Emotion-driven Music Recommendation System with Chatbot Interaction

*Recommending music based on user emotion using Chatbot

N Shreelekha
Dept. of Computer Science
PES University
shreelekha2003@gmail.com

Mridvi Sharma
Dept. of Computer Science
PES University
sharmamridvi2003@gmail.com

Aditi M
Dept. of Computer Science
PES University
aditi.medayhal@gmail.com

Dr. Mamatha H R
Dept. of Computer Science
PES University
mamathahr@pes.edu

Dr. Preethi P
Dept. of Computer Science
PES University
preethip@pes.edu

***Abstract*—This paper presents a novel music recommendation system using a chatbot interface, offering personalized suggestions based on user emotion. Leveraging natural language processing, the system interprets user text to determine emotional state and recommends music accordingly. The seamless interaction between user and chatbot enhances user experience, with recommendations derived from sentiment analysis. Implementation details, including sentiment analysis integration, are provided. User studies demonstrate the system's efficacy in providing tailored music recommendations, contributing to interactive and personalized music discovery experiences.**

Keywords : Sentimental Analysis, Spacy , Keyword Extraction,Chatter Bot, BERT, TextBlob

I. Introduction

In today's digital age, music consumption is increasingly driven by personalized experiences tailored to individual preferences and moods. Traditional music recommendation systems often rely on collaborative filtering or content-based approaches, overlooking the nuanced emotional context of users. This paper introduces a novel approach to music recommendation, merging the realms of natural language processing and emotion analysis within a chatbot interface. By harnessing the power of sentiment analysis, the proposed system aims to bridge the gap between user emotions expressed through text and personalized music suggestions. The integration of a chatbot facilitates seamless interaction, allowing users to convey their emotional states through text messages and receive music recommendations tailored to their mood in real-time. Through detailed implementation and evaluation, this research seeks to enhance user engagement and satisfaction by delivering intuitive and personalized music discovery experiences. By leveraging emotion-driven recommendation capabilities within a conversational interface, this study contributes to the advancement of interactive music recommendation systems, catering to the evolving needs and preferences of modern music enthusiasts.

II. Literature Survey

Music therapy [1] is thought to have healing benefits on the body and psyche, as evidenced by the use of Indian classical ragas to cure ailments. Music's vibrations stimulate the central nervous system and can increase blood flow and energy flow in the body, facilitating faster recovery. Overall, music therapy is regarded as a highly effective method for relaxation, healing, and improving well-being.

[2] Music and movie recommendation Chatbot determines the mood of the user, followed by music that will be played or a collection of films that will be displayed on a website depending on the mood. The goal is to assess the user's emotional state consistently and accurately. This comprehensive plan aims to provide a more engaging and individualized entertainment experience.

[3]. Also, it was identified that listening to music that is congruent with your mood will bring a feeling of the presence of an empathetic friend

[4].This concept of using music to cure depression inspires us to develop an emotion-based music recommendation system using deep learning. Broadly recommendation systems are divided into two types which are content-based filtering and collaborative filtering

[5]. Since content-based filtering deals with what the user liked in the past, it may not match with the genre of song that the user wants to listen to presently and in addition there would be a cold start recommending a fresh user with all the music that they might like. Similarly, collaborative filtering checks for similarity among users and suggests songs that the user may like rather than what the user wants to listen to at a point in time. Hence it is important to consider the user's environment, activity, and emotion to recommend the right genre of songs to them. Because of the above-mentioned drawbacks of content-based and collaborative filtering methods [6J, today's streaming services like Spotify, iTunes, etc.

use a hybrid recommendation approach.

III. DATASET COLLECTION

The songs dataset used in this study consists of a collection of music tracks sourced from various sources and curated to facilitate the evaluation of the music recommendation system. The dataset includes metadata for each song, including attributes such as song name, artist, album, language, and sentiment. The dataset is divided into several categories based on sentiment (positive, negative) and language (English, Hindi, Kannada, Punjabi, Telugu).

IV. PROPOSED SYSTEM

The complete system divides into three parts i.ChatBot, ii. emotion detector from text iii. music recommendation system based on the mood.

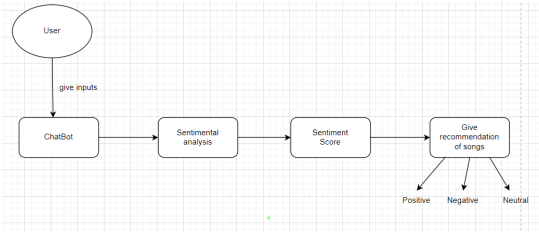

Fig. 1. Flow Chart

We had gathered a diverse dataset of songs which were hand labeled into three classes i.e Positive,Negative,Neutral. Later we used a pretrained model for interacting with user which is ChatterBot . The pretrained ChatterBot is then fine-tuned to the training data .

Based on the textual data which was given as an input by the user, Keyword extraction is done . After the keywords are fetched Sentimental Analysis is performed . Further based on the sentiment score the five songs are recommended to the user .

A. User Interface:

The user interface (UI) serves as the primary interaction point between the user and the music recommendation system. It is designed to be intuitive and user-friendly, facilitating seamless communication with the underlying components of the system. The UI typically consists of a web-based interface accessible through a browser. Users can input their queries or requests via text input fields and receive responses from the Chatbot in real-time. The UI may also include additional features such as buttons, dropdown menus, and interactive elements to enhance the user experience.

B. Natural Language Processing (NLP) Module:

Preprocessing: User queries are preprocessed to remove noise, tokenize the text, and prepare it for further analysis.

Keyword Extraction: Relevant keywords and phrases are extracted from the user input using techniques such as tokenization and part-of-speech tagging. The spaCy library is often employed for efficient keyword extraction.

Sentiment Analysis: We utilize TextBlob, for sentiment analysis.TextBlob offers a straightforward method of computing sentiment polarity scores for text inputs.We establish a threshold value against which the sentiment polarity score is compared, categorizing inputs as positive, negative, or neutral based on this comparison. If the score falls below the threshold, indicating negativity, we recommend songs with corresponding themes. Conversely, scores exceeding the threshold prompt recommendations of positive, uplifting songs. For scores within a certain range around the threshold, we classify sentiment as neutral, suggesting versatile or ambient songs. This approach enables efficient song recommendations based on emotional context while minimizing computational complexity.

C. Machine Learning Model

The machine learning (ML) model is responsible for making predictions based on the processed user queries and other relevant data. The system utilizes both pre-trained and custom-trained models for different tasks: BERT Model: A pre-trained BERT model is employed for sentiment analysis. BERT is a state-of-the-art language representation model that captures bidirectional context in text data, enabling accurate sentiment classification

D. Song Database

The song database serves as the repository of music metadata used by the recommendation system. It stores information about individual songs, including their title, artist, album, language, and sentiment. The database is organized and indexed to facilitate efficient retrieval and querying. Songs are sourced from various sources, such as online music databases or curated playlists, and stored in CSV files or a relational database for easy access.

E. Chatbot Response Generation

The chatbot response generation component is responsible for crafting personalized responses to user queries. It takes into account the processed user input, sentiment analysis results, and other contextual information to generate appropriate responses. Responses may include song recommendations, informational messages, or conversational prompts. The system may utilize predefined response templates or custom responses stored in a response dictionary to generate dynamic and engaging interactions with the user.

V. IMPLEMENTATION DETAILS

A. Technologies Used

Flask: Flask is a lightweight and versatile web framework for Python. It is used in this implementation for developing the web application and handling user requests. Flask's simplicity

and flexibility make it well-suited for building interactive web interfaces.

Transformers Library: The Transformers library, developed by Hugging Face, provides easy-to-use interfaces for working with state-of-the-art natural language processing models, including BERT. In this implementation, the Transformers library is utilized to integrate the pre-trained BERT model for sentiment analysis.

spaCy: spaCy is a powerful and efficient natural language processing library for Python. It offers robust functionality for tasks such as tokenization, part-of-speech tagging, and named entity recognition. In this implementation, spaCy is utilized for keyword extraction from user queries, enhancing the system's ability to understand the user's intent and context.

B. Preprocessing Steps

Tokenization: User queries are tokenized using the BERT tokenizer before being fed into the sentiment analysis module. Tokenization involves breaking down the text input into individual tokens or words, which are then encoded into numerical representations suitable for input to the BERT model. Tokenization ensures that the input data is properly formatted and structured for analysis.

Keyword Extraction: Keyword extraction is performed using spaCy to identify relevant keywords and phrases within the user queries. This process involves analyzing the syntactic and semantic structure of the text to extract meaningful terms related to music genres, languages, and other relevant topics. Keyword extraction enhances the system's ability to understand the user's preferences and provide accurate recommendations.

C. Sentiment Analysis

The sentiment analysis module employs a pre-trained BERT model to analyze the emotional context of user queries. BERT (Bidirectional Encoder Representations from Transformers) is a deep learning model that captures bidirectional context in text data, enabling it to accurately classify text into different sentiment categories, such as positive, negative, or neutral. The sentiment analysis module utilizes the pre-trained BERT model to classify user queries into positive or negative sentiment categories, providing valuable insights into the user's mood and preferences.

D. Song Recommendation

Based on the processed user query and detected sentiment, the system selects relevant songs from the song database and presents them to the user as recommendations. The song recommendation process involves querying the song database based on criteria such as language, sentiment, and relevance to the user's preferences. The system utilizes advanced filtering and ranking algorithms to ensure that the recommended songs align with the user's interests and mood.

VI. Experimental Results

To evaluate the performance of the music recommendation system, a user study was conducted with a sample group of participants. Users were asked to interact with the system and provide feedback on the accuracy and relevance of the song recommendations.

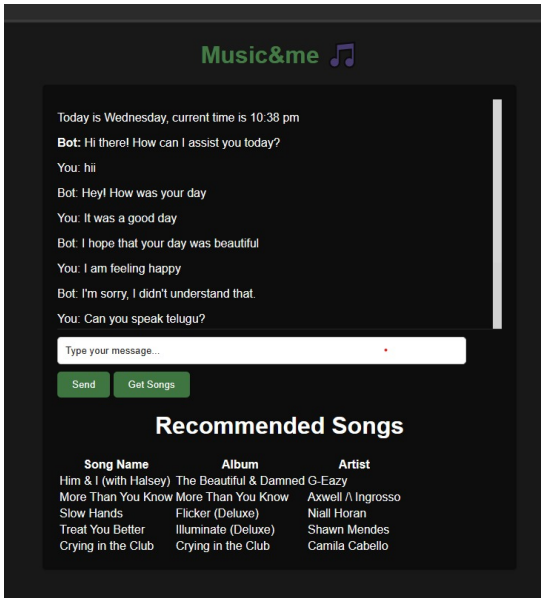

Fig. 2. Interactive UI

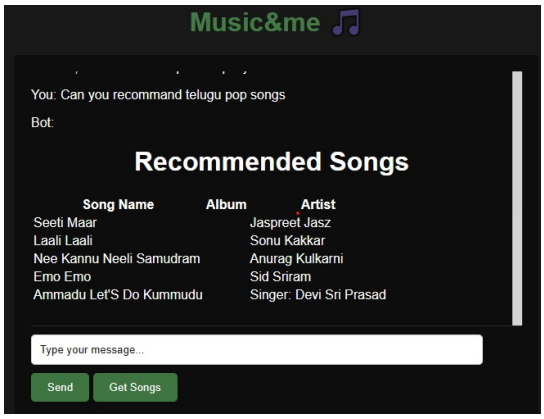

Fig. 3. Multiple Languages

VII. Conclusion

In this paper, we presented a comprehensive approach to designing and implementing an intelligent music recommendation system that leverages the synergy between natural language processing (NLP) techniques and machine learning algorithms. The proposed system effectively addresses the challenge of providing personalized song recommendations by considering both the semantic meaning and emotional context of user queries.

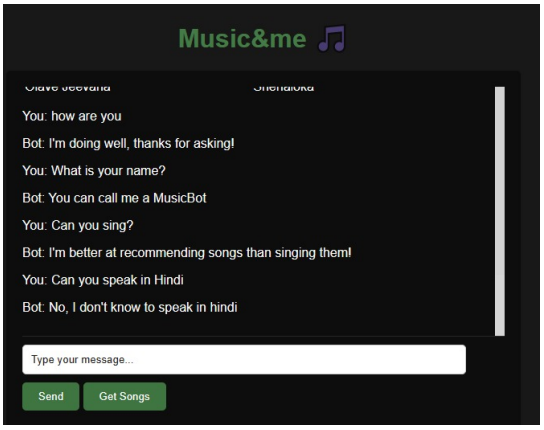

Fig. 4. Meaningful Conversation

By integrating advanced NLP capabilities, such as keyword extraction and sentiment analysis, the system gains a deeper understanding of user preferences and mood, enabling it to generate more accurate and relevant song recommendations. The utilization of state-of-the-art models like BERT for sentiment analysis enhances the system's ability to capture nuanced emotional nuances in user queries, thereby improving the overall recommendation quality.

Furthermore, the incorporation of machine learning models for song classification and recommendation enables the system to adapt and personalize its recommendations based on user interactions and feedback. By continuously learning from user interactions, the system can refine its recommendation algorithms and tailor suggestions to each user's unique preferences and tastes.

VIII. Future Work

Enhanced User Feedback Mechanisms: Incorporating more robust user feedback mechanisms, such as implicit feedback from user interactions and explicit ratings, can further improve the accuracy and personalization of song recommendations. Multi-modal Recommendation: Exploring the integration of multi-modal data, including audio features and user listening history, can enrich the recommendation process and provide more comprehensive and diverse recommendations. Cross-lingual Recommendation: Extending the system's capabilities to support cross-lingual recommendation, allowing users to discover music across different languages and cultures, can broaden its appeal and user base.

References

[1] Krupa, K. S., et al. "Emotion aware smart music recommender system using two level CNN." 2020 Third International Conference on Smart Systems and Inventive Technology (ICSSIT). IEEE, 2020.

[2] Nair, Amrita, et al. "Emotion based music playlist recommendation system using interactive chatbot." 2021 6th international conference on communication and electronics systems (ICCES). IEEE, 2021.

[3] Mathew, Neenumol, Nitish Chooramun, and Mhd Saeed Sharif. "Implementing a Chatbot Music Recommender System based on User Emotion." 2023 International Conference on Innovation and Intelligence for Informatics, Computing, and Technologies (3ICT). IEEE, 2023.

[4] B. Zhai, B. Tang and S. Cao, "Music Recommendation System Based on Real-Time Emotion Analysis," 2022 International Conference on Culture-Oriented Science and Technology (CoST), Lanzhou, China, 2022

[5] Joshi, Saurav, Tanuj Jain, and Nidhi Nair. "Emotion based music recommendation system using LSTM-CNN architecture." 2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT). IEEE, 2021.

[6] Patra, Braja Gopal, Dipankar Das, and Sivaji Bandyopadhyay. "Retrieving similar lyrics for music recommendation system." Proceedings of the 14th International Conference on Natural Language Processing (ICON-2017). 2017.

[7] Ulleri, Pranesh, et al. "Music recommendation system based on emotion." 2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT). IEEE, 2021.

[8] Chang, Shun-Hao, et al. "A personalized music recommendation system using convolutional neural networks approach." 2018 IEEE international conference on applied system invention (ICASI). IEEE, 2018.

[9] Gunde Eliyajer, B Natarajan, R Bhuvaneswari, R Elakkiya, "A Novel Approach for Song Recommendation System Using Deep Neural Networks", 2023 IEEE World Conference on Applied Intelligence and Computing (AIC), pp.382-387, 2023.

[10] Jayadeep Jayakumar, P Supriya, "CNN based Music Recommendation system based on Age, Gender and Emotion", 2022 6th International Conference on Electronics, Communication and Aerospace Technology, pp.1356-1359, 2022.

[11] P. N J, S. Keshav and R. R, "Emotion Based Carnatic Music Recommendation System," 2023 7th International Conference on Computation System and Information Technology for Sustainable Solutions (CSITSS), Bangalore, India, 2023

[12] S. Kumar, R. K. Nandi, S. Roy and A. Sarkar, "Design and Implementation of AI Based Efficient Emotion Detection and Music Recommendation System," 2023 14th International Conference on Computing Communication and Networking Technologies (ICCCNT), Delhi, India, 2023

[13] A. Nair, S. Pillai, G. S. Nair and A. T, "Emotion Based Music Playlist Recommendation System using Interactive Chatbot," 2021 6th International Conference on Communication and Electronics Systems (ICCES), Coimbatre, India, 2021

[14] A. Sahu, A. Kumari, A. Goyal, R. Rani, G. Jaiswal and A. Dev, "Sentiment-Driven Music Recommendations: A Comparative Study of ML Algorithms and Chatbot Implementation," 2023 Global Conference on Information Technologies and Communications (GCITC), Bangalore, India, 2023

[15] Aarushi Sahu, Anamika Kumari, Avni Goyal, Ritu Rani, Garima Jaiswal, Amita Dev, "Sentiment-Driven Music Recommendations: A Comparative Study of ML Algorithms and Chatbot Implementation", 2023 Global Conference on Information Technologies and Communications (GCITC)