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A COMPREHENSIVE REVIEW OF CHATBOT-BASED SONG RECOMMENDER SYSTEM

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Abstract : Emotions are based on human feelings, which can be expressed or not, and they serve as different types of behavioral indications. The exclusion of emotions aids in identifying a person's behavioral state. The main objective of this paper is to recommend appropriate music based on the user's emotional state using a suitable API that is readily available. This paper focuses on a chatbot that uses artificial to analyze the user's tone in text form as users increasingly interact with systems through text and voice assistants. A chatbot is a computer software created specifically for messaging networks that uses artificial intelligence to engage in conversations with humans.

An song and emotion-based recommendation system permits the users to listen to music based on their emotions. Existing systems use audio signals using the CNN approach and collaborative filtering to recommend songs based on the user's history. The proposed research work develops a personalized system, where the user's current emotion is analyzed with the help of the chatbot. The chatbot identifies the user's sentiment by asking some general questions. Based on the input provided by the user, current emotion or mood is analyzed by the chatbot and it will generate the playlist. The proposed recommendation system utilizes the APIs for the playlist generation and recommendation.

Keywords: Interactive Chatbot, Application Program Interface, Interactive Systems, Recommender Systems, Playlist generation.

1.Introduction: In recent years, the proliferation of digital music platforms has transformed the way individuals discover and interact with music. Traditional recommendation systems, often driven by collaborative filtering and content-based approaches, have faced challenges in meeting the diverse preferences and evolving tastes of users. To address these challenges, this paper introduces a novel chatbot-based music recommender system designed to enhance user engagement and personalize the music discovery experience.

The chatbot leverages natural language processing (NLP) techniques to facilitate intuitive conversations with users, allowing them to express their musical preferences in a more natural manner. By understanding user queries and feedback, the system can provide tailored recommendations that reflect individual tastes, moods, and

contexts. This interactive approach not only enhances user satisfaction but also fosters a deeper emotional connection to the music being recommended. The ability of automated decision-making systems to assess a person's emotional state makes them useful in a wide range of application such as personalized recommendations. People today frequently prefer listening to music that resonates with their current moods and interests. [6] A system that suggests songs to users based on their emotional states is the focus of this paper. By using computer vision components to analyze text and interactions, this is achieved. Inside of a chatbot. The chatbot performs the function of a virtual assistant, capable of participating in conversations to address user needs. These chatbot programs can easily be integrated into well-known platforms like Facebook Messaging, Slack, and others. [8] They do this through streamlining interactions between customers and services, enhancing the overall customer experience while giving businesses opportunities to increase customer engagement and operational efficiency, ultimately resulting in a reduction in costs of customer service.

- This paper presents the development of a custom chatbot as a foundational step in creating professional chatbots.
- The aim is to overcome limitations of existing chatbots, which primarily serve business purposes.
- The chatbot facilitates meaningful conversations and offers song recommendations based on the user's emotional tone.
- To implement song recommendations, we utilize the Last.fm API, similar to the Spotify API.
- The IBM Tone Analyzer API is employed to analyze the tone and emotions expressed in conversations.
- Collaborating with these APIs enables the chatbot to incorporate user-oriented features, enhancing its functionality.
- The paper emphasizes emotion detection through text analysis to improve user interaction and engagement.

2.Literature Survey: Most mainstream audio and video recommender systems, such as Spotify, Netflix, Gaana, and YouTube, predominantly rely on search queries and user preferences, often overlooking the emotional aspect of user needs. A novel CNN- based model has been proposed to address this gap by detecting emotions and generating playlists tailored to the user's emotional state. This innovative model integrates specialized modules designed for detecting emotions conveyed through facial expressions as well as sentiments expressed during interactions with a chatbot .By incorporating these modules, the model enhances the overall performance and robustness of the music recommender system, ensuring that users' emotional needs are effectively met. This study presents a novel approach to song selection by associating colors with emotions, implemented through a Color-to-Music application. The project was structured in

three stages: first, creating a music library that connects colors to feelings and corresponding music; second, developing two types of graphical user interfaces (GUIs) for color selection; and third, collecting data from 120 trial participants. The overall accuracy of the Color-to-Music Library was found to be only 51.11%, indicating a need for improvement. Specifically, the linkages between the HSV model and the fundamental aspects of music require enhancement [1].

This study proposes a human emotion recognition system that utilizes a combined approach of 2D-Linear Discriminant Analysis (LDA) integrated with 2D-Principle Component Analysis (PCA). Simulated results reveal that this method outperforms its alternatives, specifically 2D-LDA and 2D-PCA, in terms of feature extraction. Furthermore, when paired with our proposed feature extraction technique, the KNN classifier shows superior performance compared to the SVM classifier, highlighting the effectiveness of our approach in accurately recognizing human emotions.

This paper introduces a novel music emotion recognition model tailored specifically for music generated through Scratch, a platform that allows children to create their own background music. The model employs a main melody extraction algorithm to compile a dataset of Scratch-generated pieces, from which key features are extracted and input into a Convolutional Neural Network (CNN). The learned features from the CNN are then processed by a Recurrent Neural Network (RNN) to achieve final classification results. While the RNN captures sequential information, the CNN focuses on identifying significant musical elements. However, the overall accuracy of the emotion recognition model remains limited. The study suggests that different emotion models can affect music emotion recognition tasks due to the complex relationship between music emotion and its underlying components. Additionally, some musical qualities may be lost in the dataset creation process, and since music emotion is not solely encoded in the audio, analyzing audio data alone may not fully capture the emotional depth of the music[2].

The innovative competence-based song suggestion problem is presented in this paper. They created a singer profile that accounts for voice pitch, intensity, and quality to represent a singer's vocal prowess. To train a speech quality evaluation function that could be calculated at query time, we presented a supervised learning approach. Additionally, a scaled- down vocalist profile is suggested to lessen the recording task in competency modeling.[3] Competence-Based Song Recommendation: Matching Songs to One’s Singing Skill – March 2015

A chatbot is an AI-powered program designed to engage in conversations with users, usually through messaging platforms. This project explores how advancements in

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Artificial Intelligence and Machine Learning can enhance various services. The chatbot utilizes WordNet to analyze user input and identify the closest matching response from a predefined set of statements. The primary objective is to develop an online chatbot system that assists users in navigating a college website, leveraging AI techniques such as Natural Language Processing to provide accurate and helpful interactions.

3.Proposed Methodology: A chatbot is a conversational software program designed to replicate human communication skills. It engages people in discussion automatically. It's a modern, innovative method ofcustomer service that makes use of a chat interface and artificial intelligence. [10] AI-powered chatbots have revolutionized the way we interact with technology. They possess the remarkable ability to understand natural language, picking up on both meaning and emotion, and crafting intelligent responses. This means customers no longer have to endure long waits on the phone or send countless emails to get the answers they seek—they can engage in a more comfortable, efficient manner.

These chatbots not only enhance user experience but also help reduce call volumes, streamline average handling times, and lower customer service costs. However, achieving such sophisticated capabilities is no small feat; it requires a complex interplay of various system components.

In this study, the term "AI chatbot" is embraced as a synonym for conversational agents or advanced dialogue systems, highlighting their role as essential tools in modern communication.

Taxonomy of Chatbot:
The taxonomy of chatbots can be categorized based on various criteria, including functionality, technology, interaction style, and deployment method. Here's an overview of the main categories:

1.Functionality
- Rule-Based Chatbots: Operate on predefined rules and scripts, responding to specific commands and questions. They are limited in flexibility and context understanding.
- AI-Powered Chatbots: Use natural language processing (NLP) and machine learning to understand user intent and context, allowing for more dynamic and intelligent interactions.
- Transactional Chatbots: Designed to assist users in completing specific tasks, such as booking tickets, making purchases, or scheduling appointments.
- Informational Chatbots: Provide users with information on various topics, often functioning as FAQs or knowledge bases.

2.Technology
- Text-Based Chatbots: Communicate through written text, typically in messaging apps or websites.
- Voice-Activated Chatbots: Use speech recognition technology to engage

users through voice, commonly found in smart speakers and virtual assistants.

- Multimodal Chatbots: Combine text, voice, and visual elements to create a more interactive experience.

3. Interaction Style

- Task-Oriented Chatbots: Focus on completing specific tasks and guiding users through processes (e.g., booking a flight).
- Conversational Chatbots: Emulate human-like conversations, engaging users in more open-ended dialogues and building rapport.
- Hybrid Chatbots: Blend both task-oriented and conversational elements, adapting to user needs dynamically.

4. Deployment Method

- Standalone Chatbot: Operate independently, often on dedicated platforms or applications.
- Integrated Chatbots: Embedded within existing systems (e.g., websites, customer service platforms) to enhance functionality.
- Social Media Chatbots: Deployed on social media platforms (e.g., Facebook Messenger, WhatsApp) to engage users directly.

5.User Experience

- Personalized Chatbots: Tailor interactions based on user data and preferences, enhancing relevance and engagement.
- Generic Chatbots: Provide standardized responses and interactions, without significant personalization.

6. Industry/Application

- Customer Service Chatbots: Assist with customer inquiries, support, and service-related tasks.
- E-commerce Chatbots: Help users find products, make purchases, and provide recommendations.
- Healthcare Chatbots: Offer medical advice, appointment scheduling, and health monitoring.
- Education Chatbots: Support learning through tutoring, answering questions, and providing resources.

This taxonomy illustrates the diverse landscape of chatbots, highlighting their varied functionalities, technologies, and applications. Understanding these categories can help businesses and developers design and implement effective chatbot solutions tailored to specific needs and user expectations.

4.Objective: Design and develop a conversational Chatbot Song Recommender System that utilizes natural language processing (NLP) and machine learning algorithms to provide personalized song recommendations to users based on their preferences, emotions, and listening habits, with the goal of:

1. Enhancing user experience through accurate and relevant song suggestions
2. Increasing music discovery and exploration

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3. Providing an engaging and interactive way for users to find new music

The purpose of our application is to identify the user's expressed mood, and after that, songs are played to match that mood. This program, in contrast to others, attends to the fundamental requirements of music listeners without upsetting them. Increase consumer happiness and involvement. Make as much of your platform as you can unique. Provide customers with an engaging, high-quality streaming experience. Develop the trust and listening abilities of your users

Architectural Design: The implementation of the proposed system utilizes machine learning, a prominent application of Artificial Intelligence, enabling systems to learn and adapt autonomously without requiring explicit programming by a developer. This system aims to construct a song recommendation system that suggests songs to users based on their behaviors, activities, or preferences. By leveraging information such as user similarity and previous playlist data, the system predicts user preferences, facilitating the recommendation of songs that align with their tastes.

Fig 1: Architectural design of chatbot song recommendation system

Dataset: Songs that are based on conversations and emotions require datasets. In this case, the chatbot is capable of generating responses because it has already received training on a dataset of talks, which exposes it to a variety of dialogue samples. The emotion dataset also includes positive, negative, and neutral polarity. As a result, the dataset contains instances of exchanges and facial expressions that communicate emotions in all three directions: Positive (happy, excitement, or joy), Negative (sadness, wrath, or frustration), and Neutral (neutrality, indifference, or objectivity).

The chatbot can be programmed to recognize and react to various emotional cues in a conversation by including these emotion datasets into the model's training. Depending on whether the lyrics are meant to induce positivity, negativity, or neutrality, it can produce music lyrics that reflect the appropriate emotional tone. These datasets are used to improve the chatbot's capacity to produce songs that effectively capture the necessary conversational and emotional elements. The model maybe made to comprehend and produce lyrics that correspond to particular conversational tenses and emotional tones by training it on these datasets.

Conversation		Emotion Dataset		
Dataset		Dataset		
ID	Message	Bot replay	Emotion	Polarity
001	Hi	Hello	Positive	Positive
002	How are You?	I'm Fine,	Negative	Neutral

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		Thanks.		
003	I feel Sad.	Oh no, What's wrong?	Neutral	Negative

Fig2.Example conversation with Chatbot

Last.fm: Setting up the Last.fm Songs API allows us to provide personalized song recommendations to users based on their tone or emotion. By utilizing this API, we can offer song suggestions without the need to gather extensive data, possess significant computational resources, or invest excessive time in web scraping for songs aligned with specific tone information previously extracted. In the Last.fm API, we use the "songs input" tag to retrieve songs.

Chatbot Server: Using flexible code that permits conditioning of the model's replies based on any categorical variable, the chatbot is built using Keras and TensorFlow. Cake Chat acts as the backbone for chatbots that can communicate their emotions. It offers a framework that makes it possible to incorporate emotional cues into the chatbot's responses, improving the effectiveness of how it expresses emotions. The code is flexible and enables developers to build chatbots with dynamic emotional capabilities by utilizing Keras and TensorFlow.

- The chat uses linguistic analysis to detect emotional and language tones in written text. Chatbot Server is a backend for chatbots the are able to express emotions via conversations. Based on emotion detected it will recommend the song from last.fm.Chatbot system has 2 module there are admin anduser. Both module can login to system and access the features of the respective modules.
- Login: Here user allowed to access chatbot system. User can verifies themselves by providing their username andpassword.
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- Admin: Admin can login by their login credentials then if any update is required admin can modify it, also admin can see the login details of the users.

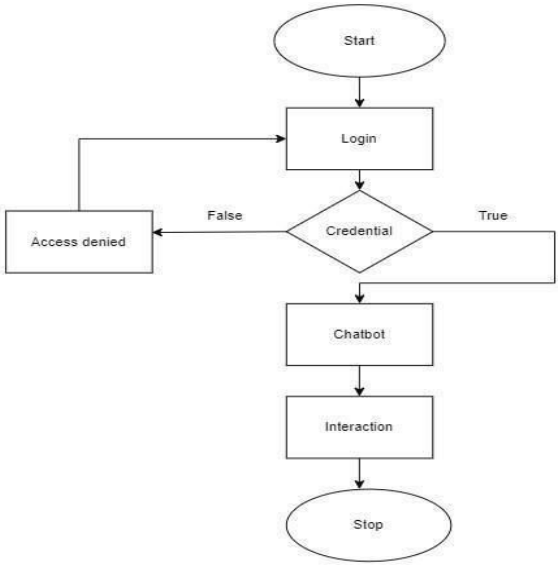

Fig 3: Flowchart of chatbot song recommendationsystem

Once the user login successfully user can redirected to chatbot page. Then the user can start the conversation with the chatbot. Chatbot receive the message from the user

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and it detects the emotion of the text message after that it recommends song along the text message.

- The dialogue context feature vector is assessed using cosine similarity to articles in the database.
- If the similarity is more than the cutoff, end the conversation and output dialogue context; otherwise, carry on speaking with the chatbot.
- Chatbot recommended songs are from playlist of the last.fm. User can exit the chatbot system by clicking on logout button

.5.Results:

The chatbot song recommendation system is designed to deliver a personalized musical experience, tailored to each user's unique tastes and listening history. By seamlessly integrating with the Last.fm API, the system taps into an extensive music database and user listening data, ensuring that every recommendation is both relevant and exciting.

Imagine a conversation where the chatbot, like a trusted friend, asks about your favorite artists or the genres you love. It takes note of your recent listens and picks up on the tone of your messages, sensing your current mood. Whether you're feeling upbeat, contemplative, or nostalgic, the chatbot is equipped to suggest the perfect tracks to accompany your emotions.

Utilizing advanced techniques such as collaborative filtering and content-based filtering, the system intelligently generates recommendations that resonate with your preferences. As you chat, it crafts a curated playlist, displaying fresh song suggestions alongside your favorites. This interactive dialogue not only enhances your musical journey but also makes discovering new tunes a delightful experience. With each interaction, the chatbot evolves, learning more about you and your evolving tastes, ensuring that the soundtrack of your life is always just a message away.

ID	Favorite Artists	Genres	Listening History
1	Radiohead, Muse	Alternative rock, Indie	Karma Police,Uprising
2	Beyonce, Rihanna	R&B, Hip-hop	Formation, Work
3	Ed Sheeran	Pop,Singer-songwriter	Shape of You

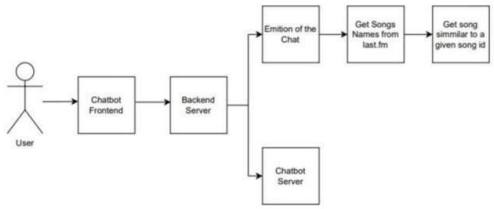

Fig 4: User preferences and Listening history

1. Recommendation Accuracy

A central issue is the efficacy of the recommendation system. How well does it perform in suggesting songs that users enjoy? Evaluating this can involve analyzing user feedback and satisfaction levels. Key

metrics to consider include:

- Recall: How many relevant songs are recommended?
- Precision: What proportion of recommended songs are actually liked by users?
- User Engagement: Are users interacting more with the chatbot as a result of its recommendations?

2. Personalization

The degree to which the algorithm tailors recommendations to individual preferences is crucial. This topic invites exploration of various personalization techniques:

- Collaborative Filtering: Utilizing data from similar users to enhance recommendations.
- User Profiling: Creating detailed profiles based on listening history and preferences.
- Machine Learning Algorithms: Employing advanced algorithms to continuously learn from user interactions and improve the relevance of suggestions.

3. User Experience

The effectiveness of the chatbot's conversational abilities significantly impacts user satisfaction. Key points for discussion include:

- Comprehension: How well does the chatbot understand user queries ?
- Responsiveness: Does the chatbot provide timely and appropriate responses?
- Natural Interaction: Can users engage in meaningful conversations that feel organic and enjoyable?

4. Integration with Last.fm API

The technical aspects of integrating the Last.fm API into the chatbot warrant attention. Important considerations include:

Communication: Ensuring smooth and efficient communication between the chatbot and the API.

- API Queries: Handling requests and retrieving data effectively.
- Data Processing: Transforming raw data from the API into actionable recommendations.
- Authentication: Managing user authentication and API key security.

5. Ethical Considerations

Finally, it's essential to address the ethical implications of the recommendation system. Discussion points include:

- User Privacy: How is user data collected, stored, and utilized? Are users adequately informed?
- Data Security: What measures are in place to protect sensitive user information?
- Bias and Filter Bubbles : Could the recommendation system inadvertently reinforce biases or limit exposure to diverse music genres? It's crucial to implement

safeguards to promote fairness and diversity in recommendations.

By exploring these topics, stakeholders can better understand the challenges and opportunities presented by a Last.fm API-based chatbot music recommendation system, leading to more effective and user-friendly solutions.

6.Conclusion:

Chatbots have emerged as valuable tools for simplifying human work through effective communication. While current research primarily emphasizes response improvement, there is a pressing need to explore linguistic aspects like emotional and sentiment analysis. Incorporating these features can enhance user experience by enabling chatbots to provide personalized and empathetic interactions. Additionally, leveraging artificial intelligence offers a promising avenue for enhancing chatbot capabilities and services. This direction can lead to intelligent and efficient chatbots that cater to diverse user needs. Moreover, the proposed work on human emotion recognition can be extended to effectively recognize mixed emotions, enabling a deeper understanding of individuals' emotional states. By considering these avenues, chatbots can evolve into powerful assistants, simplifying tasks and offering valuable support to humans in various domains

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