Project Summary – Melody in Emotion

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Project Design

The intent of this project was to design a model that could classify songs into a specific emotion that listening to it invokes. Can we make clear distinctions between sad songs and happy songs, or other more ambiguous emotions as well? In particular, I wanted to analyze the audio of the song itself and make classifications based on the actual sound sample.

In order to determine this, I utilized Spotify as my primary source. Spotify, as the prominent music streaming service on the planet, provides a variety of low level audio features via the Spotify API. I also wanted to utilize the API's ability to provide 30 second audio samples in order to look at the actual sound wave and generate additional features such as the spectral centroid and MFCCs, however due to time pressure that was not conducted. Many of the features utilized were numerical floats on a scale from 0 to 1, but there were certain factors that were larger numbers such as loudness which was measured in decibels.

Modeling for this project was performed utilizing several different classification models. I utilized a StandardScaler to try and bring all of my features in line with each other and minimize the impact of the different weights of each variable. I then split my dataset into 80% for training and 20% for testing, and worked with a few different model types. My initial model utilized K-nearest Neighbors, however I also attempted classification with Naïve Bayes, Random Forest, and Logistic Regression. After running through each model, my best model ended up being Logistic Regression as it had the best accuracy and the best AUC. Random Forest also worked very well, however I chose not to pursue it due to the longer runtime.

Tools

- Python
  - Pandas, Numpy, Spotipy
  - Sklearn, Jupyter Notebook, matplotlib
- Microsoft Word, Microsoft Powerpoint

Data

The bulk of the dataset was obtained by pulling from the Spotify API. I created a list of playlist urls that I took from Spotify's pre-curated Moods section and determined what emotional state each playlist was attempting to invoke. Then I created a file to run through the list and pull all of the song links from each playlist. Once I had that, I went to the API and pulled out all of the requisite audio features for each song. I also pulled a link for the preview audio sample for each song, however I later realized that not every song had a preview sample so I would have to trim

down my dataset if I was going to approach that topic. This would have trimmed down the initial dataset of around 3,000 songs down to 1,300. I chose not to utilize the audio samples in the end, so I was able to work with my initial set of 3,000 songs.

All the features utilized for this model can be found in Appendix I. Almost every feature was already prepared for usage as Spotify output them as floats between 0 to 1. There were a few exceptions, but they were handled by the StandardScaler. It was not particularly difficult to get the data, although I did find myself questioning some of Spotify's selections for their curated playlists. I also found that there were duplicates between the different playlists which inflated my dataset. I considered curating my own playlists for usage, however I chose not to pursue that path as it would have been immensely time-consuming. I also noticed that some song titles did not come out correctly in the final dataframe, however as song titles were not utilized for the model it was safe to ignore them.

What I Would Do Differently Next Time

I think my initial approach and start was good. I was on track for most of the project. I did stall once it got to the audio sample analysis as I felt I did not really understand exactly what I was doing and that I needed more time to learn about the process. I also underestimated how long the SQL challenge would take, and it ended up eating away more time than I realized. Finally the major issue was that I got sick during the project, and this ended up sapping a lot of my energy and made it difficult to accomplish what I wanted to do. For the future, I will try to better manage my expectations on time and work on making sure I allot my resources properly.

Appendix I: Features

VARIABLE	TYPE	DESCRIPTION
MOOD	String	Emotion that the song would invoke. In practice, was a boolean but intended as a string.
SONG NAME	String	Song Identifier
ARTIST NAME	String	Artist Identifier
MODALITY	Boolean	Determines whether the song is in Major or Minor key
ENERGY	Float	A value that tries to measure how intense the song is
TEMPO	Int	Measures how fast the song is in Beats Per Minute (BPM)
VALENCE	Float	Measure of the positivity of the song
INSTRUMENTALNESS	Float	A value for how much of the song involves vocals, and how much is more purely instrumental sounds
LOUDNESS	Float	Measures how loud the song is in decibels (dB)
SPEECHINESS	Float	Measures how much of the song is spoken word as opposed to singing