Portfolio

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10/2/23

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This is a Quarto book.

This is a line.

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```
1 + 1
```

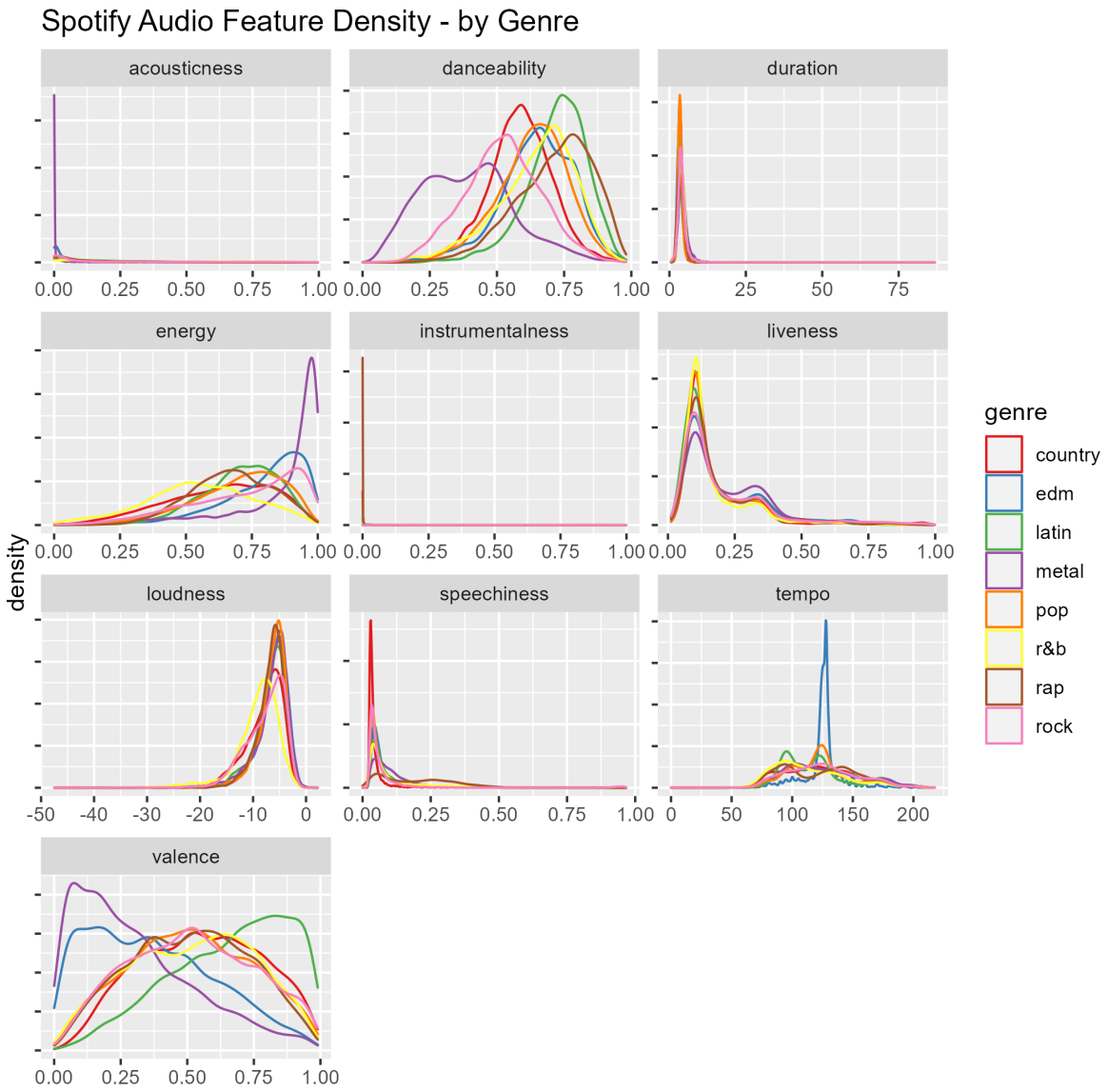
```
[1] 2
```

1 Spotify Data Analysis

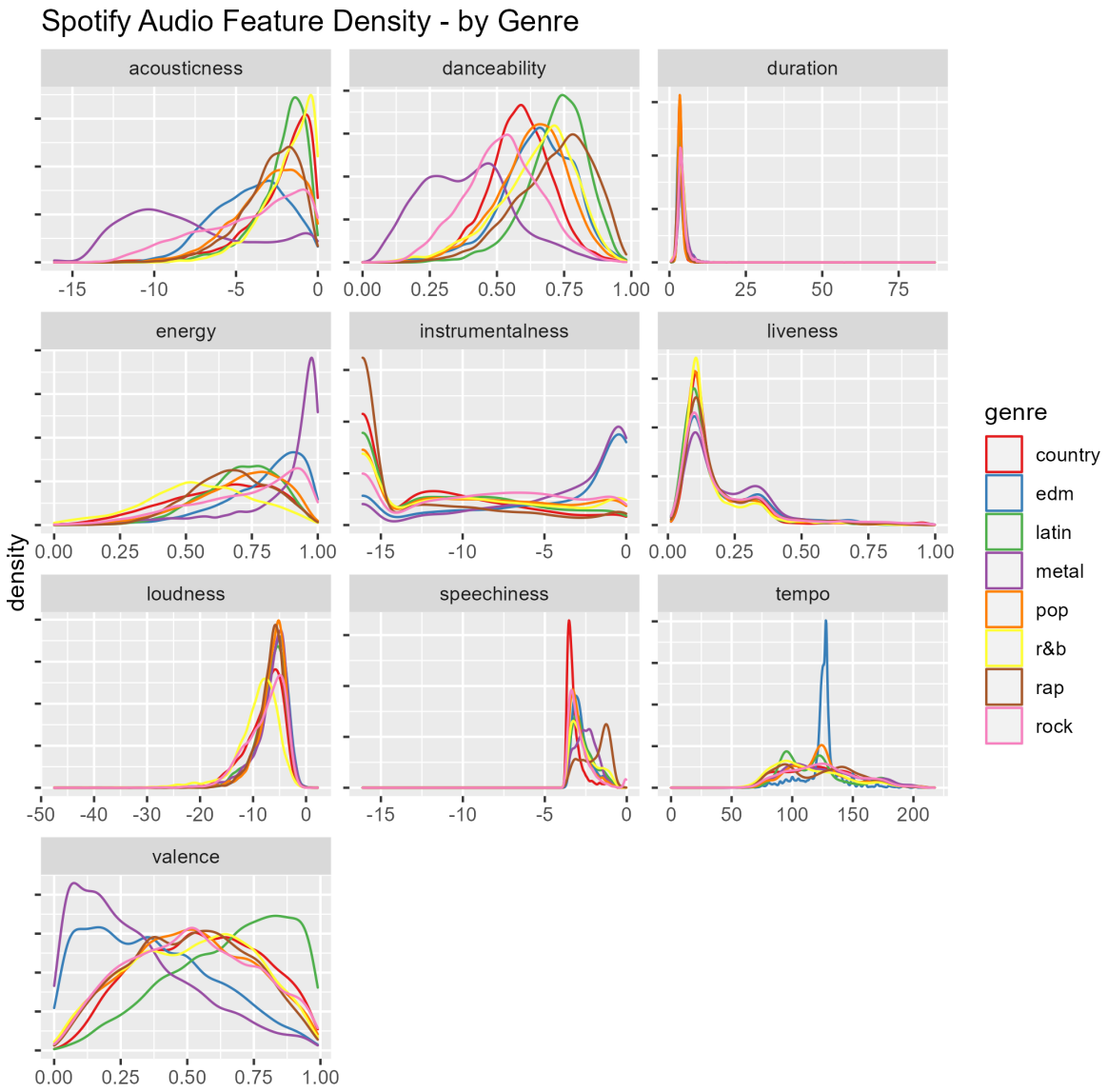
One of my favorite hobbies is listening to music. Not just through headphones or in the car, but listening to live music and experiencing all of the energy that comes with live performances. Some time ago I found out that R had a package, `spotifyr` Thomas (2022), that was a wrapper for getting track audio features from Spotify's API. I started exploring the functionality of the package along with a few projects people had done (see)

https://d2l.ai/index.html

First things first, I needed data before I could analyze. I utilized some function calls to pull down data from Spotify's API with a few predetermined genres of music. From here, I read this in to R to begin exploring what data I had. There were some issues.



Acousticness seems drastically skewed to the right and concentrated right around 0. Instrumentalness and Loudness seem to also have similar problems. Duration **seems** fine, but there's a large tail that extends to almost an hour and a half. There needs to be some cleaning done here to get the data into an easily analyzed format.



This seems a bit better but duration still looks skewed so lets see why there is such a long tail to the right. First I'll start by looking at how many songs have a duration longer than 10 minutes.

```
  Count
1    99
```

There are only 99 songs with a duration longer than 10 minutes and the overall dataset has 36K songs. For the purposes of this analysis it's best to take these out as they don't represent

the majority of the data.

One more look at the density plot before we start taking apart the features and looking towards prediction/classification.

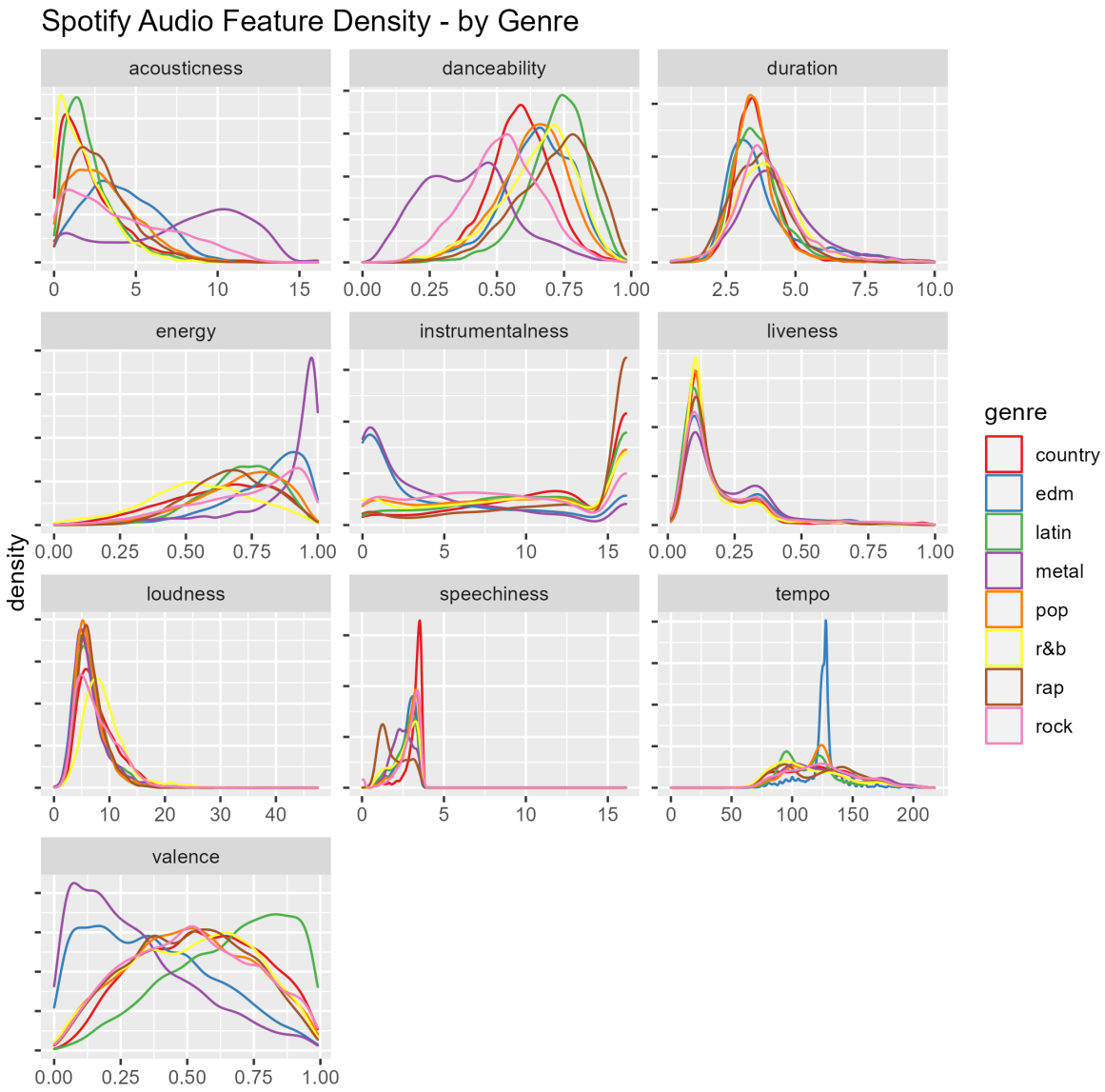
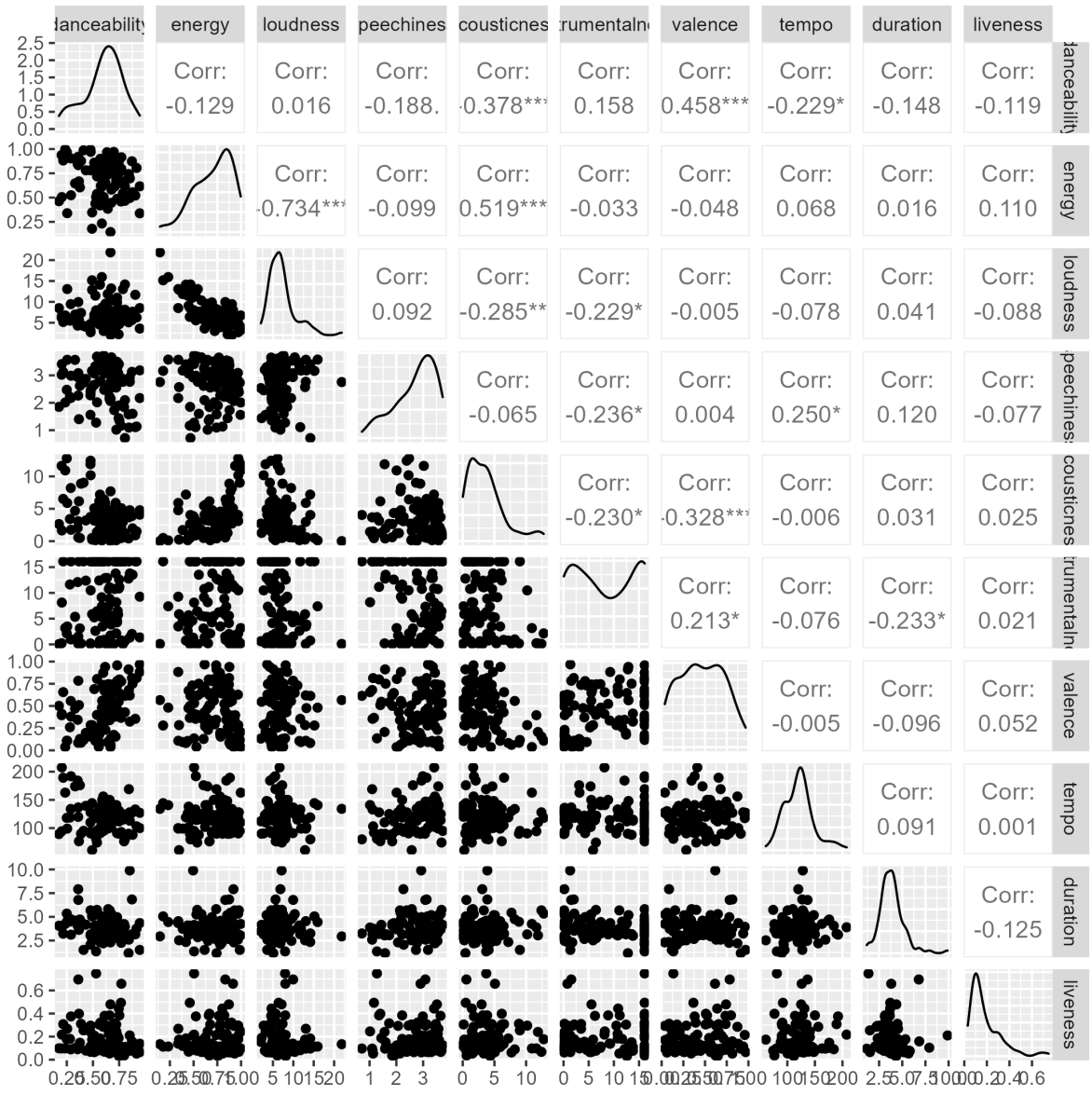


Table 1.1: Distribution of Song Counts by Genre

Genre	Count
country	4282

Genre	Count
edm	4696
latin	3644
metal	4990
pop	5368
r&b	3924
rap	4751
rock	4265


danceability
energy
loudness
peechines
cousticnes
rumentaln
valence
tempo
duration
liveness
Corr: -0.129
Corr: 0.016
Corr: -0.188.
Corr: -0.378***
Corr: 0.158
Corr: 0.458***
Corr: -0.229*
Corr: -0.148
Corr: -0.119
Corr: -0.734***
Corr: -0.099
Corr: 0.519***
Corr: -0.033
Corr: -0.048
Corr: 0.068
Corr: 0.016
Corr: 0.110
Corr: 0.092
Corr: -0.285**
Corr: -0.229*
Corr: -0.005
Corr: -0.078
Corr: 0.041
Corr: -0.088
Corr: -0.065
Corr: -0.236*
Corr: 0.004
Corr: 0.250*
Corr: 0.120
Corr: -0.077
Corr: -0.230*
Corr: -0.328***
Corr: -0.006
Corr: 0.031
Corr: 0.025
Corr: 0.213*
Corr: -0.076
Corr: -0.233*
Corr: 0.021
Corr: -0.005
Corr: -0.096
Corr: 0.052
Corr: 0.091
Corr: 0.001
Corr: -0.125

2 Data Separation for Modeling

3 Finding Separation in Metal and Nonmetal Genres

Performing classification analysis on 8 genres leads to poor accuracy. While each song has many features, the differences may be too small to meaningfully differentiate one genre from another. However, there are still genres that we could certainly recognize as being starkly different. Metal happens to be my favorite genre, but I do listen to country from time to time and it would be hard to mistake one song from each genre for the other. I'll break this experiment out into two parts:

1. One experiment will be looking at metal songs vs. every other genre grouped together as "nonmetal"
2. A second experiment will look at metal vs. country music

3.1 Metal and Nonmetal

3.2 Metal and Country

Starting with logistic regression.

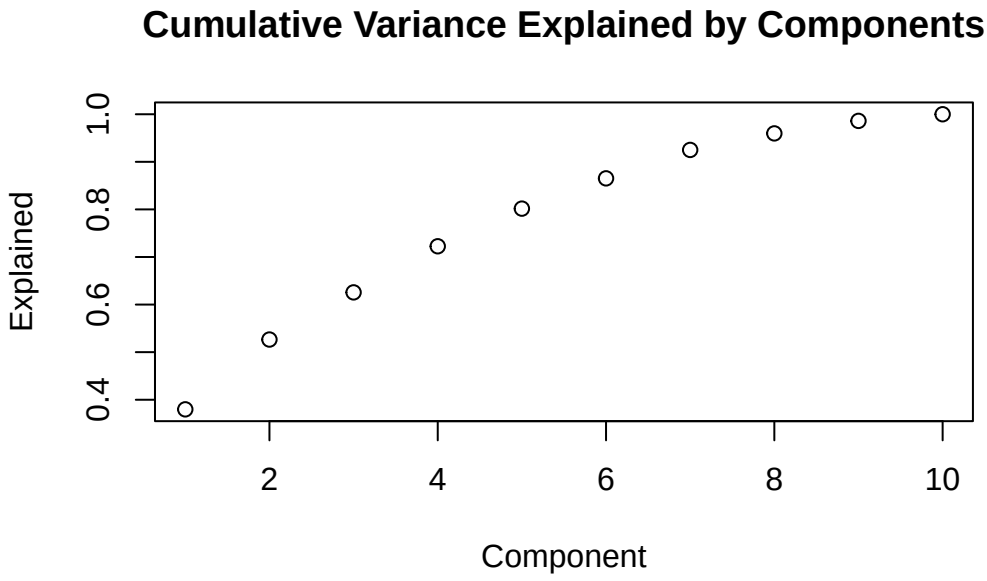
Predicted classes and performance.

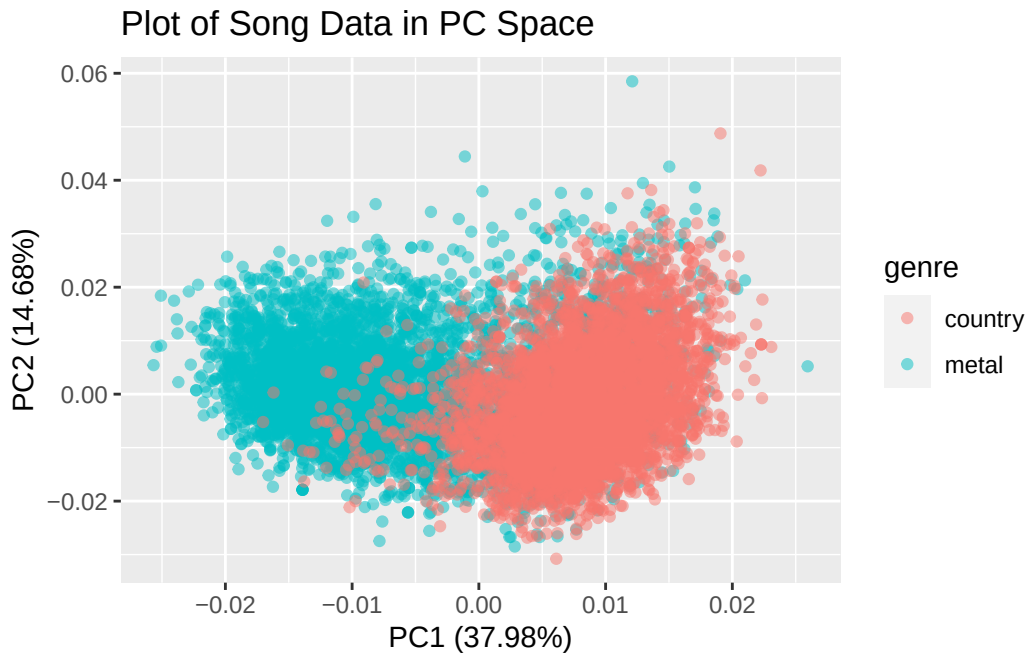
```
Confusion Matrix and Statistics

          Reference
Prediction metal country
   metal    1306     138
   country   226    1112

               Accuracy : 0.8692
                 95% CI : (0.8561, 0.8815)
    No Information Rate : 0.5507
    P-Value [Acc > NIR] : < 2.2e-16
```

```
                Kappa : 0.7373

 Mcnemar's Test P-Value : 5.114e-06

            Sensitivity : 0.8525
            Specificity : 0.8896
         Pos Pred Value : 0.9044
         Neg Pred Value : 0.8311
             Prevalence : 0.5507
         Detection Rate : 0.4694
   Detection Prevalence : 0.5191
      Balanced Accuracy : 0.8710

       'Positive' Class : metal
```

Random forest example.

```
          country metal
  country    1130   120
  metal       202  1330

[1] 0.8842559
```


Cumulative Variance Explained by Components
Explained
0.4
0.6
0.8
1.0
2
4
6
8
10
Component


Plot of Song Data in PC Space
PC2 (14.68%)
0.06
0.04
0.02
0.00
−0.02
−0.02
−0.01
0.00
0.01
0.02
PC1 (37.98%)
genre
country
metal

References

Thomas, Charlie. 2022. “Spotifyr Documentation.” 2022. http://www.rcharlie.com/spotifyr/.