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Identifying Trends in Audio Features to Recommend Music

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Abstract - *Music is available in large numbers and the overload is excess. Hence a recommender system helps a user to narrow down the search to a few relevant songs that a user might want to listen to. All recommendation engines recommend music to users based on different features and metadata of music. Genres are important because we develop strong tastes in particular genres, as per our liking. It helps us organize our music collection.*
But genre-based music recommendation is traditionally carried out based on the genre that is provided by the artist which is very vague and defines only what the artist thinks about the music. Every artist has their own perspective about how they understand a genre, and this confusion will reduce the efficiency of a recommendation to a user. A more descriptive genre-based music recommendation using genre clustering identifies a distinct group based on musical features alone and can improve the reliability for recommendation.

Key Words: **K-Means Clustering, Genre Clustering, Music Recommendation, Cold Start, Genre Similarity.**

1. INTRODUCTION

Clustering music into genres based on audio features allow music to be described in new ways. Artists have always used their own notion of genre to describe music in the past. Music pleases every human being in a different way and the only way to make it uniform is to identify a common trend from the audio features and describe music. Sometimes there is confusion to what a genre label actually defines. A more descriptive naming approach solves this problem. Recommendation of music is carried out in different ways, popularity based recommendation is the most common of them all. Newer algorithms adapt content-based recommendations where music is curated to a user based on the user's behavior. Tracking all the music played by a listener and recommending similar types of music to the user. A different approach to this would be to include the user to user behavior and combining it with the content-based recommendation.

1.1 Clustering

Clustering algorithms are used to learn from data points and segregate them into smaller groups of data points based on different features, Clustering is the ideal way to find similarities in a large pool of data points and these groups that are formed can be said to have similar trends. They allow us to identify trends in data and based on how these data points are distributed on graphs, each group can be assigned some description or label. Similarly in a recommendation engine clustering will identify similar users using which user to user interactions can be tracked.

1.2 K-Means

K-means clustering is the most popular clustering Machine learning algorithm that uses the nearest mean method based on the Euclidean distance to identify which group a data point belongs to. It considers cluster centers and takes straight line distance to unclassified points and groups them to the nearest cluster centre. The figures below represent how clustering is able to identify new data points that are not subjected to an artists' preferences.

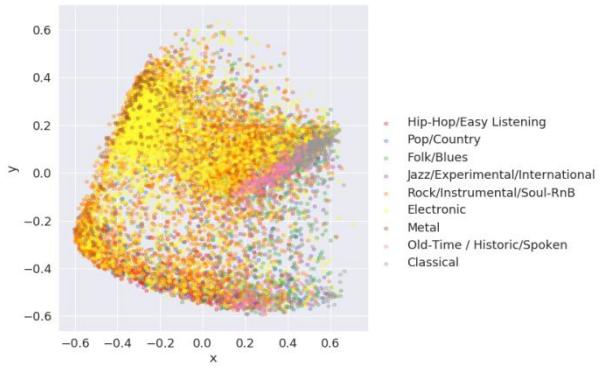

Figure-1: Predefined genre before clustering

By using audio properties to cluster and group similar tracks together users will be listening to what they want rather than what is defined by the artist. Recommendation based on the genre can be further made more user-understandable by naming each cluster with descriptive names. Recommendation using K-means works on top of the clustered data to recommend the most suitable tracks to the user.

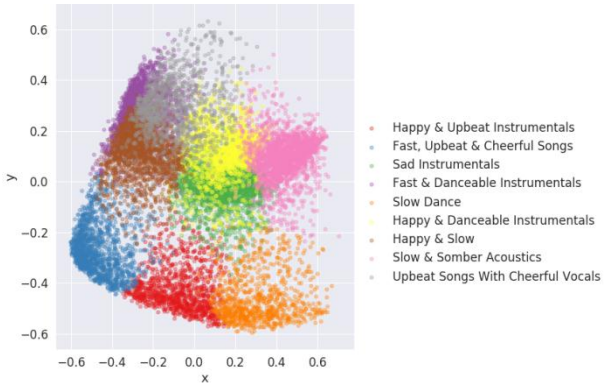

Figure -2: Genre by descriptive names after clustering

2. DATASETS AND USER DATA EXTRACTION

Free Music Archives is an open-source database that provides a huge collection of musical data and consists of over a million songs; it also contains metadata about different musical properties.

Free Music Archives dataset is collected from four different files that are Tracks, Features, Echonest, and Genres. This contains information about the song, the artist who sang the song, its genre, and other features that we will be using to define descriptive names. Some primary features are acousticnesss that defines the use of acoustics in a song, danceability describes how suitable a track is for dancing, instrumentalness checks if a track contains no vocals, liveness detects the presence of an audience in the recording, speechiness detects the presence of spoken words in a track User data is also extracted from the application to get user interactivity and to study the kind of music the user listens to.

This data is used to extrapolate and get recommendations for the user. User behaviors are also used to get popularity metrics for the songs.

3. PROPOSED METHOD

The figure below represents the basic architecture of the system, Data gathering consists of collecting user interaction data and data from FMA. Acoustics, danceability, energy, instrumentalness, liveness, speechiness, tempo and valence are some properties that can be extracted from the FMA dataset. This data is cleaned and normalized before use.

The recommendation engine is the core of the system and consists of machine learning algorithms to cluster genres and recommend. Genre clustering is carried out by performing K-Means algorithm on the FMA dataset and each track is associated with a descriptive label.

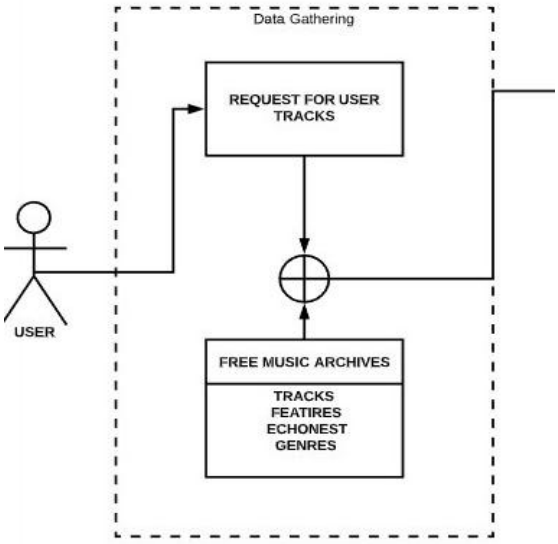

Figure-3: Data Gathering

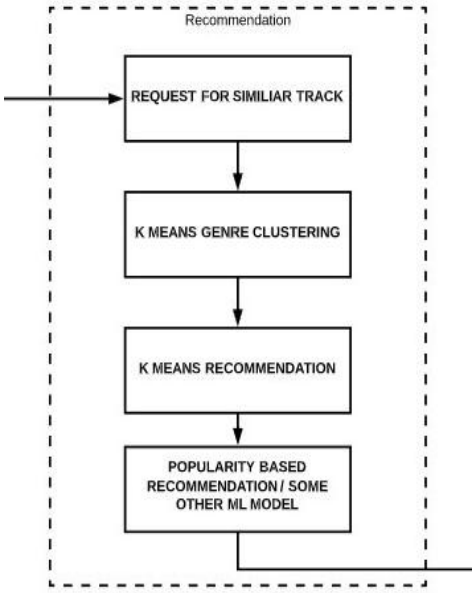

Figure-4: Recommendation

Recommendation works over the clustered data and other features that are added on from the FMA which are relevant for feature-based recommendation. Genre and Artist based recommendations are carried out by identifying the most frequently occurring genres and artists from all the tracks that were listened to by the user, after performing a mode operation and then recommending from that particular pool of songs.

A popularity based filter or another Machine learning algorithm can work along with it to improve the recommendation since a pool might sometimes consist of

a slightly larger number of songs than a user might want at a point of time. User behavior can be used to build popularity metrics; this is done by identifying the occurrence of tracks across all users.

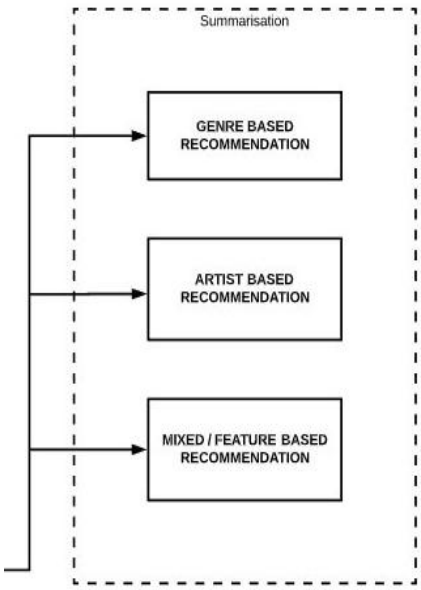

Figure-5: Summarization

To prevent the cold start problem, a content-based recommendation is used, where users' preferences are asked beforehand to recommend a few songs.

3. CONCLUSION

All the previously existing recommendation models used traditional recommending algorithms where they use the genre defined by the artist as a property to cluster tracks to different groups. A more ideal way to recommend songs to users will be based on the type of music which is identified by the features. By doing so it improves the likeability of recommendation and gives a more distinct meaning to the type of music recommended. Simple machine learning models were used for recommendation and genre clustering. This can be improved upon to better the model's efficiency.

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