Aphelion Music: Model Training & Testing Report

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INTRODUCTION

For the project implementation, many libraries are employed, models are tested and finally Music Genre is classified.

This report focuses solely on Models' outputs (training & testing), for the full report kindly refer to the file named ***Aphelion Music Report (Team 5).pdf***.

You may also refer the GitHub repo: **https://github.com/adityapanwar94/ME781/**

Models:

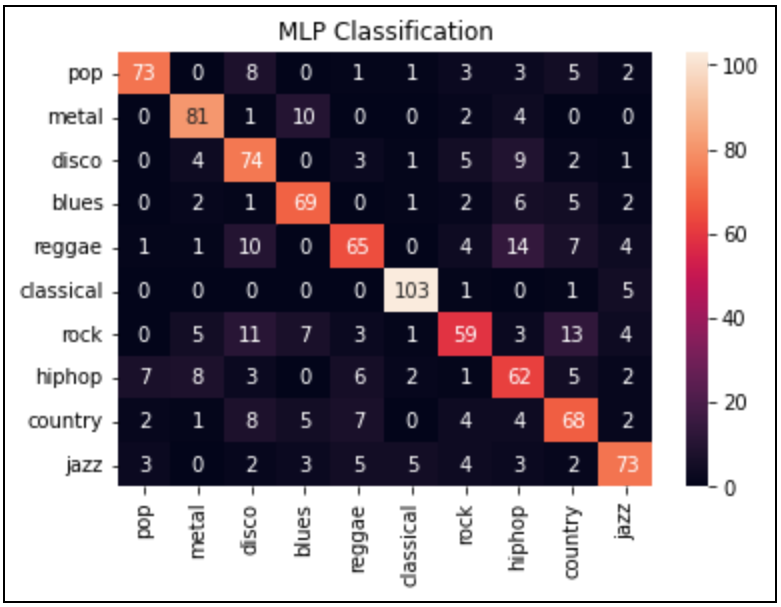
Various models as described in the full report were tested against the extracted features (MFCC) of the GTZAN dataset.

1. ANN (artificial neural network):
    a. Code file: ANN.ipynb
    b. Model Summary:

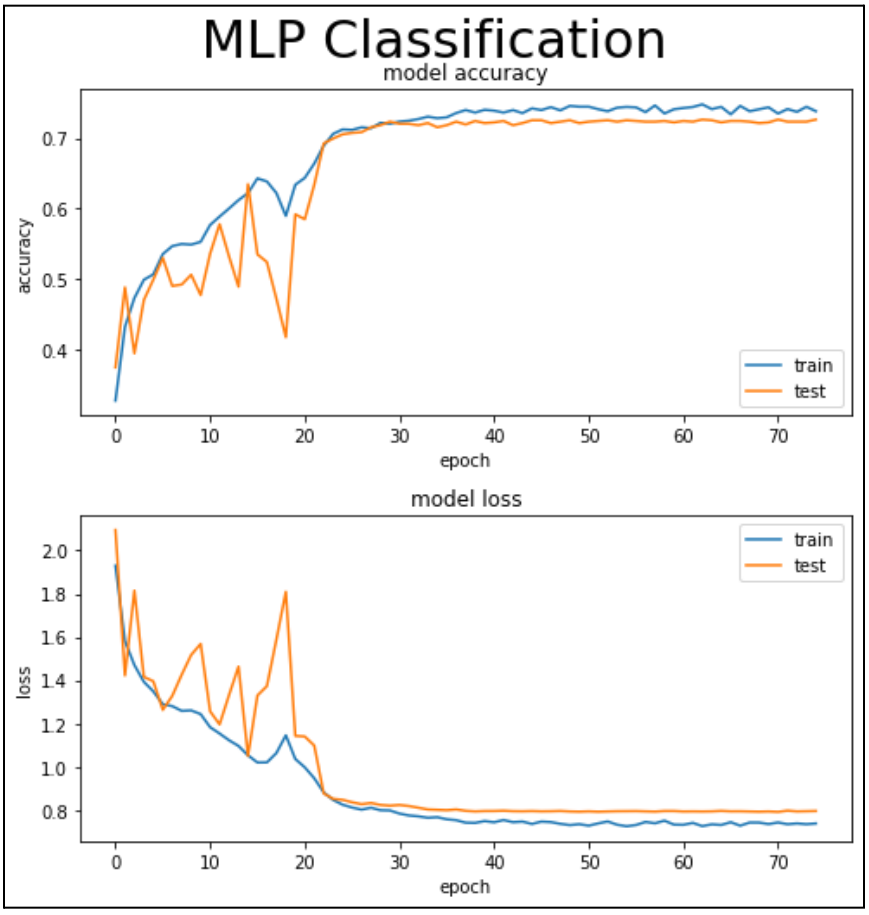
```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 flatten (Flatten)           (None, 1690)              0

 dense (Dense)               (None, 512)               865792

 dense_1 (Dense)             (None, 512)               262656

 batch_normalization (BatchN  (None, 512)              2048
 ormalization)

 dropout (Dropout)           (None, 512)               0

 dense_2 (Dense)             (None, 256)               131328

 dense_3 (Dense)             (None, 256)               65792

 batch_normalization_1 (Batc  (None, 256)              1024
 hNormalization)

 dropout_1 (Dropout)         (None, 256)               0

 dense_4 (Dense)             (None, 128)               32896

 dense_5 (Dense)             (None, 128)               16512

 batch_normalization_2 (Batc  (None, 128)              512
 hNormalization)

 dropout_2 (Dropout)         (None, 128)               0

 dense_6 (Dense)             (None, 64)                8256

 dense_7 (Dense)             (None, 64)                4160

 batch_normalization_3 (Batc  (None, 64)               256
 hNormalization)

 dropout_3 (Dropout)         (None, 64)                0

 dense_8 (Dense)             (None, 10)                650

=================================================================
Total params: 1,391,882
Trainable params: 1,389,962
Non-trainable params: 1,920
_________________________________________________________________
```

Fig: ANN model summary

c. Confusion Matrix:



d. Plots:



2. CNN (convolutional neural network):

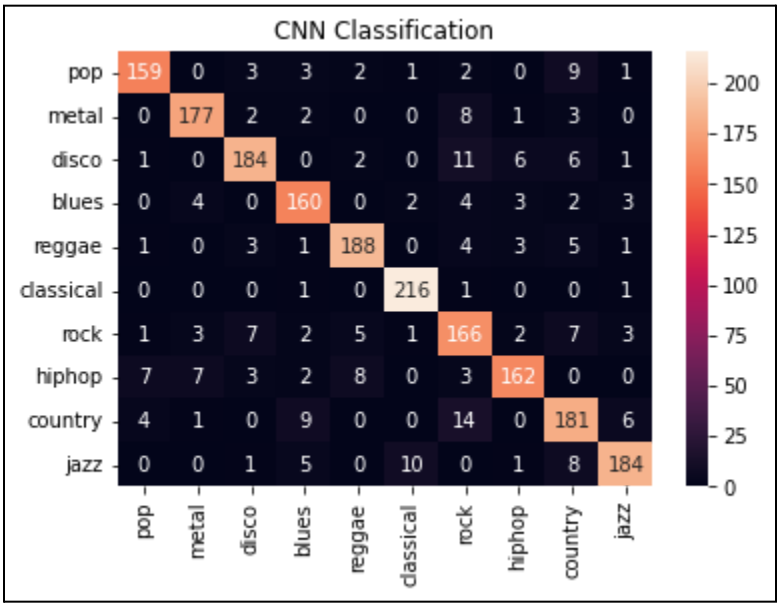
a. Code file: CNN.ipynb

b. Model Summary:

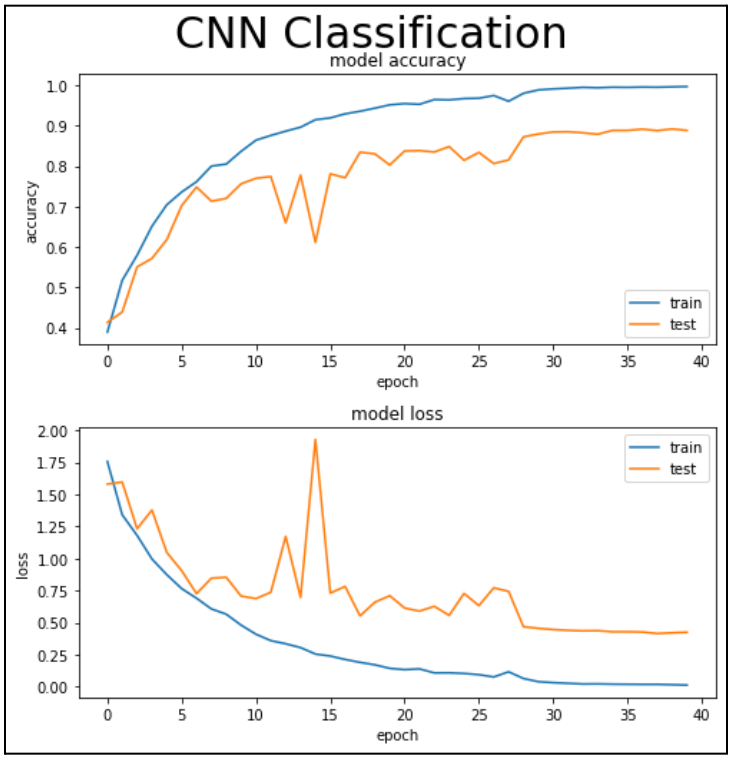
```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 130, 13, 256)      6656

 batch_normalization (BatchN  (None, 130, 13, 256)     1024
 ormalization)

 max_pooling2d (MaxPooling2D  (None, 65, 6, 256)       0
 )

 conv2d_1 (Conv2D)           (None, 65, 6, 128)        819328

 batch_normalization_1 (Batc  (None, 65, 6, 128)       512
 hNormalization)

 max_pooling2d_1 (MaxPooling  (None, 32, 3, 128)       0
 2D)

 conv2d_2 (Conv2D)           (None, 32, 3, 64)         204864

 batch_normalization_2 (Batc  (None, 32, 3, 64)        256
 hNormalization)

 max_pooling2d_2 (MaxPooling  (None, 16, 1, 64)        0
 2D)

 flatten (Flatten)           (None, 1024)              0

 dense (Dense)               (None, 128)               131200

 batch_normalization_3 (Batc  (None, 128)              512
 hNormalization)

 dropout (Dropout)           (None, 128)               0

 dense_1 (Dense)             (None, 64)                8256

 batch_normalization_4 (Batc  (None, 64)               256
 hNormalization)

 dropout_1 (Dropout)         (None, 64)                0

 dense_2 (Dense)             (None, 10)                650

=================================================================
Total params: 1,173,514
Trainable params: 1,172,234
Non-trainable params: 1,280
_________________________________________________________________
```

Fig: CNN model summary

c. Confusion Matrix:



d. Plots:



3. LSTM (Long Short term Memory):

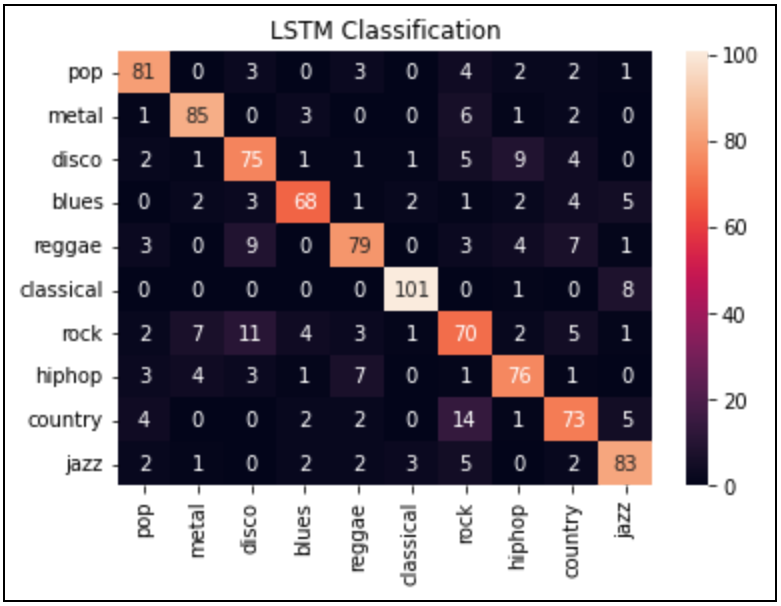
a. Code file: LSTM.ipynb

b. Model Sumary:

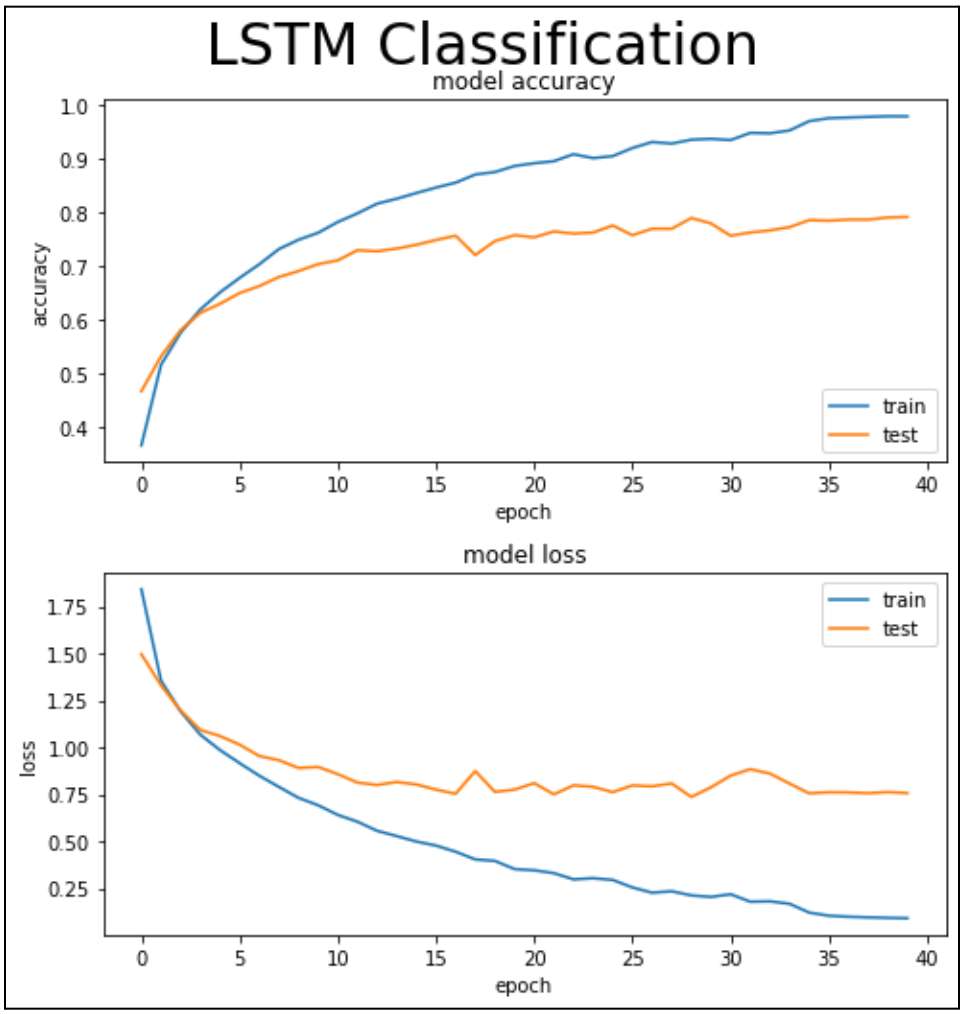
```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm (LSTM)                 (None, 130, 128)          72704

 lstm_1 (LSTM)               (None, 128)               131584

 dense (Dense)               (None, 64)                8256

 dense_1 (Dense)             (None, 64)                4160

 dense_2 (Dense)             (None, 10)                650

=================================================================
Total params: 217,354
Trainable params: 217,354
Non-trainable params: 0
_________________________________________________________________
```

Fig: LSTM model summary

c. Confusion Matrix:



d. Plots:


LSTM Classification
model accuracy
accuracy
epoch
train
test
model loss
loss
epoch
train
test

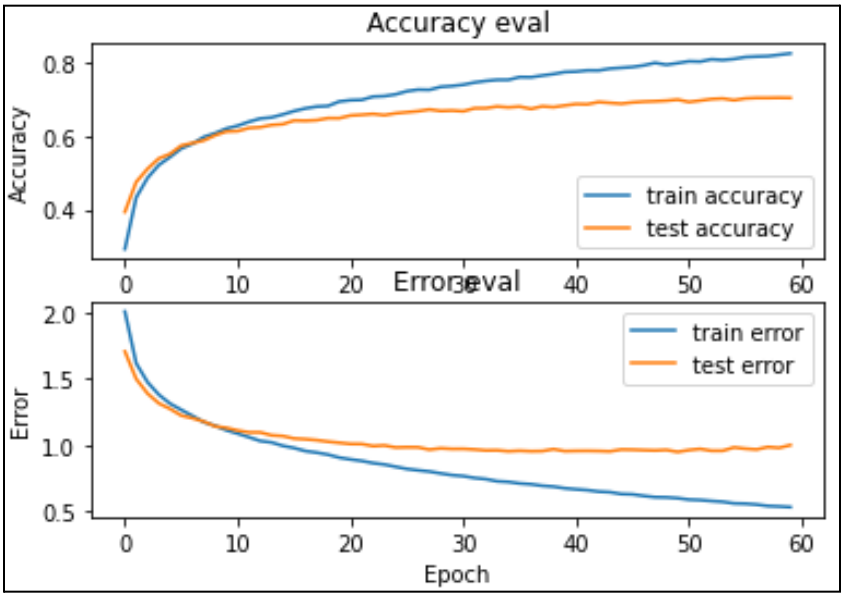
4. RNN (Recurrent Neural Networks):

a. Code file: RNN.ipynb

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm (LSTM)                 (None, 44, 64)            19968

 lstm_1 (LSTM)               (None, 64)                33024

 dense (Dense)               (None, 64)                4160

 dropout (Dropout)           (None, 64)                0

 dense_1 (Dense)             (None, 10)                650

=================================================================
Total params: 57,802
Trainable params: 57,802
Non-trainable params: 0
```

Fig: RNN model summary

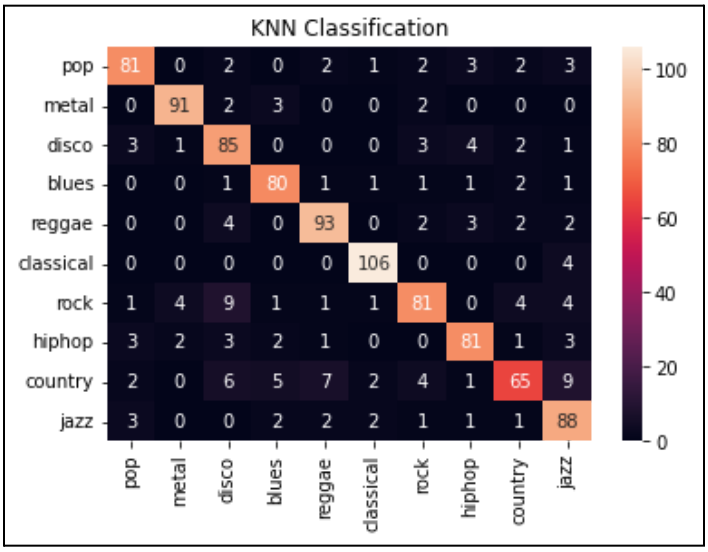
b. Plots:



5. ML models (Long Short term Memory):

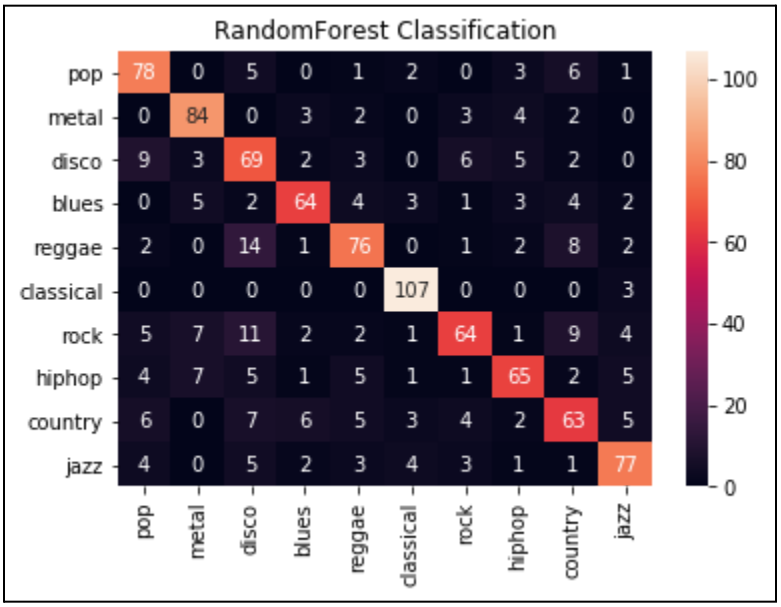
a. Code file: ML.ipynb

b. kNN Confusion Matrix:



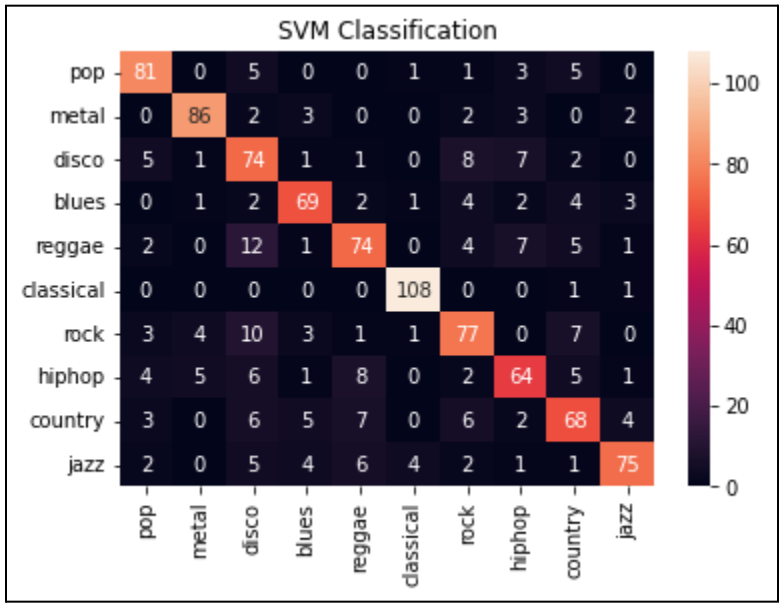

```
Train Accuracy:  0.9988883948421521
Test Accuracy:  0.851
```

c. Random Forest Confusion Matrix:



```
Train Accuracy:  0.9851044908848378
Test Accuracy:  0.747
```

d. SVM Confusion Matrix:




```
Train Accuracy:  0.8724988883948421
Test Accuracy:  0.778
```

Log Files:

Navigate through the **base submission folder** > **Log Files**

Find the relevant log files for various models:

- *CNN_logs*
- *ANN_logs*
- *LSTM_logs*
- *RNN_logs*