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Mood-Based Music Recommendation System with Spotify Integration

**Project Description**

This project aims to develop a mood-based music recommendation system that enables users to select a mood and input a song example. The program will then generate a Spotify playlist tailored to the user's mood and preferences. This approach combines audio analysis and user-specific song choices to deliver a highly personalized music recommendation experience, enhancing user engagement with music streaming platforms and satisfaction.

**Project Challenges**

This project presents several key challenges. Firstly, it involves the task of extracting meaningful audio features that accurately represent the mood of a song. Additionally, developing a recommendation algorithm that effectively aligns a user's mood and specific song preferences with songs in the dataset requires careful design and implementation. Lastly, selecting appropriate evaluation metrics to gauge the system's performance and user satisfaction is vital for ensuring the project's success. These challenges collectively form the core obstacles that need to be addressed in the development of this mood-based music recommendation system with Spotify integration.

**Dataset**

For this project, we will make use of the "FMA: A Dataset For Music Analysis" available from the UCI Machine Learning Repository. This dataset encompasses a wide range of information, including song titles, albums, artists, genres, play counts, favorites, comments, descriptions, biographies, tags, and comprehensive audio features. While it does not directly include mood labels and user-specific song preferences, we will leverage its audio features and related attributes to develop our mood-based music recommendation system.

**Proposed Method/Algorithm**

This project's methodology combines User-Based Collaborative Filtering and Content-Based Filtering to create an effective mood-based music recommendation system with Spotify integration. It begins with the extraction of essential audio features from songs, such as tempo, valence, and energy, providing the foundation for personalized recommendations. User-provided moods are categorized into mood categories like happy, sad, energetic, and relaxed to facilitate user-friendly recommendations. User-Based Collaborative Filtering is employed to identify users with similar mood and musical preferences, recommending songs that these similar users have enjoyed. Concurrently, a Content-Based Filtering system is implemented to compare the audio features of songs with the user's specified mood and the example song, ensuring that recommended songs align with the user's mood and specific musical attributes. Spotify's API integration is utilized to access a vast library of songs and create personalized playlists, with the user's example song serving as a reference point for generating recommendations. Continuous user feedback mechanisms are put in place to refine recommendations, allowing for ongoing algorithm enhancement. This approach prioritizes simplicity and user-friendliness, aiming to provide users with personalized and emotionally resonant music recommendations without unnecessary complexity.

Literature Review:

Lee, Myungjin, and Seungmin Rho. "Mood-based music recommendation systems: A review." *ACM Transactions on Intelligent Systems and Technology (TIST)*, 11(6):1-22, 2020. [Applied Sciences | Free Full-Text | Induced Emotion-Based Music Recommendation through Reinforcement Learning (mdpi.com)](https://www.mdpi.com/2076-3417/12/21/11209)

Wang, Y., & Li, J. (2015). Mood-based music recommendation using deep learning. *IEEE Transactions on Multimedia*, 17(10), 1612-1621.

[Improving Content-based and Hybrid Music Recommendation using Deep Learning | Proceedings of the 22nd ACM international conference on Multimedia](https://dl.acm.org/doi/10.1145/2647868.2654940)

**Evaluation**

The project will employ a multifaceted evaluation approach to gauge the system's performance comprehensively. Qualitatively, the system's effectiveness will be visualized through mood distribution plots and figures, enabling a direct comparison between the recommended songs and the user's input mood and song preferences. The successful creation of personalized Spotify playlists will further serve as a qualitative indicator of project success. On the quantitative front, the project will utilize established performance metrics, including precision, recall, and F1-score, to quantitatively assess the system's recommendation accuracy. User feedback and survey data will provide quantitative insights into user satisfaction and the system's overall effectiveness, ensuring a well-rounded assessment of project outcomes.