

Using waveforms to train a song recommendation model

Background

I've always enjoyed recommending new songs to friends which fit their music taste. Seeing how distinct images can be grouped through tSNE led me to investigate whether this concept could be applied to music. By grouping someone's music catalog, we could determine whether a new single fits the characteristics of that group and therefore fits their music taste.

Method

Just as images are visual objects which can be represented numerically through RGB data, songs are auditory objects which can be represented numerically through waveform data. Audio frames measure the amplitude of certain channels in a song at a given time, and waveforms represent the cumulative distribution of these audio frames. A song's waveform can be extracted from its WAV file using Python's wave module, and the WAV files of four J. Cole songs and four Kendrick Lamar songs were used to fit a tSNE embedding. The purpose of this embedding is to potentially visualize a grouping of waveforms by artist.

Results

The 2-D embedding was fairly erratic each time tSNE was run. No distinct clusters could be identified since each point seemed equidistant to one another. This is most likely due to the small sample size, which was limited by the data intake process. Waveforms for songs had to be extracted from a downloaded WAV file which used 30MB+ of storage for each song. Automating this process could provide the ability to test tSNE on a larger catalog.

Reflection

It was interesting to functionally implement the capabilities of tSNE on music. If this idea is successful with a large sample size, there seems to be many potential benefits. For example, a streaming platform such as Spotify could use KNN to recommend new songs to users based on the nearest neighbors to songs they already listen to.

References

1. Article on waveform analysis: <https://towardsdatascience.com/waveform-analysis-unlocks-the-data-in-music-c47e773f1fa8>
2. Video on waveform extraction and plotting: https://www.youtube.com/watch?v=n2FKsPt83_A
3. Youtube to WAV converter: <https://youtubeto.org/en/youtube-wav.html>