

Machine Learning Project Proposal:
Multi class classification of music genres based on a track's audio
features

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1 Motivation

Music genre prediction can be usefull to let listeners explore new music based on their preferences. Besides, it could also be used to find music in other genres, based on some of the characteristics of a specific genre you like. For example, runners could prefer a specific tempo, then it could be possible that a different genre has a similar tempo, and could thus also be suitable music for running.

This could also be used for therapeutic listening. Some users might use music therapy to calm down and prefer a specific loudness or instrumentalness. Then, music genre classification could help them look for a suitable genre to listen to based on their preferences.

2 Dataset description

The dataset [2] contains data of 50 000 different songs in a CSV format acquired with the Spotify API. There are a total of eleven different genres, meaning that we should have enough data samples to apply both traditional and machine learning based multi-class classification. In the dataset however, there are some columns that could be irrelevant to the research we conduct, like for example the artist and track name, the id, and obtained date. However, this last one could turn out to be useful for newer genres, however we might have to generalise this into a year instead of an exact date. The dataset contains the following columns:

Columns and their description	
Columns	Description
instance_id	unique ID for each music
artist_name	artist name
track_name	track name
popularity	how popular is the music
acousticness	how acoustic is the song, range from 0-1
danceability	Metric based on tempo, rythm stability, beat strength and overall regularity, range from 0-1
duration_ms	the duration of the song in ms
energy	energetic songs tend to feel fast loud and noisy.
instrumentalness	Instrumental songs are defined as songs that
key	the key of the song ($C, C\# \rightarrow B$)
liveness	Value that predicts whether a song was performed live or not. Range from 0-1. values from 0.8 and up can be considered live
loudness	Overall loudness of the track in dB. Range from -60 - 0
mode	major or minor
speechiness	detects the presence of spoken words in a track. Range from 0-1. non speech tracks can be considered for values below 0.33
tempo	the tempo of the song in BPM
obtained_date	the date the data was obtained
valence	Value that depicts whether a song sounds positive or not.
music_genre	Electronic, Anime, Rock, (8 others)

3 Method

Several methods can be compared to categorise a random song. The performance of these methods can be compared at the end. Depending on this, we will compare the performance of the following methods to categorise songs with their respective genre:

3.1 Support Vector Machines

The first approach that will be explored is the use of Support Vector Machines. This is one of the most basic and most used approaches to classify data, so this should be definitely explored as a start

3.2 Random Forest

Another popular way to implement a machine learning algorithm is by using a Random forest. This technique takes in multiple combinations of the supplied dataset (Bootstrap sampling) and turns it into a new dataset. Then on these datasets, some of the different features get used (Random Feature Selection). This has several benefits for our kind of data. It also adds in protection to overfitting.

3.3 Feed Forward Neural Network

The previous two examples were just implementations of machine learning. If we want to implement a machine learning approach, a Feed Forward neural network could be of interest.

4 Other research

Genre classification using machine and deep learning has been researched before. One often used dataset is the GTZAN Dataset. This dataset contains both the audio signals, as a CSV file with some of the audio features like the RMS value. However this data is very technical and may be difficult for non-technical people to understand. This dataset was used in this paper [1] to classify songs into a genre. The most efficient technique turned out to be a Convolution Neural Network (CNN). However this can't be easily applied to tabular data.

5 References

References

- [1] Mitt Shah et al. "Music Genre Classification using Deep Learning". In: *2022 6th International Conference on Computing Methodologies and Communication (ICCMC)*. 2022, pp. 974–978. DOI: 10.1109/ICCMC53470.2022.9753953.
- [2] VICSUPERMAN. *Prediction of music genre*. URL: <https://www.kaggle.com/datasets/vicsuperman/prediction-of-music-genre>.