

Spotify Playlist Song Recommender

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Project Goal

- Build a playlist-based music recommender that recommends songs given a playlist.
- Use two Kaggle datasets:
 - Spotify Tracks Metadata (114k songs, audio features)
 - Spotify Playlists (12.8M playlist entries from 100k+ playlists)
- Combine song metadata + real playlist behavior to model user taste.

Final Model Results

Per-Track kNN + track/artist/genre Word2Vec embeddings

- Quantitative: Recall@5 ≈ 0.16
 - ~60× improvement over genre baseline (≈ 0.0027)
- Qualitative: the model consistently recommends tracks that match the playlist's artists and genres

Evaluation Process

- Test on 2000 playlists ($4 < n < 300$)
- Hide 2 tracks per playlist
- Feed remaining playlist tracks into the model
- Get the top-5 song recommendations
- Calculate the Recall@5 and MRR



Baseline Models

1

Pure Random

Return a random song from the song metadata dataset.

Recall@5 = 0.0001

2

Random by Genre

Return a random song of the most common genre in the playlist.

Recall@5 = 0.0027



All Models

1

Pure Random

Return a random song from the song metadata dataset.

Recall@5 = 0.0001

2

Random by Genre

Return a random song of the most common genre in the playlist.

Recall@5 = 0.0027

3

KNN on playlist centroid

Return the closest neighbors to the playlist's averaged track features.

Recall@5 = 0.1537

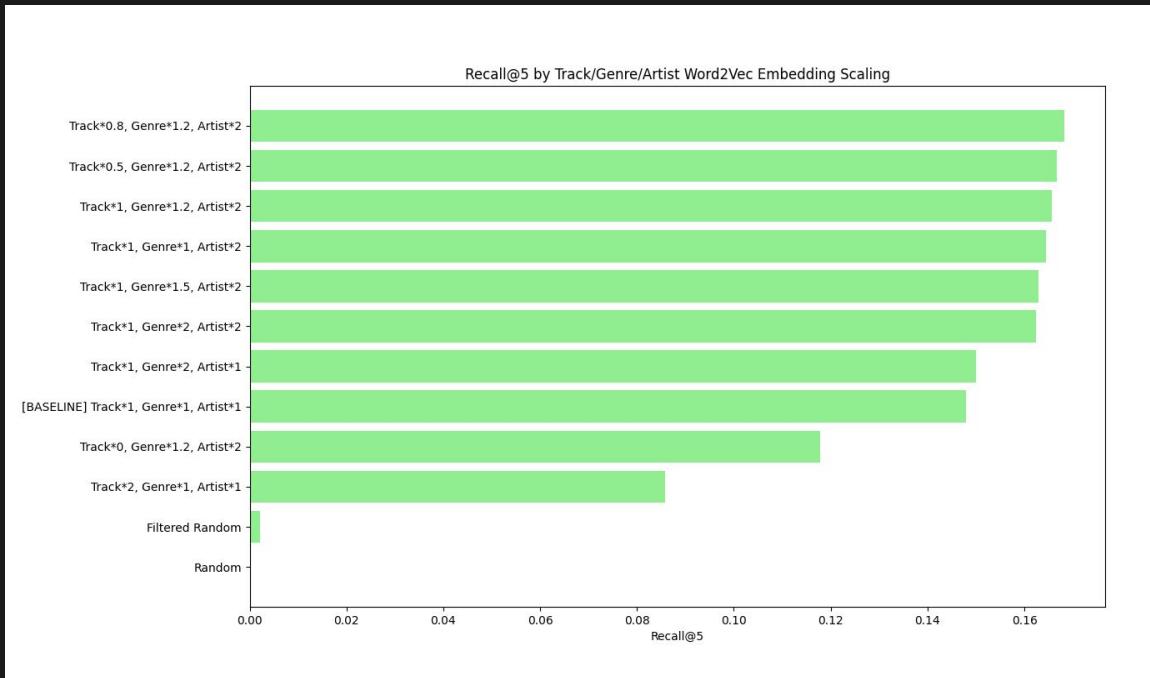
4

KNN per playlist track

Returns tracks from aggregated per-track neighbors.

Recall@5 = 0.1672

Word2Vec Embeddings



Track ID Embeddings

Learn vector representations of individual songs based on which tracks co-occur in playlists. This captures collaborative-filtering signals and groups songs users tend to listen to together.

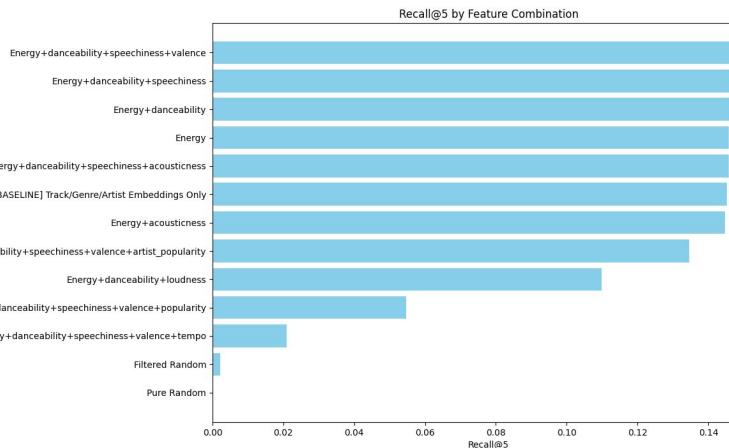
Genre Embeddings

Embed genre labels based on how often genres appear together within playlists. This captures higher-level stylistic and mood relationships not tied to specific tracks.

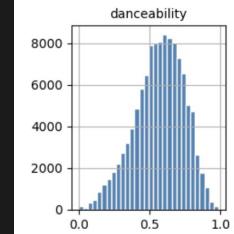
Artists Embeddings

Learn embeddings for artists by observing which artists frequently appear in the same playlists. This captures cross-artist similarity and typical user listening patterns.

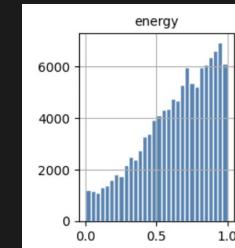
Song Metadata Features



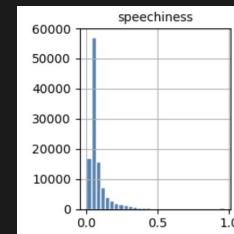
Danceability



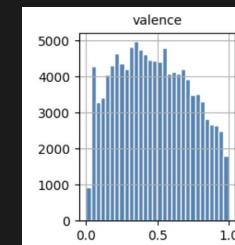
Energy



Speechiness



Valence



Qualitative Check

Moody Teen Pop (input)

Sweater Weather – The Neighbourhood
Another Love – Tom Odell
Locked out of Heaven – Bruno Mars
Lost – Frank Ocean
Electric Love – BØRNS
Dancing Queen – ABBA
Rolling in the Deep – Adele

Moody Teen Pop (output)

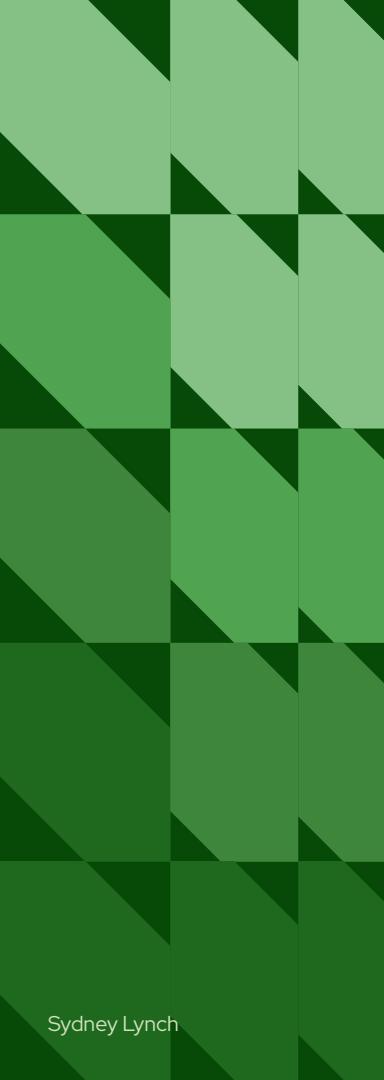
Does Your Mother Know – ABBA
Treasure – Bruno Mars
That's What I Like – Bruno Mars
Just the Way You Are – Bruno Mars
Talking to the Moon – Bruno Mars
Rumour Has It – Adele
Novacane – Frank Ocean
Chiquitita – ABBA
Set Fire to the Rain – Adele
Moonshine – Bruno Mars

Basic Rap (input)

No Role Modelz – J. Cole
Not Afraid – Eminem
Bohemian Rhapsody (Remastered 2011) – Queen
Without Me – Eminem

Basic Rap (output)

Rap God – Eminem
The Real Slim Shady – Eminem
The Prayer – Kid Cudi
Venom – Eminem
Lose Yourself – Eminem
Bohemian Rhapsody – Queen
On Fire – Lloyd Banks
Pistol Pistol (Remix) – Obie Trice
X Gon' Give It To Ya – DMX
The Rain – DMX



Thank you