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CHATBOTEMOTIONRECOGNITIONAND MUSIC RECOMMENDATION

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ABSTRACT

In recent years, intelligent chatbots have become an integral part of human-computer interaction, enabling personalized user experiences. Recognizing a user's emotions accurately allows chatbots to respond empathetically and provide relevant suggestions. This project presents a **chatbot system capable of emotion recognition** using natural language processing (NLP) and machine learning techniques. The detected emotions are then used to recommend **personalized music playlists**, enhancing user engagement and satisfaction. The system leverages sentiment analysis, deep learning modelssuch as **LSTMor CNN**, and amusic database tomap emotional states to appropriate songs. Experimental results demonstrate that the hybrid approach effectively identifies user emotions and provides **context-aware music recommendations**, creating an interactive and emotionally intelligent chatbot experience. This integration of emotion recognition with music recommendation has potential applications in **entertainment, mental health support, and personalized digital assistants**.

Keywords: Chatbot, Emotion Recognition, Sentiment Analysis, Music Recommendation, Natural Language Processing (NLP), Machine Learning, LSTM, Deep Learning.

IINTRODUCTION

With the growing adoption of **artificial intelligence (AI)** in daily life, chatbots have become a popular tool for human-computer interaction. Traditional chatbots respond based on pre-defined rules or keywords, often failing to understand the **emotional context** of a user's input.Emotionrecognitionenableschatbotstodetect and interpret users' feelings through text, voice, orfacial cues, allowing them to respond in a more **empathetic and personalized manner**.

Integrating **music recommendation** with emotion recognition enhances user engagement, as music is closely linked to emotional states and can influence mood.Byanalyzinguseremotionsusing**natural**

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language processing (NLP) and machine learning algorithms, chatbots can suggest songs or playlists tailored to the user's current emotional state. This not only improves the interactive experience but also has applications in **entertainment, mental health support, and personalized digital assistants**.

Theprojectfocusesondevelopinga **hybridsystem** that combines **emotion recognition** with a **context-aware music recommendation engine**, providing users with an intelligent, emotionally aware, and interactive platform.

II RELATEDWORK

Emotion recognition in chatbots has been an active area of research in artificial intelligence and human-computer interaction. Early systems relied on **rule-based approaches** that detected emotions through predefined keywords, but these methods lackedaccuracy and adaptability to varied user expressions. With the advancement of **machine learning and deep learning**, models such as **Support Vector Machines (SVM), Convolutional Neural Networks (CNN), and Long Short-Term Memory (LSTM) networks** have been widely applied to identify emotions from text, speech, and facial expressions. Studies have shown that **LSTM and hybrid models** are particularly effective in capturing contextual and sequential dependencies inuser inputs, resulting in higher emotion recognition accuracy.

In parallel, **music recommendation systems** have evolved fromsimplecollaborativefilteringandcontent-based methods to hybrid approaches that combine **user preferences, contextual information, and emotional states**. Some research has explored the integration of emotion recognition with music recommendation, demonstrating that systems that adapt to user moods provide **higher user satisfaction and engagement**. However,manyexisting systemsstillfacechallengesin **accurateemotiondetectioninnaturallanguage,real-time responsiveness, and seamless integration with recommendation engines**.

The proposed system addresses these limitations by combining **state-of-the-art emotion recognition techniques with a context-aware music recommendation engine**, providing users with an interactive, emotionally intelligent chatbot experience that adapts in real time to their emotional state.

III LITERATUREREVIEW

Emotion recognition in chatbots has been extensively studied to enhance user interaction and engagement. Earlyapproachesreliedon**rule-basedorlexicon-based methods**, where predefined keywords or sentiment dictionaries were used to detect emotions from text. While simple to implement, these methods werelimitedinunderstanding **contextualmeaningand complex expressions**, often resulting in low accuracy.

With the rise of **machine learning**, models such as **Support Vector Machines (SVM)** and **Random Forests** were applied to classify emotions based on extracted textual or speech features. These models improved accuracy but required **careful feature engineering** and struggled with sequentialdependencies in user inputs.

Recent advances in **deep learning**, particularly **Long Short-Term Memory (LSTM) networks**, **Convolutional Neural Networks (CNN)**, and **hybrid models**, have shown superior performance in capturing contextual and temporal patterns in natural language. These methods enable more accurate emotion recognition even in nuanced conversations.

In parallel, music recommendation systems have evolved from **collaborative filtering and content-basedfiltering**to**hybridrecommendationmodels**

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that incorporate user behavior, context, and emotional states. Studies have demonstrated that linking **emotion recognition with music recommendation** improves user satisfaction, engagement, and personalization.

Despite these advancements, challenges remain in **real-time emotion detection, handling ambiguous inputs, and integrating the recognition system seamlessly with a recommendation engine**. The proposed system leverages hybrid deep learning models and a context-aware recommendation engine to provide **accurate, real-time, and emotionally intelligent music suggestions** based on user interactions.

IV EXISTINGSYSTEM

In the existing systems, chatbots typically rely on **rule-based or basic machine learning methods** to detect user emotions and provide responses. Rule-based systems use predefined **keywords or sentiment dictionaries** to classify emotions, which makes them simple but often inaccurate, as they cannot understand the context or handle nuanced expressions. Some chatbots use **single machine learning models**, such as Support Vector Machines (SVM) or simple neural networks,toclassifyemotionsfromtextorvoiceinputs.
While these models improve accuracy compared torule-based approaches, they are **limited in capturing sequential patterns or contextual dependencies** in natural language.

For music recommendation, existing systems often use **collaborative filtering or content-based filtering**, which suggests music based on user history or similar users' preferences. However, these methods do not consider the **real-time emotional state** of the user, resulting in recommendations that may not match the user's current mood. Overall, current systems arelimited in providing **accurate emotion recognition, personalized music suggestions, and real-time interaction**, which reduces the overall user experience.

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DISADVANTAGES

The existing chatbot systems for emotion recognition and music recommendation have several limitations. Rule-based approaches are **inflexible and cannot accurately interpret contextual or nuanced expressions**,leadingtoincorrectemotionclassification. Single machine learning models, while more advanced, often **struggle with sequential dependencies** in user inputs and require significant **feature engineering** for acceptable accuracy. For music recommendation, traditional collaborative or content-based filtering methods **do not account for the user's real-time emotional state**, resulting in suggestions that may not match the current mood. Furthermore, most existing systems lack **real-time processing and seamless integration** between emotion recognition and recommendation modules, reducing the interactivityand personalization of the user experience. These shortcomings highlight the need for a **hybrid, context-aware system** that can accurately detect emotions and provide **emotion-driven, personalized music recommendations** in real time.

V PROPOSEDSYSTEM

The proposed system introduces a **hybrid chatbot framework** that combines advanced **emotion recognition techniques** with a **context-aware music recommendation engine**. The system analyzes user inputs using **natural language processing (NLP) and deep learning models**, such as **LSTM and CNN**, to detectemotionsaccurately, even in complexor nuanced sentences. Once the user's emotional state is identified, the system maps it to a **music recommendationmodule** that selects songs or playlists aligned with the detected emotion, enhancing user engagement and satisfaction. By integrating multiple algorithms andreal-time processing, the hybrid model overcomes the limitations of existing systems, including **inaccurate emotiondetection,lackofcontextunderstanding,**

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and static music recommendations. The proposed system is designed to be **adaptive, interactive, and responsive**, providing a personalized user experience that combines emotional intelligence with music preference for entertainment, mood management, and mental wellness applications.

ADVANTAGES

The proposed hybrid chatbot system offers several key benefits over existing approaches. By combining **advanced emotion recognition** with a **context-aware music recommendation engine**, it provides **highly accurate and real-time detection** of user emotions. This enables the chatbot to respond empathetically and offer music suggestions that match the user's current mood, enhancing **personalization and user engagement**. The hybrid approach leverages the strengths of multiple machine learning algorithms, making it **robust, adaptable, and capable of handling complex or ambiguous inputs**. Additionally, integrating real-time analysis with music recommendations allows the system to support **mental wellness, entertainment, andinteractive experiences**, which traditional systems cannot achieve. Overall, the proposedsystemprovidesa **smarter,moreinteractive, and emotionally intelligent chatbot** that delivers a superior user experience.

VI METHODOLOGY

The proposed system uses a **hybrid approach** to integrate **emotion recognition** and **music recommendation** for an intelligent chatbot. The methodology begins with **data collection**, where user inputs in text form are gathered for analysis. The text is preprocessed using **natural language processing(NLP) techniques** such as tokenization, stop-word removal,andstemmingtocleanandstandardizethe input. Next, **feature extraction** is performed to capture meaningful patterns from the text, including sentiment, contextual cues, and emotion-related keywords. A **deep learning model**, such as a **Long Short-Term Memory (LSTM) network** or **Convolutional Neural Network (CNN)**, is then used to classify the user's emotionalstate accurately. Once the emotion is detected, it is passed to the **music recommendation module**, which maps the emotion to a set of songs or playlists using a **context-aware hybrid recommendation system**. Finally, the system provides **real-time responses and music suggestions**, creating an interactive and emotionally intelligent user experience. Continuous training and updates ensure the system adapts to new expressions and evolving user preferences.

VII SYSTEM MODEL

SYSTEMARCHITECTURE



VIII RESULTSANDDISCUSSIONS

Results

Chatbot Emotion Recognition &Music Recommendation

In propose work we have utilized different deeplearning algorithms such as CNN, LSTM, BILSTM and LSTM + GRU along with BERT embedding to detect emotion using various Chatbot techniques such as Text, Voice or Webcam Face video.

Totrainabovealgorithmswehaveusedemotiondataset available on KAGGLE which can be download from

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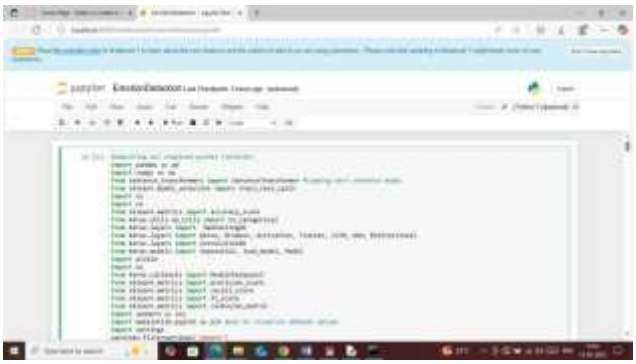
https://www.kaggle.com/datasets/parulpandey/emotion-dataset?select=training.csv

Above algorithms get trained on Emotion dataset and then each algorithm performance is evaluated in terms of accuracy, precision, recall and FSCORE.

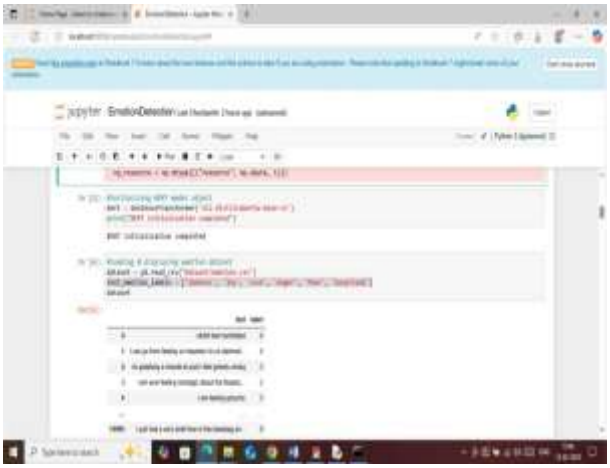
For training and algorithm testing we have used JUPYTERnotebookandforpredictionwehaveutilized WEB framework.

ScreenShots

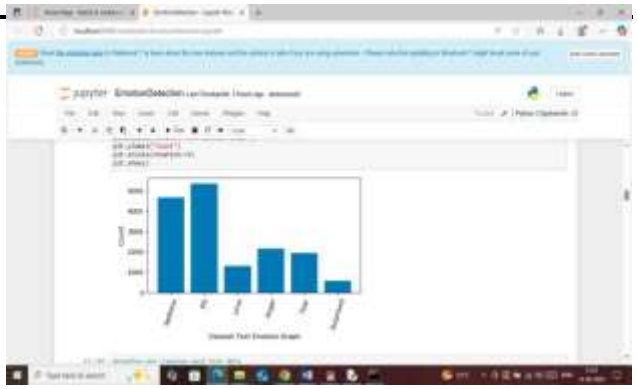
To run jupyter notebook double click on 'runJUPYTER.bat' file to start jupyter notebook and then will get below page



Inabovescreenloadingrequiredpackageandclasses



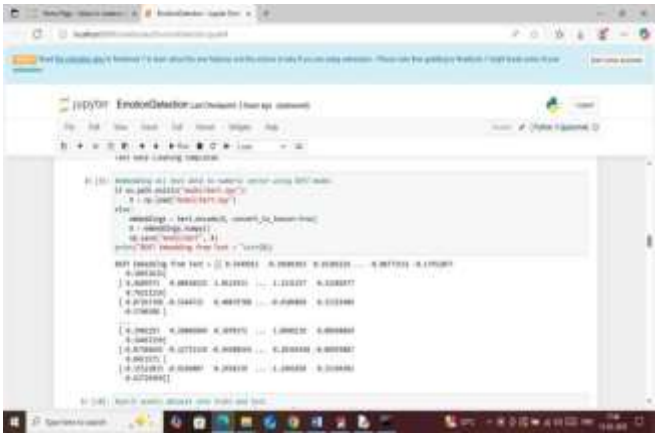
In above screen initialization BERT model object and then loading and displaying emotion dataset where first column contains TEXT and second column contains emotion labels



In above screen visualizing graph of different class labels found in dataset where x-axis represents emotion and y-axis represents number of text found under that emotion



In above screen defining function to clean text datafrom dataset



In above screen applying BERT model on text data to generate numeric vector and then can see generated numeric values

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In above screen splitting data into train and test where application using 80% dataset for training and 20% for testing



In above screen defining CNN algorithm which getting trained on 80% dataset and then applying 20% test data to calculate prediction accuracy



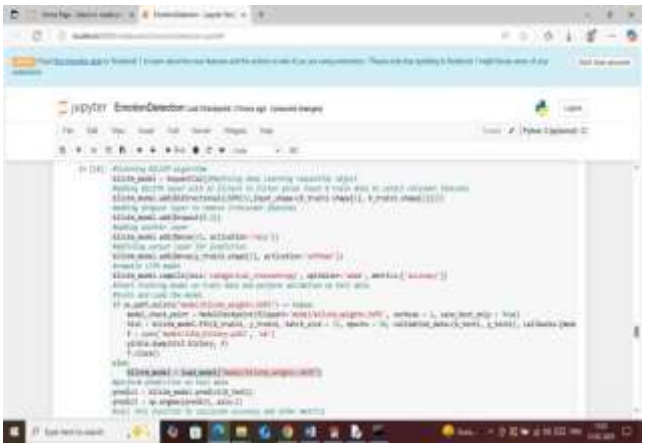
In above screen CNN got 91% accuracy and can see othermetricsalsoandtheninconfusionmatrixgraphx-axis represents True Labels and y-axis represents predicted labels and then all different colour boxes in diagonalrepresentscorrectpredictioncountand remainingblueboxesrepresentsincorrectprediction count which are very few



In above screen training LSTM algorithm and below is the output

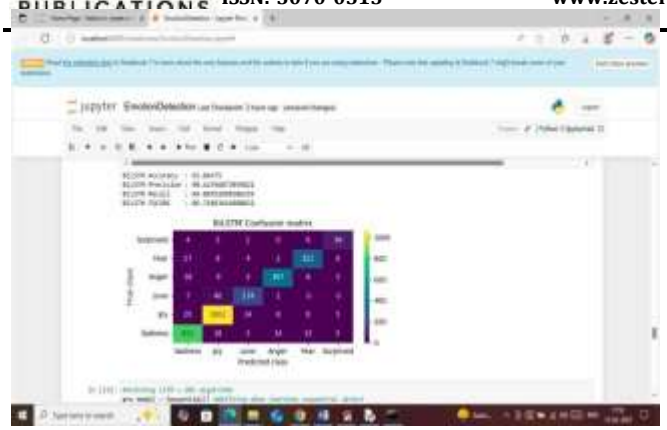


InabovescreenLSTMgot79%accuracy



In above screen training BILSTM algorithm and below is the output

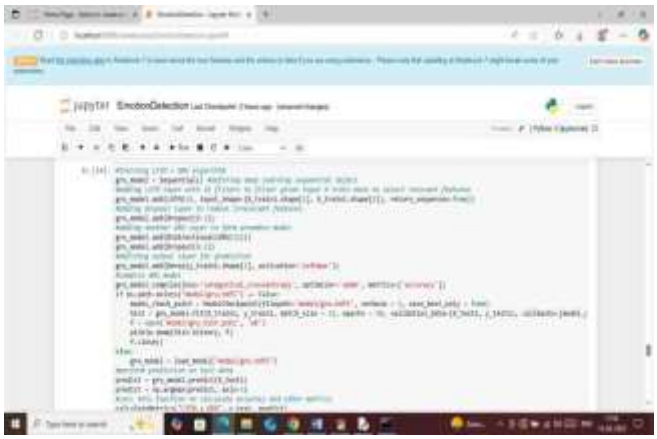
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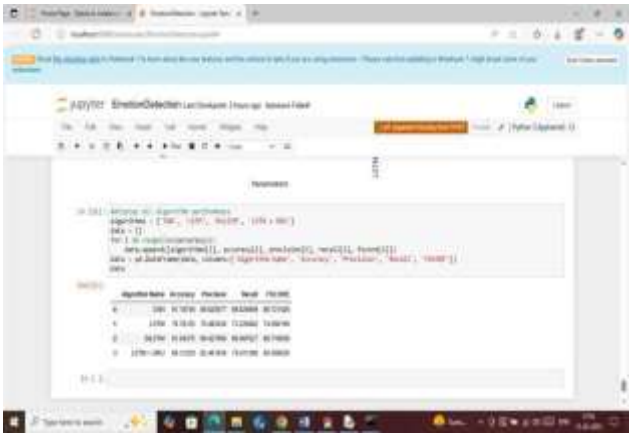
InabovescreenBILSTMgot91.84%accuracy



In above screen visualizing all algorithms performance where x-axis represents algorithm names and y-axis representsaccuracyandothermetricsindifferentcolour bars

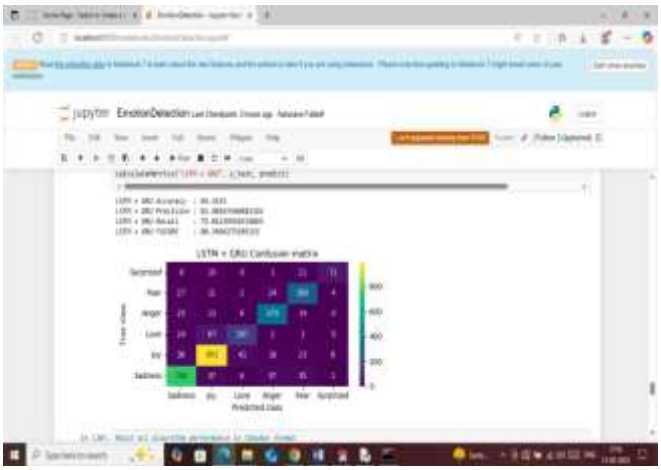


Inabove screentrainingLSTM+GRU algorithmand below is the output



In above screen displaying allalgorithm performance in tabular format and in all algorithms BILSTM got high accuracy.

So in above screen we have seen each algorithmtraining and testing performance and now double click on 'runWebServer.bat' file to start python server and then will get below page



InabovescreenLSTM+GRUgot84%accuracyand can see other metrics also

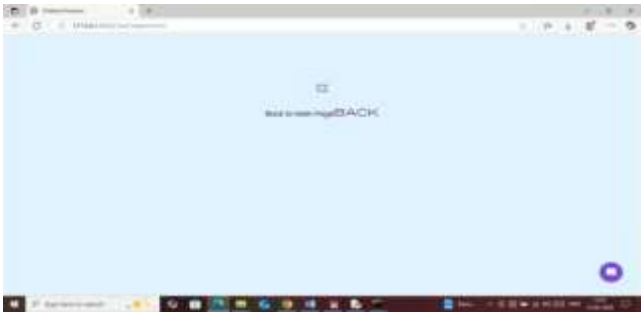
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In above screen python server started and now open browser and enter URL as http://127.0.0.1:8000/index.htmland then press enter key to get below page



In above screen click on 'Text Chatbot' link to get below page



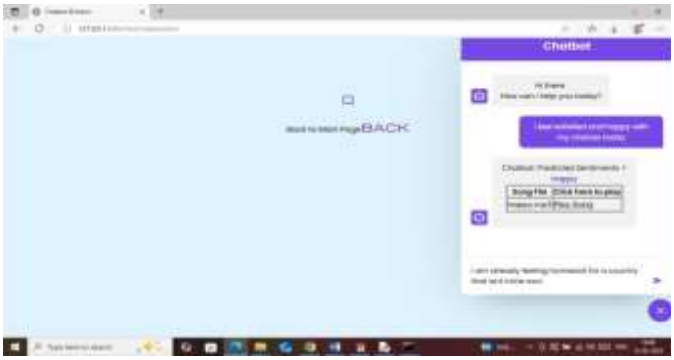
In above screen from right side bottom click on 'Blue' icon to start Chatbot and get below page



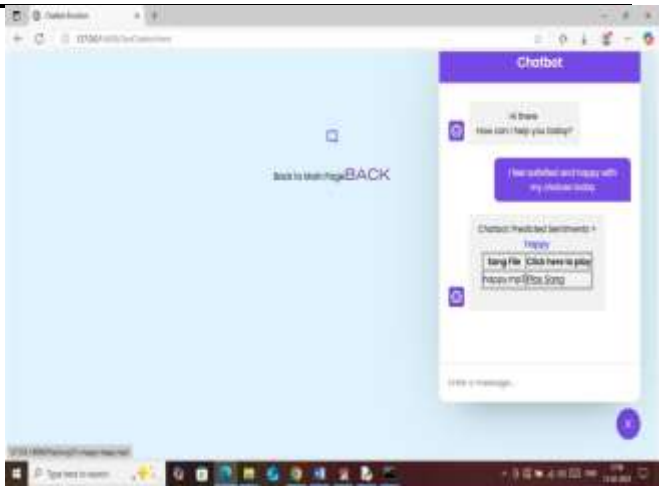
In above screen I type some message and then press arrow icon to get below prediction result

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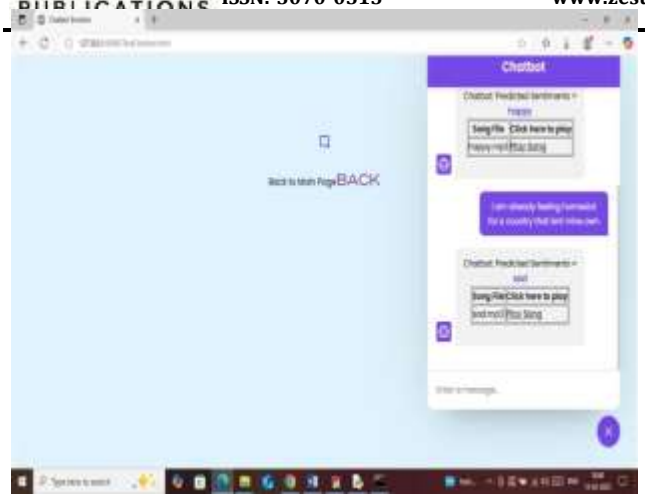
Inabovescreengivensentencepredictedas‘happy’and then suggesting some song and you can click on ‘Play Song’ link to start playing song. Now testing another sentence



In above screen giving another sentence and below isthe Chatbot response



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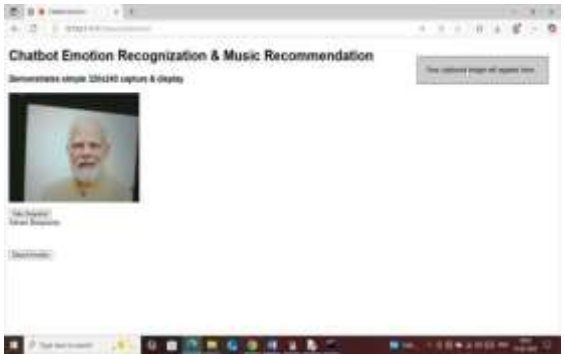


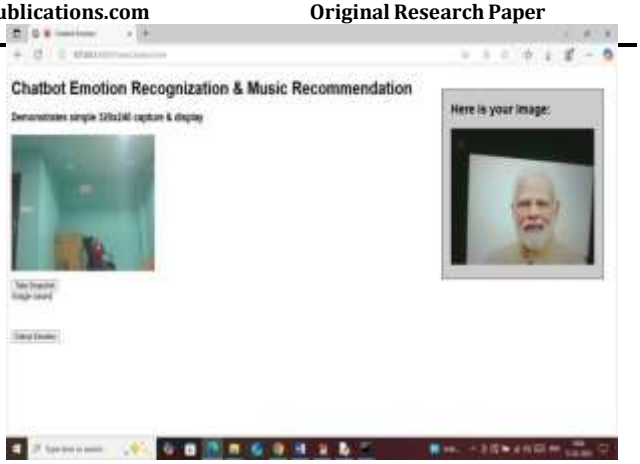
In above screen predicted emotion is 'SAD' and similarly give any text and get emotion and recommended song list. Now click on 'Back'link to get back to main page



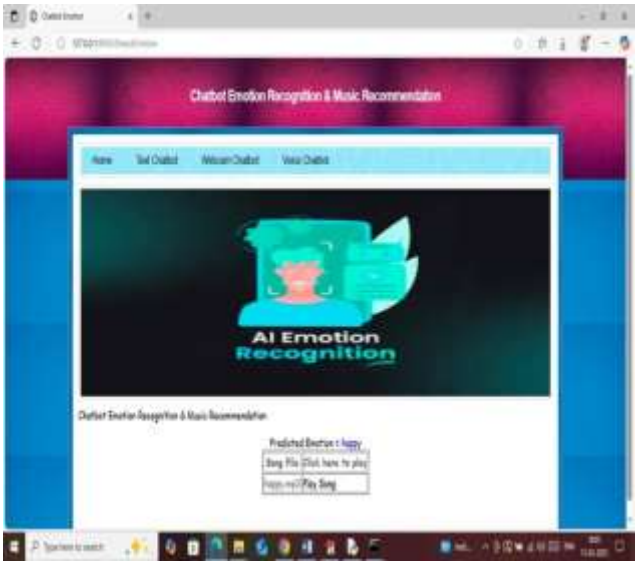
In above screen click on 'Webcam Chatbot'link to get below page

In above screen in webcam you can show face and then clickon'TakeSnapshot'buttontocapturefaceandthen click on 'Detect Emotion'button to get list of songs





In above screen in right side can see face detected and now click on 'Detect Emotion'link to get below page



In above screen from face 'happy' emotion is detected and similarly you can try with different faces with live webcam and in below screen testing another live image



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In above screen face is predicted as neutral and now click on 'Voice Chatbot' link to record voice and then recommend songs



In above screen click on 'Get Microphone' link to connect application to microphone and then will get below page

In above screen click on 'record' button and start speaking and once done then click on 'Stop' button to get below page





In above screen recorded voice emotion predicted as 'surprise' and similarly you can try with any other live voices.



In above screen anytime click on 'Back'button to back to main page.

IX CONCLUSION

The proposed hybrid chatbot system successfully integrates **emotion recognition** with a **music recommendation engine**, providing a more**interactive, personalized, and emotionally awareuser experience**. By leveraging advanced **NLP and deep learning models** such as LSTM and CNN, the system can accurately detect a user's emotional state from text inputs, even in complex or nuanced conversations. The context-aware music recommendation module then delivers **tailored music suggestions** that align with the user's mood, enhancing engagement, entertainment, and potential mental wellnesssupport.Comparedtotraditionalchatbotsand

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standalone recommendation systems, the proposed hybrid model offers **higher accuracy, real-time responsiveness, and adaptability** across diverse user interactions. Overall, this system demonstrates the potential of combining **emotional intelligence with personalized recommendations** to create smarter,more human-centric digital assistants.

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