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Our Music Playlists
Matrix Factorization in Spotify:
Shuffling Music
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Spotify Shuffle Feature

Happiness

You listened 4h35min

Spotify's shuffle feature has become a hit, shuffling the user's favorite songs, creating an endless experience for the user.

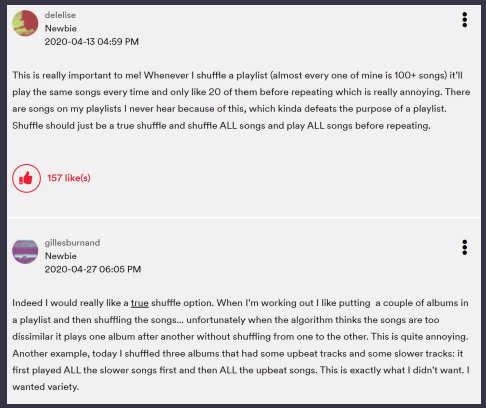
Sadness

You listened 3h15min

But, other users are not happy due to Spotify's shuffle feature which does not allow a true shuffle within a playlist.

Context

There have been many comments and suggestions regarding the “shuffle” feature posted on the Spotify Community Blog.



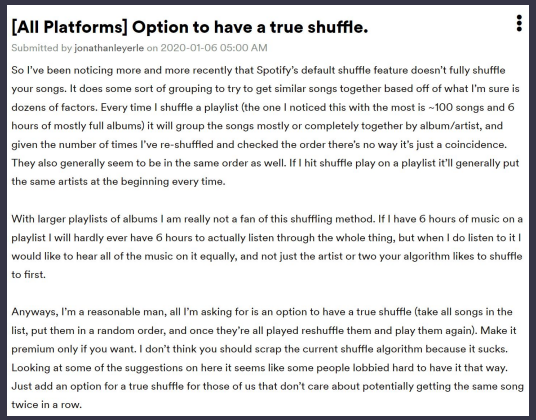
delelise
Newbie
2020-04-13 04:59 PM

This is really important to me! Whenever I shuffle a playlist (almost every one of mine is 100+ songs) it'll play the same songs every time and only like 20 of them before repeating which is really annoying. There are songs on my playlists I never hear because of this, which kinda defeats the purpose of a playlist. Shuffle should just be a true shuffle and shuffle ALL songs and play ALL songs before repeating.

157 like(s)

gillesburnand
Newbie
2020-04-27 06:05 PM

Indeed I would really like a true shuffle option. When I'm working out I like putting a couple of albums in a playlist and then shuffling the songs... unfortunately when the algorithm thinks the songs are too dissimilar it plays one album after another without shuffling from one to the other. This is quite annoying. Another example, today I shuffled three albums that had some upbeat tracks and some slower tracks: it first played ALL the slower songs first and then ALL the upbeat songs. This is exactly what I didn't want. I wanted variety.



[All Platforms] Option to have a true shuffle.

Submitted by jonathanleyerle on 2020-01-06 05:00 AM

So I've been noticing more and more recently that Spotify's default shuffle feature doesn't fully shuffle your songs. It does some sort of grouping to try to get similar songs together based off of what I'm sure is dozens of factors. Every time I shuffle a playlist (the one I noticed this with the most is ~100 songs and 6 hours of mostly full albums) it will group the songs mostly or completely together by album/artist, and given the number of times I've re-shuffled and checked the order there's no way it's just a coincidence. They also generally seem to be in the same order as well. If I hit shuffle play on a playlist it'll generally put the same artists at the beginning every time.

With larger playlists of albums I am really not a fan of this shuffling method. If I have 6 hours of music on a playlist I will hardly ever have 6 hours to actually listen through the whole thing, but when I do listen to it I would like to hear all of the music on it equally, and not just the artist or two your algorithm likes to shuffle to first.

Anyways, I'm a reasonable man, all I'm asking for is an option to have a true shuffle (take all songs in the list, put them in a random order, and once they're all played reshuffle them and play them again). Make it premium only if you want. I don't think you should scrap the current shuffle algorithm because it sucks. Looking at some of the suggestions on here it seems like some people lobbied hard to have it that way. Just add an option for a true shuffle for those of us that don't care about potentially getting the same song twice in a row.

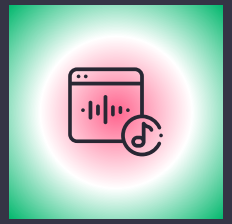
- No true shuffle feature
- Repeats the same songs at the beginning of the playlist that the user listens to
- Does not show a true randomization within a playlist when on shuffle

Problem Statement

Spotify, a music streaming service, has contracted Angie Analytics, a data consulting firm, to be able to fix this shuffling feature in order to satisfy the customer's needs.

Provide recommendations to hand off to the Analytics team in order to apply implementation and fully solve the shuffle feature issue for Spotify.

Dataset



YourLibrary

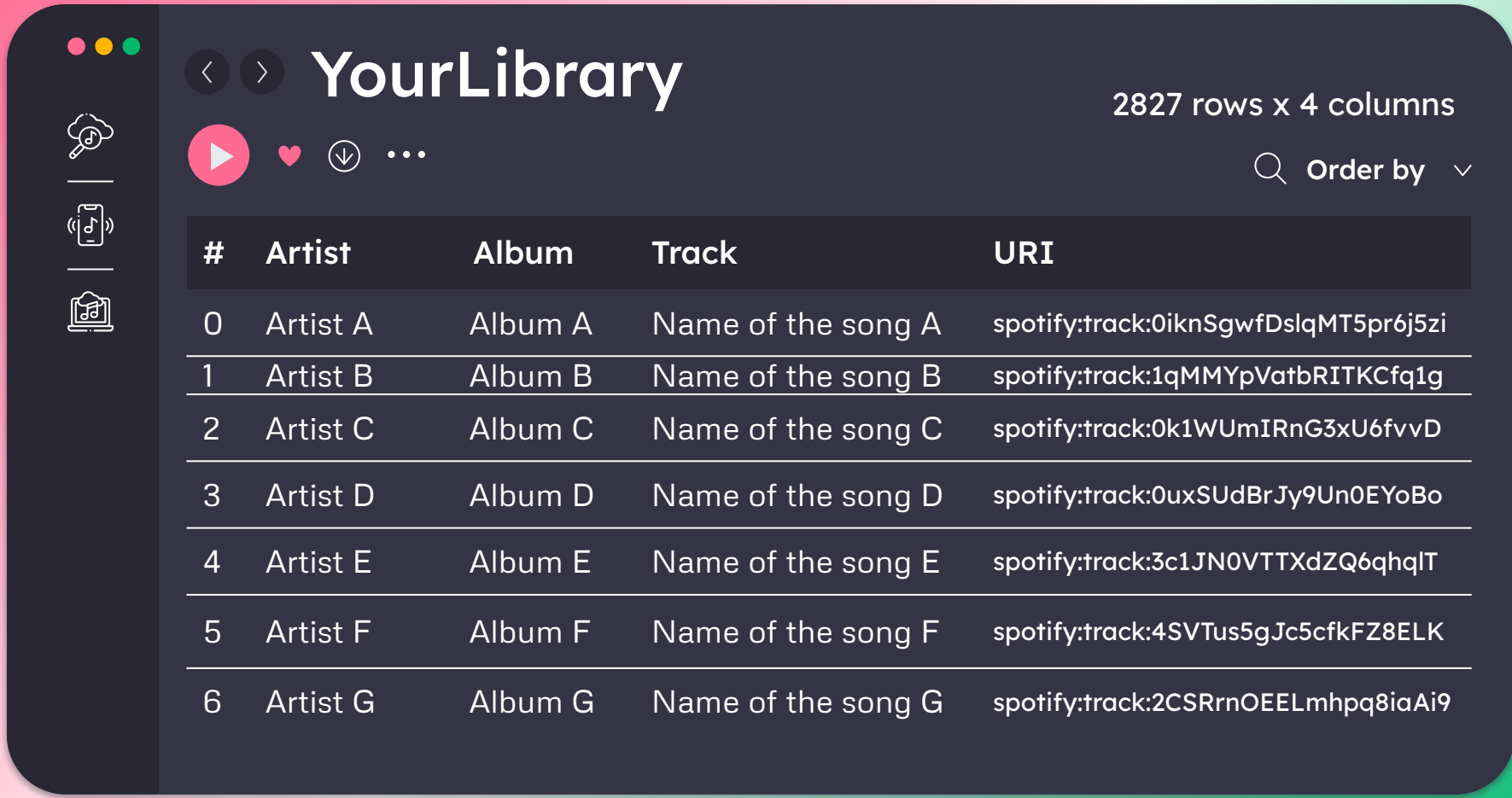
3:15

Requested Spotify to send user data

User data was sent to the user where data was able to be viewed regarding user's saved music tracks, album, spotify track uri (uniform resource identifier), artist

Cleaning the data: renaming columns, identifying any nulls, dropping unnecessary columns

2827 rows x 14 columns



#	Artist	Album	Track	URI
0	Artist A	Album A	Name of the song A	spotify:track:0iknSgwfDslqMT5pr6j5zi
1	Artist B	Album B	Name of the song B	spotify:track:1qMMYpVatbRITKCfq1g
2	Artist C	Album C	Name of the song C	spotify:track:0k1WUmIRnG3xU6fvvD
3	Artist D	Album D	Name of the song D	spotify:track:0uxSUdBrJy9Un0EYoBo
4	Artist E	Album E	Name of the song E	spotify:track:3c1JN0VTTXdZQ6qhqlT
5	Artist F	Album F	Name of the song F	spotify:track:4SVTus5gJc5cfkFZ8ELK
6	Artist G	Album G	Name of the song G	spotify:track:2CSRrnOEELmhpq8iaAi9

How to create a true shuffle?

Implementing machine learning

- Can create a more sophisticated shuffling model
  - Matrix factorization
    - Breaking down a large matrix of user-song interactions into smaller matrices that represent latent factors that contribute to those interactions
      - Generating a reorder of songs from a playlist that the user has not streamed in recently for a particular user
  - Neural networks
    - user's listening history and generating a model that the next song in the shuffle playlist is a song that has not been listened to
  - Reinforcement learning
    - Training an agent to learn a shuffling strategy that maximizes user satisfaction. The agent receives feedback on its shuffling decisions from the user and adjusts its strategy based on that feedback.

Matrix Factorization

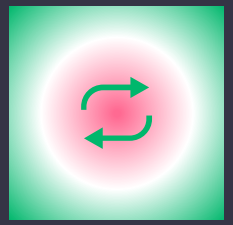
Advantages

- **Personalization:** learn user preferences and recommend songs that are personalized to each user's taste
- **Scalability:** handle large amounts of data and can be scaled up easily to accommodate more users and songs
- **Simplicity:** easy to implement and interpret
- **Diversity:** recommend songs that are not necessarily popular, which can help users discover new and diverse music
- **Collaborative filtering:** leverage the preferences of other users with similar taste to recommend new songs.

Disadvantages

- **Cold-start problem:** struggle to make recommendations for new users or songs with little or no data
- **Sparsity:** can struggle with sparsity in the data, which can lead to poor recommendations for certain users or songs

Next Steps



Implementation

3:15

Send off Dataset for implementation of Matrix Factorization to Analytics Team.

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Our Music Playlists

Thank You!

Any questions?

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Resources

Garza, Jair. “Why Use Matrix Factorization?” *Jair G Website*, 8 Feb. 2020, https://jairgs.github.io/matrix-factorization/.

“Recommendation System Using Matrix Factorization.” *Auriga IT*, 17 Jan. 2023, https://www.aurigait.com/blog/recommendation-system-using-matrix-factorization/#:~:text=The%20Matrix%20Factorization%20techniques%20are%20usually.

“Shuffle Play Is Not Random.” *Solved: Shuffle Play Is Not Random - The*, 11 Apr. 2021, https://community.spotify.com/t5/iOS-iPhone-iPad/Shuffle-play-is-not-random/td-p/750619#solutionsRow.

Team, Great Learning. “Matrix Factorization Explained: What Is Matrix Factorization?” *Great Learning Blog: Free Resources What Matters to Shape Your Career!*, 31 Oct. 2022, https://www.mygreatlearning.com/blog/matrix-factorization-explained/#:~:text=Matrix%20factorization%20is%20one%20of%20the%20most%20sought-after,product%20or%20service%2C%20and%20recommend%20multiple%20options%20available.