1. **How to run the code, how to use the system, functionalities of each program file**

Inside of the Assignment 4 Folder there is an AudioFeature.jar file. Double click this file and the program will load. Upon loading the program, You will notice a list of audio files. Audio files are preloaded into the interface and displayed within the list presented. To the right of the list there are different methods of anaylizing the audio files data. Below is the output terminal, where the results of the data analysis is displayed. There are four methods of analysis: SMO (Sequential Minimal Optimization), ZeroR, J48, and NaiveBayes. SMO utilizeds the sequential minimal optimization algorithm for training support vectors and was created by John Platt. ZeroR creates 0-R classifiers from data and then predicts the mean and the mode from these classified datums. J48 creates a decision tree, which can be pruned or unpruned depending upon request. Naïve Bayes uses estimation to produce precison values based on the existing training data.

Once a user has chose their testing data, they can then see the outputted results in the output section of the program. Depending on the method of classification and analysis, results vary.

1. **List and briefly introduce libraries/tools/techniques you used in your development**

I used the musicg lightweight API within my Java program to classify the data within each .wav file. Once the features and data has been extracted, I write all data to a .arff formatted file so that the WEKA Data Mining program may utilize functionality. I iniitialize runtime commands via each button action peformed that run against WEKA’s code base.

1. **List features and their values for the audio files and show what files are used as training data, what are testing.**

From the Audio files I am pulling Audio Format, sample rate, bits per sample, block alignment, byte rate, channels, chunk size, FFT sample size, frames per second, number of frames, number of frequency units, unit frequency, time steps, maximum amplitude, minimum amplitude, mean amplitude, standard deviation of amplitude, zero crossing rate, spectral centroid, and audio type. I compiled all of this data into one large file and then used WEKA’s traning/test distribution methods.

1. **Show comparison between model output and ground truth label (as discussed in 2.4) and display the precision and recall value of your model on the testing data.**

Results from the J48 Pruned tree

J48 pruned tree

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Chunk Size <= 128034: MUSIC (8.0)

Chunk Size > 128034

| Chunk Size <= 128036

| | Maximum Amplitude <= 2749: SPEECH (6.0)

| | Maximum Amplitude > 2749

| | | Mean <= 0.000064: SPEECH (13.0/5.0)

| | | Mean > 0.000064: MUSIC (3.0)

| Chunk Size > 128036

| | Mean <= -0.0003: SPEECH (5.0)

| | Mean > -0.0003: MUSIC (5.0/1.0)

Number of Leaves : 6

Size of the tree : 11

Time taken to build model: 0.17 seconds

Time taken to test model on training data: 0.05 seconds

=== Error on training data ===

Correctly Classified Instances 34 85 %

Incorrectly Classified Instances 6 15 %

Kappa statistic 0.7

Mean absolute error 0.1938

Root mean squared error 0.3113

Relative absolute error 38.7692 %

Root relative squared error 62.2649 %

Total Number of Instances 40

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure ROC Area Class

0.75 0.05 0.938 0.75 0.833 0.933 MUSIC

0.95 0.25 0.792 0.95 0.864 0.933 SPEECH

Weighted Avg. 0.85 0.15 0.865 0.85 0.848 0.932

=== Confusion Matrix ===

a b <-- classified as

15 5 | a = MUSIC

1 19 | b = SPEECH

=== Stratified cross-validation ===

Correctly Classified Instances 25 62.5 %

Incorrectly Classified Instances 15 37.5 %

Kappa statistic 0.25

Mean absolute error 0.4047

Root mean squared error 0.5503

Relative absolute error 80.9405 %

Root relative squared error 110.0605 %

Total Number of Instances 40

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure ROC Area Class

0.55 0.3 0.647 0.55 0.595 0.631 MUSIC

0.7 0.45 0.609 0.7 0.651 0.631 SPEECH

Weighted Avg. 0.625 0.375 0.628 0.625 0.623 0.631

=== Confusion Matrix ===

a b <-- classified as

11 9 | a = MUSIC

6 14 | b = SPEECH