Understanding Pop Music in 2018 - STAT 410 Project Proposal

**Question**

What makes a song popular? Energetic party music or chill acoustic music for studying? Do we empathize with heartbreaking love songs more, or like cheerful music better? In my project, I want to investigate the relationship between a song's attributes and its popularity. Specifically, what attributes, if any, are the determining factors for a song's popularity? What attributes have a positive correlation with popularity?

**Method**

I will take advantage of Spotify's API endpoint, which allows easy access to the information of over 35 million songs in its database. As one of the major music player, I assume that it reflects the world's music taste. Spotify has advanced audio analysis algorithms that parameterize each song with semantic characteristics like acousticness, danceability, and energy etc. The API also provides a value for each song's popularity, calculated from the number of the streams and how recent the streams are.

1000 songs with different popularities will be chosen randomly to ensure the variance in response and the results will generalize to other songs. Below is a table that lists the regressors I plan to use. I will first fit an MLR model on the dataset, and then investigate the significance level, the interaction between regressors (e.g. danceability and tempo), and try to reduce the number of parameters.

| | Data | Range | Example<br>[Billie Jean - Michael Jackson] |
|---|---|---|---|
| Regressor | acousticness | [0.0, 1.0] | 0.0236 |
| | danceability | [0.0, 1.0] | 0.92 |
| | duration_ms | positive int measured in ms | 293827 |
| | energy | [0.0, 1.0] | 0.654 |
| | instrumentalness<br>(Predicts whether a track contains no vocals) | [0.0, 1.0] | 0.0158 |
| | liveness<br>(the presence of an audience in the recording. | [0.0, 1.0] | 0.0359 |
| | loudness (in dB) | [0.0, 1.0] | -3.051 |
| | speechiness<br>(the presence of spoken words in a track) | [0.0, 1.0] | 0.0401 |
| | tempo | float | 117.046 |
| | valence<br>(the musical positiveness conveyed by a track) | [0.0, 1.0] | 0.847 |
| Response | popularity | int between [0,100] | 83 |

Experiment Setup:

The following data for 1000 songs will be collected (extracted from the Spotify API documentation ):

| | Data | Range | Description |
|---|---|---|---|
| Regressor | acousticness | [0.0, 1.0] | A confidence measure from 0.0 to 1.0 of whether the track is acoustic. 1.0 represents high confidence the track is acoustic. |
| | danceability | [0.0, 1.0] | Danceability describes how suitable a track is for dancing based on a combination of musical elements including tempo, rhythm stability, beat strength, and overall regularity. |
| | duration_ms | positive int measured in ms | The duration of the track in milliseconds |
| | energy | [0.0, 1.0] | represents a perceptual measure of intensity and activity. Typically, energetic tracks feel fast, loud, and noisy. For example, death metal has high energy, while a Bach prelude scores low on the scale. Perceptual features contributing to this attribute include |

| | | | |
|---|---|---|---|
| | | | dynamic range, perceived loudness, timbre, onset rate, and general entropy. |
| | instrumentalness | [0.0, 1.0] | Predicts whether a track contains no vocals. “Ooh” and “aah” sounds are treated as instrumental in this context. Rap or spoken word tracks are clearly “vocal”. The closer the instrumentalness value is to 1.0, the greater likelihood the track contains no vocal content. Values above 0.5 are intended to represent instrumental tracks, but confidence is higher as the value approaches 1.0. |
| | liveness | [0.0, 1.0] | Detects the presence of an audience in the recording. Higher liveness values represent an increased probability that the track was performed live. A value above 0.8 provides strong likelihood that the track is live. |
| | loudness | [0.0, 1.0] | The overall loudness of a track in decibels (dB). Loudness values are averaged across the entire track and are useful for comparing relative |

| | | | |
|---|---|---|---|
| | | | loudness of tracks. Loudness is the quality of a sound that is the primary psychological correlate of physical strength (amplitude). Values typical range between -60 and 0 db. |
| | speachiness | [0.0, 1.0] | Speechiness detects the presence of spoken words in a track. The more exclusively speech-like the recording (e.g. talk show, audio book, poetry), the closer to 1.0 the attribute value. Values above 0.66 describe tracks that are probably made entirely of spoken words. Values between 0.33 and 0.66 describe tracks that may contain both music and speech, either in sections or layered, including such cases as rap music. Values below 0.33 most likely represent music and other non-speech-like tracks. |
| | tempo | float | The overall estimated tempo of a track in beats per minute (BPM). In musical terminology, tempo is the speed or pace of a given piece and |

| | | | |
|---|---|---|---|
| | | | derives directly from the average beat duration. |
| | valence | [0.0, 1.0] | describing the musical positiveness conveyed by a track. Tracks with high valence sound more positive (e.g. happy, cheerful, euphoric), while tracks with low valence sound more negative (e.g. sad, depressed, angry). |
| | popularity (response) | int between [0,100] | |