GALGOTIAS
UNIVERSITY

Decoding the Beat: A Data-Driven Insight into Spotify's Recommendation System

Team Details:

Gauri Goel:23SCSE1011321

Priyanshu Rawat: 23SCSE1011069

Anchal Ranote: 24SCSE1180694

Sumit Singh: 23SCSE1012175

Section:25

OVERVIEW

Music streaming platforms like Spotify have revolutionized how we consume audio content. Central to their success is their ability to personalize recommendations. Every time a user opens Spotify, they are presented with "Made For You" playlists, "Daily Mixes," "Discover Weekly," and "Release Radar" — all generated based on complex algorithms and user behavior.

However, these recommendation systems often operate as "black boxes" — users don't fully understand *why* they're being shown certain songs or artists. This project seeks to lift the veil on that mystery by using Spotify's own API and data analysis tools to break down, visualize, and explain the logic behind the recommendations

Purpose

•To explore **how Spotify recommends songs** to users based on their listening history.

•To use **Spotify's Web API** to fetch user data like top tracks, artists, genres, and audio features.

•To analyze **what kind of music a user listens to** — whether it's more energetic, calm, happy, or danceable — using acoustic feature metrics.

•To compare Spotify's **actual recommendations** with what the user tends to listen to and assess the alignment.

•To generate **visual insights** into the patterns of user preferences.

WHY IS THIS RELEVANT?

While Spotify's AI is sophisticated, users often:

•Don't know **why** they're getting specific recommendations.

•Don't realize how much **data Spotify collects and uses** about their preferences.

•Miss the opportunity to analyze their own musical evolution or mood shifts.

With increasing reliance on AI-based platforms, **transparency and interpretability** of recommendation systems is more important than ever — especially in areas like music, where taste is deeply personal.

PROJECT SCOPE & TECHNOLOGY STACK

- **Language**: Python
- **APIs**: Spotify Web API
- **Libraries**:
- Spotipy for API interaction
- Pandas, NumPy for data cleaning
- Matplotlib, Seaborn, Plotly for visualization
- Optional: Streamlit or Tableau/Power BI for dashboarding.

SPOTIFY API OVERVIEW

Spotify offers a robust Web API to access track, artist, genre, and recommendation data.
• Authentication uses OAuth 2.0 for secure access to user data.
• We use the Spotipy Python library to interact with Spotify's API easily.

DESCRIPTION OF SPOTIFY DATA

Track Name, Artist Name, Album, Genres, Duration, Popularity Score

• Acoustic Features: danceability, energy, tempo, valence, etc.

• Can fetch Top Tracks, Recently Played, and Recommended Tracks.

• Provides deep insights into mood-based or genre-based recommendation logic.

PLANNED OUTCOMES

Track Name, Artist Name, Album, Genres, Duration, Popularity Score
• Acoustic Features: danceability, energy, tempo, valence, etc. Identify personal listening trends: genre, tempo, mood, etc.
• Understand how Spotify tailors its recommendations.
• Visualize data in a user-friendly way.
• Generate a mini-profile of music habits and how they evolve.

• Can fetch Top Tracks, Recently Played, and Recommended Tracks.
• Provides deep insights into mood-based or genre-based recommendation logic.

FUTURE ENHANCEMENTS

•Add support for **multiple user profiles** to compare musical tastes across people.

•Apply **machine learning** to cluster users or predict mood from song features.

•Integrate **sentiment analysis** on song lyrics using NLP.

•Compare Spotify with **other platforms** like Apple Music or YouTube Music.

•Build a **live Streamlit dashboard** to interactively explore the insights.

CONCLUSION

The **Spotify Recommendation Insights** project offers a unique opportunity to explore how personalized music experiences are shaped using data. By utilizing **Spotify's Web API**, we were able to extract meaningful listening data and analyze it with the help of **Python-based data analytics tools**.

Through the study of **audio features** like energy, tempo, danceability, and valence, this project builds a detailed **"music taste profile"** for the user. It then compares Spotify's algorithmically suggested tracks with this profile to evaluate the accuracy and relevance of recommendations.

This project not only demystifies the black-box nature of recommendation engines but also encourages **algorithmic transparency** and user awareness. It empowers users to better understand their own listening behavior and how it's interpreted by a commercial AI system.

In essence, this project bridges the gap between human taste and machine intelligence in a practical, personalized, and visually engaging way. It serves as a **stepping stone for deeper projects in AI, music analytics, and personalized content delivery systems**.

THANK YOU