Spotify Data Analysis*
Comparison of Audio Features Between Multiple Artists

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October 10, 2024

Using the `spotifyr` package, this paper analyzes audio data features `danceability`, `energy`, and `loudness` by comparing between three artists, `Coldplay`, `Radiohead`, and `The National`.

1 Introduction

This paper provides an analysis of music using the Spotify API ("Spotify Web API Documentation" 2023). In this analysis, we examine three singers: Coldplay, Radiohead and The National. By utilizing Spotify's extensive database of music and the Spotify API, we analysis three key audio features: Energy, danceability and loudness, which provide quantitative insights into the musical characteristics of each band. Coldplay, Radiohead, and The National differ slightly in musical style: The National shows higher danceability, while Coldplay has greater energy and loudness than Radiohead.

2 Data

For each artist, audio features of their tracks were downloaded from Spotify API ("Spotify Web API Documentation" 2023), including `danceability`, `energy`, and `loudness`. `Danceability` refers to how suitable the audio is for dancing using elements sush as tempo, rhythm, and beat strength. A value of 0.0 is least danceable and 1.0 is most danceable. `Energy` takes into account dynamic range, perceived loudness, timbre, onset rate, and general entropy on a scale of 0.0 to 0.1 where energetic tracks feel fast, loud, and noisy. `Loudness` refers to overall loudness of a track in decibels (dB) typically between -60 and 0 db.

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*Code and data are available at: https://github.com/DavidFJ207/spotify_analysis

Energy

Band   0.554034895833333   0.593263063063063   0.601251121076233
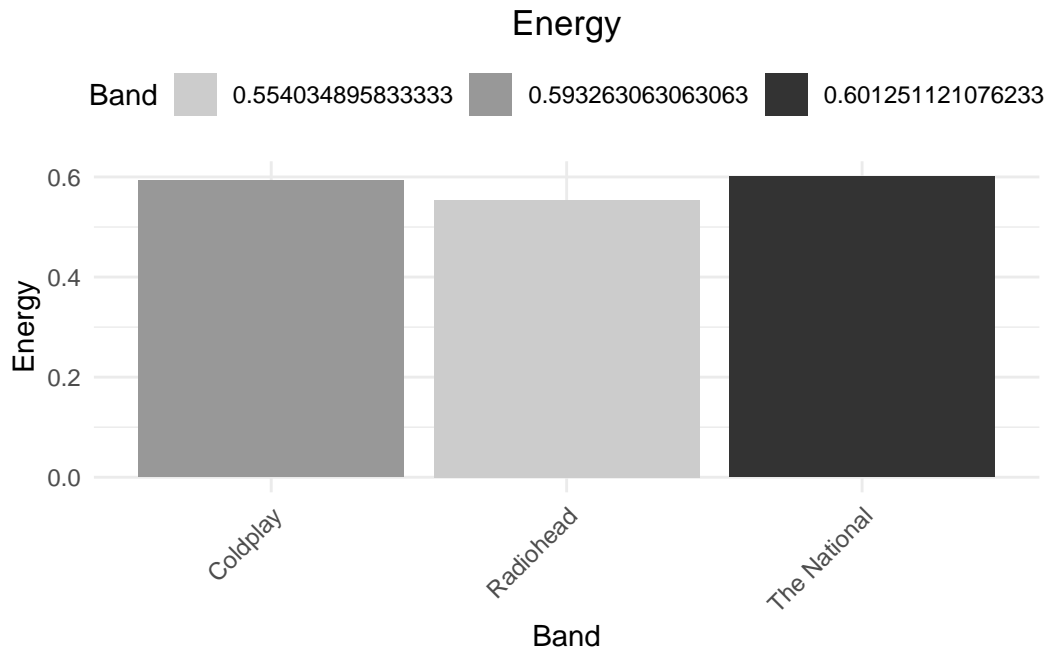
Figure 1: Data summary of audio features for Coldplay

Loudness

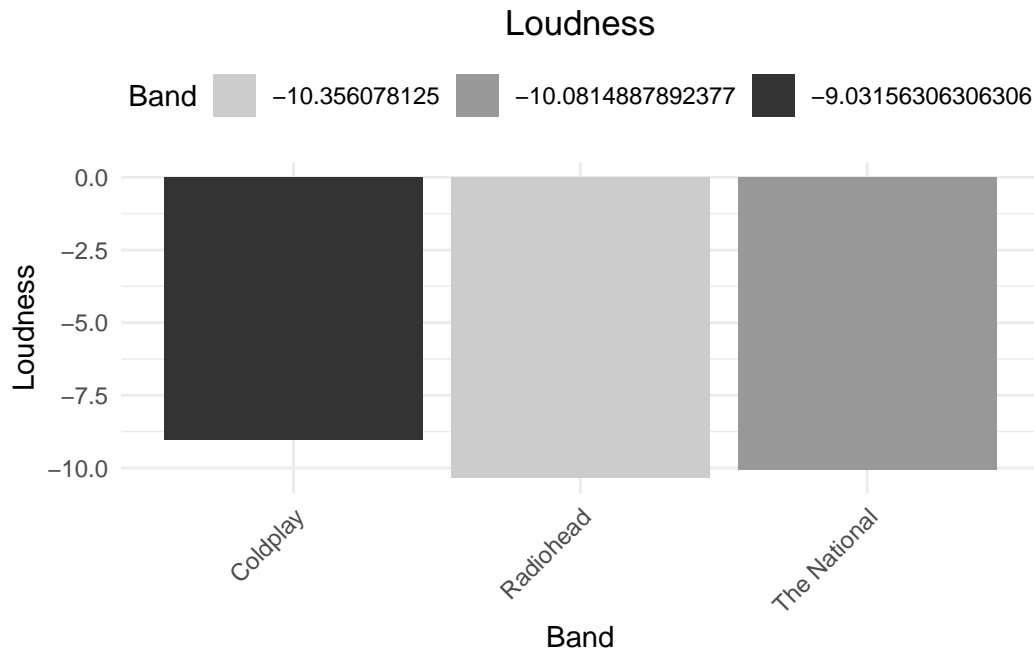Band   −10.356078125   −10.0814887892377   −9.03156306306306

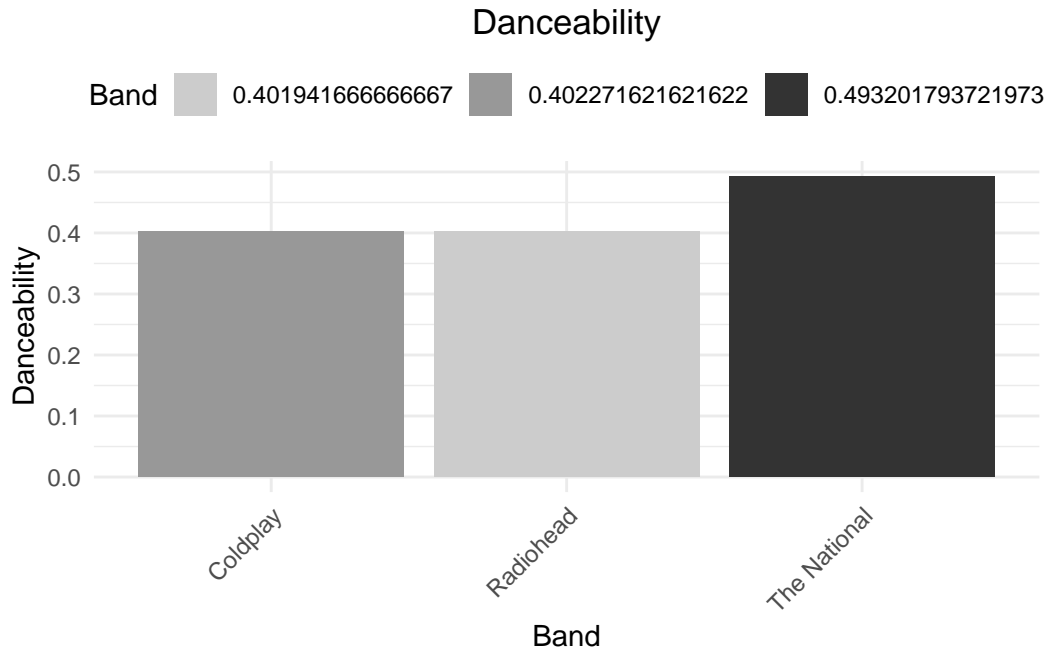Figure 2: Data summary of audio features for Coldplay

3 Results

Figure 3: Average Danceability for Coldplay, Radiohead, and The National

3.1 Trends

As shown in Figure 4 , there is a clear relationship between a band's loudness, energy, and danceability. Songs with higher loudness tend to have greater danceability, as indicated by the positive trend in the first scatter plot's line of best fit. Conversely, the second plot reveals that tracks with lower energy are also more danceable. These visual trends confirm that increasing loudness and decreasing energy are both associated with higher danceability in a band's music.
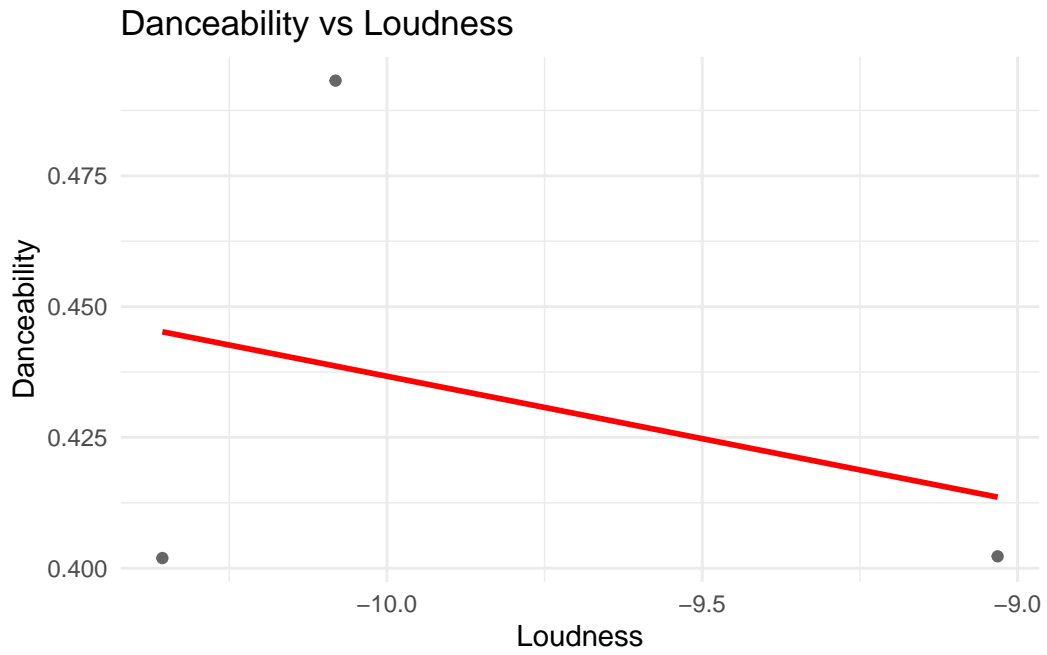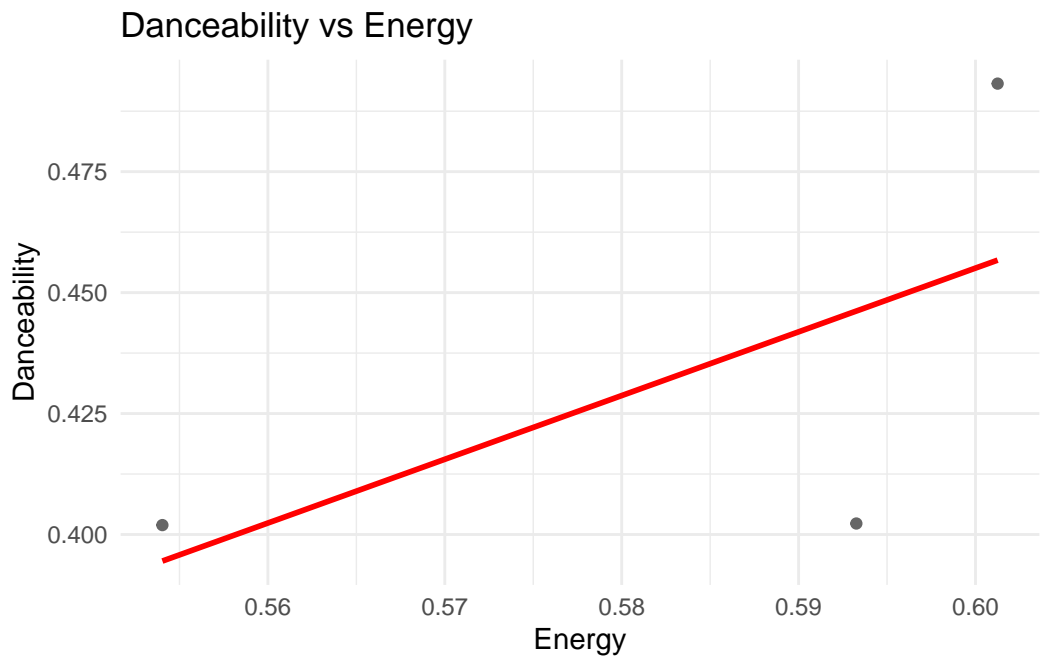
Figure 4: Danceability Correlation

Figure 5: Danceability Correlation

3.2 Implications

While Spotify's data doesn't explicitly reveal how metrics like danceability are measured, we can infer that factors such as loudness and energy contribute to this metric. As shown in Figure 3, bands like Coldplay with higher energy and loudness tend to align with a more mainstream, dynamic sound, which could contribute to a higher perceived danceability. Radiohead, with lower energy and loudness, may favor more introspective and atmospheric compositions, which might explain a lower danceability score. The National's combination of moderate energy, lower loudness, and higher danceability suggests that other subtler factors, like rhythm or emotional resonance, could play a role. These patterns imply that metrics like energy and loudness might be indirectly influencing danceability, shaping the overall listening experience in ways we can interpret but not fully quantify.

4 References

For data analysis, we used R (R Core Team 2023), (Wickham et al. 2019), and the `spotifyr` package (Thompson 2023). The data was obtained through the Spotify API ("Spotify Web API Documentation" 2023), and the starter folder was retrieved from a github repossository (Alexander 2021).

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R Core Team. 2023. *R: A Language and Environment for Statistical Computing.* Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

"Spotify Web API Documentation." 2023. 2023. https://developer.spotify.com/documentation/web-api/.

Thompson, Charlie. 2023. *Spotifyr: R Wrapper for the 'Spotify' Web API.* https://github.com/charlie86/spotifyr.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. https://doi.org/10.21105/joss.01686.