



# Songscape

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# I. Introduction

If mankind has ever had a truly universal language, it would have to be music. For as long as we have had the ability to express itself, music has been an indispensable tool in our arsenal in order to communicate the more intractable and therefore perhaps the more fundamental parts of our nature.

A deeper understanding then of the subtle intricacies surrounding our taste in music, both the similarities and differences can we believe provide highly useful insight into the structure and shifts of our societal fabric.

With streaming services like Spotify aggregating a large and diverse body of music listeners under one umbrella and generating comprehensive metrics for the same, this has finally become achievable and with this project we aim to provide a view into what may be possible with comprehensive data analysis and visualisation of what is available.





## 1.1 MAIN THEME

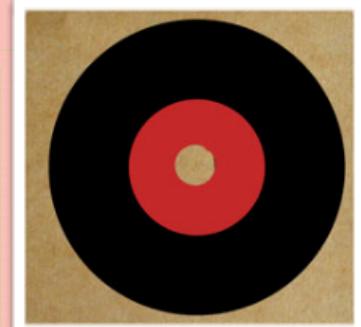
To determine **what makes a piece of music popular** and how those factors change with **geographical location, across time and with the choice of medium** i.e. genre and language, with a specific focus on non English works.

## 1.2 MAIN QUESTIONS EXPLORED

### EVOLUTION OF TASTE IN MUSIC OVER THE YEARS

**How have people's taste in music evolved between 1950 - 2018?**

A closer examination of the genres, artists and audio features of the Top 100 tracks on billboard charts over the years offer insights into trends in music taste. An in-depth exploration that reveals what features might effect the popularity of a song in different periods and if there is a significant similarity in features of commercial successful songs.



### DIVERSITY IN MUSIC ACROSS COUNTRIES

**How taste in music differs from country to country?**

An in-depth study of the Top 100 songs by Country on Spotify to obtain interesting statistics on how different or similar preference for music is across the world. Meaningful patterns and connections among various countries and the audio features of the popular songs are discovered.



### NON ENGLISH POPULAR SONGS

**What are the audio feature of the songs in various languages other than english that are gaining popularity internationally?**

While songs featuring in Global Charts were previously in English, the representation of tracks in other languages like Spanish, Korean, Italian, French etc. is on the rise. An analysis of audio features of these songs can help in predicting the musical elements that make songs universally appreciated by both native as well as non-native speakers of the language.



## 1.3 Tools Used

### Data Procurement

Titles of top songs were scraped from **Spotify** and **Billboard** charts. Spotify for Developer Platform is an initiative by Spotify to facilitate its users in utilising the extensive catalog of data including calculated audio features of tracks that can be extracted using the Spotify Web API. Using this API, we generated our own dataset for tracks and attributes of interest for the purpose of analysis. **The code for scraping and dates preparation is present in the file titled “DataProcure.py”**

### Data Preprocessing

**Weka** and Python's **matplotlib** and **seaboard** libraries was used for data preprocessing and preliminary visualisations. The data was cleaned and attributes that captured the maximum variance or similarity were chosen. Data was normalised wherever necessary. Coefficient matrix, simple time graph, histograms and box plots were constructed to explore data and choose data for further exploration.

### Visualisation

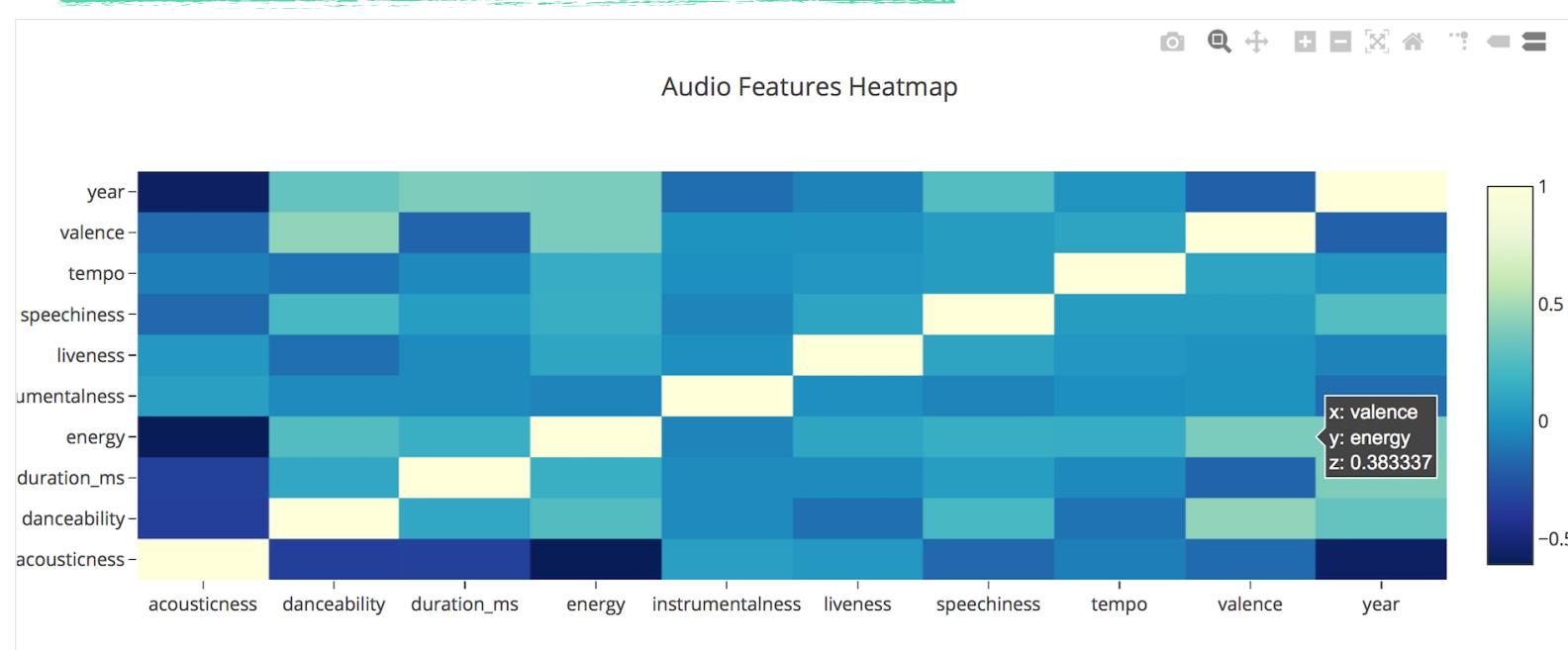
We chose to generate and display our graphs using the open source **plotly library in python** with **dash studio** on top to provide complex and dynamic visualisations in a single, easy to access dashboard in HTML serviced over a local web server.

The major benefit of this approach was the ability using plotly to generate **dynamic plots** that can be redrawn based on user selection to enable a variety of different views to be presented in a single plot. This makes the whole visualisation more tractable and thus easier to digest, as well as allowing the user the freedom and scope to really explore the data and come up with new insights, potentially beyond even the scope of what we had planned out originally.

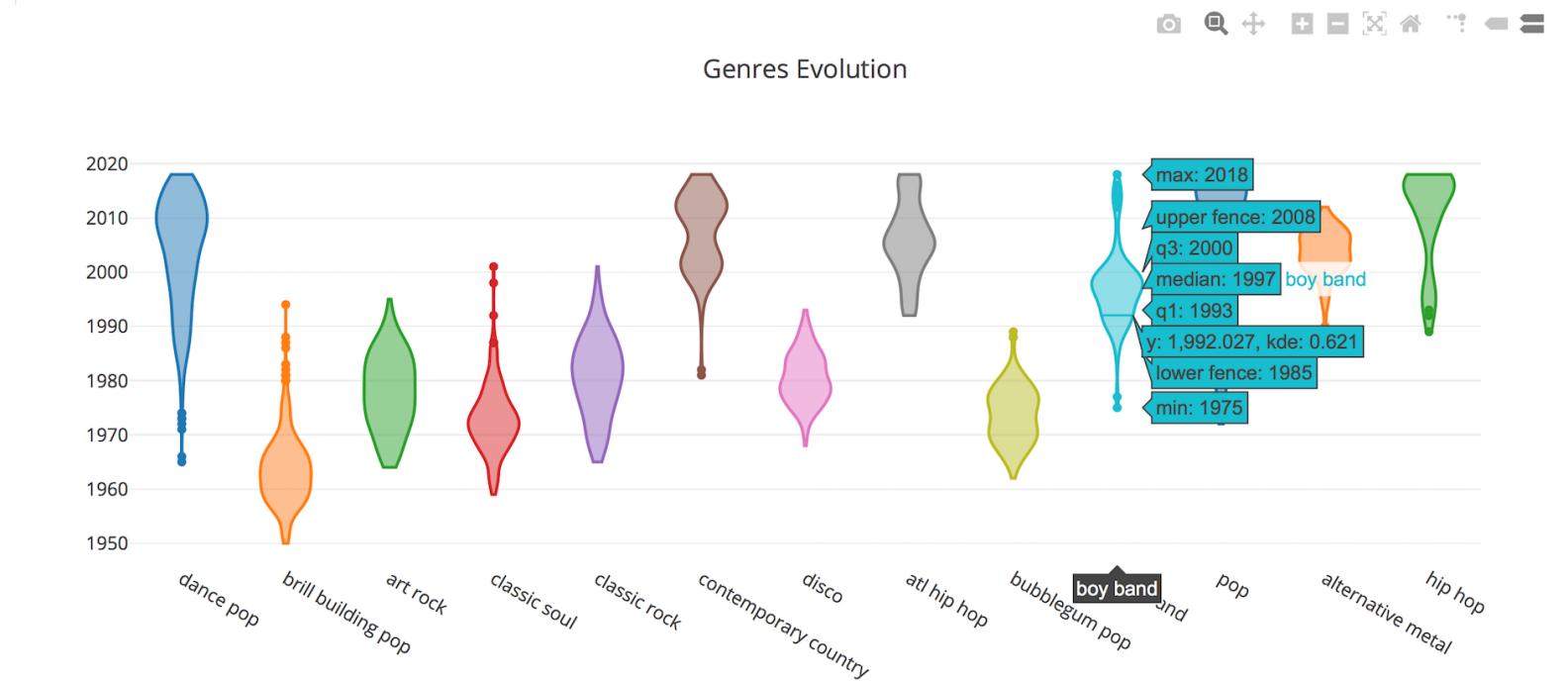
Another benefit of plotly is its **high user interactivity** with useful **graph manipulation features** that come bundled in for free with all the plots, such as zooming, selecting and autoscaling to name a few. This really allows the user to get the most out of a plot and approach the visualisation as they see fit.

One downside to plotly has been the **relatively steep learning curve** over more traditional tools such as Tableau since it needs everything to be written and configured in code as opposed to a graphical interface which provide much more ease of use. However, we felt that the initial set up time was worth it for the benefits it brought later in terms of the flexibility and power of the underlying technology.

## 2.1 Evolution of Taste In Music

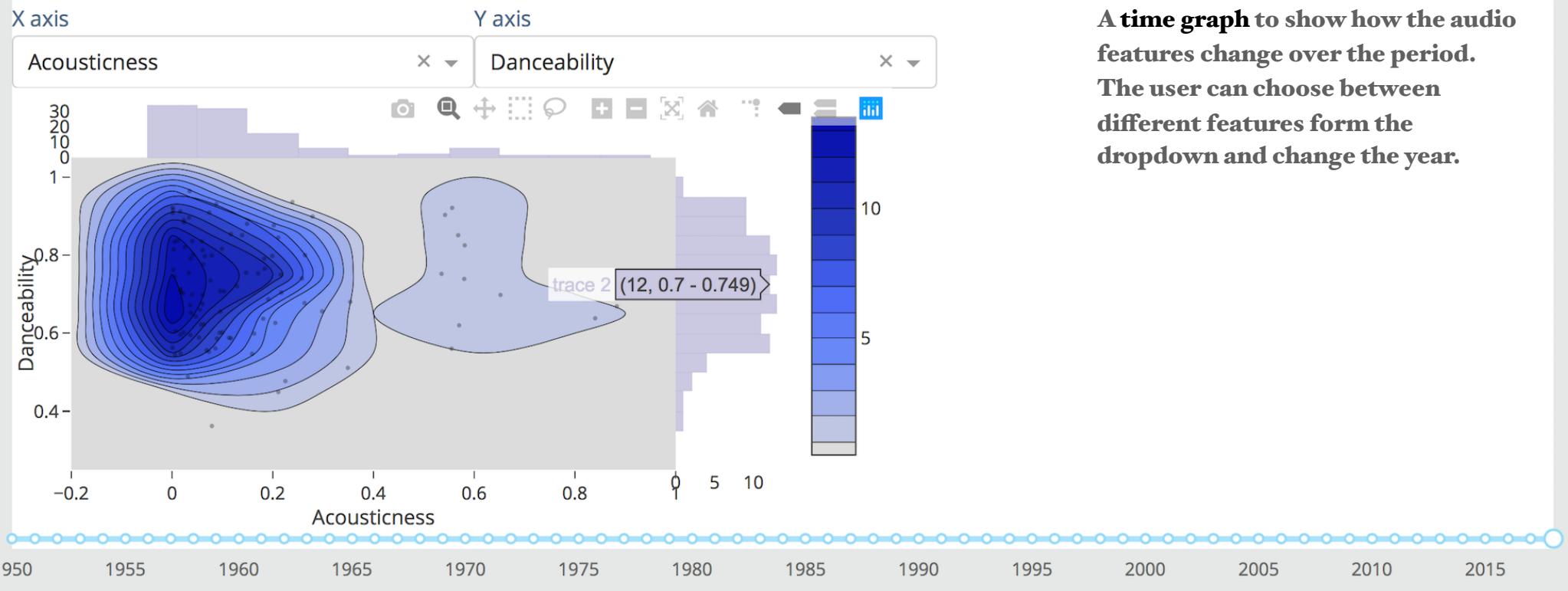


A **heat map** is used to represent the correlation between different audio features over the period 1950 - 2015. Hovering over the graph displays the Pearson coefficient.



A **violin graph** to show how genres evolve over the years and capture the variation with respect to time as well as with respect to other audio features.

## Change of Audio Features in Time



## Audio Features by Song

Year:

2018

x ▾

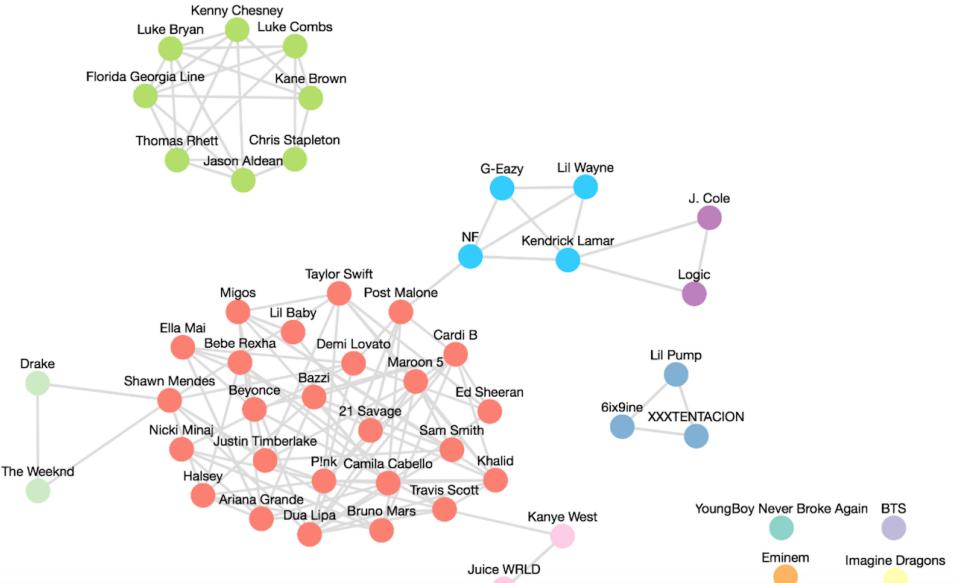
Rank	Artist	Song
1	Drake	God's Plan
2	Ed Sheeran	Perfect
3	Bebe Rexha & Florida Georgia Line	Meant To Be
4	Camila Cabello Featuring Young Thug	Havana
5	Post Malone Featuring 21 Savage	Rockstar
6	Post Malone Featuring Ty Dolla \$ign	Psycho
7	Cardi B, Bad Bunny & J Balvin	I Like It
8	Zedd, Maren Morris & Grey	The Middle
9	Drake	In My Feeling
10	Maroon 5 Featuring Cardi B	Girls Like You
11	Drake	Nice For What
12	Juice WRLD	Lucid Dreams
13	Post Malone	Better Now
14	Bruno Mars & Cardi B	Finesse

## Artists Network

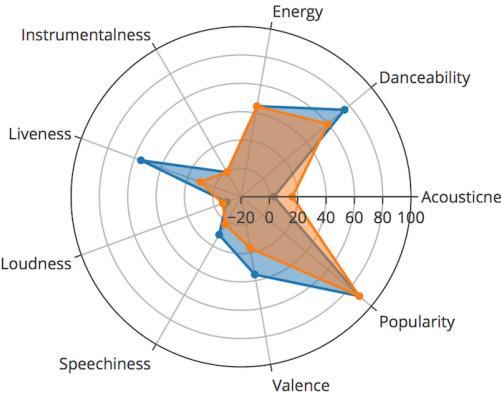
Year:

2018

x ▾



## Audio Features



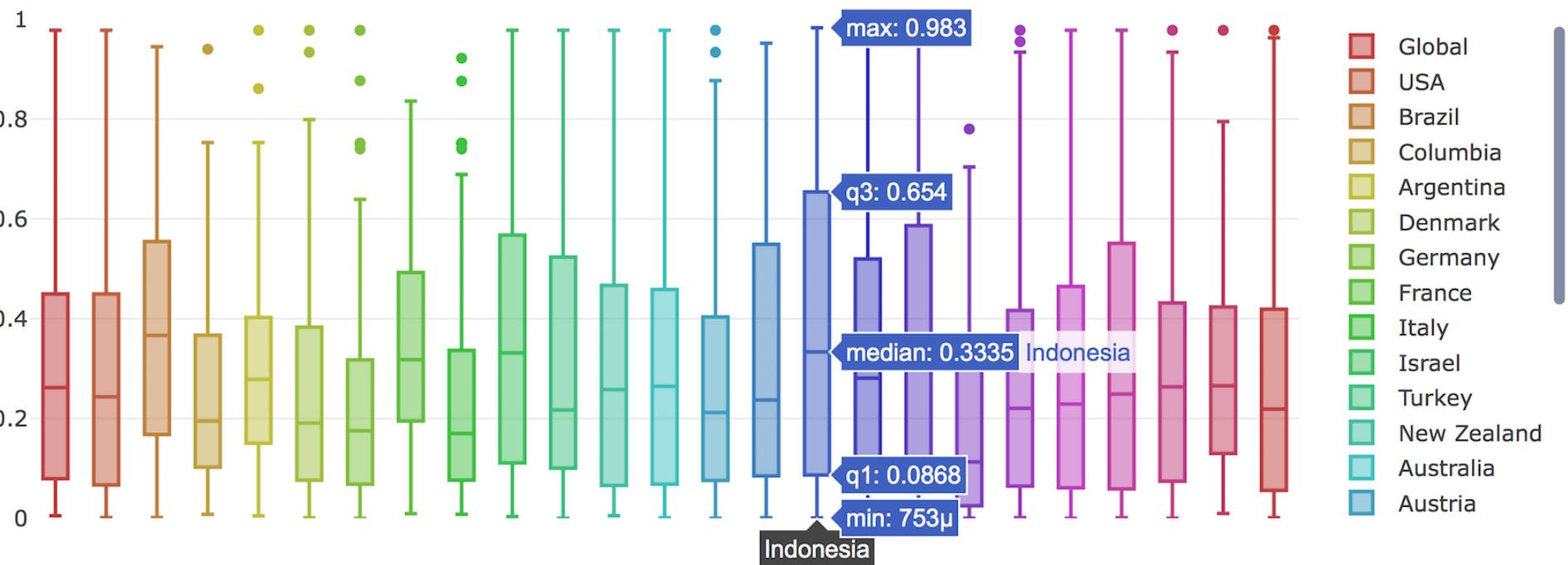
**A radar plot** is used to represent the different audio features by song name. The user can choose from different years as well as more than one song to compare.

**A network graph** is used to represent connections between different artists. The user can choose from different years for network analysis.

## 2.2 Diversity in Music Across Countries



Audio Features by Country

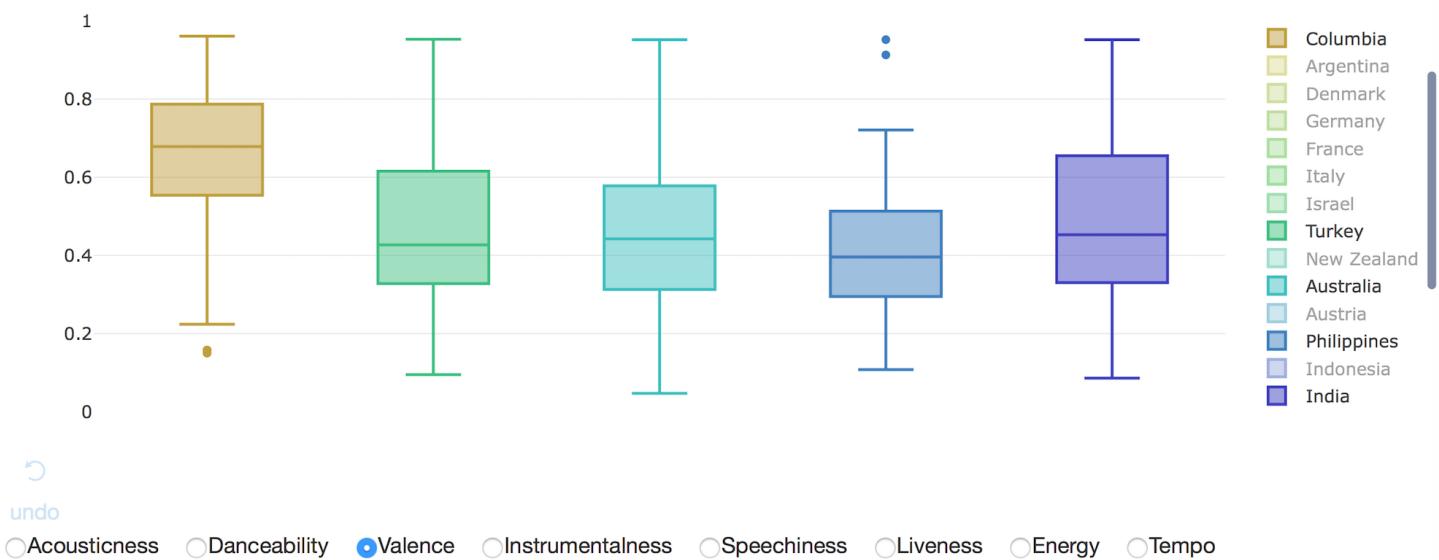


undo

Acousticness    Danceability    Valence    Instrumentalness    Speechiness    Liveness    Energy    Tempo

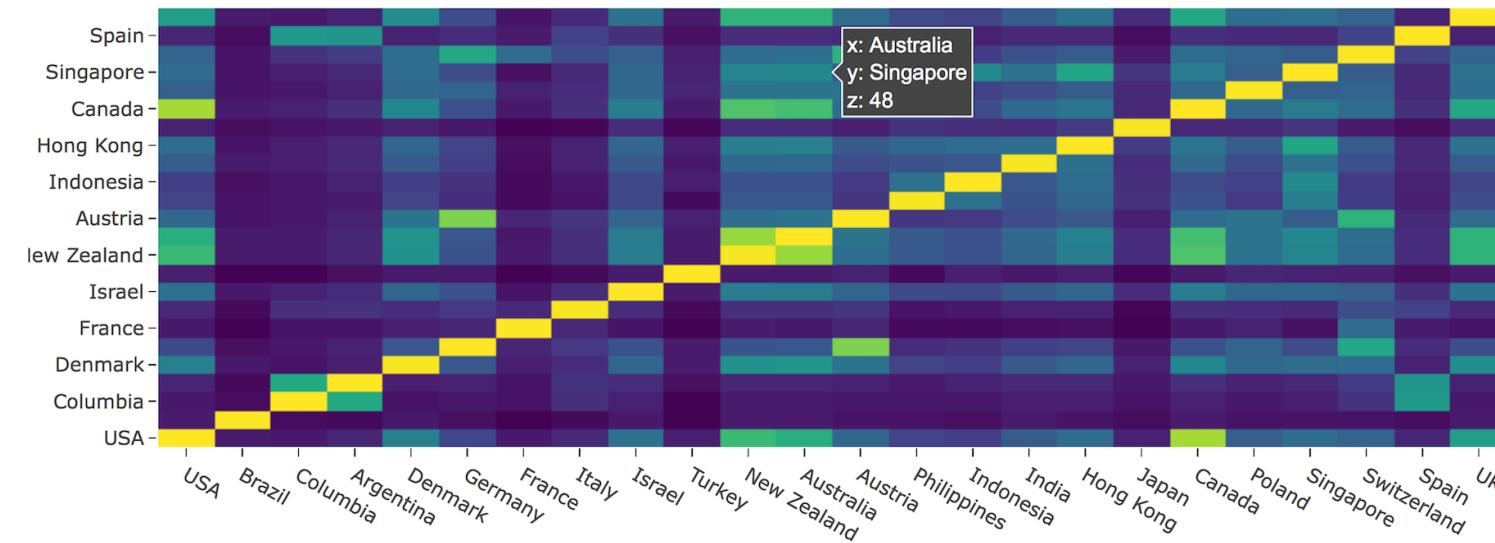
Box plot is chosen for macro analysis of the audio features of different countries as it can help visualise the distribution of data and highlight the outliers. The user can hover over the plot for details. One can also choose to focus on a few countries by selecting from the legend on the left. Additionally, the user can choose from the different features by clicking on the radio buttons at the bottom. The colours for each country are kept consistent across all charts for analysis diversity in music across country to make the interpretation more intuitive.

## Audio Features by Country



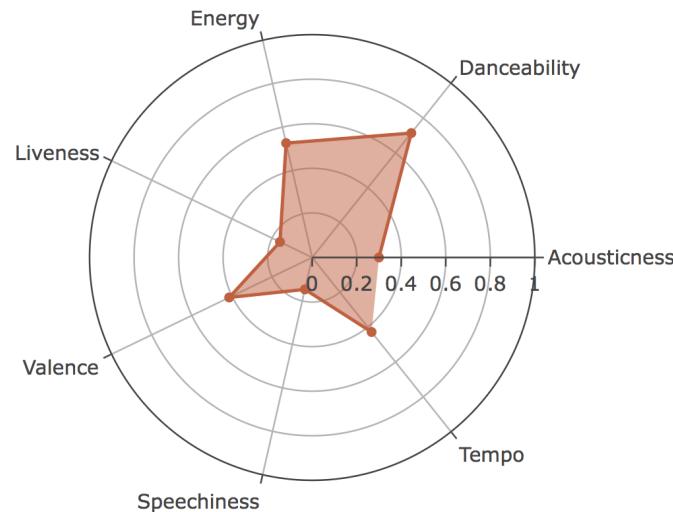
The user can explore more by choosing the countries that they want to compare instead of focusing on all the countries. This prevents crowding and helps the user focus on the necessary details.

## Common Songs between Countries



A heat map is used to represent the number of common songs in top 100 charts between different countries. This is done to help the user get an idea of the similarity and differences between countries in an easy glance. The user can also hover over the graph to get the details.

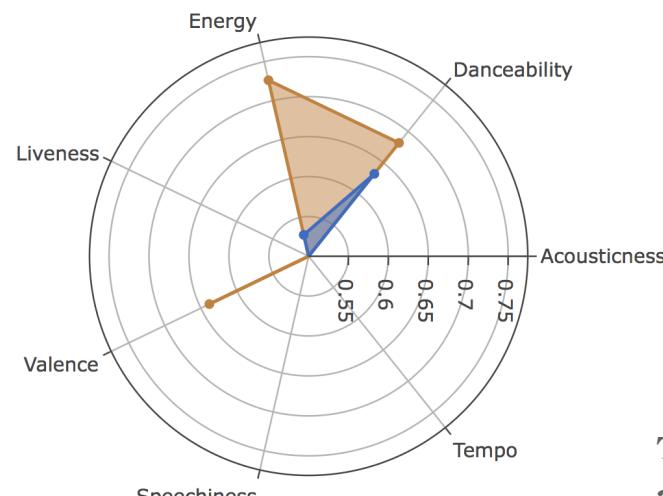
Audio Features (Mean Values) by Country



x USA

x ▾

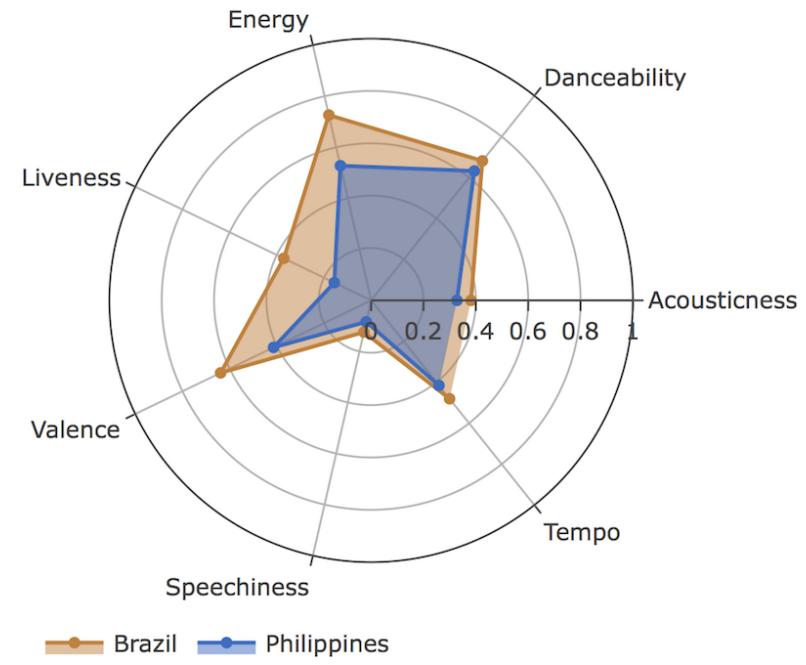
Audio Features (Mean Values) by Country



—●— Brazil   —●— Philippines

**A polar plot (radar graph)** is used to represent the audio feature profile for each country. The user can choose more than one country at a time from the drop down list to facilitate comparison of different country profiles. This helps the user explore similarities and differences across countries in details. The colour scheme is consistent with the box plot.

Audio Features (Mean Values) by Country



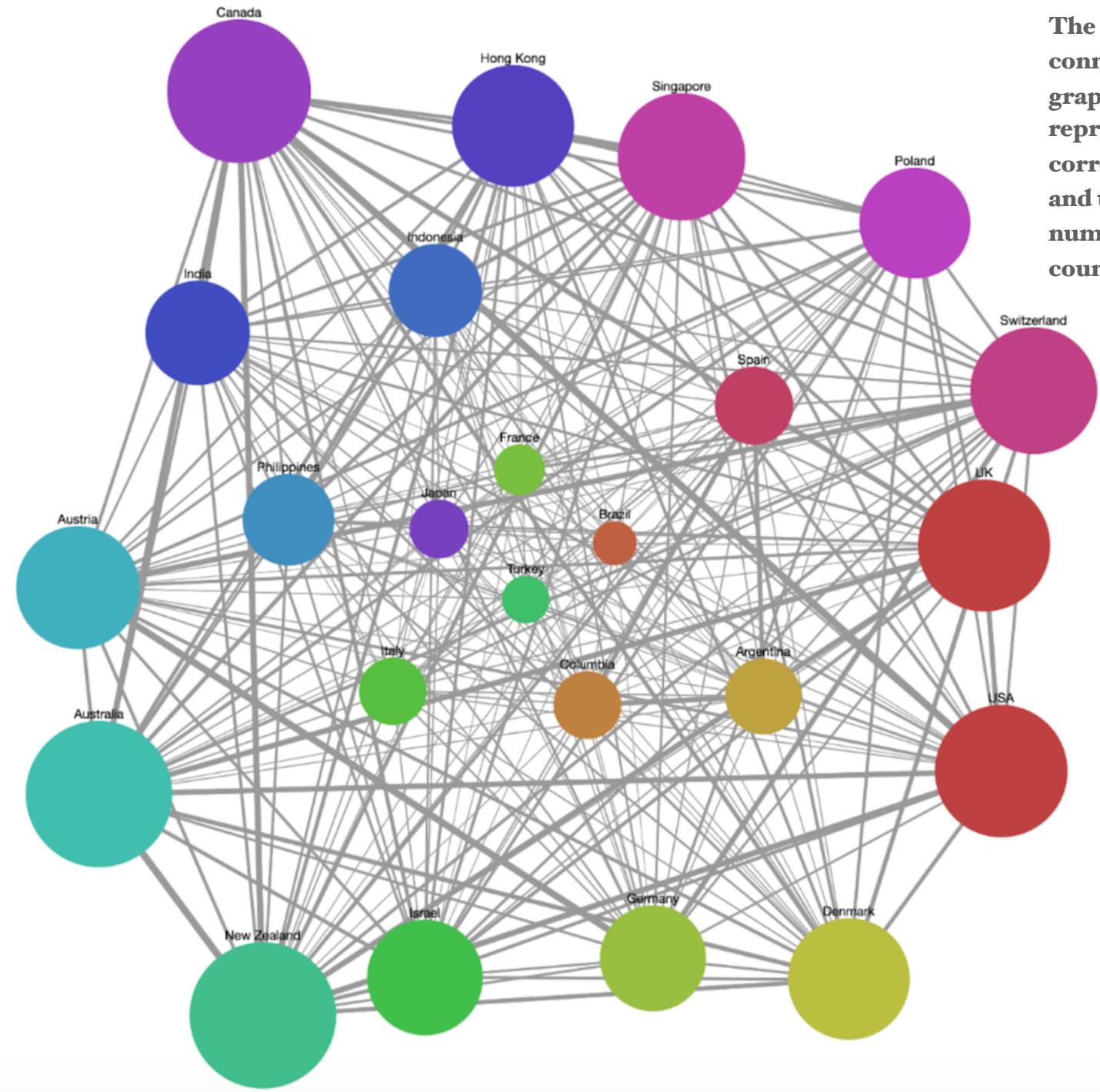
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x Brazil

x Philippines

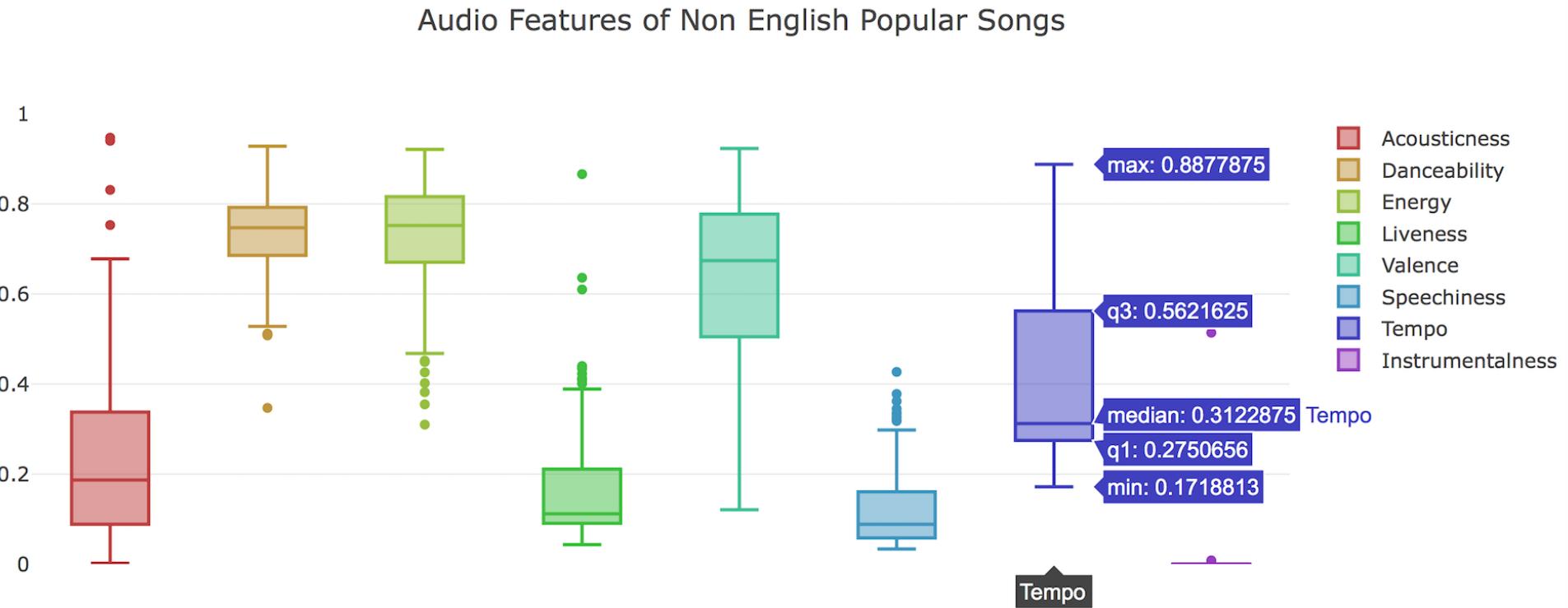
x ▾

The user can also zoom in on different features of interest for a clearer analysis. Hovering over the graph will also provide the values.

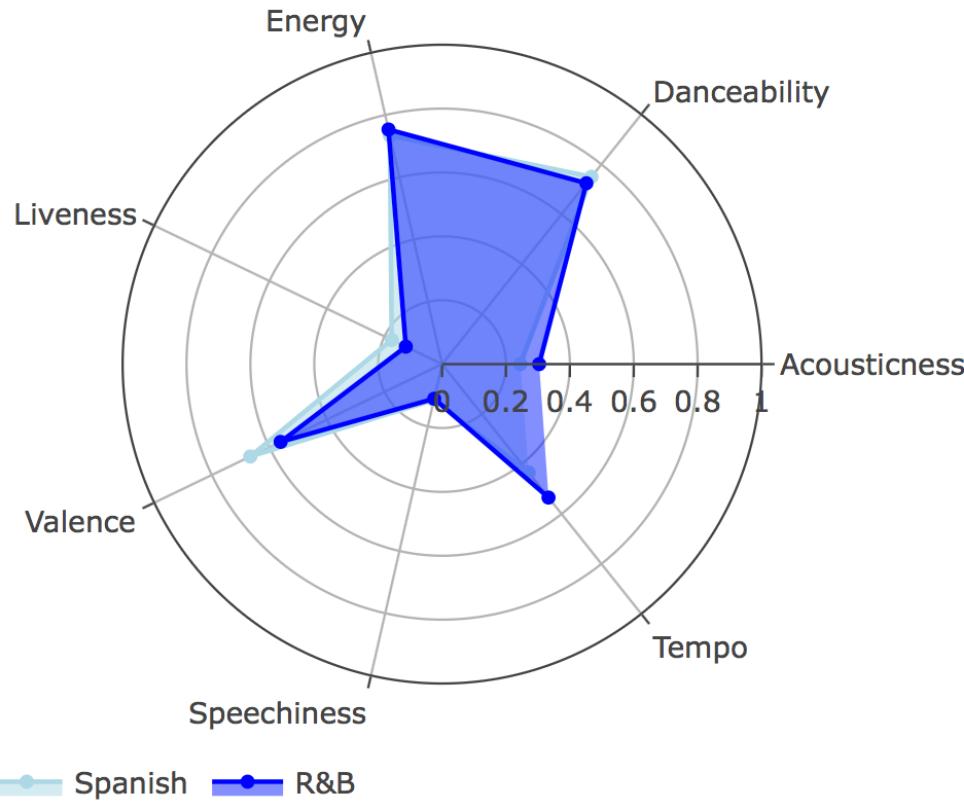


The **network graph** tries to explore the strength of connections between different countries. The graph can be zoomed in for details. The nodes represent different countries. The size of nodes corresponds to the total number of connections and the weight of the edges is proportional to the number of connections between any two countries.

## 2. 3 Non English Popular Songs



**Box plot is chosen for macro analysis of the audio features of non english popular songs to help understand the distribution of songs . The user can choose to select certain features or zoom in on the feature of interest for further exploration.**

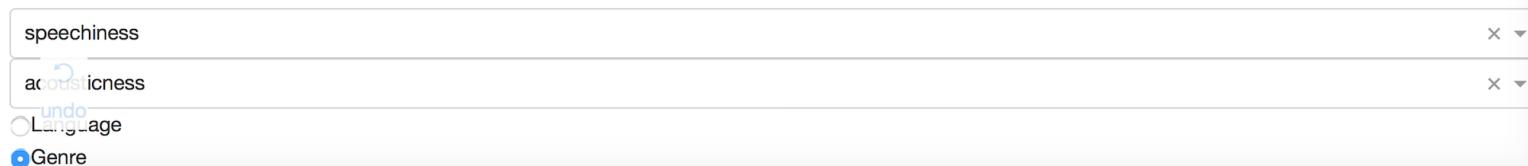
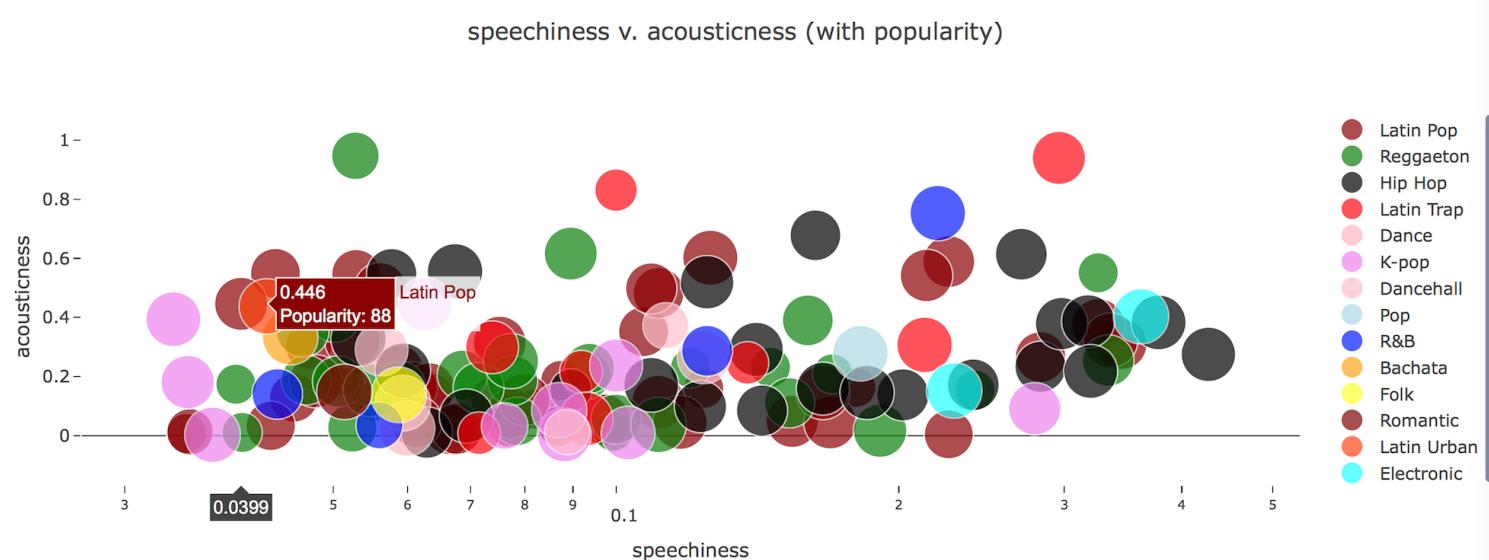
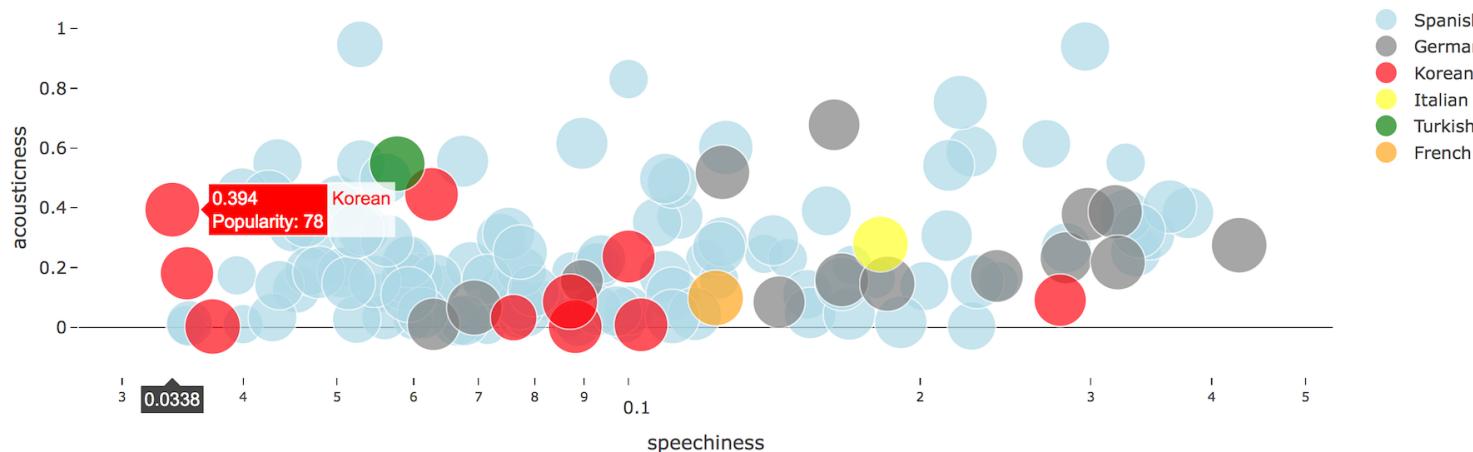


x
Spanish
x ▾

x
R&B
x ▾

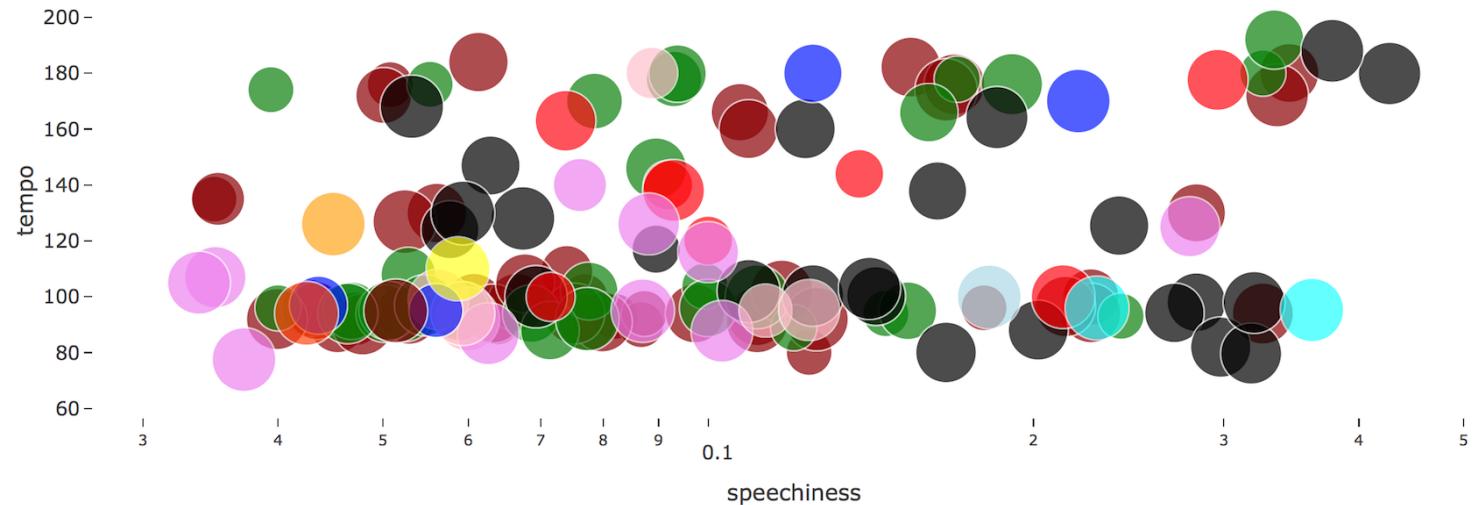
A **polar plot (radar graph)** is used to represent the audio feature profile for each language and genre. The user can choose more than one language or genre from the drop down menu. This helps the user explore similarities and differences across audio features from different languages and genres and between genres and languages to draw meaningful connections (e.g. audio features of Spanish songs are more likely to match R&B genre).

speechiness v. acousticness (with popularity)



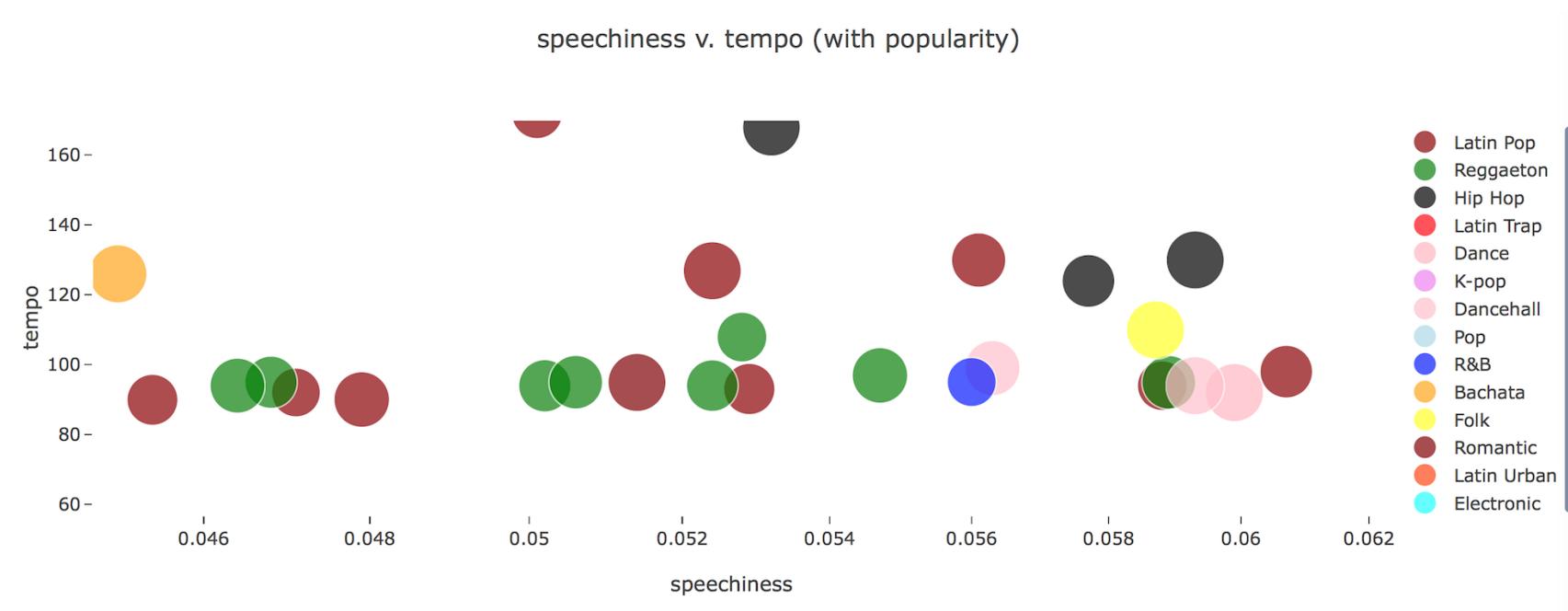
**A bubble graph that examines the effect of different audio features on popularity is plotted which dynamically allows the user to change the axis using the drop down menu. Furthermore, audio buttons are provided to help user choose between genre or language (the two categories for choosing the colours). Hovering over the data points shows the category and the popularity which is represented by the size of the bubble. Most songs are equally popular as they are chosen from the Top 100 Global Charts for analysis.**

speechiness v. tempo (with popularity)



Axis can be  
manipulated

speechiness v. tempo (with popularity)



Select regions and  
zoom in to facilitate  
analysis