Machine Learning Nanodegree
Capstone Proposal

Classifying Song Genres from Audio Data

Ahmad Alshehri – February 4, 2019

- **Domain background**

In 2005, music streaming services were flung to the forefront of public attention with Pandora. By fusing the streamlined interface of iTunes with related musical characteristics, Pandora created an online service which recommended new music based on a user's listening history, allowing users to bookmark artists and discover new acts. While it certainly took a while to gain traction, Pandora influenced several modern streaming services including Spotify, and by 2013, the website had over 200 million users, demonstrating its influence to the modern world of streaming

In recent years streaming services with huge catalogs have become the primary means through which most people listen to their favorite music. But at the same time, the sheer amount of music on offer can mean users might be a bit overwhelmed when trying to look for newer music that suits their tastes. Streaming services have been looking into means of categorizing music genres in order to allow for personalized recommendations systems for the users. One method involves direct analysis of the raw audio information in a given song, scoring the raw data on a variety of metrics.

- **Problem statement**

The goal of this project is to distinguish between rock and Hip-hop music based only on the track information. A song is about more than its title, artist, and number of listens. We have another dataset that has musical features of each track such as energy, danceability, and acousticness on a scale from -1 to 1.

My hypothesis is to first merge the two datasets together by the track ID and remove any irrelevant information my model before starting my analysis.

- **The datasets and inputs**

In this project, I will be using a dataset comprised of songs of two music genres Hip-Hop and Rock. I will train a classifier to distinguish between the two genres based only on track information derived from The Echo Nest (now part of Spotify). These exist in two different files, which are in different formats - CSV and JSON. While CSV is a popular file format for denoting tabular data, JSON is another common file format in which databases often return the results of a given query. The dataset contains 17,733 different songs in the fma-rock-vs-hiphop.csv.

Both datasets can be found on the following link:

- https://www.kaggle.com/aniruddhachoudhury/classify-song-genres-from-audio-data#echonest-metrics.json

- **Solution Statement**

The solution to this problem is to apply a supervised learning model with labels as the target variable. Though. Having too many features could lead to overfitting, I will apply the following techniques before choosing my supervised learning model of choice:
- Data Preprocessing
- Dimensionality Reduction
- Principle Components Analysis

This seems to me as a classification problem since the songs are either one of the two different categories (Rock and Hip-Hop). My solution approach will be mainly supervised learning, my models of choice are Logistic Regression classifier.

- **A benchmark model and Evaluation metrics**

A simple decision tree classifier model will be used as a bench mark model that the logistic regression model performance can be measured with. I will be evaluating my model performance using:
- Precision
- Recall
- F1-score
- Cross-Validation

Looking at the row data, it seems Rock genre have the high percentage of the data. Therefore, some data balancing might be required to avoid creating a biased model.

- **Project design**

Explaining the project in laymen terms these are the main steps I will be taking:
1. Upload and explore the datasets
2. Pairwise relationship between continuous variables
3. Normalize the feature to scale the data
4. Apply Principle components analysis on the scaled data
5. Train both decision tree and logistic regression classifiers
6. Balance the date for greater performance to kill bias if found
7. Evaluate models performance using cross-validation

- **Reference:**

FMA: A Dataset for Music Analysis
https://arxiv.org/pdf/1612.01840.pdf

https://www.kaggle.com/aniruddhachoudhury/classify-song-genres-from-audio-data#echonest-metrics.json