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Chatbot: Music Recommendation System

Amitkumar Shinde[1], Ashwini Umbarge[2], Neha Morkhande[3], Renu Akkawar[4]
Assistant Professor, CSE-AI, G H Raisoni College of Engineering and Management, Pune, India [1]
Students, AI, G H Raisoni College of Engineering and Management, Pune, India[2,3,4]

Abstract: *This paper presents the development of a Chatbot Music Recommendation System that utilizes artificial intelligence to enhance user engagement through personalized music suggestions. The system operates on two primary mechanisms: passive recommendations based on contextual factors such as time of day and weather conditions, and interactive suggestions during user engagement. By integrating real-time data from external APIs, the chatbot can provide relevant song recommendations tailored to the user's environment, such as upbeat tracks for sunny days or calming melodies for rainy weather. Additionally, the system employs natural language processing techniques to understand user preferences and emotions, allowing it to refine its recommendations over time. A comprehensive evaluation of the system's performance is conducted through user feedback and interaction metrics, demonstrating its effectiveness in improving the music discovery experience. The findings indicate that the chatbot not only enhances user satisfaction but also fosters a deeper emotional connection with music. This research contributes to the field of music recommendation systems by merging technology with user-centric design, ultimately transforming how individuals interact with music in their daily lives.*

Keywords: Chatbot, Music Recommendation, Artificial Intelligence, Natural Language Processing, User Engagement

I. INTRODUCTION

In today's digital landscape, fostering user engagement is crucial, particularly for music streaming services. This paper introduces a "Chatbot Music Recommendation System" that harnesses users' emotions, the time of day, and weather conditions to deliver contextually relevant music suggestions, enhancing overall satisfaction.

- **Mood**: The system tailors recommendations based on the user's current emotional state, offering tracks that either resonate with or contrast against their feelings.
- **Time of Day**: Recommendations are optimized according to the user's daily activities, providing energetic tracks for morning routines, upbeat tunes for workouts, and calming music for evening relaxation.
- **Weather**: Real-time weather data informs the music selection, featuring cheerful songs on sunny days and soothing melodies during dreary weather.

II. OBJECTIVE

The primary objective of this project is to develop a Chatbot Music Recommendation System that provides personalized song suggestions based on user interactions, emotional context, time of day, and current weather conditions. By integrating advanced natural language processing (NLP) techniques and real-time data from external APIs, the chatbot will analyze user sentiments during conversations to generate relevant music recommendations. The system aims to enhance user engagement by creating an immersive experience where users can explore music tailored to their moods. Additionally, this project seeks to contribute to the field of music recommendation systems by emphasizing the importance of emotional intelligence in technology, ultimately transforming how individuals discover and enjoy music in their daily lives. Through this innovative approach, we aspire to foster deeper connections between users and their musical experiences, making music discovery not just a task but an enjoyable journey that resonates with their emotions and preferences.

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III. MOTIVATION

In an age where music serves as a universal language, the ability to personalize music experiences has become increasingly vital. The proliferation of streaming platforms has led to an overwhelming array of choices, making it challenging for users to discover new music that aligns with their preferences and emotional states. Traditional recommendation systems often rely on static algorithms that fail to consider the dynamic nature of human emotions and contextual factors such as time of day and weather conditions. This gap presents an opportunity to harness the capabilities of chatbots, which can engage users in interactive conversations while providing tailored music suggestions based on real-time emotional analysis.

IV. LITERATURE SURVEY

Table I presents a summary of key papers relevant to chatbot: music recommendation system, including their methodologies and the authors' contributions. This literature survey showcases recent research in AI- powered Music Recommendation System and related technologies. Smith [1] demonstrates the potential of AI in Music Recommendation System.

Emotion Based Music Recommendation System

Emotion-Based Music Recommend System designed to enhance the music listening experience by automatically generating playlists that align with the user's emotional state. It utilizes facial recognition technology to detect emotions through captured images, classifying them into categories such as happiness, sadness, and anger. The system then curates a playlist based on the identified mood, aiming to reduce the manual effort of creating music lists. Additionally, it incorporates user feedback to refine its recommendations over time.

Emuse – An Emotion Based Music Recommendation system

The development of an emotion-based music recommendation system called EMUSE, which uses facial expression analysis to identify a user's emotions. By leveraging deep learning techniques, specifically convolutional neural networks, the system suggests songs that align with the detected mood, aiming to improve the overall music experience for users.

Chatbot Song Recommendation System

The Chatbot Song Recommendation System leverages artificial intelligence to analyze user emotions through text interactions, providing personalized music suggestions via the Last.fm API. By integrating emotion detection and machine learning, the chatbot enhances user engagement and satisfaction, creating a dynamic and empathetic music discovery experience.

An Emotion Based Music Recommendation System Using Deep Learning

Emotion-based music recommender system utilizing deep learning techniques, specifically a Convolutional Neural Network (CNN), to classify emotions from audio files transformed into Mel Frequency Spectrograms. By analyzing curated datasets, the system aims to alleviate negative emotional states in dementia patients through tailored music recommendations, achieving impressive classification metrics such as 95.25% accuracy and 72.44% recall.

V. PROPOSED SYSTEM

A Chatbot Music Recommendation System that incorporates contextual awareness and emotional analysis into its recommendation engine to overcome these drawbacks. Using sophisticated natural language processing (NLP) techniques, this system suggests music to users based on their moods and environment and engages them in meaningful conversations.

BACKGROUND STUDY

Users' interactions with digital music platforms have changed dramatically as a result of the development of music recommendation systems. By providing customized music recommendations, these systems have evolved into vital

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resources for improving user experiences. Traditionally, content-based filtering and collaborative filtering have been the two main techniques used by the majority of recommendation systems. While content-based filtering concentrates on the qualities of songs themselves, such as genre, tempo, and lyrical content, collaborative filtering examines trends in user behavior to suggest songs based on the tastes of like users. These old methods have a lot of drawbacks even though they are good at making recommendations. Their incapacity to take into account contextual circumstances that affect musical choices is a significant disadvantage. For instance, a user's mood and, thus, their music, can be greatly influenced by the time of day or the weather. Additionally, existing systems often lack emotional intelligence; they do not account for the user's emotional state during interactions. This oversight can lead to recommendations that feel disconnected from the user's current experience, resulting in lower engagement and satisfaction. Furthermore, many users express a desire for a more interactive and conversational approach to music discovery. Traditional interfaces often require users to navigate complex menus or search through extensive catalogs, which can be cumbersome and uninspiring. The need for a more engaging experience highlights a gap in existing technologies that fail to provide a seamless interaction between users and their music. Emerging research indicates a shift toward integrating advanced technologies such as natural language processing (NLP)and machine learning into music recommendation systems. By employing these technologies, developers can create chatbots capable of understanding user emotions and contextual cues through conversation. Such systems can dynamically adapt recommendations based on real-time feedback, offering a more personalized experience that resonates with users' current moods and situations. The proposed Chatbot Music Recommendation System aimsto bridge these gaps by combining emotional analysis with contextual awareness in its recommendation engine.This innovative approach seeks to enhance user engagement by providing tailored song suggestions that align with both emotional states and external conditions, ultimately transforming how individuals discover and enjoy music.

BENIFITS

The system has a number of benefits.

- **Real-Time Response**: Prompt suggestions derived from user input.
- **High Customization**: Responds to users' feelings and intentions with little to no input from the user.
- **Automation**: Makes music recommendations smoothly with little need for human participation.
- **Scalability**: Easily integrated with other music platforms such as Apple Music, Spotify, etc.
- **User-Friendly**: Offers people a seamless, conversational interface to engage with.

SYSTEM ARTITECTURE

Below is an illustration of the Chatbot: Music Recommendation System's system architecture. Real-time input processing is achieved by integrating user inputs with an intent classification model within the architecture. Using the Spotify API, the categorized intent initiates a song suggestion. Additionally, the system has a feedback mechanism that allows users to communicate with the chatbot and modify the music recommendations.

- **Chat Interface**: Takes in messages from users and sends them to the backend so that intents can be classified.
- **Intent Classification**: The user's message is processed by a neural network model that determines the user's intent and mood.
- **Music Recommendation Engine**: Based on a mood mapping of the classified intent, Spotify's API is utilized to retrieve recommended music.
- **Response Generation**: In real-time, the chatbot provides an appropriate response that includes the music track.

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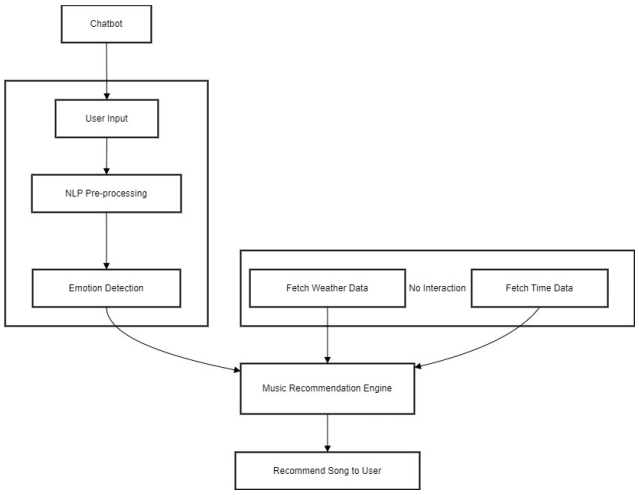

Fig. Block Diagram of Music Recommendation System

NATURAL LANGUAGE PROCESSING (NLP)

Natural Language Processing is crucial for understanding, processing, and generating human language in a way that is both meaningful and useful. The key NLP techniques applied in this paper include:

1. Gathering and preprocessing data

- **Collect information**: assemble a dataset of musical tracks with the genre, release date, and mood tags appended to each track. Gather user information Compile information about the listening history, location, and mood of the user.
- **Prepare the data**: For consistency, the data should be cleaned and standardized.

2. Engineering Features

- **Features based on time**: Features like the season, holidays, day of the week, and time of day can be extracted. Features determined by the weather Obtain the user's location's weather information, including temperature, humidity, and precipitation.
- **Emotionally driven characteristics**: To ascertain the emotional state of user-generated content (such as playlists and social media posts), apply text sentiment analysis.

3. Training of Models

- **Construct a hybrid model**: To take advantage of both, combine a collaborative filtering model based on user preferences with a content-based filtering model based on music features.
- **Train the model**: Use a machine learning algorithm (e.g., Random Forest, Gradient Boosting) to learn patterns in the data and predict music recommendations.

4. Recommendation Generation

- **Input user data**: Provide the user's current time, weather, and emotional state to the model.
- **Generate recommendations**: The model will use this information to suggest music tracks that align with the user's preferences and context.

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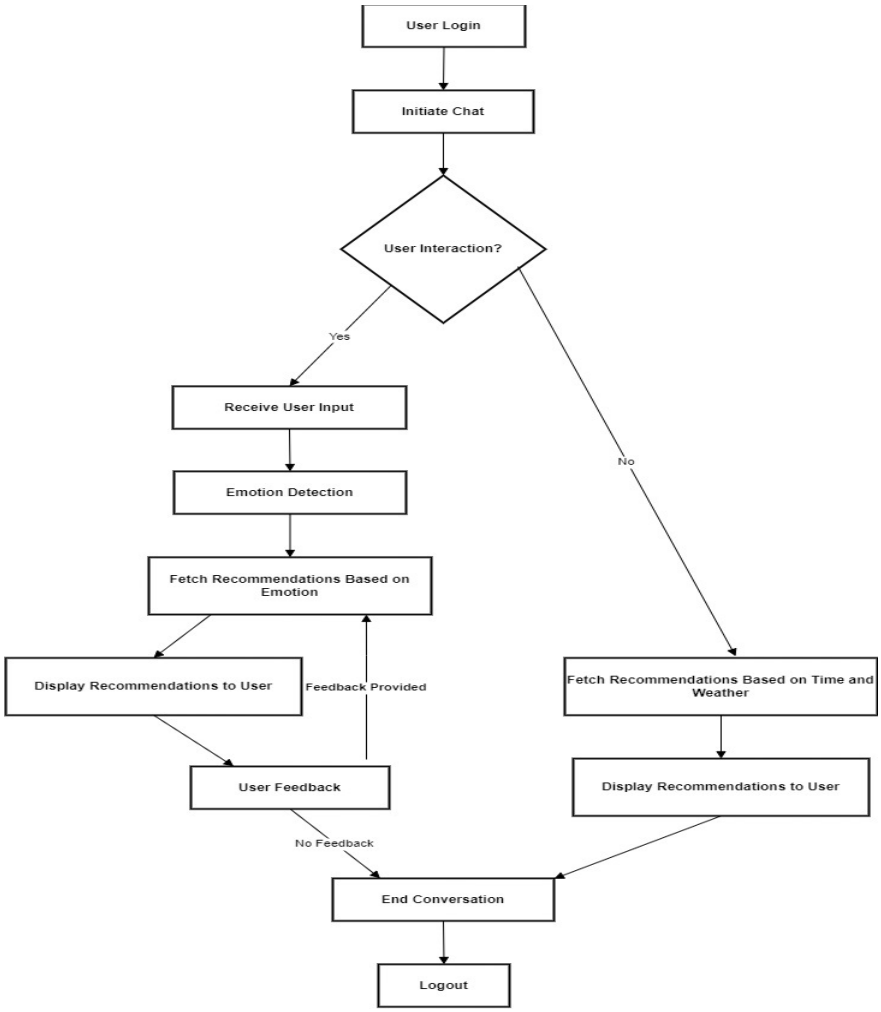

Fig. Flowchart for Music Recommendation System

A method for suggesting music that bases its recommendations on two primary scenarios: user input and external variables like the time of day and weather.

Thisis a detailed explanation of how it operates:

User-Interaction Choice:

- The first thing the system does is see if the user is interacting with it.
- If so, it accepts input from the user in the form of requests or messages.
- If the answer is no, it checks the weather and time automatically to generate suggestions without requiring human input.

Input from Users and Emotion Recognition:

- When user input is present, Natural Language Processing (NLP) is used by the system to preprocess the input.
- After that, it analyses the processed information and applies Emotion Detection to determine the user's emotional state (such as happy, sadness, or rage).

Category Emotions:

Three categories are identified based on the detected emotion: Happy, Sad, or Angry.

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The system communicates with a Music Recommendation Engine based on the emotional category, and the engine chooses songs that correspond with the identified mood.

Climate and Time-Based Suggestion:
The system retrieves the current time and weather information if the user is not interacting.
After that, the system makes a music recommendation based on the weather (sunny, rainy, etc.) and time of day (morning, evening, etc.).

Recommended Music:
The song is suggested to the user by the system after they have chosen it, either because of their feelings or because of the time and weather.

SPECIFIC MODELS AND ALGORITHMS

Mechanism of the Music Recommendation System

The suggested music recommendation system is developed in an organized manner, starting with data collection and ending with real-time deployment. The system makes real-time music recommendations based on user input and mood detection by integrating a neural network model with Spotify's API.

Step 1: Gathering and Preparing Data
In order to train the chatbot to comprehend the intent and emotion of users, data preparation is essential. To build a well-defined dataset, this stage entails obtaining intent patterns, accurately categorizing them, and pre-processing the text .

```
def collect_and_prepare_data():
raw_data= load_intent_patterns_and_responses
('data.json')
 tokenized_data=
tokenize_and_clean_patterns(raw_data) encoded_data=
label_encode_intents(tokenized_data) augmented_data=
apply_text_augmentation(encoded_data)
return augmented_data
```

Step 2: Training and Model Selection
Selecting the right model to categorize user intents is crucial to providing precise music recommendations. Using the provided data, a neural network model is trained to identify user intents like "happy,""sad," or "neutral."

```
def train_intent_classifier(training_data):
model = initialize_neural_network(input_size
=len(training_data
['vocab']),hidden_size=10,num_classes=
len(training_data['labels']))
train_data, val_data = split_data(training
_data) trained_model = train_model(model,
train_data, val_data) return trained_model
```

Step 3: System Development
After training, the model is integrated with the Spotify API and chatbot interface to make suitable music recommendations based on the user's mood. The development of the real-time chat and music recommendation system is the main emphasis of this stage

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```
def develop_chatbot_system(trained_model):
chatbot_interface = create_chat_interface()
music_recommendation_system = integrate_spotify_api()
real_time_processor = implement_real_time_intent_processing(chatbot_interface, trained_model)
return chatbot_interface, real_time_processor, music_recommendation_system
```

Step 4: Validation and Testing

Evaluating the system's performance in terms of recommendations and intent detection accuracy involves testing it under various user scenarios. At this step, the model and system components are adjusted in light of real-world interactions.

```
deftest_and_validate_system(chatbot_system):
accuracy, performance = evaluate_intent_classification(chatbot_system['model'])
music_relevance = validate_music_recommendation(chatbot_system['music_system'])

system_refinements = analyze_errors_and_improve(accuracy, performance, music_relevance)
return system_refinements
```

Step 5: Implementation and Enhancement

Improve the system's user interface and implement it in a practical setting. This phase guarantees that the chatbot a system offers effective music recommendations and prompt responses

```
defoptimize_and_deploy(chatbot_system):
optimized_system=fine_tune_performance(chatbot_system)
user_interface = finalize_chatbot_ui()
deployed_system=deploy_in_target_environments(optimized_system, user_interface)
returndeployed_system
```

Significance and Pertinence

This project has the potential to significantly improve user experience by offering mood-based tailored music choices. This chatbot fills in the gap by providing users with quick and dynamic reactions to their moods, something that traditional recommendation algorithms may not be able to do in real-time when responding to complex human emotions. It can be especially helpful in mood-based playlists, entertainment apps, or music-based relaxation therapy apps.

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