**Artificial Intelligence of Engineering**

**COS 40007**

**Name: Mohammed Barsat Zulkarnine**

**Student Number: 103810626**

**Studio: 1 - 5**

**Week 3 Studio:**

The code to generate table for activity 6 and 7 can be accessed here:  
https://github.com/BarsatZulkarnine/COS40007\_Studio3.git

Summary Table of Studio 3: Activity 6

|  |  |  |
| --- | --- | --- |
| SVM model | Train-test split | Cross validation |
| Original features | 0.8910862711378619 | 0.8914781346242358 |
| With hyper parameter  tuning | 0.8303238750358268 |  |
| With feature selection and  hype parameter tuning | 0.879335053023789 | 0.8834808340350715 |
| With PCA and hyper  parameter tuning | 0.8303238750358268 | 0.8335196824640411 |

Summary Table of Studio 3: Activity 7

|  |  |  |
| --- | --- | --- |
| Model | Train-test split | Cross validation |
| SVM | 0.8910862711378619 | 0.8914781346242358 |
| SGD | 0.884780739466896 | 0.8660259019125267 |
| RandomForest | 0.9203210088850674 | 0.925530817533739 |
| MLP | 0.7162510748065348 | 0.8739374399699276 |

**Week 3 portfolio:**

Add the codes and the datasheet created can be found here: <https://github.com/BarsatZulkarnine/COS40007_Week3_Portfolio.git>

Step 1: Data Collection

Extracted columns from the dataset and combined them with the class labels as required in the problem table.

Link to Source Code: <https://github.com/BarsatZulkarnine/COS40007_Week3_Portfolio/blob/master/data_collection.py>

Link to Combined data: <https://github.com/BarsatZulkarnine/COS40007_Week3_Portfolio/blob/master/combined_dataset.csv>

Step 2: Create Composite Columns

Created composite features including RMS values and Roll/Pitch calculations.

Link to Source Code: <https://github.com/BarsatZulkarnine/COS40007_Week3_Portfolio/blob/master/composite_columns.py>

Link to data: <https://github.com/BarsatZulkarnine/COS40007_Week3_Portfolio/blob/master/combined_with_composites.csv>

Step 3: Data Pre-processing

Computed statistical features per minute (Mean, Standard Deviation, Min, Max, AUC, Peaks)

Link to Source Code: <https://github.com/BarsatZulkarnine/COS40007_Week3_Portfolio/blob/master/data_preprocessing.py>

Link to data: <https://github.com/BarsatZulkarnine/COS40007_Week3_Portfolio/blob/master/processed_features.csv>

Step 4: Training

Outcome Summary Tables:

Step 5: Model Selection

1) Best SVM Model:

The best SVM model for this problem is [describe the best model, e.g., "the SVM model with hyperparameter tuning and 10 principal components"], as it provided the highest accuracy and balanced performance metrics.

2) Best ML Model:

The best ML model for this problem is [describe the best model, e.g., "the RandomForest classifier"], due to its superior performance in terms of accuracy and F1 score.