
Harmonic Moods: Personalized Music Suggestions via Facial Emotion Recognition

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Abstract: A user's emotion can be detected by his/her facial expressions. These expressions can be derived from the live feed via the system's camera. A lot of research is being conducted in the field of Computer Vision and Machine Learning (ML)/Deep Learning (DL), where machines are trained to identify various human emotions. Machine Learning/Deep Learning provides various techniques through which human emotions can be detected. One such technique is to use CNN model with Keras, which generates a small size trained model and makes Android-ML integration easier. Music is a great connector. It unites us across markets, ages, backgrounds, languages, preferences, political leanings and income levels. Music players and other streaming apps have a high demand as these apps can be used anytime, anywhere and can be combined with daily activities, travelling, sports, etc. With the rapid development of mobile networks and digital multimedia technologies, digital music has become the mainstream consumer content sought by many young people. People often use music as a means of mood regulation, specifically to change a bad mood, increase energy level or reduce tension. Also, listening to the right kind of music at the right time may improve mental health. Thus, human emotions have a strong relationship with music. In our proposed system, an emotion-based music player is created using CNN model which performs real time emotion detection and suggests songs as per detected emotion. This becomes an additional feature to the traditional music player apps that come pre-installed in our mobile phones. An important benefit of incorporating emotion detection is customer satisfaction. The objective of this system is to analyze the users face, predict the expression of the user and suggest songs suitable to the recognized emotion.

Keywords: Face Emotion Recognition, Image Processing, Computer Vision, Music Recommendation, Face detection

I. INTRODUCTION

By using music recommender system, the music provider can predict and then offer the appropriate songs to their users based on the

characteristics of the music that has been heard previously. The recommendation algorithm I used is pretty simple and follows three steps: Compute the average vector of the audio and metadata features for each song the user has listened to. Find the n-closest data points in the dataset (excluding the points from the songs in the user's listening history) to this average vector.

Music prompts a reasonable passionate reaction in its audience. Melodic inclinations have been exhibited to be exceptionally associated with character qualities and mind-sets. Facial emotions are the most common and natural methods of passing on feelings, temperaments and sentiments.

Convolutional Neural network, as a Deep Learning Neural Network, assumes a critical part in face image recognition. Cognition technology of CNN and Music Recommendation System based on Facial Emotion Gestures is created to distinguish a model that perceives facial articulations and prescribes music as indicated by comparing mind-set of the user or client.

Human beings have the innate capacity to see somebody's face and conjecture their mind-set. This capacity if learnt by an electronic gadget - computer, humanoid robot or a mobile gadget - can have important applications in reality. Music, an instrument for stirring emotions and feelings, is undeniably more remarkable than language. Music is something which takes advantage of our emotional centre as human beings [1]. Accordingly, paying attention to good music can assist us with lifting our mind-set from a negative sense to a positive sense.

For example, focusing on lively tunes when the individual is feeling grim can assist him with arising his difficulty and start feeling better. This framework proposes one such application, emotion-based music recommendation. Emotion of the client can be effortlessly speculated by taking a

gander at his/her face. For this reason, face detection and emotion recognition, examining the fiducial highlights from his/her face is essential. The issues related with face detection incorporate foundation components, lighting conditions, posture and facial demeanor.

This space of face detection and emotion detection is as of now a functioning space of examination because of advancement of Virtual Reality and Augmented Reality. Constant face detection and recognition frameworks have restricted usefulness because of the fluctuating nature of pictures as a result of the issues related like foundation, enlightenment, and so on Thus, innovative work for arrangements identified with these issues is a continuous work.

Using regular music players, a client expected to actually mastermind his playlist and select tunes that would diminish his/her attitude and energetic experience. This task was work genuine and an individual every now and again went up against the trouble of showing up at an appropriate once-over of songs. Different frameworks which recognize the disposition of the client by utilizing facial appearance have their time and memory intricacy generally high and subsequently flop in accomplishing an ongoing presentation.

II. LITEARTURE SURVEY

1) Y. Kodama; S. Gayama; Y. Suzuki; S. Odagawa; T. Shioda; F. Matsushita; T. Tabata

A method for music recommendation that can recognize user preferences has been created. A system can classify by using the automatic music content analyses of the wide range of stored music. The users choose music according to their favorites, like the words exciting, silent sad, healing, romantic, and bright. The approach of collaborative filtering is to estimate the type of music users want based on their similarity to the other users.

By using independent music content analysis, the system can classify a wide range of store music. Users can get a piece of music that they want according to their mood. Song recommendation is content based means what type of content is present in that song based on

previous feedback and suggests a new thing comparable to what the user like.

2) **Content-based Music Recommendation System** by Aldiyar Nivazov; Elena Mikhailova

Creating a music recommendation is one of the tasks in information retrieval. That research is dedicated to a content-based music recommender system. The fundamental originality of our study is the created recommender system's sound similarity-based approach to musical composition. In this paper, we have seen the two methods of developing a content-based music recommendation system. 1 st is the common subtle approach used in analyzing the acoustic features. The aim of 2 and approach is the improve the result of the recommender system of the computer vision method application.

3) **Emotion-Based Music Recommendation System** by Vijay Prakash Sharma; Azeem Saleem Gaded; Deevesh Chaudhary; Sunil Kumar; Shikha Sharma

Music is the type of art that has a better connection with the person's emotion. It can change the mood of people. The experience of the user's listing will also be enhanced if a recommendation is made based on his performance—the existence of music recommendations for a long time. However, in most cases, the recommendation is made after considering the user's performance over time, such as their last song performance and the time spent listening to music.

For the recommendation of songs, this paper suggests a neural network-based approach where they detect the mood of a person on their facial expression. That approach is more efficient than the existing ones and makes it easier for the users to search for specific playlists and create them. At the time of detecting the mood of a person, facial expression plays a role. A face is photographed using a webcam or other camera, and information is retrieved from the image. Additionally, the mood of the person is identified using this information.

4) **Music recommendation system based on usage history and automatic genre classification**

by Jongseol Lee; Saim Shin; Dalton; Sei-Jin Jang; Kyoungro Yoon

The personalized music recommendation is supported if a user wants to store many favorite songs in a music database. For the determination of the exact favorite song of the user, managing genre classification and user preferences information is needed. Here we are studying using the music genre classification problem. A minor vector feature is obtained from the already developed audio features and the low dimensional projection.

To reduce the dimensional of the feature vector with a bit of performance degradation, we apply a distance metric learning algorithm. In the personalized music system, the automated management of genre classification and performance of users is proposed in that paper.

5) Music Recommendation System Based on Emotion by Pranesh Ulleri; Shilpa Hari Prakash; Kiran B Zenith; Gouri S Nair; Jinesh M. Kannimoola

Lockdown bonds people were required to stay inside the walls of their quarters during the COVID-19 scenario, which unintentionally encouraged mental health issues, including stress and nervousness. In that situation, all music is a potential companion. The proposed emotion-based music recommendation system takes user emotion as input. It uses it to suggest songs determined by the user's expression on their face or through direct user input.

The model analyses the song's energy, liveness, instrumentality, acoustics, etc., to determine its emotion using a random forest classifier and the XGBoost algorithm and using Term-frequency, on may determine how similar specific song's lyrics are. The outcomes of extensive tests using actual data show that the proposed emotion classification method, which can be incorporated into any recommendation engine, is accurate.

6) Music recommendation system based on the continuous combination of contextual information by Iman Dolatkia; Fatemeh Azimzadeh

We see that in music players, there is a

progression in technology, especially in the cell phones users now have access to extensive archives. For users, it is a very nig problem to select a quick and easy song as per they need from the extensive libraries. For example, music in the silent forest differs from music in a crowded street. During the working time, listen to music that feeling is other than the afternoon of the holiday. It means that what time is suitable for that song is essential.

In this paper, we develop a system that system is used to collect the information on the user's context, such as temperature, geographical position or weather, and so on, and they recommend music to the user that they want at that moment. As a result, the system contains a rating mechanism that establishes how closely the context of previously played music matches the current setting and recommends the music with the most significant similarity. The findings of this study demonstrate that the recommendations this system offers under various situations are entirely up to the user.

7) T-RECSYS: A Novel Music Recommendation System by Ferdos Fessahaye; Luis Perez; Tiffany Zhan; Raymond Zhang; Calais Fossier; Robyn Markarian;

A recommendation system is a program that uses strategies to propose products to users that they would probably like. This paper aims to improve the music recommendation system even though the suggested repair can be applied to various websites and industries, such as Netflix for movies, YouTube for videos, and Amazon for commerce. Once again, variables are added, resulting in the current system's inadequacy. For the prediction of an accurate recommendation system with a real-time prediction, our algorithm uses a combination of content-based and collaborative filtering as an input, the Tune Recommendation System (T-RECSYS). We used data from the Spotify Recsys Challenge to apply our methodology, achieving a precision score of up to 88% at a balanced discrimination threshold.

III. PROPOSED SYSTEM

The proposed system benefits us to present interaction between the user and the music player.

The purpose of the system is to capture the face properly with the camera. Captured images are fed into the Convolutional Neural Network which predicts the emotion. Then emotion derived from the captured image is used to get a playlist of songs.

The main aim of our proposed system is to provide a music playlist automatically to change the user's moods, which can be happy, sad, natural, or surprised. The proposed system detects the emotions, if the topic features a negative emotion, then a selected playlist is going to be presented that contains the foremost suitable sorts of music that will enhance the mood of the person positively. Music recommendation based on facial emotion recognition contains four modules.

- **Real-Time Capture:** In this module, the system is to capture the face of the user correctly
- **Face Recognition:** Here it will take the user's face as input. The convolutional neural network is programmed to evaluate the features of the user image.
- **Emotion Detection:** In this section extraction of the features of the user image is done to detect the emotion and depending on the user's emotions, the system will generate captions.
- **Music Recommendation:** Song is suggested by the recommendation module to the user by mapping their emotions to the mood type of the song.

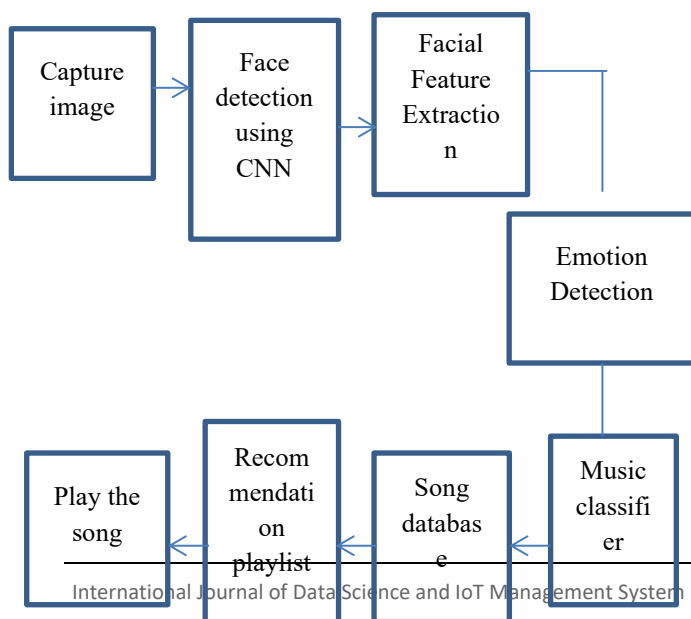
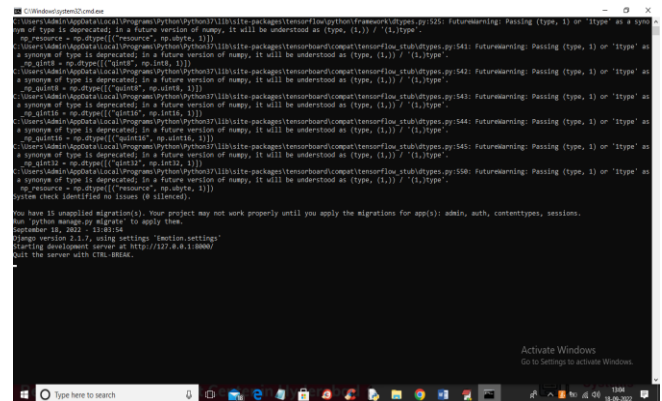


Fig.1 . Flow chart of proposed model

IV. RESULTS

To run project double click on 'run.bat' file to start python web server and get below screen



In above screen python Web Server started and now open browser and then enter URL as <http://127.0.0.1:8000/index.html> and press enter key to get below page

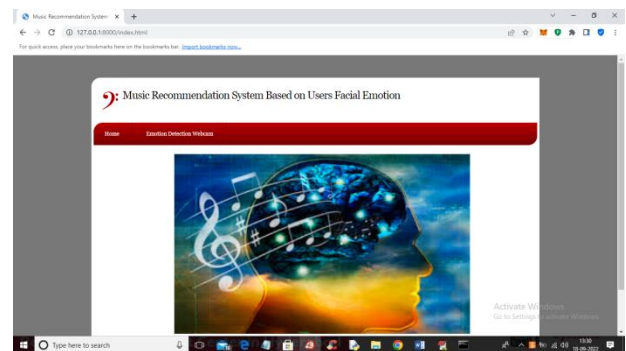


Fig. proposed Structure of Webpage

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

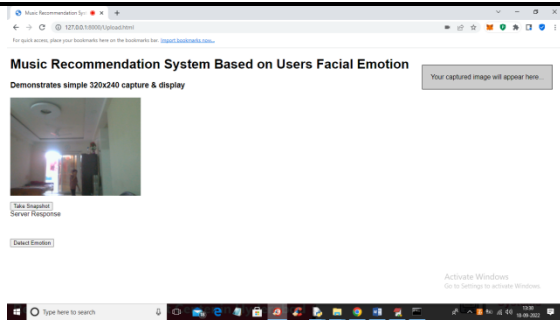


Fig. Capture the facial image from webcam

In above Webcam page show your face and then click on 'Take Snapshot' button to capture face image like below screen

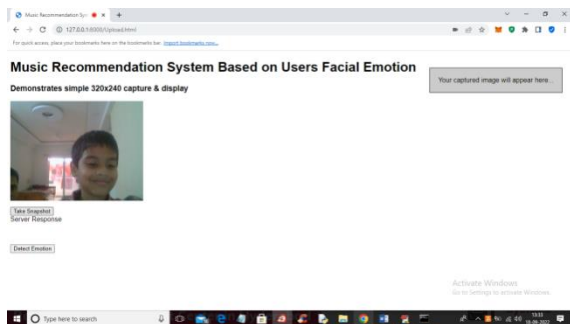


Fig. Capture the face image for facial expression recognition

In above screen showing face in webcam and now click on 'Take Snapshot' button to capture face like below screen

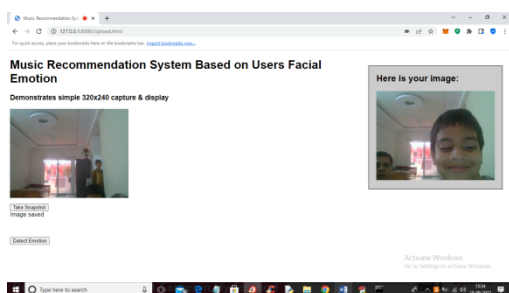


Fig. Capture the face image for facial expression recognition

In above screen face is captured and now click on 'Detect Emotion' button to predict emotion and get below song list

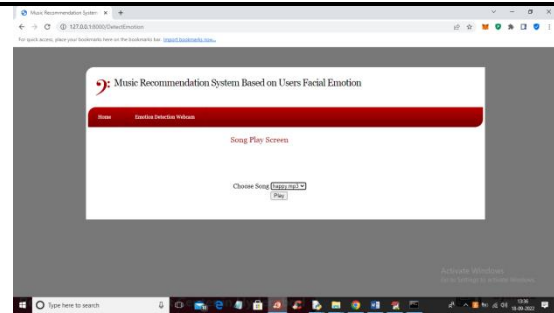
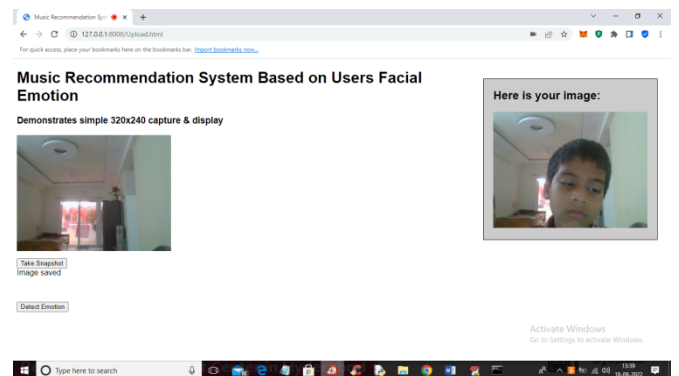
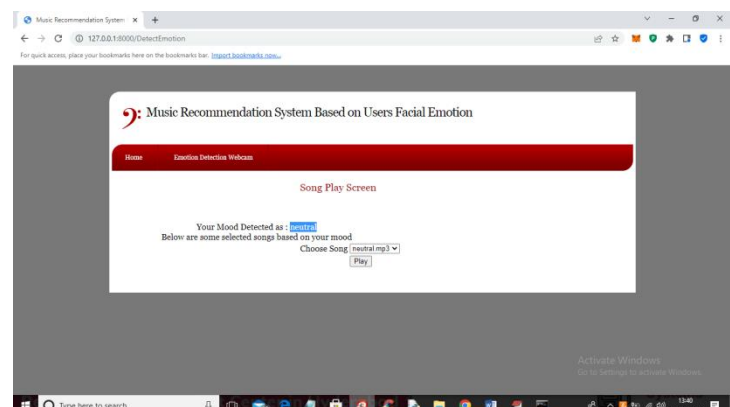


Fig. emotion recognized and above recommended song is playing

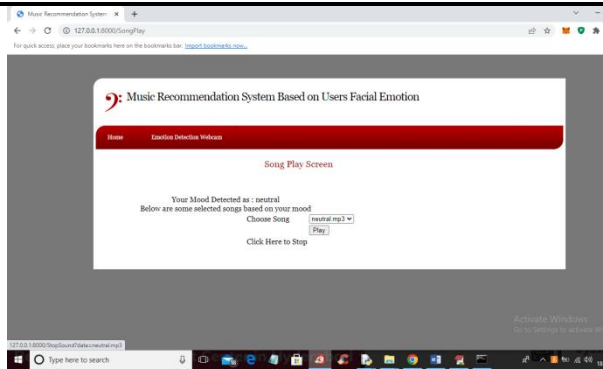
In above screen 'Happy' emotion detected and we got list of happy songs and user can select any song from drop down list and then click on 'Play' button to play song and while playing he can stop also. Now try another emotion



In above screen we captured another emotion face and now click on 'Detect Emotion' button to get below page

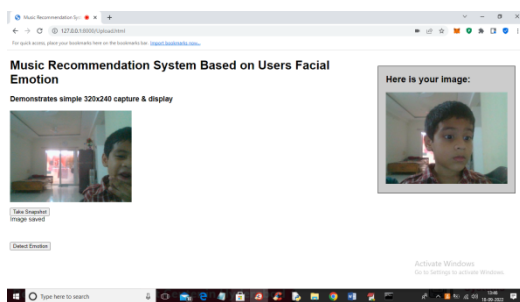


In above screen Neutral emotion detected and all neutral songs are displaying now click on 'Play' button to get below output

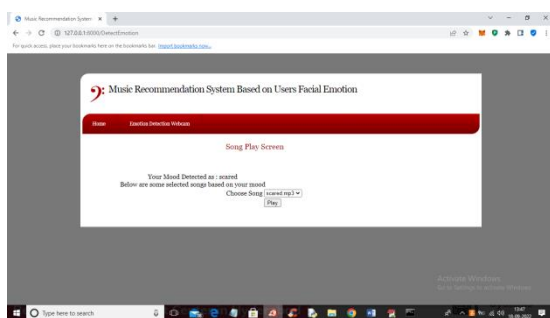


In above screen song will start playing and you can click on 'Click Here to Stop' link to stop play song.

Now in below screen we are trying another emotion



Now click on 'Detect Emotion' button to get below output



In above screen emotion detected as 'Scared' and similarly you can try various emotions and based on that emotion u will get songs list.

Note: in songs folder you can add new songs files also and application and algorithm is purely based on facial expression so try to show proper expression in Webcam to get proper emotion prediction

V. CONCLUSION

A thorough review of the literature tells that there are many approaches to implement Music Recommender System. A study of methods proposed by previous scientists and developers was done. Based on the findings, the objectives of our system were fixed. As the power and advantages of AI-powered applications are trending, our project will be a state-of-the-art trending technology utilization. In this system, we provide an overview of how music can affect the user's mood and how to choose the right music tracks to improve the user's moods.

The implemented system can detect the user's emotions. The emotions that the system can detect were happy, sad, angry, neutral, or surprised. After determining the user's emotion, the proposed system provided the user with a playlist that contains music matches that detected the mood. Processing a huge dataset is memory as well as CPU intensive. This will make development more challenging and attractive. The motive is to create this application in the cheapest possible way and also to create it under a standardized device. Our music recommendation system based on facial emotion recognition will reduce the efforts of users in creating and managing playlists.

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