

MUSIC GENRE CLASSIFICATION

Presented By Stephanie Barrett

TUESDAY, SEPTEMBER 5TH

SPRINT 3

Prevalence of Music Streaming



Top Streaming Platforms Globally

- Spotify
- Apple Music
- Amazon Music

Spotify Users

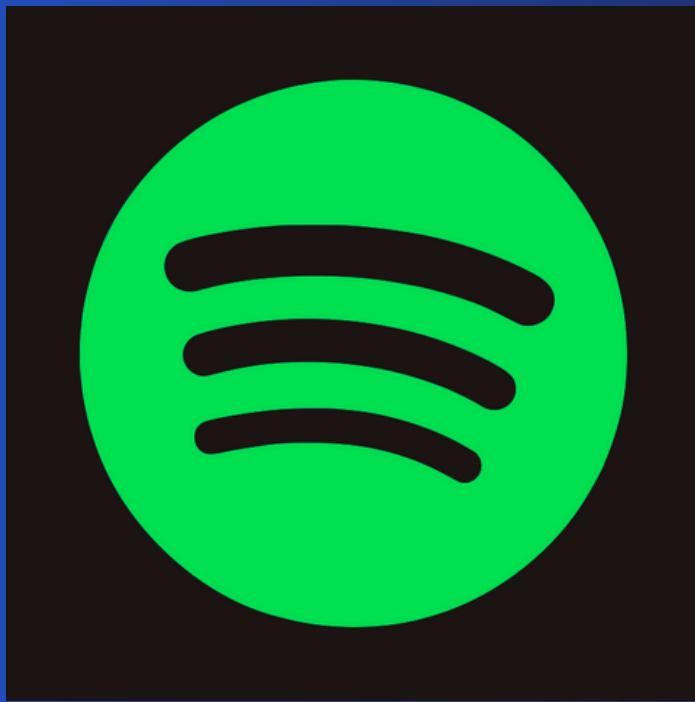
- Free Subscribers: 295 million
- Premium Subscribers: 205 million

Streaming Market:

- USD 30.42 billion in 2022
- 2023 Projection: USD 124.68 billion

Problem Statement

How can we use machine learning to predict genre of a song, leading to improvement in platform usability and user interaction on streaming platforms like Spotify, Apple Music and Amazon Music?



SPOTIFY DATASET

- Features

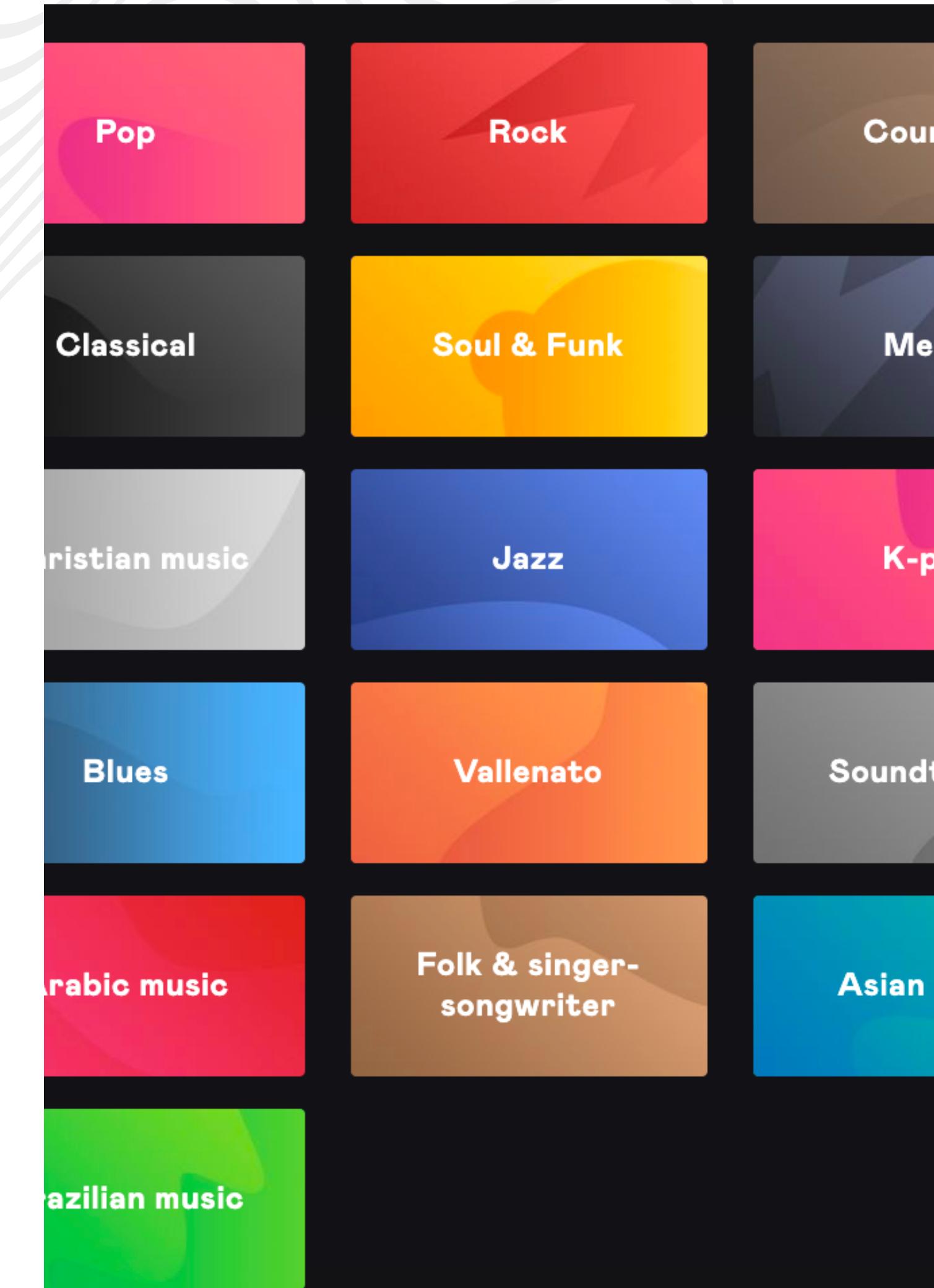
- duration in milliseconds, explicit, danceability, energy, key, loudness, mode, speechiness, acousticness, instrumentalness, liveness, valence, tempo, time signature,

- Target Variable

- genre

- Data Cleaning:

- Removal of substantial number of duplicates - upsampling for class balance



Baseline Modeling

113 Genres

General overfitting and better results from non-linear classifiers.

LOGISTIC
REGRESSION

Train Score: 5.1%
Test Score: 4.8%

DECISION TREE

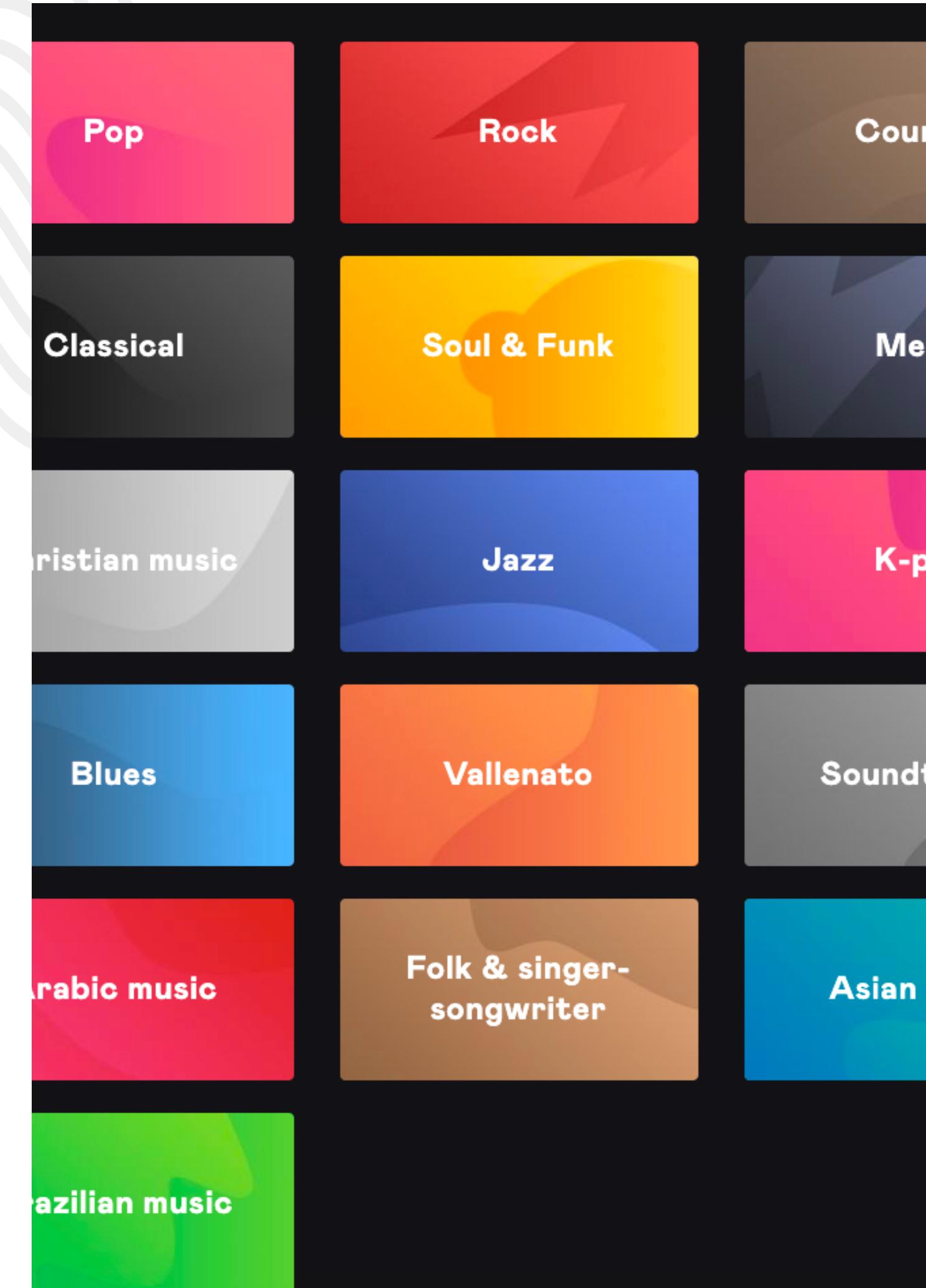
Train Score: 99.9%
Test Score: 25%

RANDOM FOREST

Train Score: 99.9%
Test Score: 40.6%

GENRE CONSOLIDATION & MODELING

- 113 Genres -> 85 Genres
 - children, chill, comedy, disney, kids, romance, party, piano, guitar, groove, pop-film
- Removal of any genres that organized by song topic or 'feel'
 - overlapping
 - noise



Baseline Modeling

85 Genres

There was a slight increase in performance due to the removal of 28 genres.

113 GENRES:

Train Score: 5.1%
Test Score: 4.8%

LOGISTIC
REGRESSION

85 GENRES:

Train Score: 5.7%
Test Score: 5.5%

Train Score: 99.9%
Test Score: 25%

DECISION TREE

Train Score: 99.9%
Test Score: 40.6%

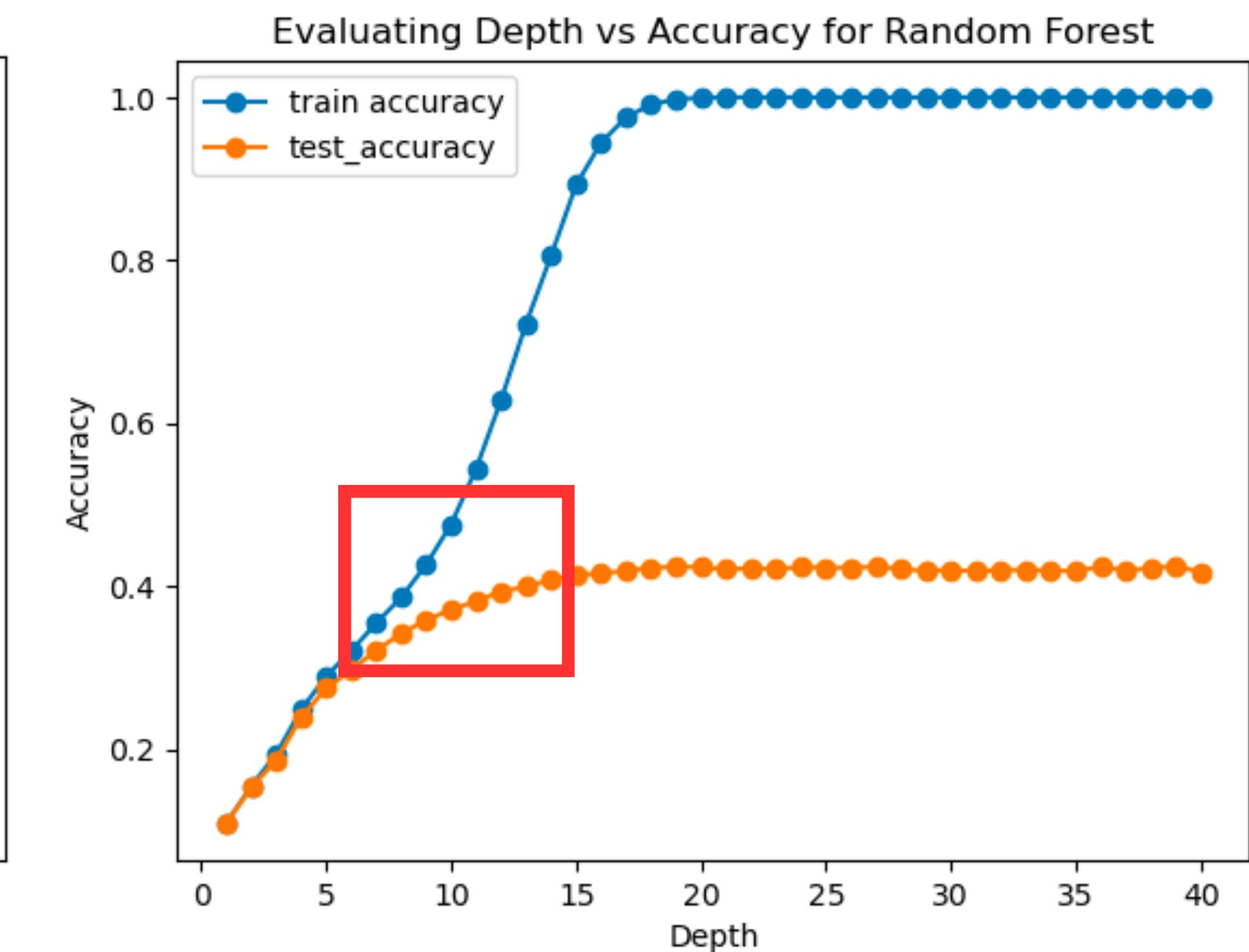
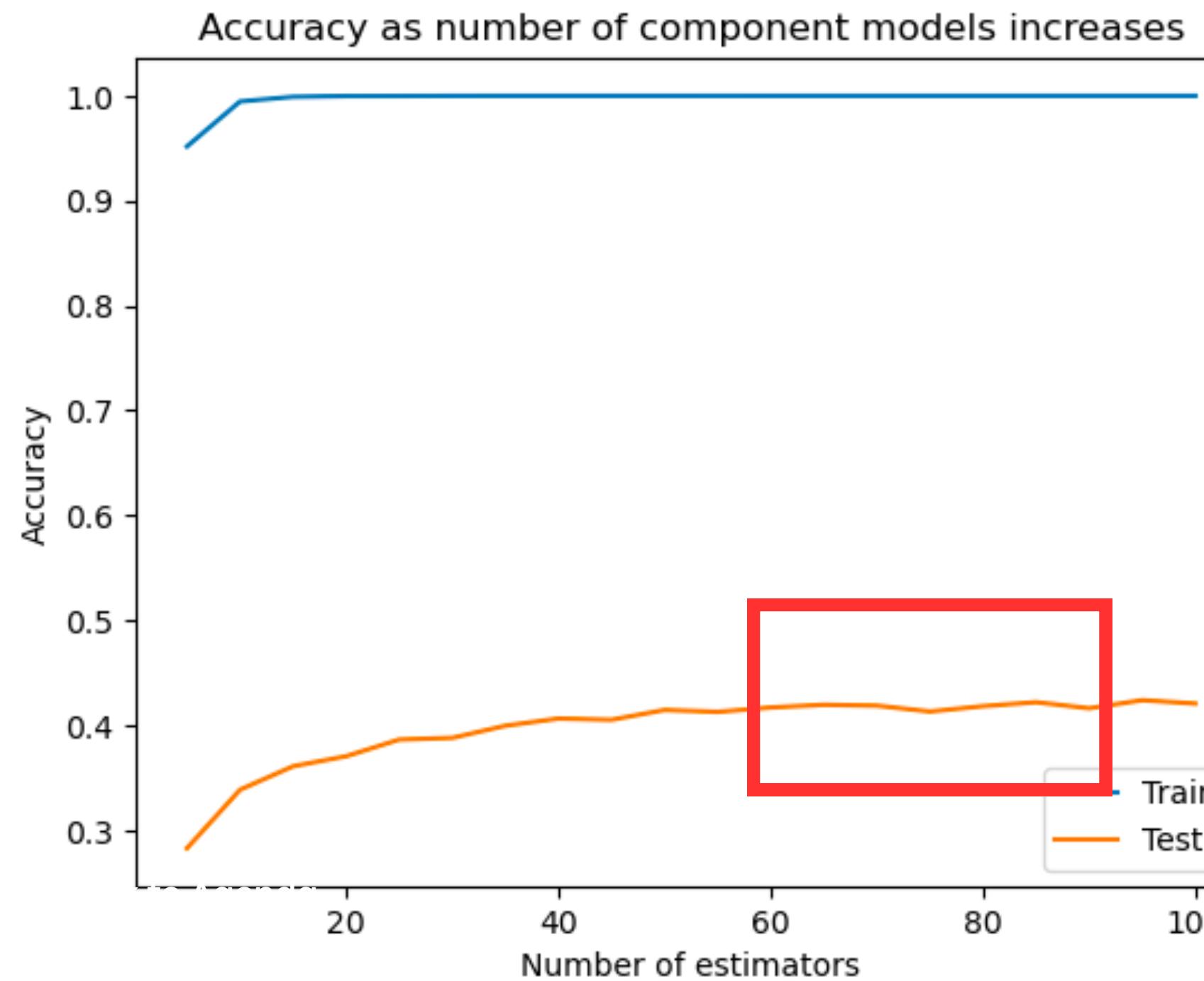
RANDOM FOREST

Train Score: 100%
Test Score: 27%

Train Score: 100%
Test Score: 42.6%

HYPERPARAMETER OPTIMIZATION OF RANDOM FOREST

NUMBER OF ESTIMATORS & MAX DEPTH



HYPERPARAMETER OPTIMIZATION OF RANDOM FOREST

GRID SEARCH

- Dimension Reduction
- Scaling
- Max Features
- Max Depth
- Min Sample Leaf
- Cross Validation - 5 folds

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 'rf_model_min_samples_leaf': 3}
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Random Forest Model Optimization - 85 Genres

The best performance without overfitting was low.

BASELINE RF:

Train Score: 99.7%

Test Score: 55.1%

RANDOM FOREST

OPTIMIZED RF:

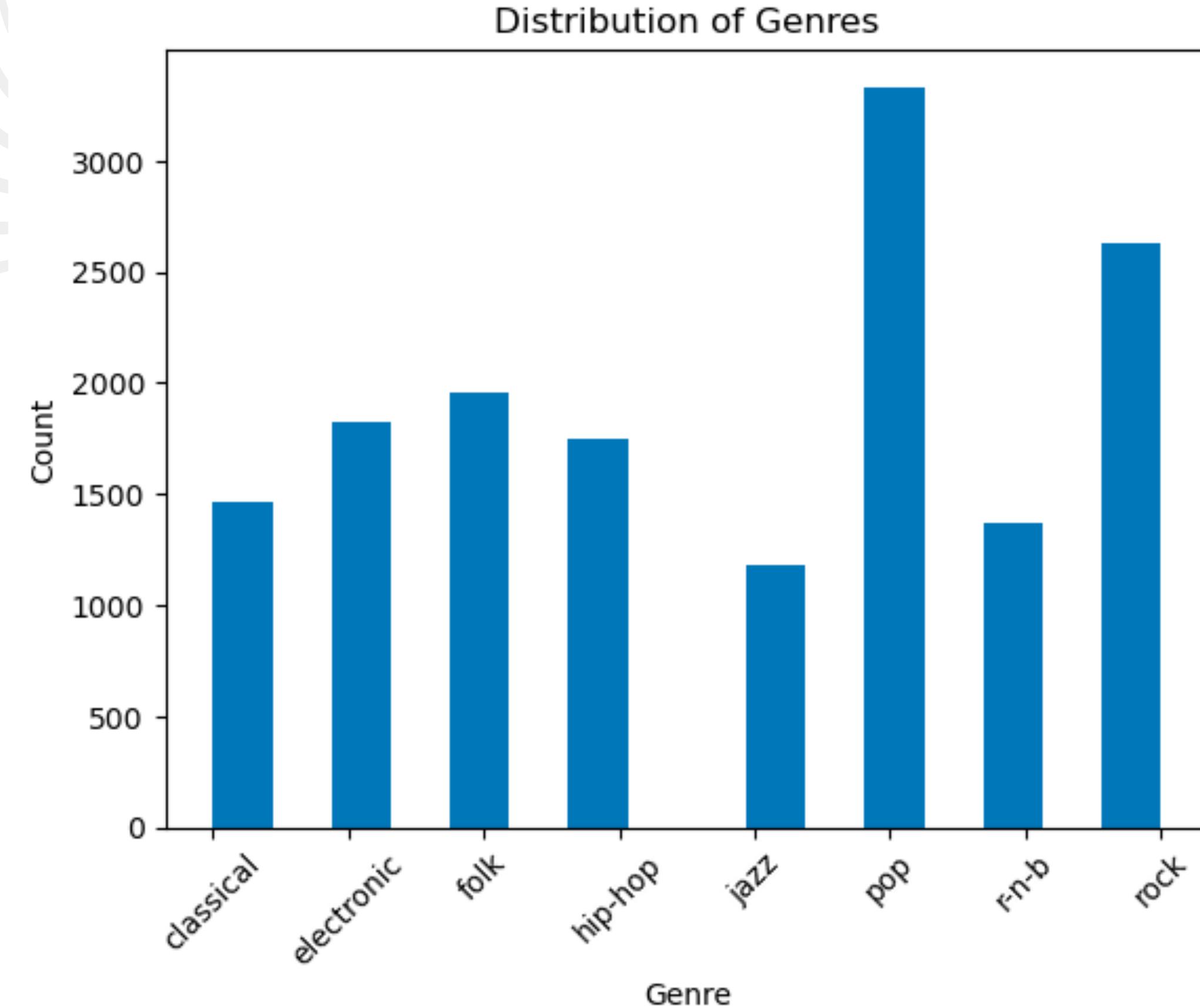
Train Score: 34%

Test Score: 32%

GENRE CONSOLIDATION

8 GENRES

- Combination of 2 Spotify Datasets
- 8 Distinct Genres
 - Rock, classical, electronic, folk, hip-hop, pop, jazz, r-n-b



Baseline Modeling

8 Genres

Significant improvement across all genres, but still overfitting.

85 GENRES:

Train Score: 5.1%
Test Score: 4.8%

LOGISTIC
REGRESSION

8 GENRES:

Train Score: 22.4%
Test Score: 22.8%

Train Score: 99.9%
Test Score: 25%

DECISION TREE

Train Score: 99.9%
Test Score: 40.6%

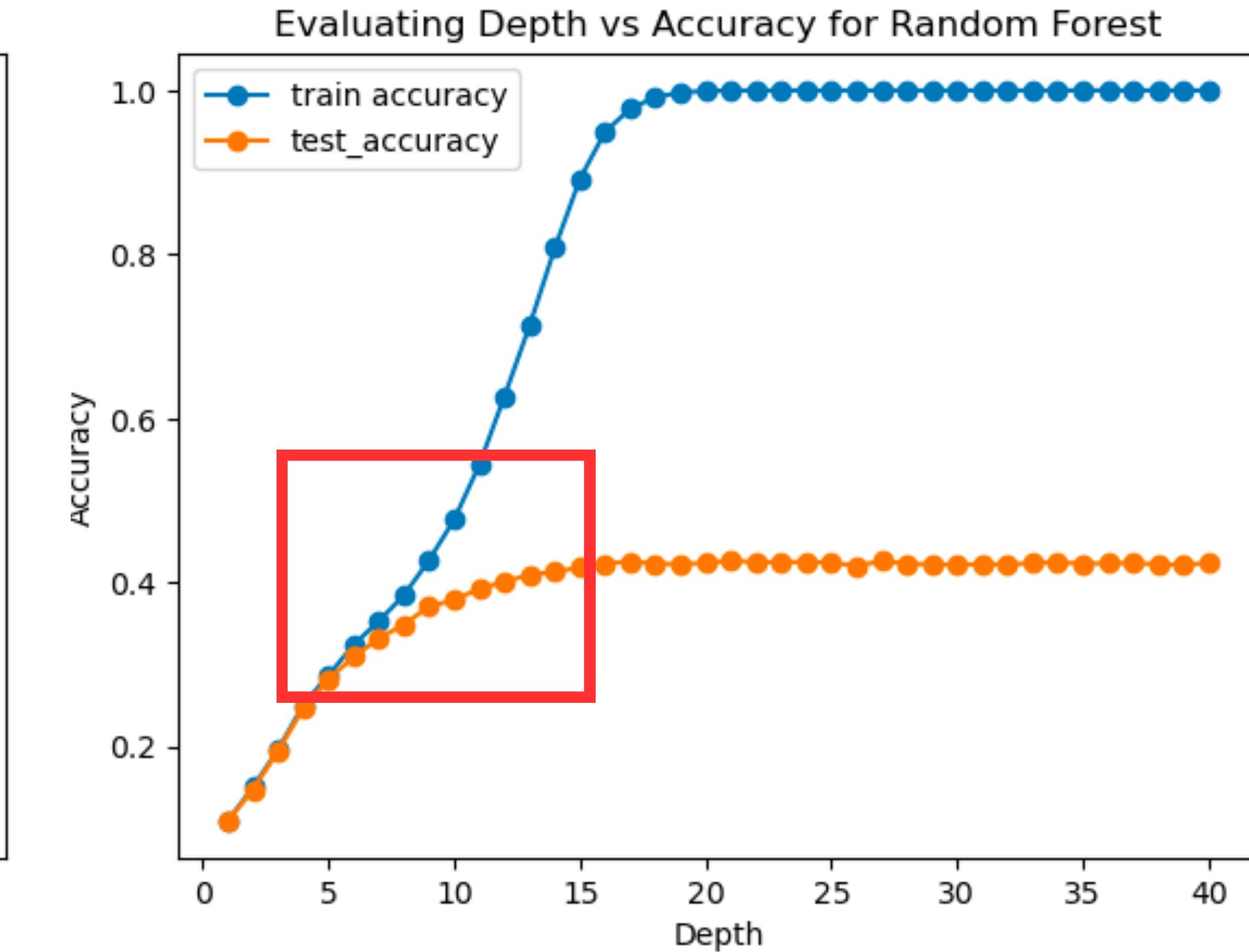
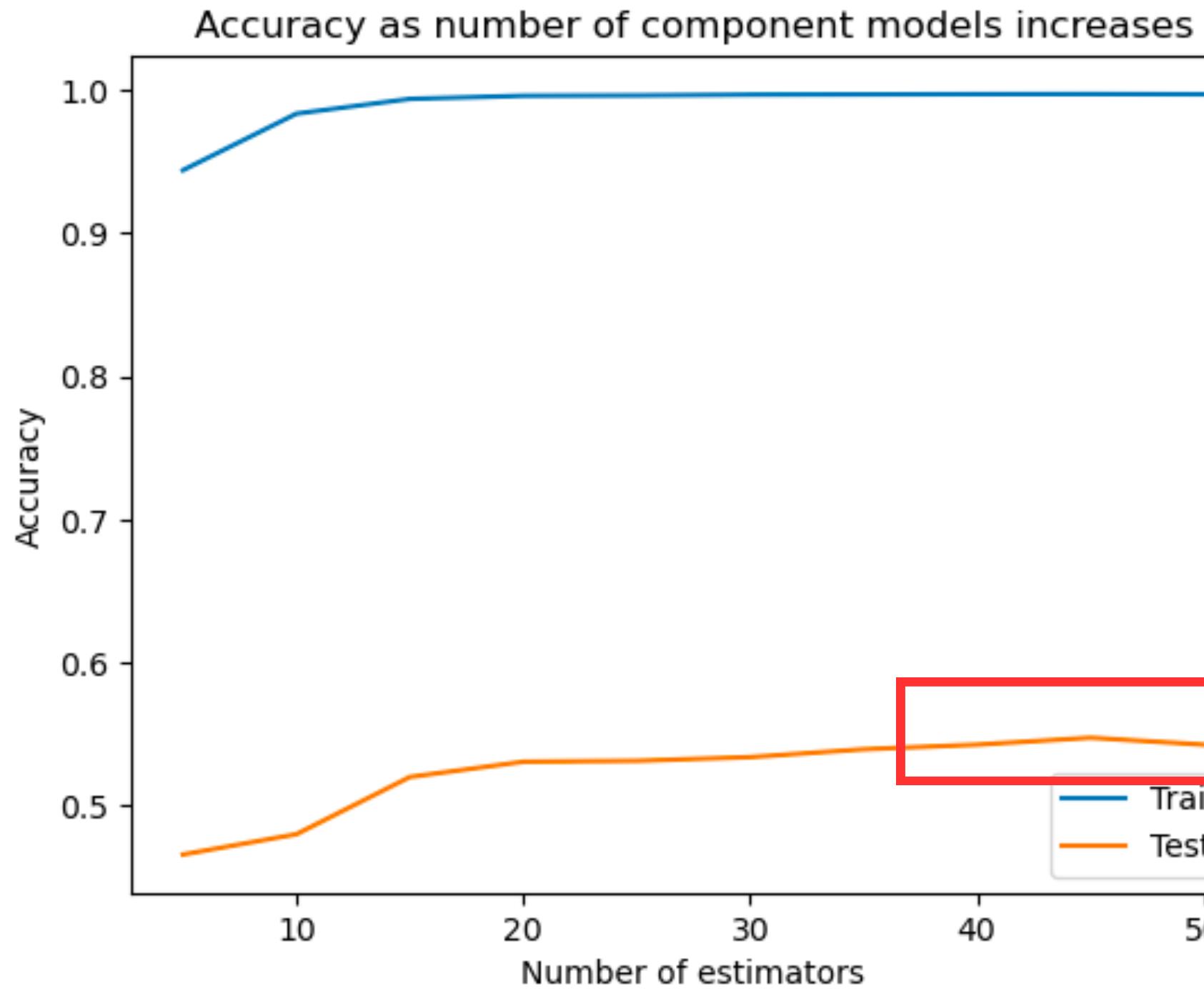
RANDOM FOREST

Train Score: 99.7%
Test Score: 40.2%

Train Score: 99.7%
Test Score: 55.1%

HYPERPARAMETER OPTIMIZATION OF RANDOM FOREST

NUMBER OF ESTIMATORS & MAX DEPTH



Random Forest Model Optimization - 8 Genres

The best performance without overfitting was low.

BASELINE RF:

Train Score: 99.7%
Test Score: 55.1%

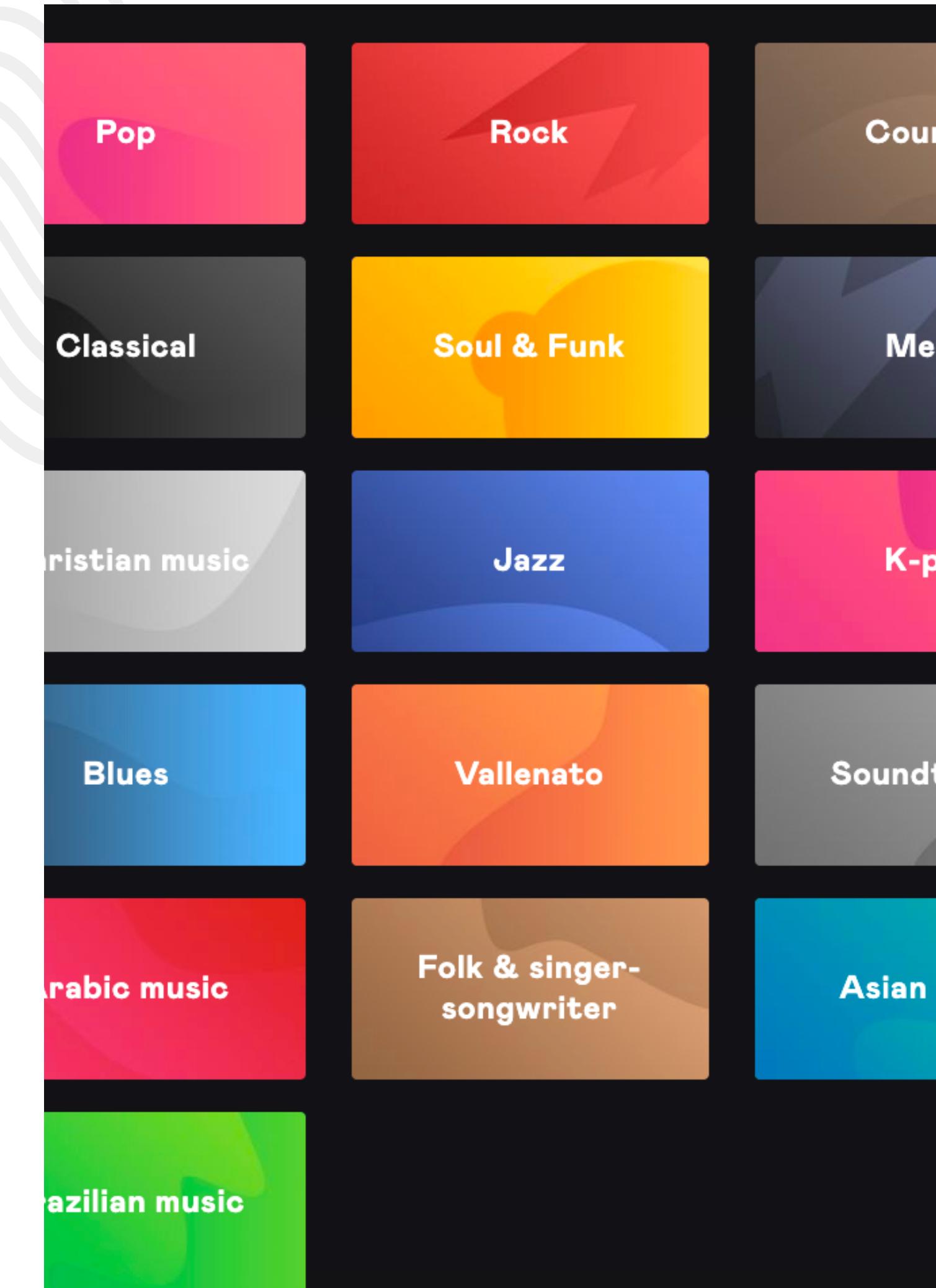
RANDOM FOREST

OPTIMIZED RF:

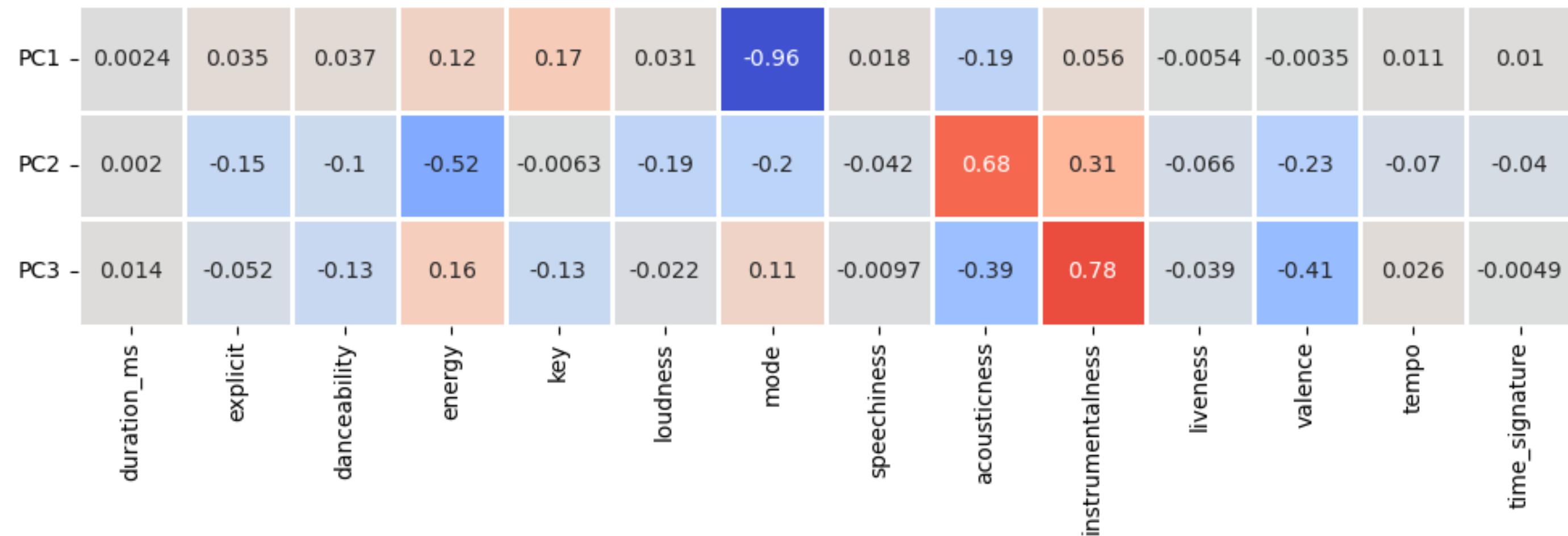
Train Score: 40%
Test Score: 37%

UNSUPERVISED LEARNING

- Can we find any patterns amongst genres using attributes?
- Scaling & Dimension Reduction
 - PCA
 - Reduced to 3 Dimensions
 - MinMax Scaler
- K-means
 - 8 Clusters

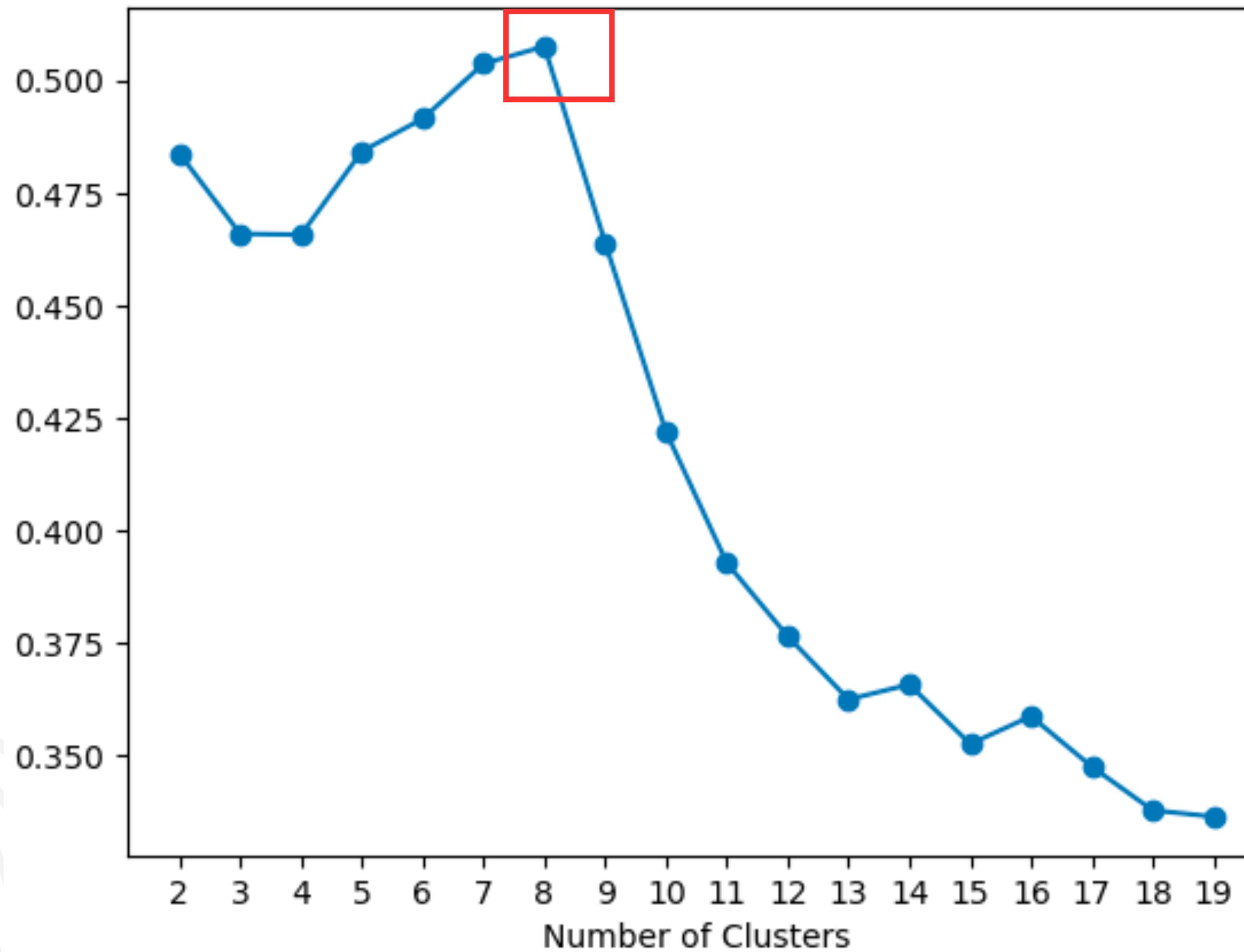


PCA(N_COMPONENTS=3) LOADINGS

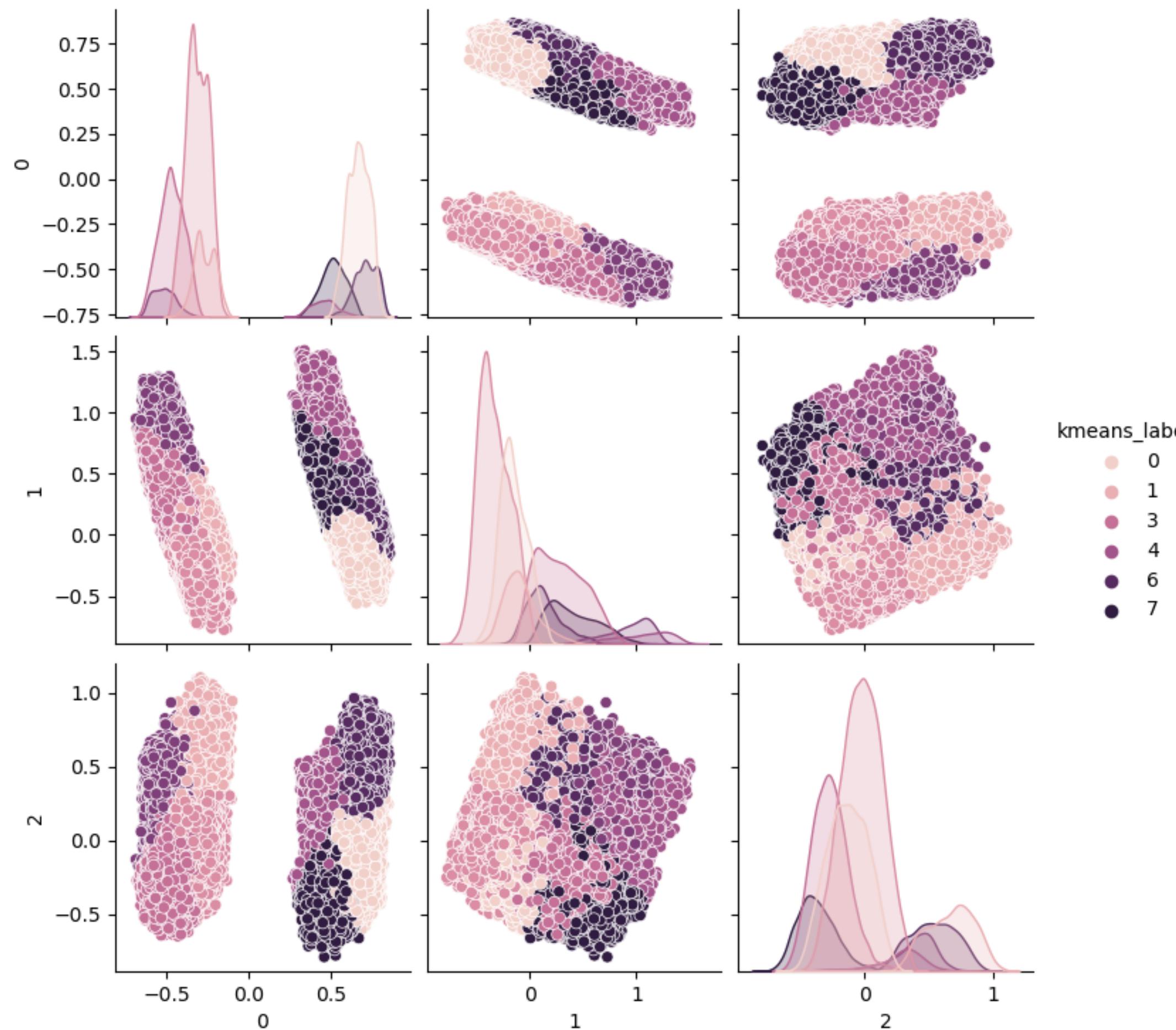


SELECTING NUMBER OF CLUSTERS

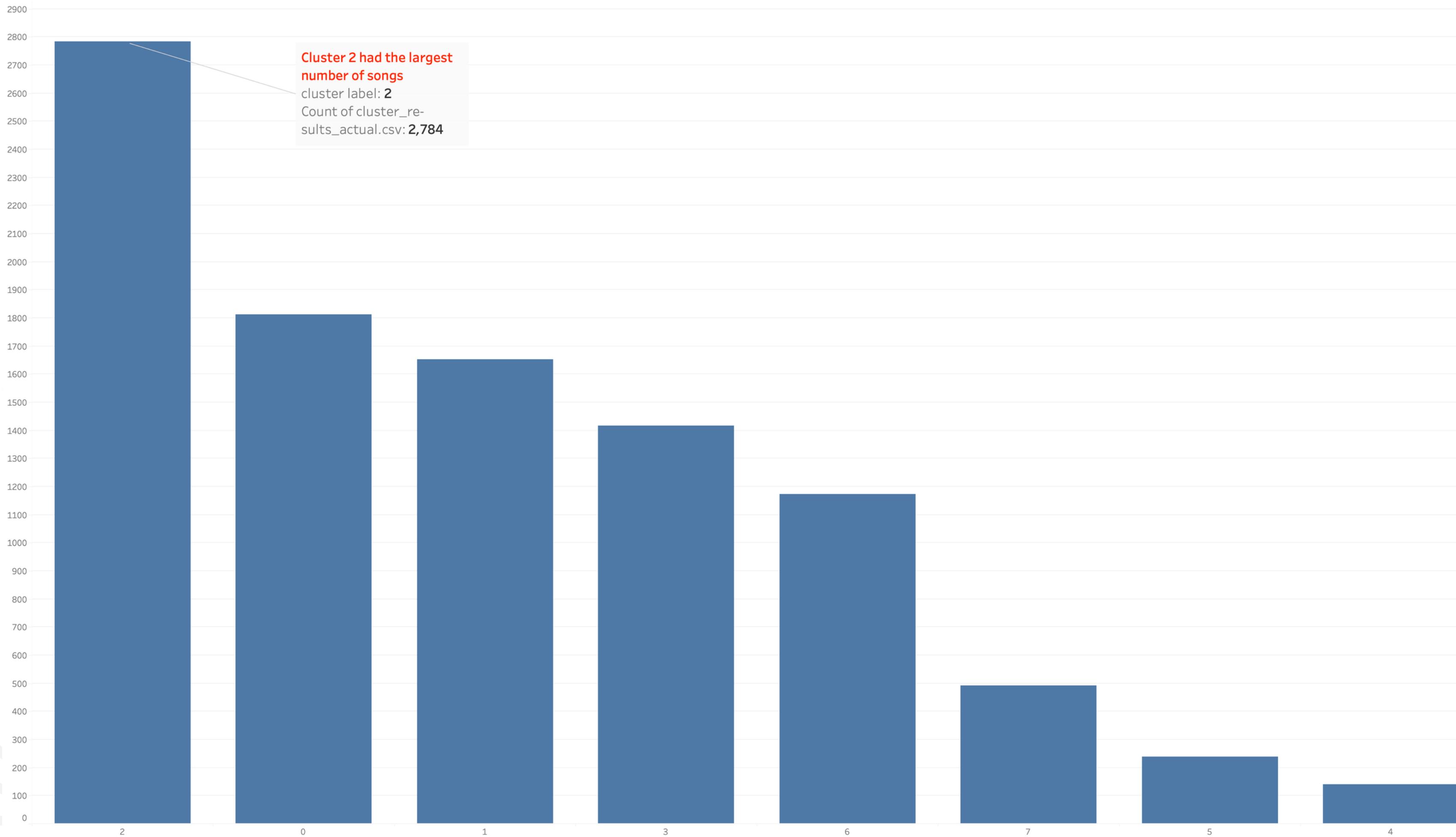
Scree Plot for K-means



CLUSTERS WITHIN EACH PRINCIPAL COMPONENT

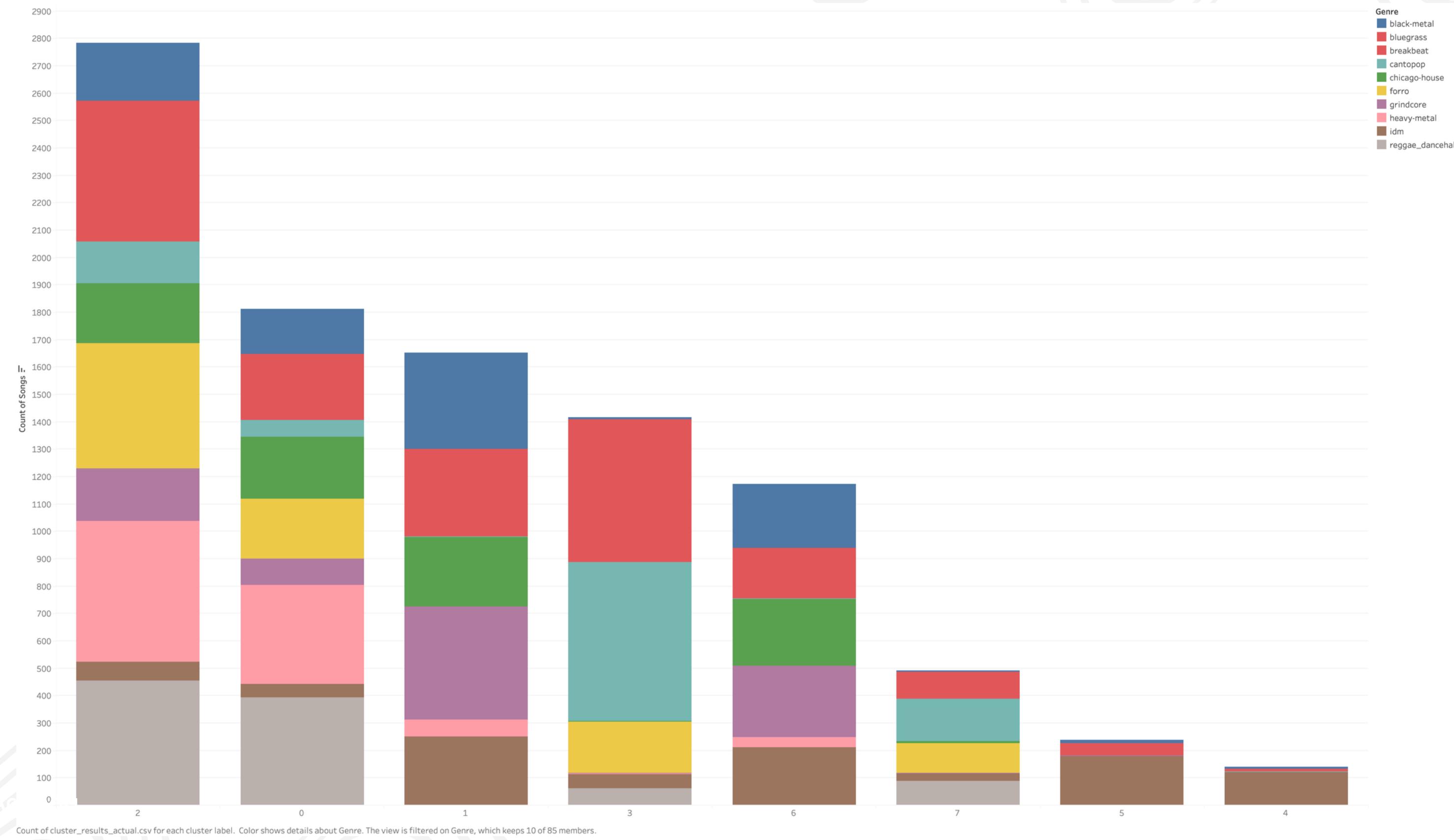


Amount of Songs in Each Cluster



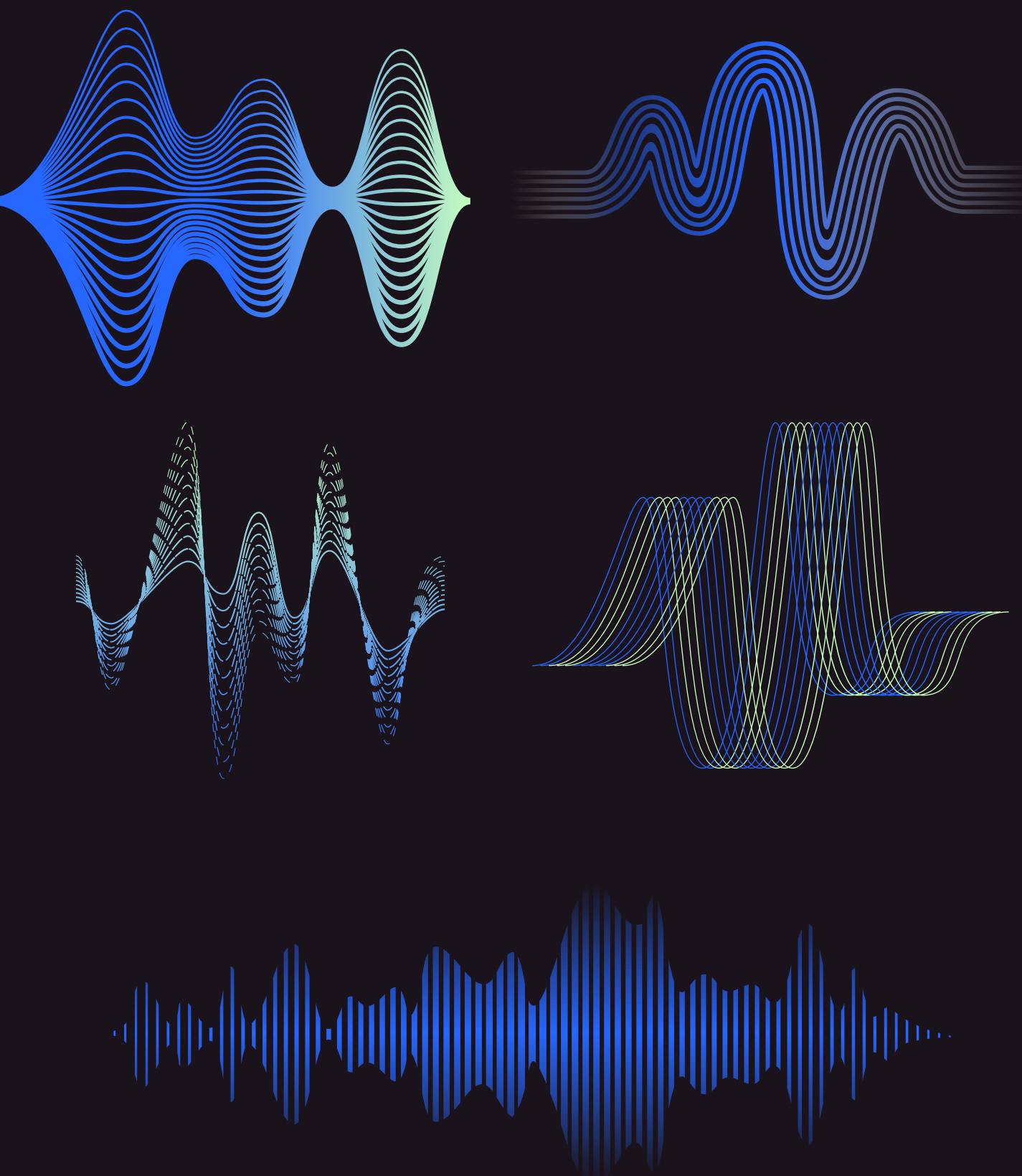
Count of cluster_results_actual.csv for each cluster label. The data is filtered on Genre, which keeps 10 of 85 members.

DISTRIBUTION OF GENRES



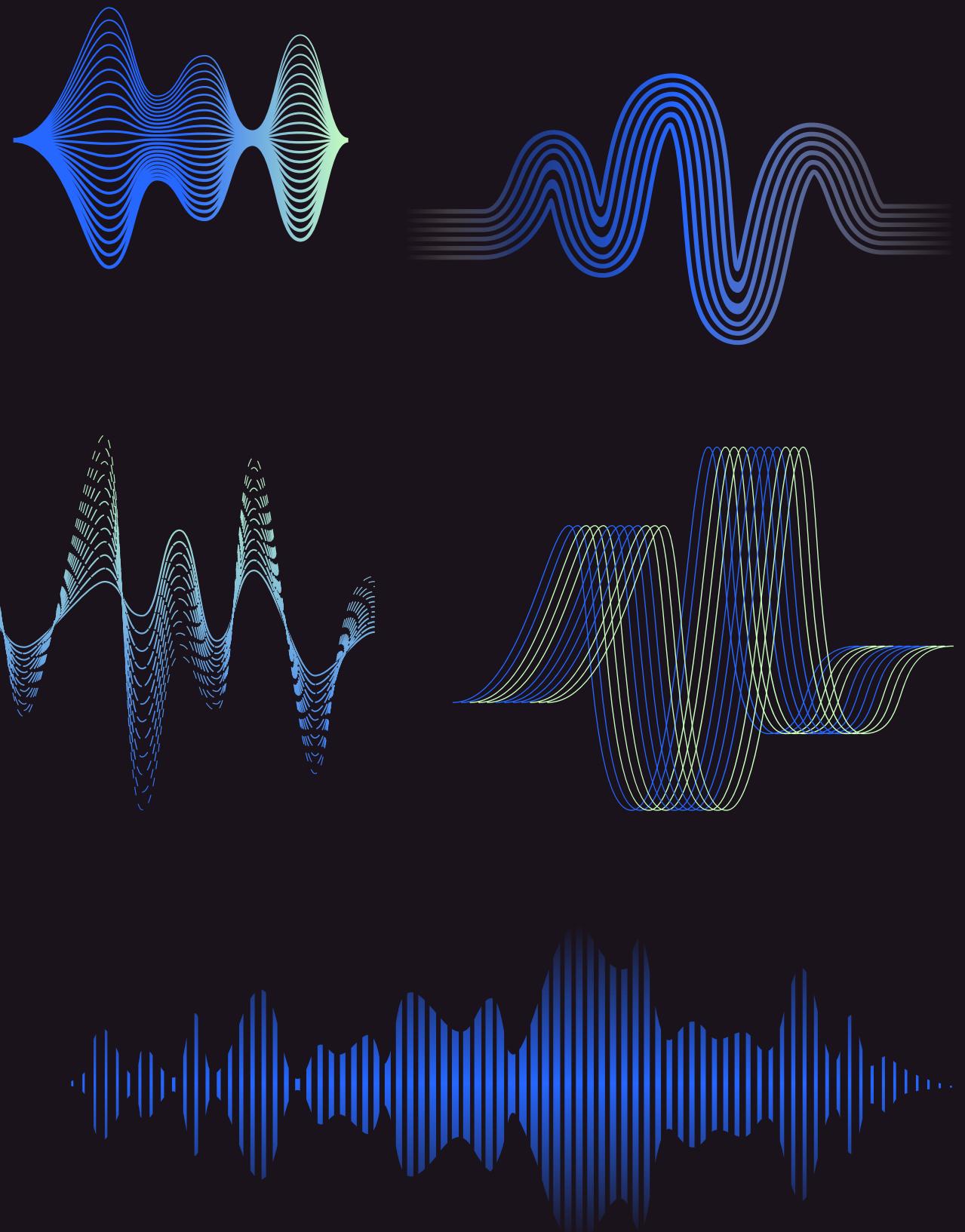
Cluster “Radio Stations”

- No genre patterns across clusters
- Clear groupings
 - Next steps: run statistical test to compare feature means within each cluster
- Potential Use
 - Starter computer-generated “radio-stations”
 - 8 “vibes”
- Recommender System
 - Utilize these clusters for feel-based “genre” categories



Possible Next Steps

- **Genre Classification**
 - Add sound clips of each song
 - Use of multiple csv files containing:
 - attributes
 - particulars of sound clips
 - sound clips themselves
 - Neural Networks
- **Radio Stations**
 - Vary cluster size



THANK YOU!

For inquiries, contact me.

EMAIL

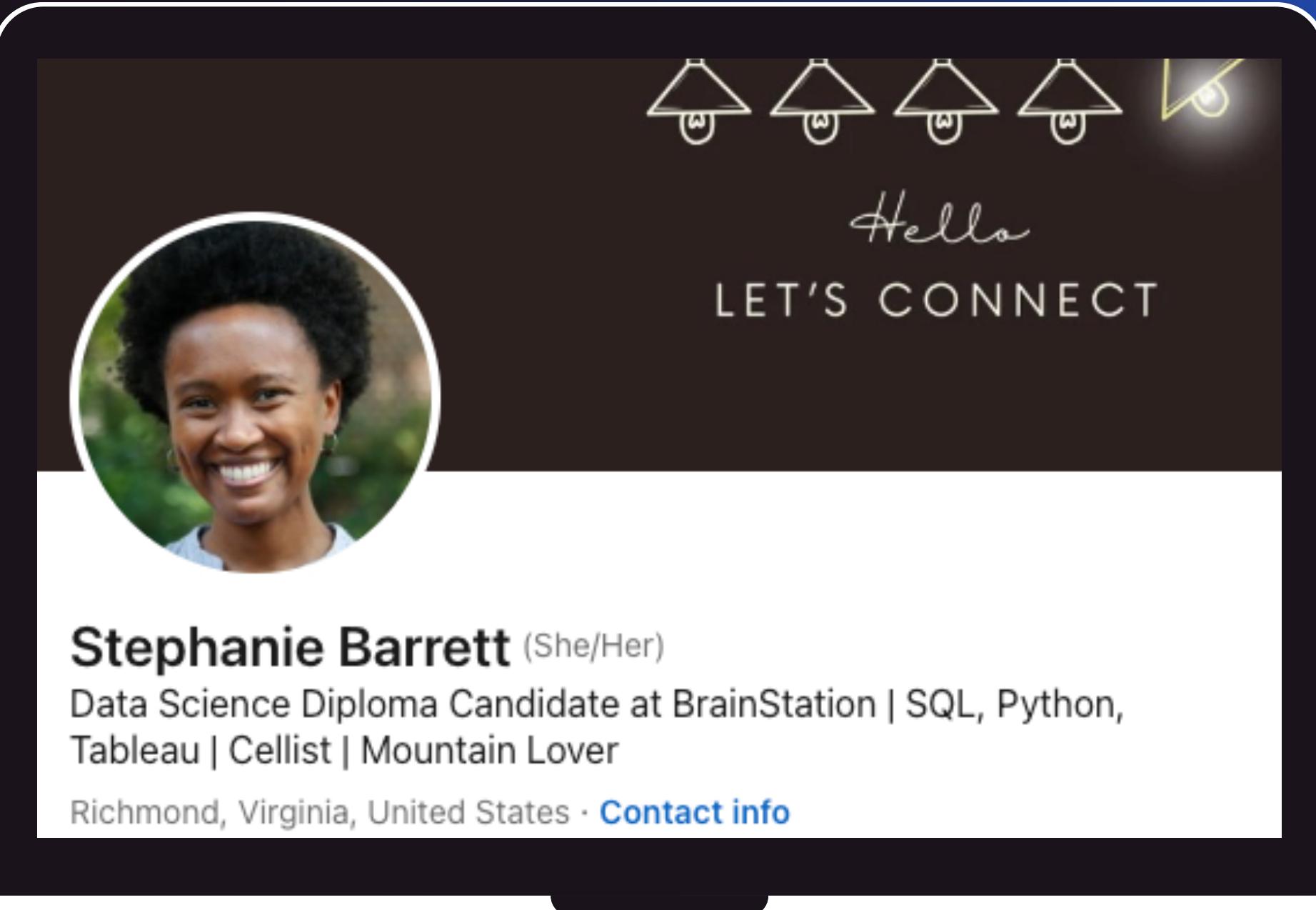
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GITHUB

<https://github.com/bartek410>

LINKEDIN

www.linkedin.com/in/stephanielbarrett



A LinkedIn profile card for Stephanie Barrett. The card features a circular profile picture of a smiling woman with dark curly hair. At the top right, there are five small icons: four white umbrellas with the letter 'W' and one yellow umbrella with a checkmark. Below the profile picture, the name "Stephanie Barrett" is displayed in bold, followed by "(She/Her)". A summary below states: "Data Science Diploma Candidate at BrainStation | SQL, Python, Tableau | Cellist | Mountain Lover". At the bottom, it shows "Richmond, Virginia, United States · [Contact info](#)". The background of the card is black, and the overall design is clean and professional.



BrainStation