

A decorative pattern of overlapping green squares and rectangles, some solid and some with diagonal lines, creating a sense of depth and movement, located on the right side of the slide.

# Spotify Playlist Song Recommender

Sydney Lynch

# 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  $\approx 0.16$ 
  - $\sim 60\times$  improvement over genre baseline ( $\approx 0.0027$ )
- 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

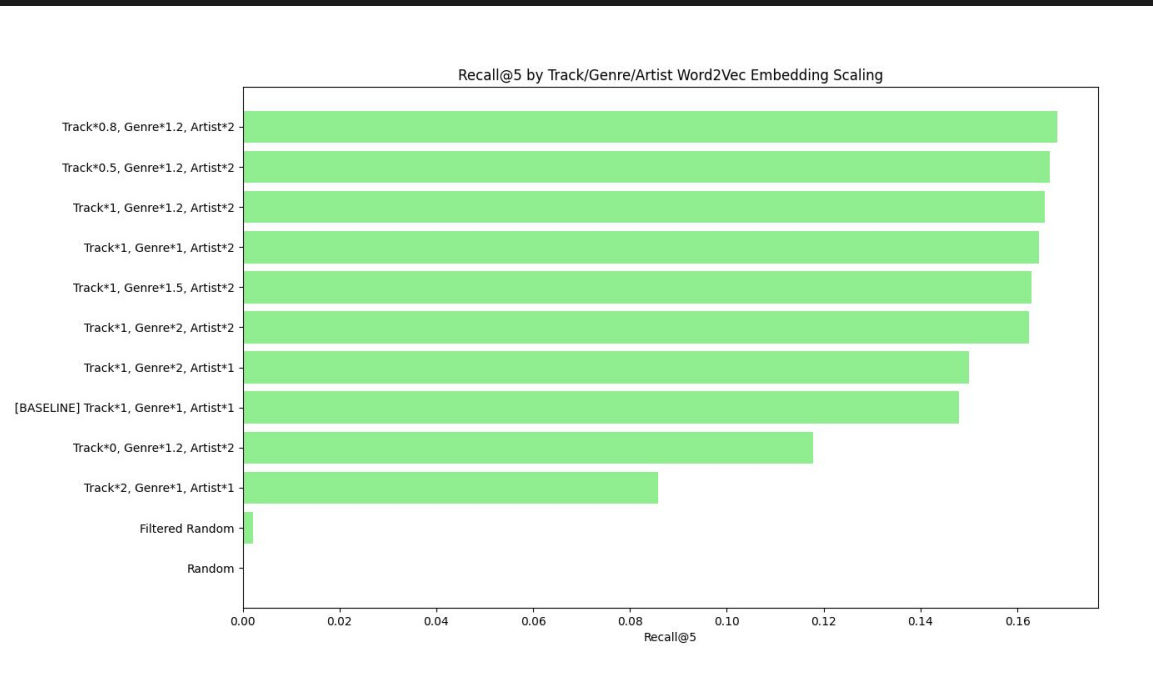
4

## 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.

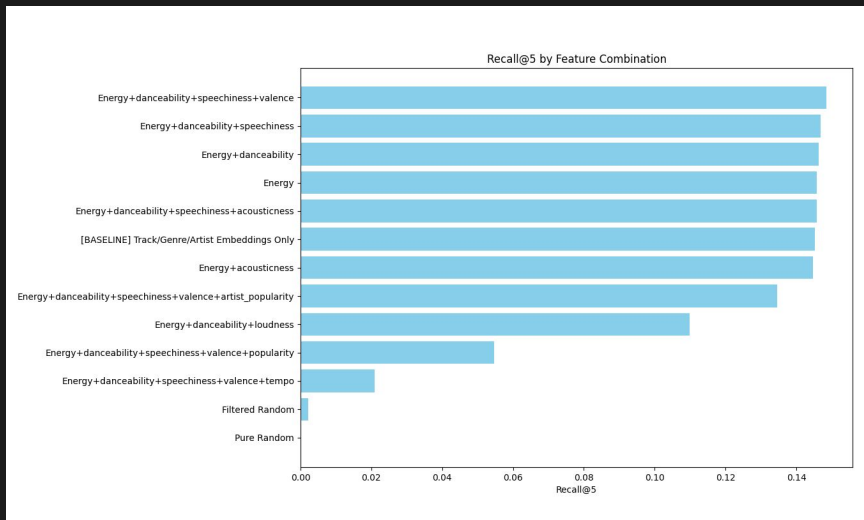
## Genre Embeddings

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.

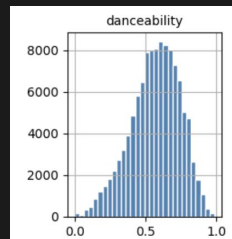
## Artists Embeddings

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

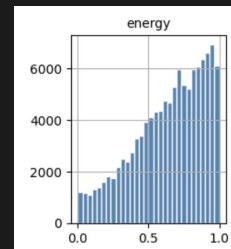
# Song Metadata Features



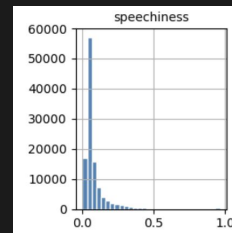
Danceability



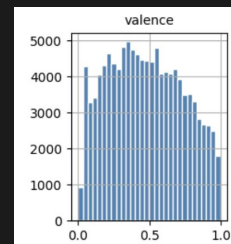
Energy



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