Task 8.2D

Section 1:

With no scaling

```
The confusion matrix for the SVM classifier for Spectral Centroid (SC) is:
[[ 0 32  0  0]
 [ 0 32  0  0]
 [ 0 32  0  0]
 [ 0 32  0  0]]
The accuracy score for the SVM classifier for Spectral Centroid (SC) is 25.000%

The confusion matrix for the AdaBoost classifier for Spectral Centroid (SC) is:
[[ 8  8  9  7]
 [ 6 10 13  3]
 [ 1 10 12  9]
 [ 6  9  9  8]]
The accuracy score for the AdaBoost classifier for Spectral Centroid (SC) is 29.688%


The confusion matrix for the SVM classifier for Spectral Bandwidth (SBW) is:
[[12 10  5  5]
 [ 3 17  2 10]
 [ 2  6  9 15]
 [ 5 10  6 11]]
The accuracy score for the SVM classifier for Spectral Bandwidth (SBW) is 38.281%

The confusion matrix for the AdaBoost classifier for Spectral Bandwidth (SBW) is:
[[ 9  9 14  0]
 [ 5  5 17  5]
 [ 9  3 19  1]
 [ 2 12 11  7]]
The accuracy score for the AdaBoost classifier for Spectral Bandwidth (SBW) is 31.250%
```

```
The confusion matrix for the SVM classifier for Spectral Band Energy (SBE) is:
[[27  1  4  0]
 [ 5 18  3  6]
 [ 7 10 10  5]
 [ 8  2  4 18]]
The accuracy score for the SVM classifier for Spectral Band Energy (SBE) is 57.031%

The confusion matrix for the AdaBoost classifier for Spectral Band Energy (SBE) is:
[[16  5  8  3]
 [ 7 11  7  7]
 [ 5 11  6 10]
 [ 8 10  4 10]]
The accuracy score for the AdaBoost classifier for Spectral Band Energy (SBE) is 33.594%


The confusion matrix for the SVM classifier for Spectral Flatness Measure (SFM) is:
[[ 0  0  0 32]
 [ 0  0  0 32]
 [ 0  0  0 32]
 [ 0  0  0 32]]
The accuracy score for the SVM classifier for Spectral Flatness Measure (SFM) is 25.000%

The confusion matrix for the AdaBoost classifier for Spectral Flatness Measure (SFM) is:
[[32  0  0  0]
 [32  0  0  0]
 [32  0  0  0]
 [32  0  0  0]]
The accuracy score for the AdaBoost classifier for Spectral Flatness Measure (SFM) is 25.000%
```

```
The confusion matrix for the SVM classifier for Spectral Crest Factor (SCF) is:
[[32  0  0  0]
 [32  0  0  0]
 [32  0  0  0]
 [32  0  0  0]]
The accuracy score for the SVM classifier for Spectral Crest Factor (SCF) is 25.000%

The confusion matrix for the AdaBoost classifier for Spectral Crest Factor (SCF) is:
[[13  7  6  6]
 [ 2 13  7 10]
 [ 3 12 12  5]
 [ 9  5  7 11]]
The accuracy score for the AdaBoost classifier for Spectral Crest Factor (SCF) is 38.281%


The confusion matrix for the SVM classifier for Renyi Entropy (RE) is:
[[22  6  3  1]
 [ 6 17  5  4]
 [ 8 11 10  3]
 [13 10  3  6]]
The accuracy score for the SVM classifier for Renyi Entropy (RE) is 42.969%

The confusion matrix for the AdaBoost classifier for Renyi Entropy (RE) is:
[[11  0 12  9]
 [ 3  0 17 12]
 [ 2  0 22  8]
 [ 4  0 18 10]]
The accuracy score for the AdaBoost classifier for Renyi Entropy (RE) is 33.594%
```

```
The confusion matrix for the SVM classifier for Shannon Entropy (SE) is:
[[19  2  7  4]
 [ 7 10 11  4]
 [ 3  7 16  6]
 [11  8  3 10]]
The accuracy score for the SVM classifier for Shannon Entropy (SE) is 42.969%

The confusion matrix for the AdaBoost classifier for Shannon Entropy (SE) is:
[[24  5  2  1]
 [ 3 11 13  5]
 [12  9  8  3]
 [ 8 10  7  7]]
The accuracy score for the AdaBoost classifier for Shannon Entropy (SE) is 39.062%


The confusion matrix for the SVM classifier for Spectral Centroid (SC) + Shannon Entropy (SE) is:
[[ 0 32  0  0]
 [ 0 32  0  0]
 [ 0 32  0  0]
 [ 0 32  0  0]]
The accuracy score for the SVM classifier for Spectral Centroid (SC) + Shannon Entropy (SE) is 25.000%

The confusion matrix for the AdaBoost classifier for Spectral Centroid (SC) + Shannon Entropy (SE) is:
[[13  4  6  9]
 [ 2  9 15  6]
 [ 1 10 11 10]
 [ 5  5 13  9]]
The accuracy score for the AdaBoost classifier for Spectral Centroid (SC) + Shannon Entropy (SE) is 32.812%
```

With scaling

```
The confusion matrix for the SVM classifier for Spectral Centroid (SC) is:
[[19  7  4  2]
 [ 8 16  4  4]
 [ 7  7 14  4]
 [ 5  4  5 18]]
The accuracy score for the SVM classifier for Spectral Centroid (SC) is 52.344%

The confusion matrix for the AdaBoost classifier for Spectral Centroid (SC) is:
[[13  7  9  3]
 [ 3  9 14  6]
 [ 1  9 14  8]
 [ 4  6  8 14]]
The accuracy score for the AdaBoost classifier for Spectral Centroid (SC) is 39.062%


The confusion matrix for the SVM classifier for Spectral Bandwidth (SBW) is:
[[11  6  6  9]
 [ 9  9  4 10]
 [12  5  5 10]
 [10 13  1  8]]
The accuracy score for the SVM classifier for Spectral Bandwidth (SBW) is 25.781%

The confusion matrix for the AdaBoost classifier for Spectral Bandwidth (SBW) is:
[[16  5  4  7]
 [18 11  1  2]
 [ 5  8  2 17]
 [13 12  1  6]]
The accuracy score for the AdaBoost classifier for Spectral Bandwidth (SBW) is 27.344%
```

```
The confusion matrix for the SVM classifier for Spectral Band Energy (SBE) is:
[[20  1  4  7]
 [ 9 12  7  4]
 [ 7  7 14  4]
 [ 8 10  3 11]]
The accuracy score for the SVM classifier for Spectral Band Energy (SBE) is 44.531%

The confusion matrix for the AdaBoost classifier for Spectral Band Energy (SBE) is:
[[32  0  0  0]
 [32  0  0  0]
 [27  1  3  1]
 [32  0  0  0]]
The accuracy score for the AdaBoost classifier for Spectral Band Energy (SBE) is 27.344%


The confusion matrix for the SVM classifier for Spectral Flatness Measure (SFM) is:
[[ 0  0  0 32]
 [ 0  0  0 32]
 [ 0  0  0 32]
 [ 0  0  0 32]]
The accuracy score for the SVM classifier for Spectral Flatness Measure (SFM) is 25.000%

The confusion matrix for the AdaBoost classifier for Spectral Flatness Measure (SFM) is:
[[32  0  0  0]
 [32  0  0  0]
 [32  0  0  0]
 [32  0  0  0]]
The accuracy score for the AdaBoost classifier for Spectral Flatness Measure (SFM) is 25.000%
```

```
The confusion matrix for the SVM classifier for Spectral Crest Factor (SCF) is:
[[10 14  4  4]
 [ 2 21  7  2]
 [ 4 19  5  4]
 [ 8 15  5  4]]
The accuracy score for the SVM classifier for Spectral Crest Factor (SCF) is 31.250%

The confusion matrix for the AdaBoost classifier for Spectral Crest Factor (SCF) is:
[[ 6  5 20  1]
 [ 5  3 24  0]
 [ 4  3 24  1]
 [ 3  2 25  2]]
The accuracy score for the AdaBoost classifier for Spectral Crest Factor (SCF) is 27.344%


The confusion matrix for the SVM classifier for Renyi Entropy (RE) is:
[[14  3  8  7]
 [ 4 10  9  9]
 [ 9  8  6  9]
 [ 6 12  2 12]]
The accuracy score for the SVM classifier for Renyi Entropy (RE) is 32.812%

The confusion matrix for the AdaBoost classifier for Renyi Entropy (RE) is:
[[19  0 12  1]
 [10  0 18  4]
 [ 7  0 24  1]
 [12  0 18  2]]
The accuracy score for the AdaBoost classifier for Renyi Entropy (RE) is 35.156%
```

```
The confusion matrix for the SVM classifier for Shannon Entropy (SE) is:
[[12  4  8  8]
 [ 8 12  9  3]
 [ 5  8  7 12]
 [12 14  3  3]]
The accuracy score for the SVM classifier for Shannon Entropy (SE) is 26.562%

The confusion matrix for the AdaBoost classifier for Shannon Entropy (SE) is:
[[12  7  4  9]
 [ 2  9 11 10]
 [ 1 15  9  7]
 [ 8 10  1 13]]
The accuracy score for the AdaBoost classifier for Shannon Entropy (SE) is 33.594%


The confusion matrix for the SVM classifier for Spectral Centroid (SC) + Shannon Entropy (SE) is:
[[22  3  6  1]
 [ 8 18  6  0]
 [11  7 12  2]
 [ 5 11  7  9]]
The accuracy score for the SVM classifier for Spectral Centroid (SC) + Shannon Entropy (SE) is 47.656%

The confusion matrix for the AdaBoost classifier for Spectral Centroid (SC) + Shannon Entropy (SE) is:
[[18  2 10  2]
 [ 1  6 21  4]
 [ 3  6 21  2]
 [ 4  5 15  8]]
The accuracy score for the AdaBoost classifier for Spectral Centroid (SC) + Shannon Entropy (SE) is 41.406%

The confusion matrix for the SVM classifier for Spectral Centroid (SC) + Spectral Flatness Feature (SFM) is:
[[19  7  4  2]
 [ 8 16  4  4]
 [ 7  7 14  4]
 [ 5  4  5 18]]
The accuracy score for the SVM classifier for Spectral Centroid (SC) + Spectral Flatness Feature (SFM) is 52.344%

The confusion matrix for the AdaBoost classifier for Spectral Centroid (SC) + Spectral Flatness Feature (SFM) is:
[[ 8 10 11  3]
 [ 1 10 14  7]
 [ 0 14  9  9]
 [ 1  7  9 15]]
The accuracy score for the AdaBoost classifier for Spectral Centroid (SC) + Spectral Flatness Feature (SFM) is 32.812%
```

For both scaling and non-scaling of the features, SVM and Adaboost classifiers performed the worst for spectral feature SFM (Spectral Flatness Feature) where both have the lowest accuracy score of 25%.

Without scaling, the best model would be SVM for SBE (Spectral Band Energy) at 57.031% and Adaboost classifier for Shannon Entropy (SE) at 39.062% respectively.

With scaling, the best model would be SVM and AdaBoost for SC (Spectral Centroid) at 52.344% and 39.062% respectively.

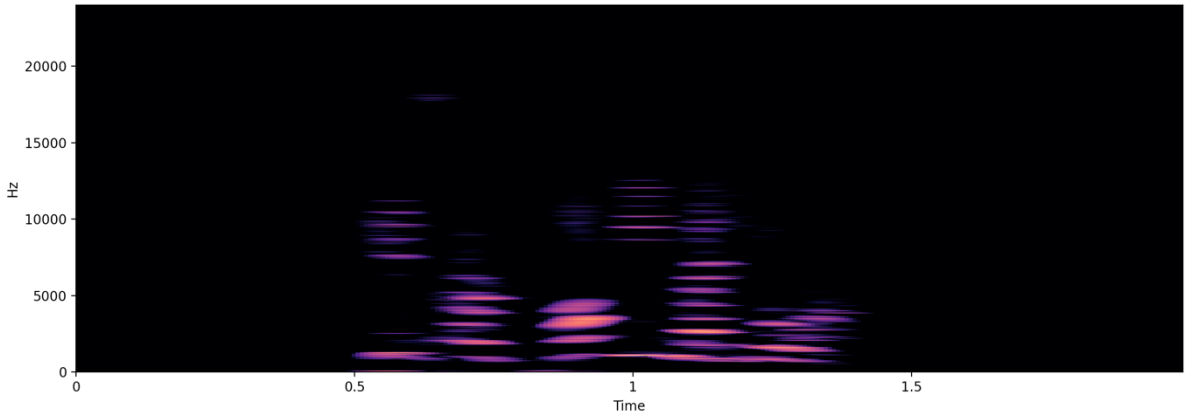
It can also be seen when two spectral features are combined, the accuracy increases with respect to the lowest accuracy of the specific spectral feature of the combined spectral features.

Section 2:

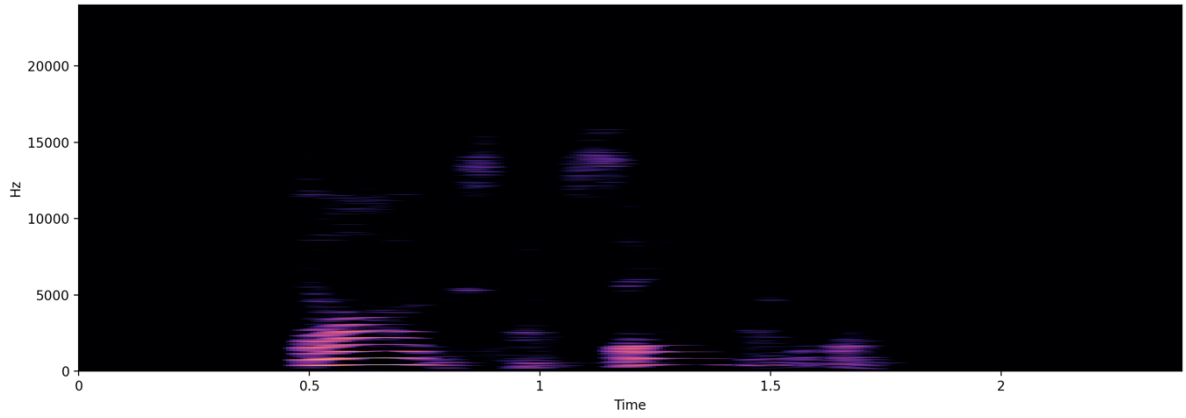
Spectrogram for the audio files below:

```
test_random_angry_audio_file: 03-01-05-02-01-01-08.wav
test_random_calm_audio_file: 03-01-02-02-02-01-05.wav
test_random_happy_audio_file: 03-01-03-02-02-02-06.wav
test_random_sad_audio_file: 03-01-04-01-02-02-08.wav
```

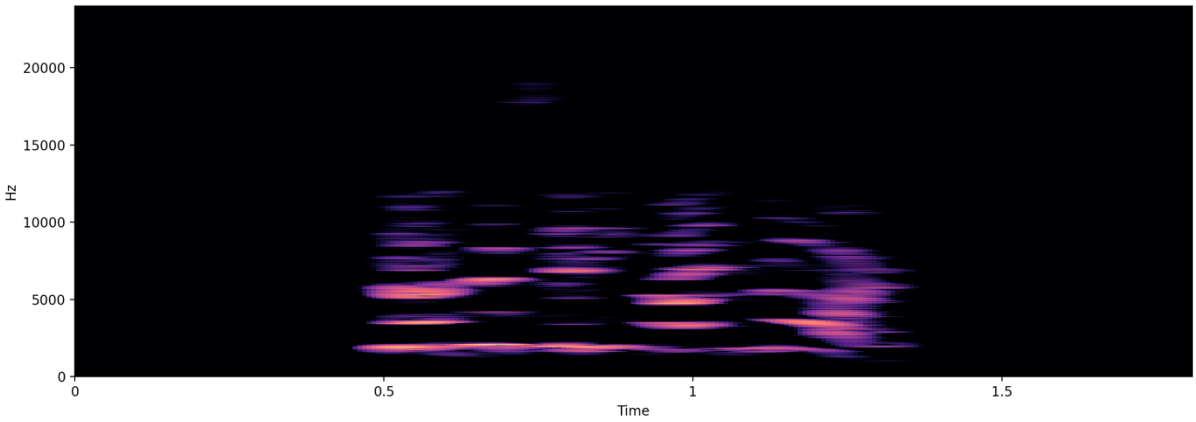
test_random_angry_audio:



test_random_calm_audio:



test_random_happy_audio:



test_random_sad_audio: