

# Thinking Outside the Music Box: A User-Centric Music Recommendation System

Caroline Coyle     Jonathan Dine     Joseph Hirschi     Megan Toronto

## Summary

**Music Box** is a novel user-centric music **recommendation system** (MRS) that intimately **involves users** in the process of generating playlists by allowing them to select the importance of different music features to **create highly personal and curated playlists**. In preference testing, Music Box introduced users to **new music 86% of the time** compared to their regular streaming platform, helping users discover new music tailored to their preferences.

## Music Box Method



## Innovation

We live in a personalized world where users demand products to focus intimately on them. Music streaming platforms fail to ask users what they want. The **core innovation in our MRS is the involvement of the user** to create personalized playlists where the user plays an active role in determining what features are important to them in a playlist.

## Sentiment Analysis

People often connect to lyrics more than they connect to musical instruments alone. Despite this, there can often be a significant **disconnect between the sound of a song and its lyrics**, where the mood of the music doesn't match the mood of the lyrics. Typically, MRS systems fail to consider whether there is consistency in the mood of music and lyrics. Our system accounts for whether there is a match in the mood.

We utilize VADER to analyze the mood of a song's lyrics and **create a lyrical valence** score that allows users to select if they want a song where the mood of the **lyrics matches the mood of the music**, or if they want contrast between the two.

## MRS Algorithm

Our MRS algorithm begins with the user determining which musical features they want to focus on in their playlist by **weighting each feature** on similarity scale on a scale of 0.25 to 1.75 with the default weight being 1.

In order to determine the recommendations for a playlist, we normalize the dataset and then scale each feature by the user's similarity weight. We then find the L2 distance between the seed song and all other songs to **determine the 20 recommended songs** that best reflect the user's weights and seed song.

## Visualizing the Data

Our algorithm relies on **data with 11 different musical features** to base similarity. After calculating the Euclidean distance between songs based on all 11 features, we **performed PCA** on the dataset to plot the points in 2D space.

To assist the user in understanding how their selected weights affect the returned playlist, our site includes a **responsive visualization based on the PCA data** that illustrates the **250 most similar songs** based on our MRS algorithm.

Once a user inputs a seed song, they **adjust the weights to determine if the musical feature should be lower, similar, or higher to that of the seed song**. In the unweighted plot, the seed song is at the center of the cluster, whereas in the weighted plot, you can see that the seed song is now further from the recommendations as a result of the selected weights.

The visualization (on right) also illustrates how the song's features relate to that of the seed song. **As the weights are adjusted, the algorithm re-calculates** which songs to recommend and adjusts its playlist based on user input.

## Methodology

In order to evaluate user experience, we conducted a **series of preferences tests** on a test **group of 42 users**. We hypothesized that users would prefer the playlist they actively helped generate (Music Box with weights) over a generic one generated by unweighted Music Box or their personal music streaming service.

We asked users to **create three separate playlists** based on the same seed song (Music Box without weights, Music Box with weights, and their own music streaming platform) and evaluate the playlists based on **familiarity, likeability, and cohesion**. Finally, we asked users to determine which playlist they preferred and to provide some additional details on UX.

We also **collected demographic information** to determine if a particular user base would be more likely to use the platform than another.

## Testing Results

Results of our testing showed that users were **evenly distributed across age, gender, and listener type** with most listeners self-identifying as casual. Music Box's main user base consists of **individuals aged 22-30 years old**.

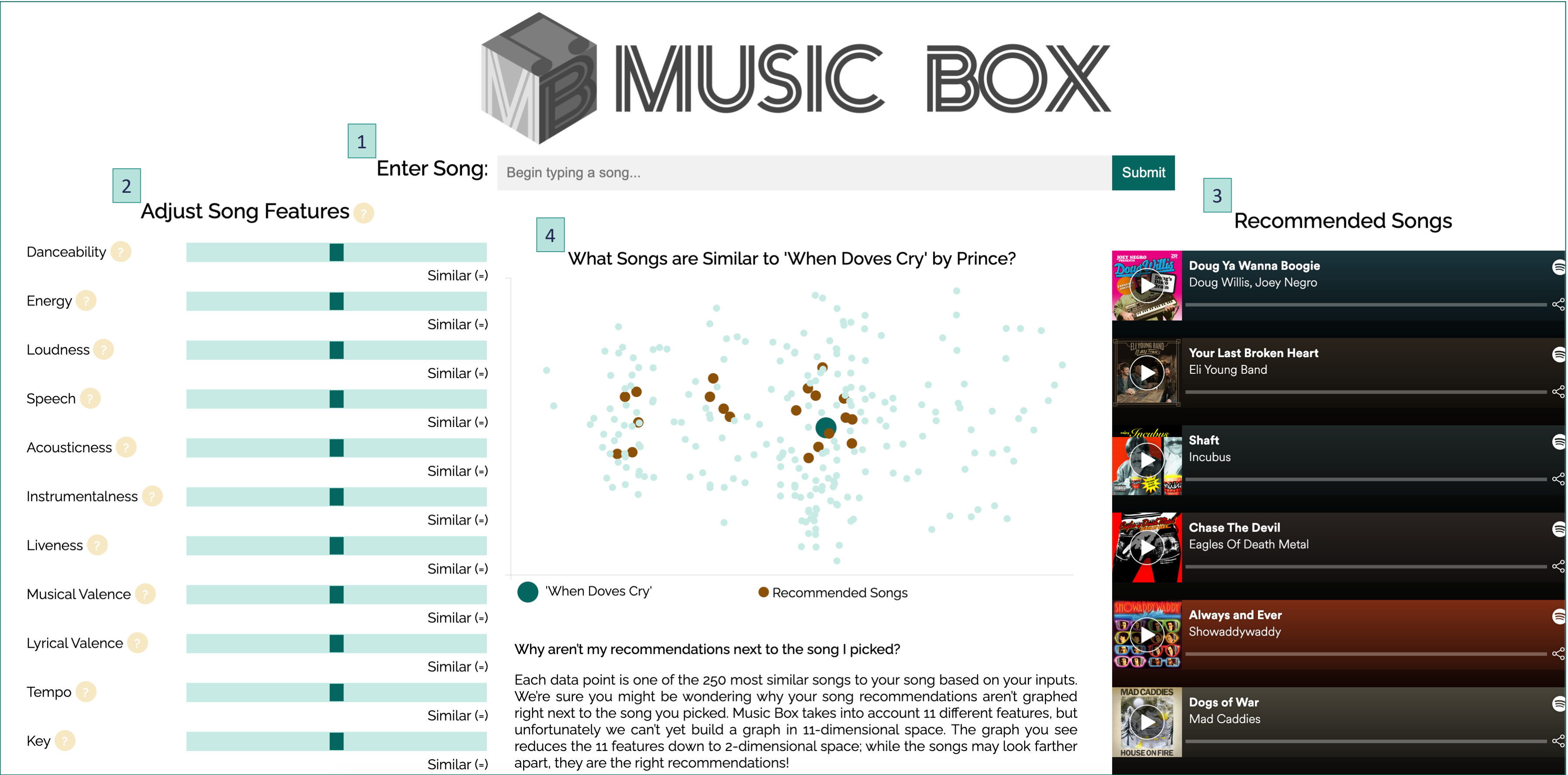
In our survey, only 29% of casual users said they would use Music Box again, while 100% of self-identified Savants said they would be interested in continuing to use the app. While Savants are less common, they may be an **underserved niche market** for Music Box. Non-Savants also struggled with the musical terminology used but found the **tooltip to provide clarity**. Users also shared possible improvements to the graph and site navigation.

While Music Box did **not perform as well as expected in playlist likeability and cohesion**, it did present a window for improvement in familiarity and helping users discover new music.

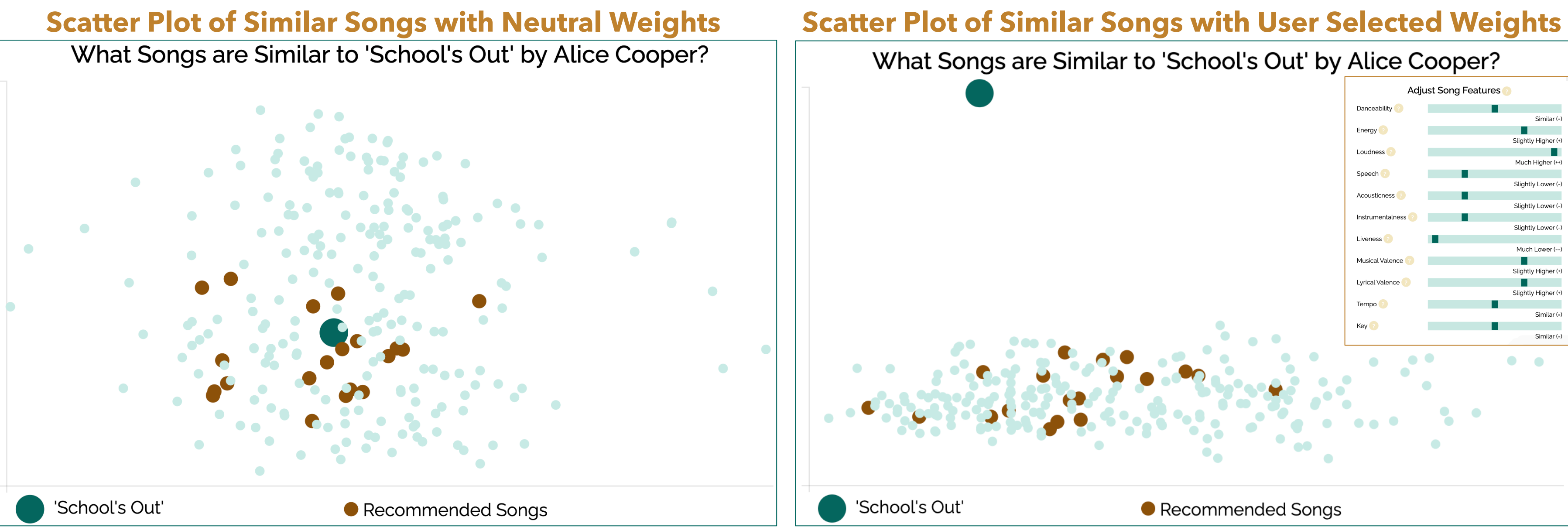
## Data

APIs Used	Spotify, Lyrics Genius
Songs Retrieved from Spotify	455,285
Musical Features Utilized from Spotify	10
Unique Songs after Data Cleaning	391,548
Songs with Lyrics from Lyrics Genius	289,000
Size of Lyrics Data Processed	9.68 GB

## User Experience



When users access Music Box, they begin by inputting a song in the search bar and **selecting their song** (1) from the dropdown menu. They then **use the feature sliders** (2) to adjust the features based on their preferences. Music terminology tooltips are available if users are not familiar with the features. After they **select their song and weights**, they **press submit** to generate their playlist. This **returns a playlist of recommended songs** (3) with featuring short clips of each track available on Spotify. The visual shows users 250 similar songs to their seed song to **encourage musical discovery and exploration** (4).



### Comparison of Recommended Songs

- |  |   |
|--|---|
| "America", Jefferson Starship                                      | Here Comes Goodbye, The Rascal Flats                        |
| Back Where I Started, The Yardbirds                                | Hypnosis, TAEMIN  |
| Crown of Creation - Live at Chicago Auditorium, Jefferson Airplane | Give Me All Your Love Tonight, Whitesnake                   |
| What's Wrong With Me, X  | Say You Love Me - Live at Ziggo Dome, Amsterdam, Simply Red |
| Bring on the Nubiles - Live at the Hope and Anchor, The Stranglers | What Can I Say - Live at Neumo, Brandi Carlile              |

## Conclusions

While users did not prefer Music Box's playlist over their personal streaming service, they did note that Music Box was much **more effective at helping them discover new songs** they liked. As a result, we believe Music Box is better positioned with users as a **music discovery tool** as opposed to a playlist generation tool. Users noted that using Music Box, they regularly **discovered 16-20 new songs** that they were previously unfamiliar with (as shown below).

While this was **not the original intention**, based on user feedback, we believe that in future iterations, it would be most prudent to **focus on developments that assist users with discovering new and exciting music** that they might not have otherwise found with their regular music streaming platform.

