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# FACIAL EXPRESSION BASED MUSIC RECOMMENDATION

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**Abstract:**

Emotion Mapping based Music Recommendation System is to provide users with suggestions that match their emotions and to assist them accordingly. The image is first captured and then converted to an emoji, and future analysis is done through the emoji's face. Analyzing a user's emotional facial expressions can help them understand the subject's current emotional or mental state. Music is an area that is likely to change a person's mood. It is well known that people use facial expressions to express what they want to say and the meaning of words more clearly. By developing an emotion mapping system, users can determine their mental state, and if they are unwell, they can change their mood by listening to pop-up messages containing songs. User's facial features are captured with the help of a webcam. By combining the user's photographs and emotion, the appropriate analysis is done, and the songs are displayed.

## Introduction

Regardless of whether they perceive the temperament of the client then their choice of melodies for making a playlist is with the end goal that it will simply pick tunes mirroring the current mind-set of the client and won't attempt to improve his mind-set in any capacity. In this way, if the client is dismal, in the current frameworks, client is furnished with a rundown of melodies with pitiful emotion which can corrupt his/her mind-set further and can prompt misery.

Along these lines, the framework proposed will distinguish the emotion of the client from his facial articulations. It will then, at that point furnish the client with a playlist of melodies, paying attention to which the client will feel good. Human emotions can be broadly classified as: fear, disgust, anger, surprise, sad, happy and neutral. A large number of other emotions such as cheerful (which is a variation of happy) and contempt (which is a variation of disgust) can be categorized under this umbrella of emotions.

These emotions are very subtle. Facial muscle contortions are very minimal, and detecting these differences can be very challenging as even a small difference results in different expressions. Also, expressions of different or even the same people might vary for the same emotion, as emotions are hugely context dependent. While the focus can on only those areas of the face which display a maximum of emotions like around the mouth and eyes, how these gestures are extracted and categorized is still an important question.

Neural networks and machine learning have been used for these tasks and have obtained good results. Machine learning algorithms have proven to be very useful in pattern recognition and classification, and hence can be used for mood detection as well. With the development of digital music technology, the development of a personalized music recommendation system which recommends music for users is essential. It is a big challenge to provide recommendations from the large data available on the internet.

E-commerce giants like Amazon, EBay provide personalized recommendations to users based on their taste and history while companies like Spotify, Pandora use Machine Learning and Deep Learning techniques for providing appropriate recommendations. There has been some work done on personalized music recommendation to recommend songs based on the user's preference. There exist two major approaches for the personalized music recommendation.

One is the content based filtering approach which analyses the content of music that users liked in the past and recommends the music with relevant content. The main drawback of this approach is that the model can only make recommendations based on existing interests of the user. In other words, the model has limited ability to expand on the users' existing interests. The other approach is the collaborative filtering approach which recommends music that a peer group of similar preference liked.

## Literature Survey

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.

Content-based Music Recommendation System by Aldiyar Niyazov; 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.

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.

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.

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 COVIG-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.

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.

T-RECSYS is an innovative music recommendation system that was developed by Ferdos Fessahaye, Luis Perez, Tiffany Zhan, Raymond Zhang, Calais Fossier, and Robyn Markarian. Additional authors include: The term "recommendation system" refers to a computer software that use various methods to suggest to consumers things that they are likely to find appealing. Despite the fact that the recommended solution may be used to a variety of different situations, the purpose of this research is to

enhance the music recommendation system. a variety of websites and sectors, including Netflix for movies, YouTube for videos, and Amazon for purchasing goods and services. Once more, variables are added, which leads to the inadequacy of the system that is currently in implementation. Our method makes use of a mix of content-based and collaborative filtering as an input, which in turn is referred to as the Tune Recommendation System (T-RECSYS). This allows for the prediction of an accurate recommendation system that also provides a real-time prediction. For the purpose of applying our technique, we used data from the Spotify Recsys Challenge. As a result, we were able to get an accuracy score of up to 88% at a discriminating threshold that was balanced.

A customized music recommendation system that makes use of KNN and an algorithm for machine learning is presented in this specific piece of research. It is our intention to propose a collaborative filtering and content filtering recommendation algorithm in order to establish a connection between the output of the network and the log files in the personalized music recommendation system. Log files that contain the user's past history of music playlists are also included in the system that has been recommended. The suggested system is able to locate the user's account by analyzing the log file, and it also provides recommendations for music based on the user's preferences. In the meantime, collaborative approaches forecast potential preferences by employing a matrix that contains ratings on various song content. These ratings are based on the degree to which the two songs feature content is similar to one another. The music is separated from the input by the plagiarism detection algorithm, which then identifies songs that are identical to the query songs and determines whether or not the query is copied. During the process of developing the customized

## Methodology

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 th e 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.

neutral, and surprised but they perform poorly on the under-represented ones like disgust and fear.

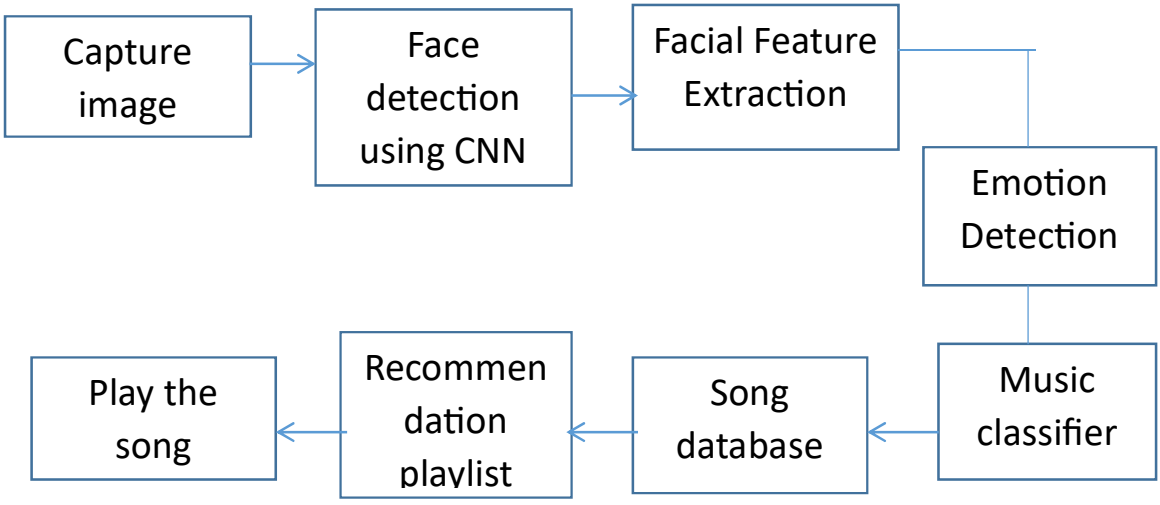



Fig.1 . Flow chart of proposed model

**Database Description**

We built the Convolutional Neural Network model using the Kaggle dataset. The database is FER2013 which is split into two parts training and testing dataset. The training dataset consists of 24176 and the testing dataset contains 6043 images. There are 48x48 pixel grayscale images of faces in the dataset. Each image in FER-2013 is labeled as one of five emotions: happy, sad, angry, surprise, and neutral.

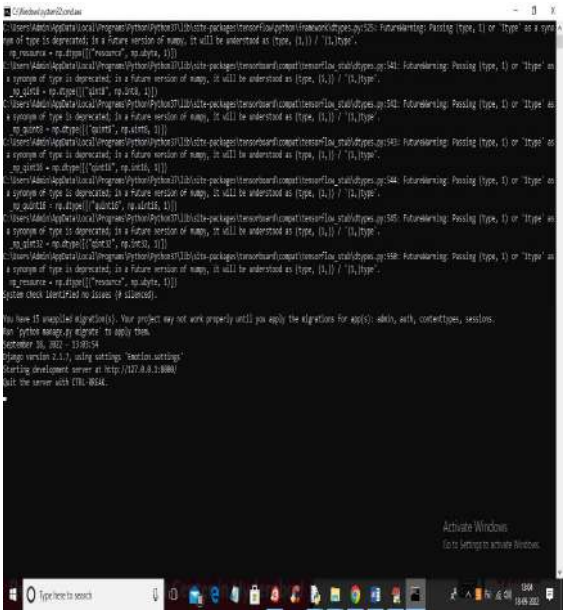
The faces are automatically registered so that they are more or less centered in each image and take up about the same amount of space. The images in FER-2013 contain both posed and unposed headshots, which are in grayscale and 48x48 pixels. The FER-2013 dataset was created by gathering the results of a Google image search of every emotion and synonyms of the emotions. FER systems being trained on an imbalanced dataset may perform well on dominant emotions such as happy, sad, angry,

Usually, the weighted-SoftMax loss approach is used to handle this problem by weighting the loss term for each emotion class supported by its relative proportion within the training set. However, this weighted-loss approach is predicated on the SoftMax loss function, which is reported to easily force features of various classes to stay apart without listening to intra-class compactness. One effective strategy to deal with the matter of SoftMax loss is to use an auxiliary loss to coach the neural network.

To treating missing and Outlier values we have used a loss function named categorical crossentropy. For each iteration, a selected loss function is employed to gauge the error value. So, to treating missing and Outlier values, we have used a loss function named categorical crossentropy.

## RESULT

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

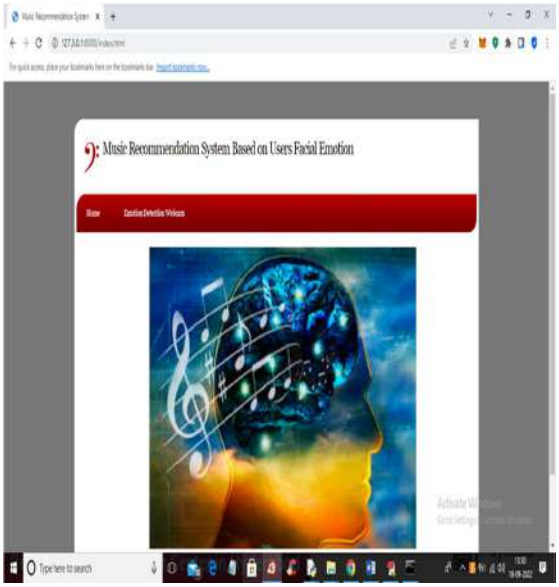



Fig. proposed Structure of Webpage

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

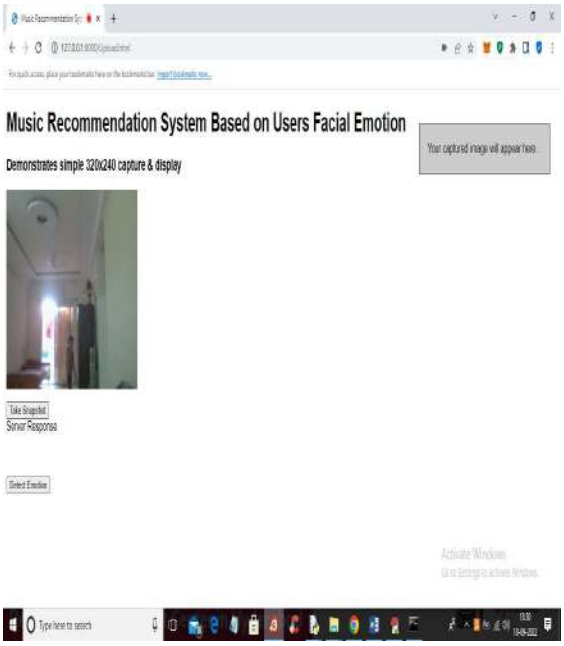



Fig.1.1 Capture the facial image from webcam

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

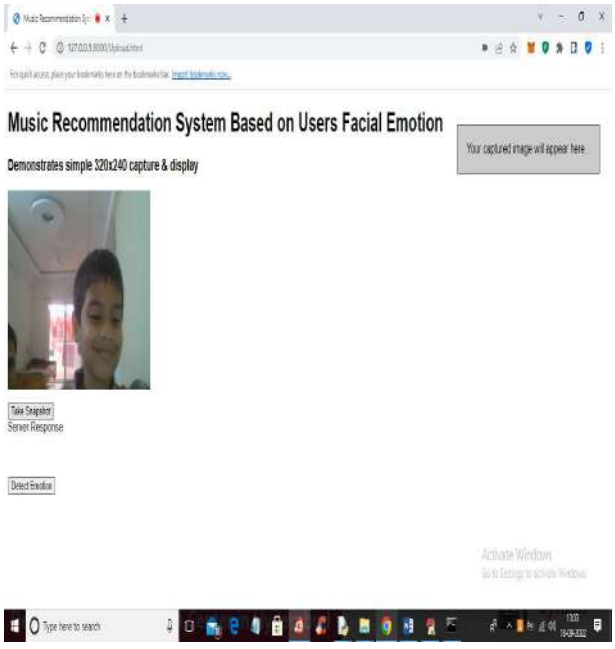


Fig.1.2 Capture the face image for facial expression recognition

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

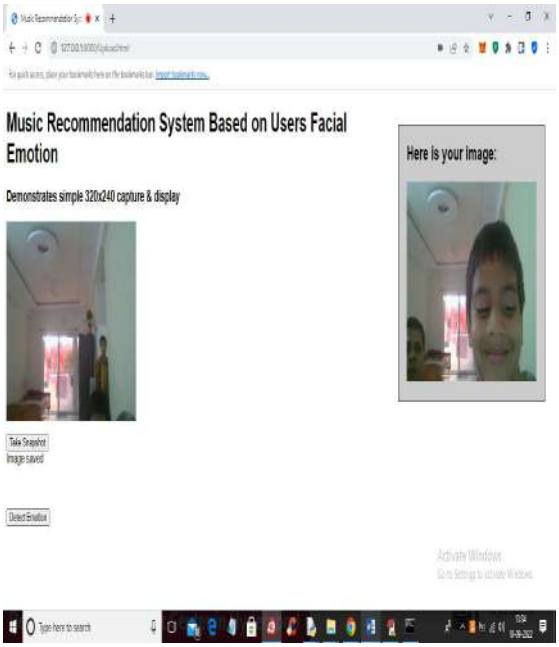



Fig. Capture the face image for facial expression recognition

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

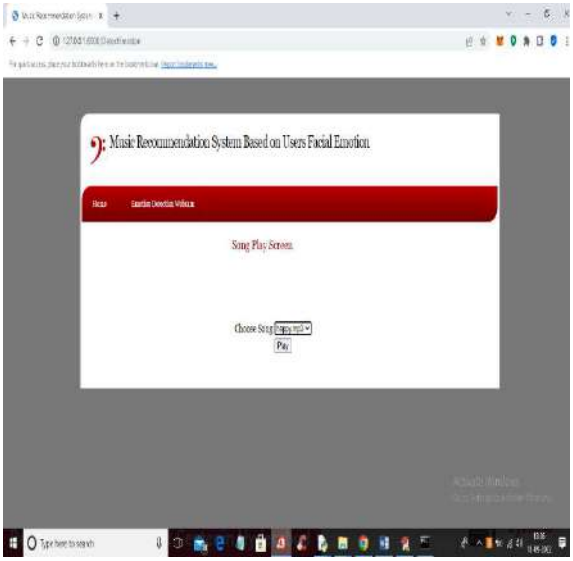
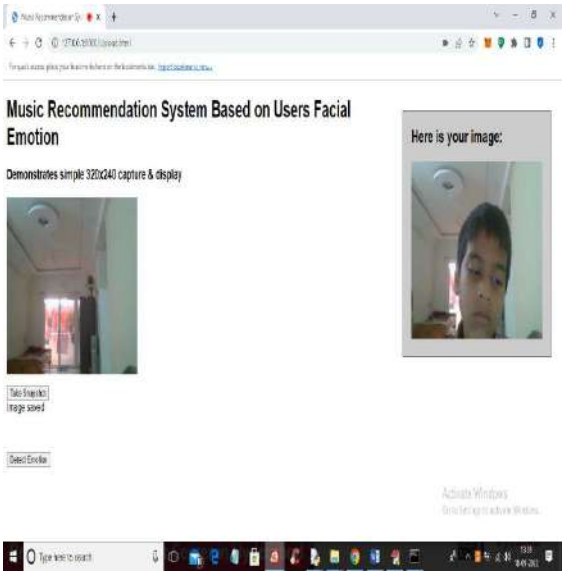
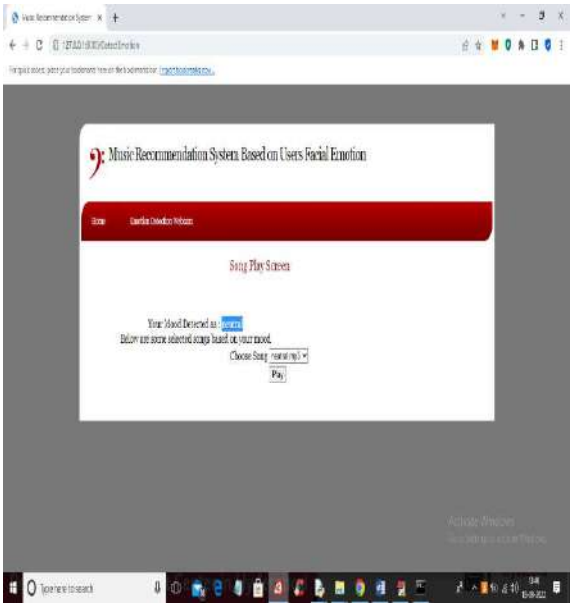



Fig.1.3 emotion recognized and above recommended song is playing

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



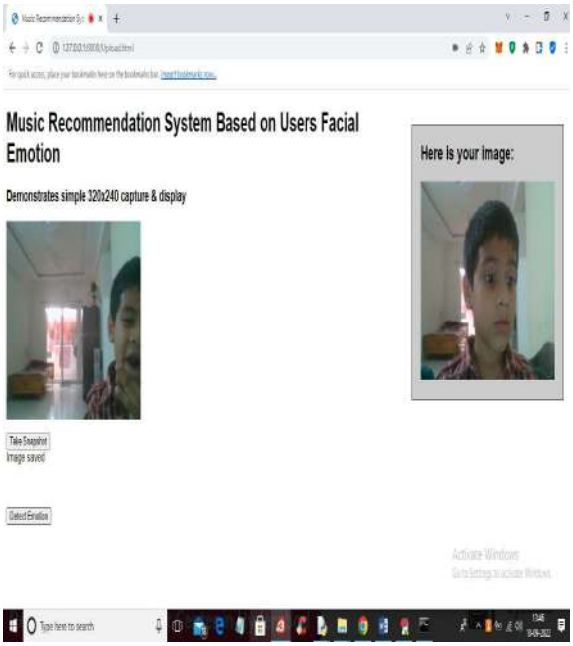

In above screen we captured another emotion face and now click on 'Detect Emotion' button to get below page



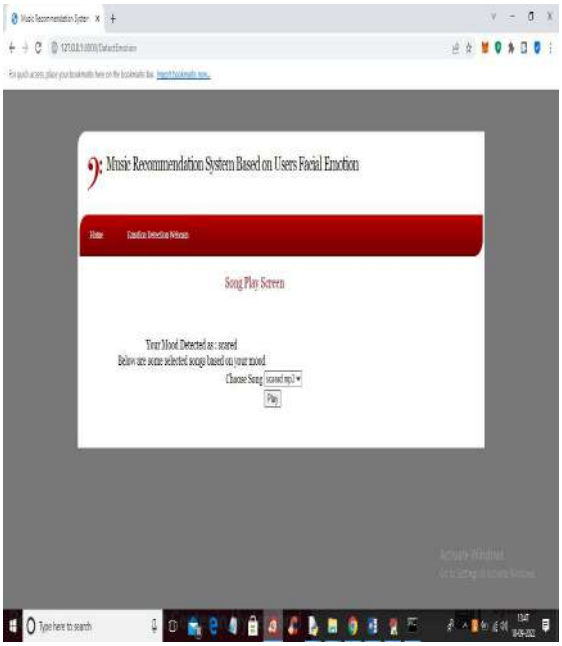
In above screen Neutral emotion detected and all neutral songs are displaying now click on 'Play' button to get below output


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

## 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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