

Can big data really predict what makes a song popular?

October 10 2022, by Hoda Khalil, Gabriel Wainer and Kevin Dick



Credit: AI-generated image ([disclaimer](#))

Music is part of our lives in different ways. We listen to it on our commutes and it resounds through shopping centers. Some of us seek live music at concerts, festivals and shows or rely on music to set the tone and mood of our days.

While we might understand the genres or songs we appreciate, it's not clear precisely why a certain song is more appealing or popular. Perhaps the lyrics speak to an experience? Perhaps the energy makes it appealing? These questions are important to answer for [music industry](#) professionals, and analyzing data is a key part of this.

At Carleton University, a group of data science researchers sought to answer the question: "What descriptive features of a song make it popular on music/[online platforms](#)?"

Revenue in the music industry

Revenue in the music industry [is derived from two sources that are affected by different factors: live music and recorded music](#). During the pandemic, although [live music](#) income dropped due to the cancelation of in-person performances, the [income from streaming](#) rose.

As digital platforms like Spotify and TikTok have grown, [the majority of music revenue has come to be contributed by digital media, mostly music streaming](#). How and whether this revenue reaches singers and songwriters at large is another matter.

Popularity on digital platforms

The popularity of a song on [digital platforms](#) is considered a measure of the revenue the song may generate.

As such, producers seek to answer questions like "[How can we make the song more popular?](#)" and "[What are the characteristics of songs that make it the top charts?](#)"

With collaborators [Laura Colley](#), [Andrew Dybka](#), Adam Gauthier, Jacob

Laboissonniere, Alexandre Mougeot and Nayeeb Mowla, we produced a systematic study that collected data from YouTube, Twitter, TikTok, Spotify and Billboard ([Billboard Hot-100](#), sometimes also denoted by data researchers as "[Billboard hot top](#)" or in our work and others' work, "Billboard Top-100").

We linked the datasets from the different platforms with Spotify's acoustic descriptive metric or "descriptive features" for songs. These features have been derived [from a dataset which yielded categories for measuring and analyzing qualities of songs](#). Spotify's [metrics capture descriptive features such as](#) acousticness, energy, danceability and instrumentalness (the collection of instruments and voices in a given piece).

We sought to find trends and analyze the relationship between songs' descriptive features and their popularity.

The rankings on the weekly [Billboard Hot-100](#) are based on sales, online streams and radio plays in the United States.

The analysis we performed by looking at Spotify and Billboard revealed insights that are useful for the music industry.

What predicts a Billboard hit?

To perform [this study](#), we used two different data sets pertaining to songs that [were Billboard hits from the early 1940s to 2020](#) and Spotify data related to over 600,000 tracks and over one million artists.

Interestingly, we found no substantial correlations between the number of weeks a song remained on the charts, as a measure of popularity, and the acoustic features included in the study.

Our analysis determined that newer songs tend to last longer on the charts and that a song's popularity affects how long it stays on the charts.

In a related study, researchers collected data for Billboard's Hot 100 from 1958 to 2013 and found that [songs with a higher tempo and danceability often get a higher peak position on the Billboard charts.](#)

Predicting Spotify song popularity

We also used the songs' features to generate machine learning models to predict Spotify song popularity. Preliminary results concluded that features are not linearly correlated, with some expected exceptions including songs' energy.

This indicated that the Spotify metrics we studied—including acousticness, danceability, duration, energy, explicitness, instrumentalness, liveness, speechiness (a measure of the presence of spoken words in a song), tempo and release year —were not strong predictors of the song's popularity.

The majority of songs in the Spotify dataset were not listed as explicit, tended to have low instrumentalness and speechiness, and were typically recent songs.

Although one may think that some features that are innate to certain songs make them more popular, our study revealed that popularity can not be attributed solely to quantifiable acoustic elements.

This means that song makers and consumers must consider other contextual factors beyond the musical features, as captured by Spotify's measurables, that may contribute to the song's success.

Elements affecting popularity shift

Our study reinforces that elements affecting the popularity of songs change over time and should be continuously explored.

For example, [in songs produced between 1985 and 2015 in the United Kingdom, songs produced by female artists were more successful.](#)

Other aspects may substantially contribute to the success of a song. Data scientists have proposed [simplicity of the lyrics](#), the advertising and [distribution plans](#) as potential predictors of songs' [popularity](#).

Attached listeners

Many musicians and producers make use of popular events and marketing strategies to advertise songs. Such events create social engagements and [audience involvement](#) which attaches the listener to the song being performed.

For the public, [live music events](#), following long lockdowns, have been opportune for reuniting friends, and [enjoying live artistry and entertainment](#).

While attending a music event or listening to a song, we invite you to reflect on what it is about the [song](#) that makes you enjoy it.

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