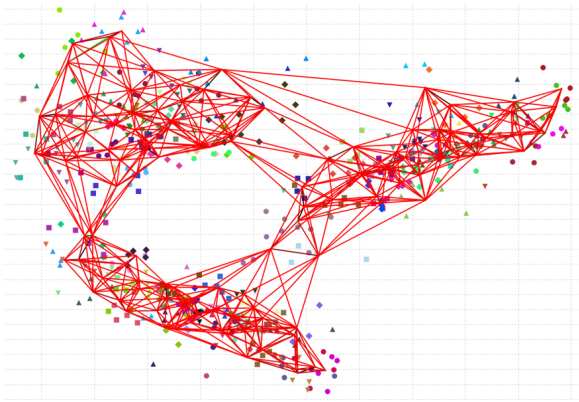
Exploratory Data Analysis on Spotify Metadata

Deepesh.D,Aniket.V,Ayush.T

Abstract:

Data analysis of spotify metadata taken from 1921 to 2020 using feature analysis etc.Investigating which audio features distinguish genres and try to cluster them using Dimension Reduction and Genre Clustering.Descriptive Analysis on Genre,artists and decade attributes.This paper focuses on verifying who the most popular artists are and to analyze the kind of music which goes viral,analyzing the behaviour of various genres over the years and to see how the popularity of various attributes vary with respect to time.

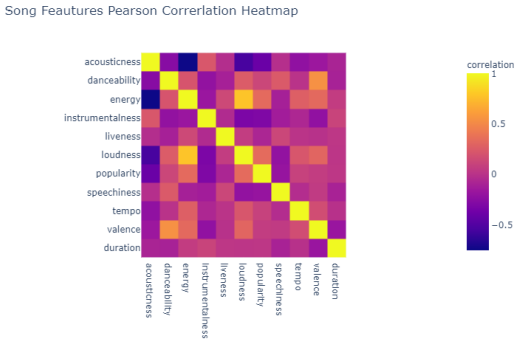


Introduction

Spotify is a well-known music streaming service that requires no introduction. It has expanded to 286 million active users and 130 million premium subscriptions in 14 years. Spotify is used by the average user for 25 hours a month, and 44 percent of users use it on a regular basis .

These figures clearly show that Spotify is a very popular streaming service, which can offer a lot of valuable data which can be studied.

The below image shows Song Features through Pearson Correlation Heatmap



Spotify offers digital copyright restricted recorded music and podcasts, including more than 70 million songs, from record labels and media companies.As a freemium service, basic features are free with advertisements and limited control, while additional features, such as offline listening and commercial-free listening, are offered via paid subscriptions. Users can search for music based on artist, album, or genre, and can create, edit, and share playlists.

Related Work

1. K-means clustering using Spotify song features Aug 27, 2020 - With the help of this paper we figured out how to handle the spotify data and how to perform and inference the Elbow method and genre clustering and Dimensional reduction

2. An Analysis of Approaches Taken in the ACM RecSys Challenge 2018 for Automatic Music Playlist Continuation - The number of songs in the playlist originally, bigger the initial dataset, better the prediction

3. Spotify Sequential Skip Prediction Paper - This paper is mainly useful in teaching us how to make use of the Spotify API to extract data from Spotify in order for processing

4. Music Streaming Sessions Paper - Studying this paper gave us an insight into how users behave, but also taught us that the data regarding this subject is quite scarce, and that only logs are available, when the scope of such data can be much greater. Now we know that the data available for user interaction does not hold much merit, we will not spend a lot of resources trying to visualize it.

5. Visualizing a Million Time Series with the Density Line Chart - This is a paper that deals with visualising extremely Dense Data. As the Spotify Dataset is vast, by studying the techiniques used in this paper to handle the dense data, we can learn a lot. For example, rather than attempting to visualize the entire data and find something, we must look for small patterns within smaller time frames, or lines that behave in particular ways. It also teaches how to use Denselines, should we require that.

6. Analyzing Spotify Data with Pandas - This article shows how to work with data from Spotify and visualize it. It shows how to work with correlations graphs, how to answer questions like “who makes the most Danceable music”, “What are the most Popular genre”, “What is the relationship between Danceability and Energy” using graphing and visualization techniques

7. HITPREDICT: PREDICTING HIT SONGS USING SPOTIFY DATA STANFORD COMPUTER SCIENCE 229: MACHINE LEARNING - With this paper, we understood that should we aim for a prediction using machine learning, LR and NN are the algorithms to go for

8. A survey of Scholarly Data Visualization (2017) - This paper gave us into an insight of how to perform an exploratory survey on

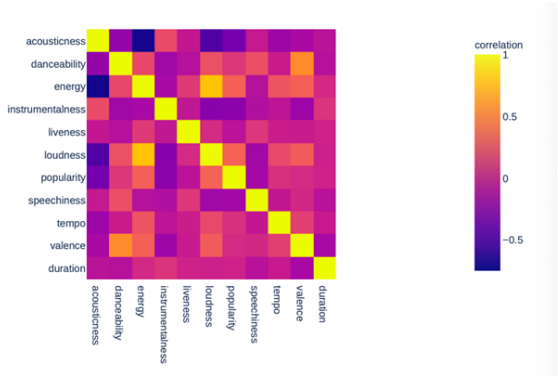
a topic with dense data. We could also learn how to form a Research paper, and how to approach an exploration project in data visualization

9. DataVis Helper: A Tool for Exploring the Design Space of Data Visualization - This paper touches on the most effective Data Visualization methods and tools that one must use while conducting exploratory analysis

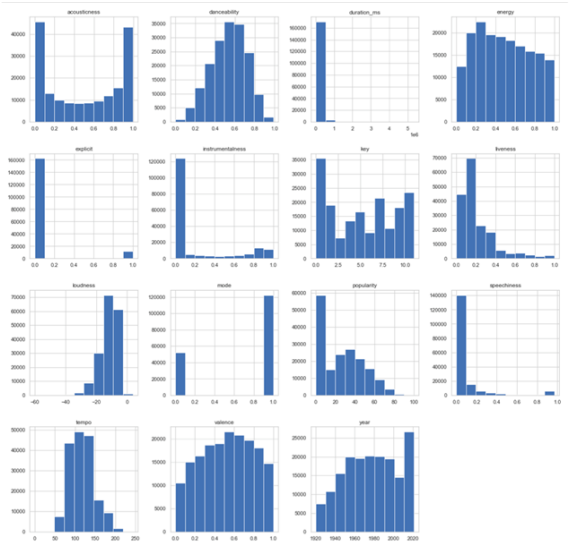
10. College data visualization on the web browser - This paper again gave us an insight on how to deal with dense data and perform exploratory analysis on such dense data, where to look for patterns and how to present them

Proposed Method and Results

1. First we clean the dataset, drop the unwanted columns and null values
2. We print and analyze the Oldest Record and the Most Recent Record
3. We plot a Pearsion Correlation Heatmap between all the attributes and analyze the correlation

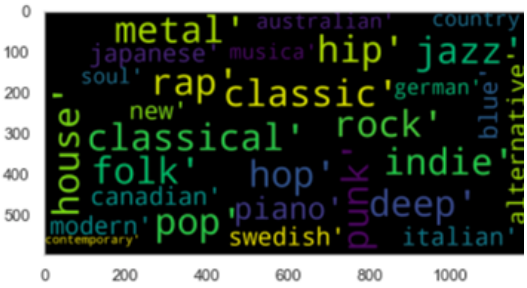


4. Conducted popularity analysis using bar chart to show to artists with popularity by mean, using line chart to compare the loudness with popularity, using a sns.joinplot and bar chart to visualize the popularity of the top 10 artists, and finally Looking at the overall Data Distribution using 15 Histograms

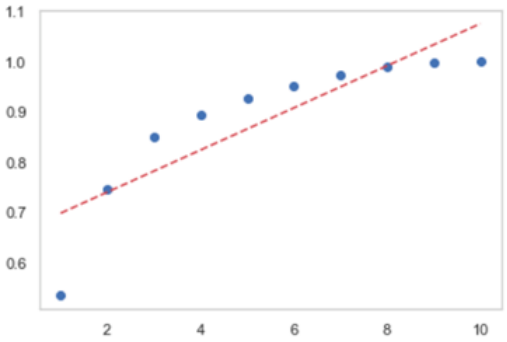


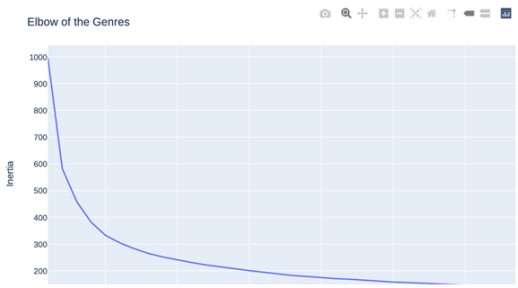
6. Compare and Check the correlation of specific features, like Danceability vs Speechiness
7. Using a Pie chart we measured the Popularity of the Keys and Modes

8. We the made a Wordcloud to see the most frequently used words



9. Finally we used Principal Component Analysis to cluster the various attributes, and we picked the first four components which covered 90% of the space. We analyzed the correlation. We performed Elbow analysis, and Figured that 20 clusters will be idea. But after performing Clustering, interesting results were not found.





Conclusion

EDA on Spotify dataset to analyze the data and plot graphs for showing correlation between song features,top artists with popularity by mean,loudness vs popularity,name of top 10 songs and artists by popularity,overall data distribution,danceability vs speechiness,Popularity vs

Acousticness,genre popularity,keys and modes,wordcloud for most common genres,analyzation by year and finally pca implementation for reducing the components.

We found out that Loudness correlates with energy, Iann Dior is the most popular Artist by mean, Danceability vs Speechiness have a perfect positive correlation, wherease popularity and acousticness have a negative correlation. G# is the most used key and Minor is the more popular mode. Classic, Hip, Classical are the three most frequently occuring words.

This analysis has shown how the enormous data collected by spotify holds so many interesting and valuable patterns and trends which one could examine and utilize to further optimize the app for a smoother user experience. All these trends are invisible to the human eye, and can only be understood by computers if the data remains numerical, but through data visualization, these patterns reveal themselves, so that the human eye can understand and work with such data, because while machine learning is a very helpful tool, human surveliance and intervention is always necessary, and this intervention can only be possible with the help of Data Visualization.

References

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WefoundoutthatLoudnesscorrelateswithenergy,IannDioristhemostpopularArtistbymean,DanceabilityvsSpeechinesshaveaperfectpositivecorrelation,whereasepopularityandacousticnesshaveanegativecorrelation.

G#isthemostusedkeyandMinoristhemorepopularmode.

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