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EMUSE – AN EMOTION BASED MUSIC RECOMMENDATION SYSTEM

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ABSTRACT

It is often confusing for a person to decide which songs to listen from a massive collection of songs on the Internet. While music genre plays a huge role in building and displaying social identity, the emotion expression of a song and even more importantly its emotional impression on the listener is often underestimated in the domain of music preferences. Only a few decades back, choosing music by genre and/or artist was effectively the only option. This has changed hugely with the availability of custom playlists and personal recommendations on digital music platforms. People tend to listen to music based on their mood and interests. It is widely known that humans make use of facial expressions to express themselves. Many people believe that at a certain point of time the number of songs present in their song's library is so large that they are unable to decide what they should play. So, by developing a recommendation system which could detect users' mood and suggest songs could greatly help the user reduce time in looking up for songs.

Keywords: Emotion Recognition, Recommendation System, Music, Songs, Emotion Extraction, Facial Extraction.

I. INTRODUCTION

Music plays an important role in our daily life. Music has always known to alter the mood of a person. Capturing and recognizing the emotion shown by a person and recommending suitable songs matching one's mood and increasingly calm the mind of a user. People often face a tough time in creating playlists manually when they have a lot of songs. It is also difficult to keep track of all songs. Sometimes songs which are added are never heard, wasting a lot of space on the device forcing the user to find and delete songs manually. So, this project aims to capture the user's emotion and give them custom curated playlists.

Figure 1: various emotions in humans

II. LITERATURE REVIEW

Renuka R Londhe proposed a paper which focused on the study of changes in the curvatures of the face and the intensities of the corresponding pixels. The author used Artificial Neural Networks which was used to classify the emotions. The author also proposed various approaches for a playlist. Parul Tambe proposed an idea which automated the interactions between the users and music player, which learned all the preferences, emotions and activities of a user ang gave songs as a result. The various facial expressions of users were recorded by the device to determine the emotion of the user to predict the genre of the music. Jayshree Jha proposed an

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emotion-based music player using image processing. This showed how various algorithms and techniques that were suggested by different authors in their research could be used for connecting the music player along with human emotions. It helped in reducing the efforts of user in creating and managing playlist and providing excellent experience to the music listeners by bringing them the most suitable song according to the users' expression. A. Habibzad proposed a new algorithm to recognize the facial emotion, which included three stages: pre-processing, feature extraction and classification. The first part describes various stages in image processing which includes preprocessing, filtering used to extract various facial features. The second part optimized the eye and lip ellipse characteristics and in the third part, the eye and lip optimal parameters were used to classify the emotions. S Metilda Florence and M Uma (2020) proposed a paper "Emotional Detection and Music Recommendation System based on User Facial Expression" where the proposed system can detect the facial expressions of the user and based on his/her facial expressions extract the facial landmarks, which would then be classified to get a particular emotion of the user. Once the emotion has been classified the songs matching the user's emotions would be shown to the user. It could assist a user to make a decision regarding which song one should listen to helping the user to reduce stress levels. The user would not have to waste any time in searching or to look up for songs. The proposed architecture contained three modules, namely, Emotion extraction module, Audio extraction module and Emotion Audio extraction module. Although it had some limitations like the proposed system was not able to record all the emotions correctly due to the less availability of the images in the image dataset being used. The image that is fed into the classifier should be taken in a well-lit atmosphere for the classifier to give accurate results. The quality of the image should be at least higher than 320p for the classifier to predict the emotion of the user accurately. Handcrafted features often lack enough generalizability in the wild settings.

III. PROPOSED SYSTEM

In the proposed system, we integrate machine learning and deep learning techniques with computer vision for detecting facial emotion and recommending music based on the emotion. The approach is to use Deep Neural Networks to learn the most appropriate feature abstraction. Deep Neural Networks are a successful approach in visual object recognition, facial verification, human pose estimation and many more. Convolutional Neural Networks have been proven very effective in areas such as image recognition and classification. The proposed system can detect facial expressions of the user using a Convolutional Neural Network model. Once the emotion has been classified, the song matching the user's emotion would be displayed. In this project a main web page is designed using the streamlit framework where an image of the user is captured. The image captured is then sent to the model to predict the emotion of the user. Once the emotion is detected, the spotify api is called by the python module spotipy to request music tracks which are then displayed in the user interface.

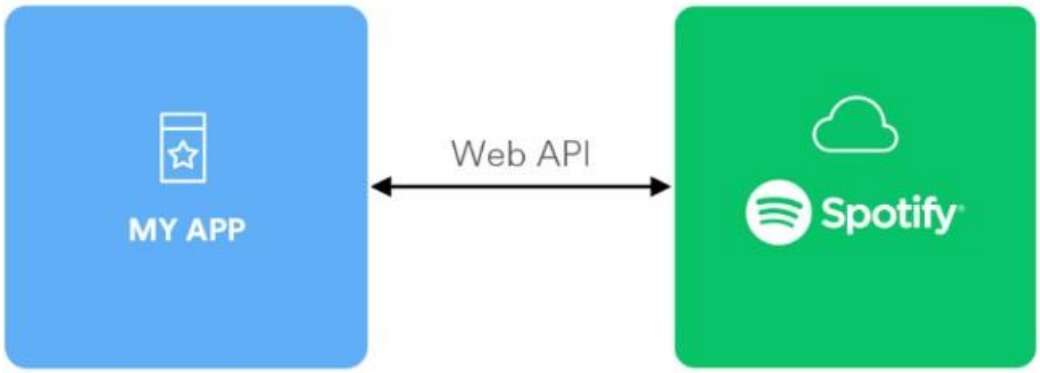

Figure 2: Spotify API

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EMOTION DETECTION

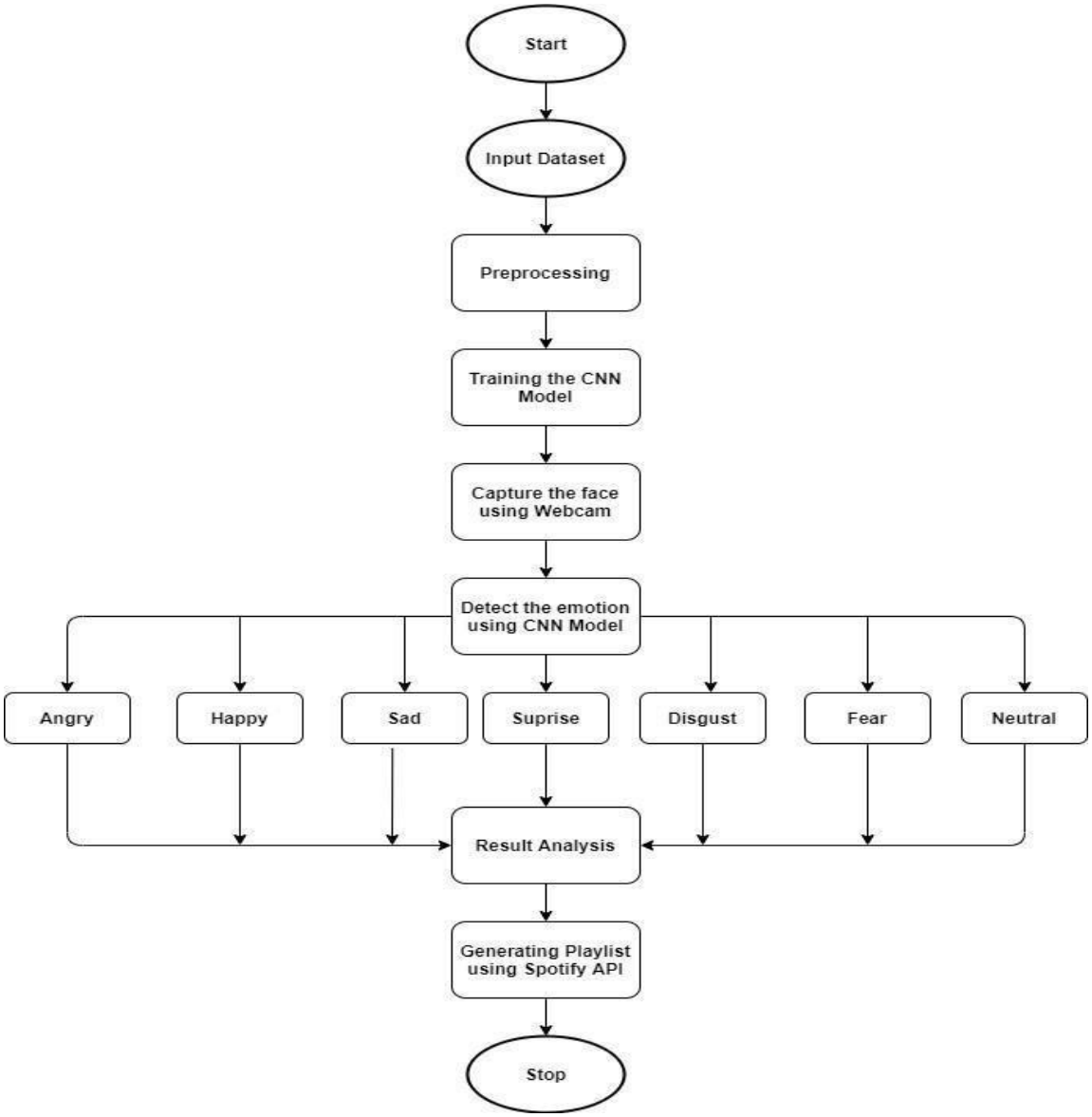

Figure 3: Flow chart

IV. SYSTEM IMPLEMETATION

The detect_emotion function takes care of emotion detection. To train our model we used the fer2013 dataset. The dataset consists of 48x48 pixel grayscale images of faces. The task is to categorize each face based on the emotion shown in the facial expression in to one of the seven categories (0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral). We split our dataset as training and testing data in the ratio of 90 and 10 respectively. The model consists of 4 CNN layers and is trained with 30 epochs.

USER INTERFACE IMPLEMENTATION

The user interface is built with the streamlit framework. As soon as the page is loaded, a small window is popped to capture the image of the user. After the image is captured, it goes through the HaarCascade classifier to detect whether a face is present or not. If face is not present then error is displayed in the UI else image is sent to the trained model to detect the emotion. After emotion is detected, the emotion is displayed on the screen and simultaneously using the detected emotion, the spotipy module runs a search for songs in the spotify collection to match the user's mood and then displayed on the screen. The tracks are embedded in such a way that the user could listen to the song in the web app itself else navigate to the spotify application by clicking on the particular track.

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V. RESULT ANALYSIS

With a 4-layer CNN model, the train accuracy reached 97% and the validation accuracy reached 82%.

Performance Measure

- No of instances: 35888
- Train Samples: 28709
- Test Samples: 7179

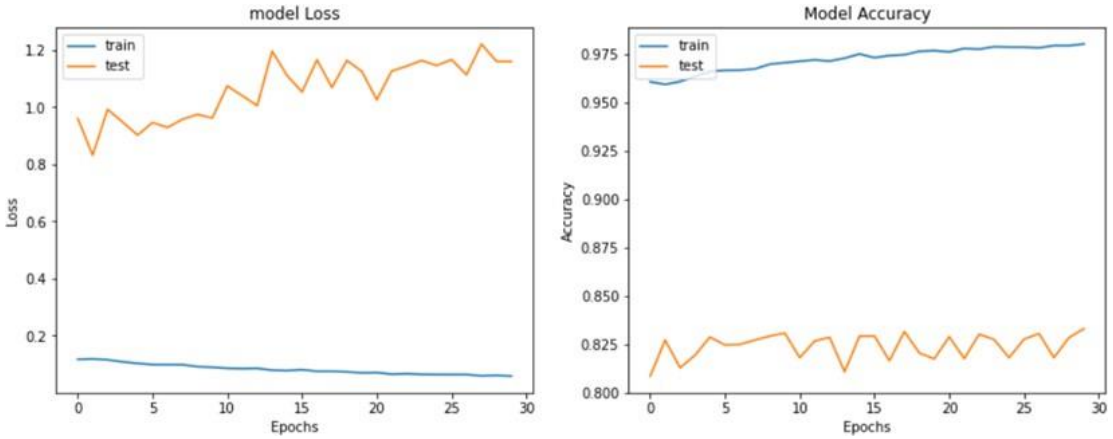

Figure 4: Model Metrics

Sample Input and Output

Figure 5: Input

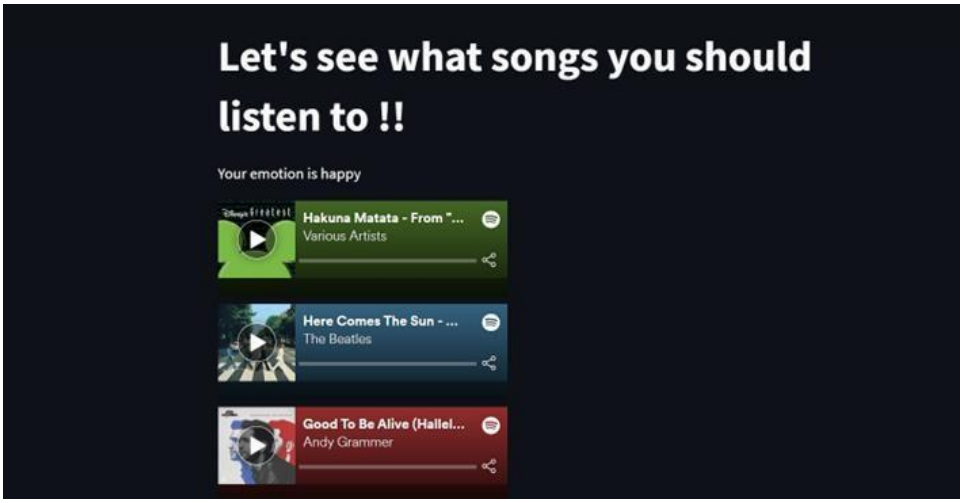

Figure 6: Output

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VI. CONCLUSION

We integrate computer vision and machine learning techniques for connecting facial emotion for music recommendation. The approach is to use Deep Neural Networks (DNN) to learn the most appropriate feature abstractions. DNNs have been a recent successful approach in visual object recognition, human pose estimation, facial verification and many more. Convolution Neural Networks (CNNs) are proven to be very effective in areas such as image recognition and classification. The proposed system can detect facial expressions of the user using a CNN model. Once the emotion has been classified, the song matching the user's emotions would be played. In this project, a main web page is designed where an image or video of the user is recorded. The image/video is then sent to the server to make the prediction about the emotion of the user. Once the emotion is detected, the next phase is to play songs. This is where the client side requests tracks from Spotify app via an API call.

VII. FUTURE WORK

This work can be extended by the following measures.

- Making this as a real time application so that actual users would be able to use it.
- Giving an option to the user about what language songs he/she wants to listen.
- Extracting songs from third party API in real time.
- Track users' mood and listening history to enhance the recommended playlist.
- Deploying this application in any cloud platform such as Azure, Google app engine etc.
- Making use of containerization with Docker containers or Kubernetes clusters.

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