
residuals = y_test - y_pred_best
plt.figure(figsize=(8, 6))
sns.histplot(residuals, kde=True)
plt.xlabel('Residuals')
```

Date: 29 July 2023

Work Done:

Continuing on visualization part. Here are progress attached below:



Date: 30 July 2023

Work Done:

Continuing on visualization part. Here are progress attached below:

