EMOTION BASED RECOMMENDATION SYSTEM FOR VARIOUS APPLICATIONS

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ABSTRACT

Most of the existing systems are highly complex in terms of time and storage for recognizing user behavior. This paper proposes an emotion based recommendation system for various applications that learns the emotions of the user from the camera. The human face acts as an important part in an individual's body and helps in detection of one's mood. The extracted input undergoes face detection, feature extraction, emotion recognition and application identification. The application includes playing music, videos, providing motivational quotes. This eliminates the time consuming and tedious task of manually segregating a playlist or searching for motivational quotes and videos. The experimental results are obtained by classifying the emotions using convolutional neural networks and support vector machine. The data are validated using testing and training method to obtain the exact emotion of the user. The applications are identified from the predicted emotions. By this way the emotions are analyzed and the required applications like playing music and motivational quotes are provided.

Keyword: - *Convolutional Neural Networks, Emotion recognition, Face detection, Machine Learning, Support Vector Machine, testing and training.*

1. INTRODUCTION

The recent advances within the field of music info retrieval, there's a brand new risk that music will be mechanically analyzed and intelligible by the pc to some linguistics level. thanks to the variety and richness of music content, several analyzers are following a mess of research topics during this field, starting from applied science, digital signal process, arithmetic, and statistics applied to humanities. Recent problems in music info retrieval embrace automatic audio genre/mood classification, music similarity computation, audio creative person identification, audio-to-score alignment, query-by-singing/humming, multiple estimation and chase, and so on. one in every of the possible applications is to supply content-based music recommendation. If we tend to take one step any and utilize the context info, we will come through a lot of intelligent context-based music recommendation.

For outstanding action in context-based music recommendation system, it typically desires multidisciplinary efforts like feeling description, feeling detection/recognition, low-level feature primarily based classification, and inference-based recommendation. AN feeling descriptor has been helpful and effective in describing music taxonomy. AN assumption for feeling illustration is that feeling will be thought-about as a group of continuous quantities and mapped into a group of real numbers. As a pioneering effort to explain human emotions, researchers planned a diacritic model wherever every have an effect on is displayed over 2 bipolar dimensions. Those 2 dimensions square measure pleasant-unpleasant and arousal-sleep. Thus, every have an effect on word will be outlined as some combination of delight and arousal parts. Later, another investigator custom-made Russel's model to music.

Thayer's model has "arousal" and "valence" as its 2 main dimensions. during this model, feeling terms were delineate as silent to energetic on the arousal dimension, and negative to positive on the valence dimension. With Thayer's model, the two-dimensional feeling plane will be divided into four quadrants with eleven feeling adjectives placed over them. On the opposite hand, Xiang and cluster planned a "mental state transition network" for

describing feeling transitions of kinsmen. within the network, mental states encompass happy, sad, anger, disgust, fear, surprise, and serene. each transition between 2 states is calculated from take a look at knowledge, and painted by some chance. However, they didn't contemplate alternative emotions like nervous and excited. Automatic feeling detection and recognition in speech and music is growing speedily with the technological advances of digital signal process and varied effective feature extraction ways. feeling detection/recognition will play a vital role in several alternative potential applications like music amusement and human-computer interaction systems.

An feeling may be a mental and physiological condition that is subjective and private; it involves heaps of behaviors, actions, thoughts and feelings. Initial analysis applied on emotions will be derived to the book `The Expression of the Emotions in Man and Animals' by Charles Robert Darwin. Darwin believed emotions to be species-specific instead of culture-specific. In 1969, once recognizing a catholicity among emotions in several teams of individuals despite the cultural variations, oceanographer and Friesen classified six emotional expressions to be universal: happiness, sadness, disgust, surprise and worry.

One in every of the primary researches on feeling detection in music is given by Feng et al. They enforced on the perspective of machine Media Aesthetics (CMA) by analyzing 2 dimensions of tempo and articulation that square measure mapped into four classes of moods: happiness, anger, disappointment and worry.

Facial expressions will be thought-about not solely because the most natural sort of displaying human emotions however additionally as a key non-verbal communication technique. If economical ways will be led to mechanically acknowledge these facial expressions, putting enhancements will be achieved within the space of human laptop interaction. analysis in facial feeling recognition has being applied in hope of accomplishing these enhancements .

In fact, there exist alternative applications which may get pleasure from automatic facial feeling recognition. AI has long relied on the realm of facial feeling recognition to realize intelligence on a way to model human emotions convincingly in robots. Recent enhancements during this space have inspired the researchers to increase the relevancy of facial feeling recognition to areas like chat space avatars and video conferencing avatars.

The ability to acknowledge emotions will be valuable in face recognition applications still. Suspect detection systems and intelligence improvement systems meant for youngsters with brain development disorders square measure another beneficiaries.

2. PREVIOUS WORK

Existing systems are extremely advanced in terms of your time and storage for recognizing user behavior. It doesn't invoke biometric primarily based feeling recognition of the users. It doesn't target user mood primarily based song recommendation.

2.1 Face Detection and Facial Expression Recognition System

The First part Face Detection are done by Color model, lighting compensation for obtaining face and morphological operations for retentive needed face i.e. eyes and mouth of the face. The system is additionally used AAM i.e. Active look Model methodology for facial feature extraction. during this methodology the purpose on the face like eye, eyebrows Associate in Nursing and mouth are situated and it produce data file which supplies information regarding model points discovered and detect the face the an expression are given as input AAM Model changes in line with expression.

2.2 Emotional Recognition from Facial Analysis exploitation Bezier Curve Fitting

The feeling recognition from face expression analysis is predicated on Bezier curve fitting. It used 2 step for face expression and feeling recognition. The primary part is detection and analysis of facial space from input original image and next part is verification of facial feeling of characteristics feature within the region of interest. The first part for face detection, this approach uses color still image supported coloring element by initialized abstraction filtering ,based on results of lighting compassion then to estimate face position and facial location of eye and mouth it used feature map once extracting region of interest this method extract points of the feature map to use Bezier curve on eye and mouth. For understanding of feeling this method uses coaching and activity the distinction of distance. With Bezier curve between entered face image and image from information.

2.3 Exploitation Animated Mood photos in Music Recommendation

The user act with a set of pictures to receive music recommendation with reference to genre of image. This method uses matter meta tags for describing the genre and audio signal process .

2.4 Interactive Mood-based Music Discovery

A large body of analysis in recommender systems focuses on optimizing prediction and ranking. However, recent work has highlighted the importance of different aspects of the recommendations, together with transparency, management and user expertise generally. Author show however mood play permits the user to explore a music assortment by latent affectional dimensions, and also the author explains a way to integrate user input at recommendation time with predictions supported a pre-existing user profile. Results of a user study (N=240) are mentioned, with four conditions being evaluated with varied degrees of visual image, interaction and management.

2.5 Enhancing Music Recommender Systems

It describes the initial analysis assumptions to boost music recommendations by together with temperament and emotional states. By together with these psychological factors it's believed that the accuracy of the advice will be increased. Additionally given attention to however individuals use music to manage their emotional states, and the way this regulation is said to their temperament.

2.6 Traditional Recommendation System

A recommender systems main task is to propose right merchandise or things to a cluster of users that may be accepted by them. the look of such recommendation engines de-pends on the domain and therefore the explicit characteristics of the information on the market. it describes recommender system parts, operating order and information flow in recommendation engine. information assortment and process unit, provides an acceptable tool for information assortment that involves users and things. DCPU sends information to Recommender Model wherever recommendation algorithms area unit executed. Recommendation Post process unit , makes the recommendations able to be shown to users when filtering out and ranking. Feedback module accustomed track usage and therefore the computer program element defines what users see and the way they'll move with the recommender. ancient recommendation engines use variety of different technologies to come up with recommendations. cooperative filtering is associate degree approach to creating recommendations by finding similarity and relation among users of a recommendation system. It presents associate degree approach to seek out things of potential interest, that aren't seen by the present user however are rated by different users, associate degreed to predict the rating that the present users would provide to an item. cooperative filtering systems suggest things supported similarity between users and their history. the things that area unit most well-liked by similar users area unit counseled to current user. Content-based filtering ways build recommendations by analyzing the properties and tags of the things that are rated by the user and therefore the description of things to be counseled.

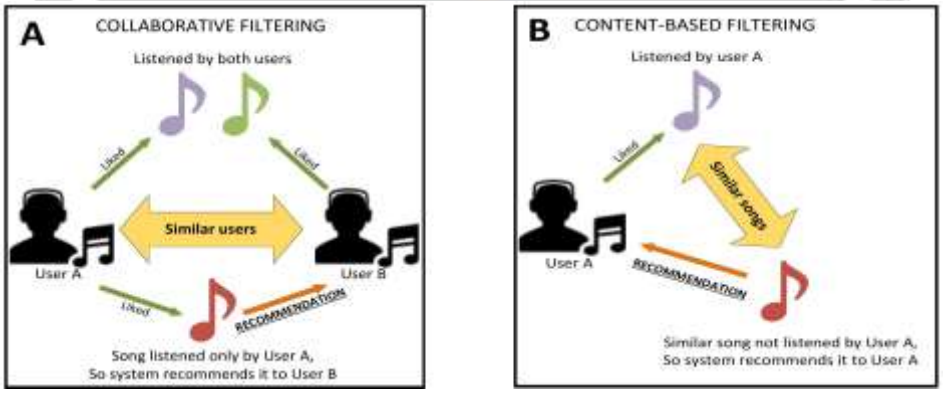

Fig-1: Collaborative and content based filtering

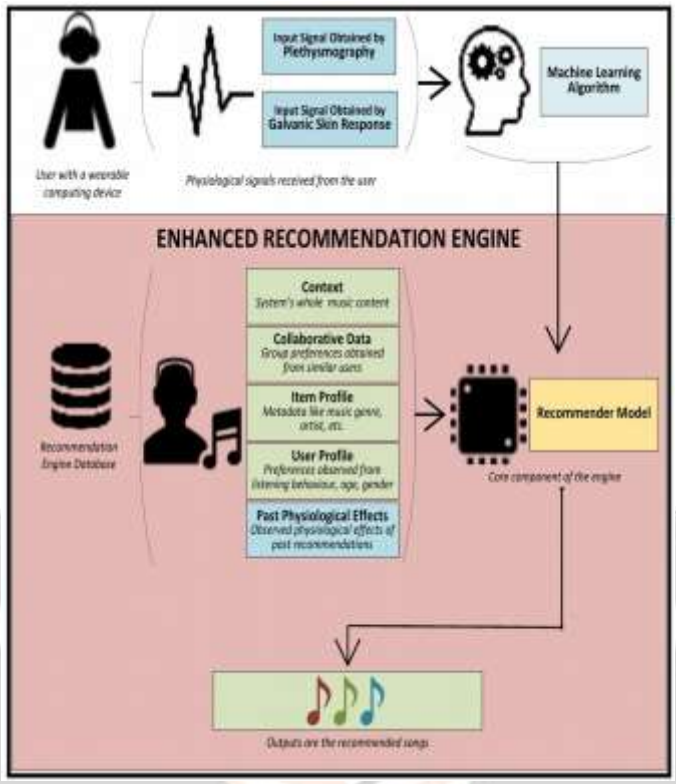

Fig-2: Enhanced Recommendation Engine

3. PROPOSED SYSTEM

The external body part is a crucial a part of a person's body and it particularly plays a crucial role in knowing a person's mood. Extracting the desired input from the external body part will currently be done directly employing a camera. one amongst the applications of this input will be for extracting the data to deduce the mood of a private. This information will then be accustomed get a listing of songs that suits the "mood" derived from the input provided earlier. This eliminates the long associated tedious task of manually segregating or grouping songs into completely different lists and helps in generating an applicable list supported a person's emotional options. With recent advances within the field of music data retrieval, there's a replacement chance that music will be mechanically analyzed and intelligible by the pc to some linguistics level. Because of the variety and richness of music content, several analyzers are following a mess of research topics during this field, starting from engineering science, digital signal process, arithmetic, and statistics applied to humanistic discipline.

Recent problems in music data retrieval embody automatic audio genre/mood classification, music similarity computation, audio creative person identification, audio-to-score alignment, query-by-singing/humming, multiple estimation and following, and so on. one amongst the possible applications is to supply content-based music recommendation. If we have a tendency to take one step more and utilize the context data, we are able to bring home the bacon additional intelligent context-based music recommendation.

An feeling could be a mental and state that is subjective and private; it involves heaps of behaviors, actions, thoughts and feelings. Initial analysis allotted on emotions will be derived to the book `The Expression of the Emotions in Man and Animals' by Darwin. Darwin believed emotions to be species-specific instead of culture-specific

.Facial Expression primarily based} feeling recommendation aims at scanning and deciphering the information and consequently making a list based the parameters provided. so projected system concentrate on sleuthing human feelings for developing emotion primarily based application system, that are the approaches utilized by accessible music players to notice emotions, that approach the music player follows to notice human feelings and the way it's

higher to use the projected system for emotion detection. It additionally provides temporary plan regarding the system operating, list generation and feeling classification.

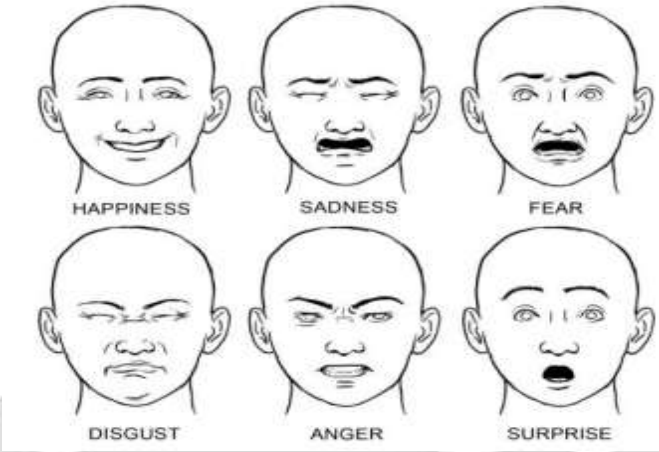

Fig-3: Types of Emotions

3.1 Architechture

The architecture of the proposed system is given below,

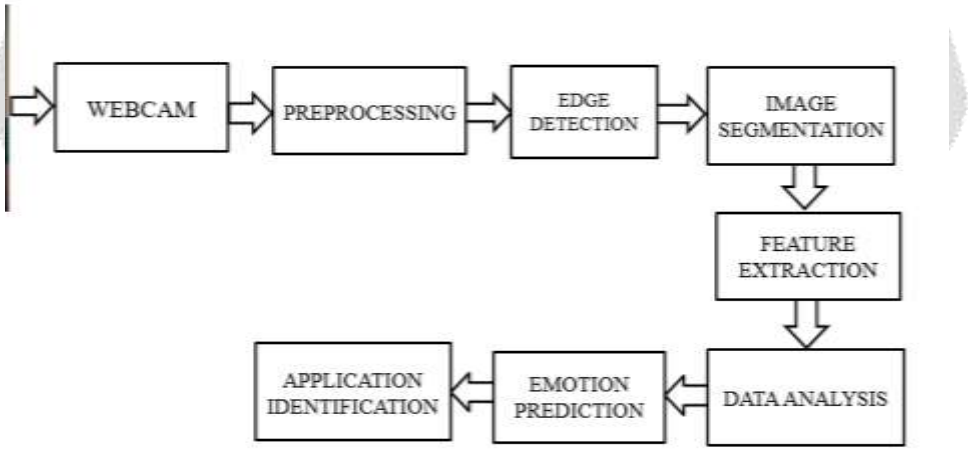

Fig-4: Architecture of Proposed System

3.2 Modules

The modules in extracting the image from human face, detecting human emotions and identifying the applications are given below

- Facial expression recognition
- Preprocessing
- Segmentation
- Feature extraction
- Eye extraction
- Eyebrow and mouth extraction
- Application identification

- **Facial expression recognition**

The input image to the system can be captured using a web cam or can be acquired from the hard disk. This image undergoes image enhancement, where tone mapping is applied to images with low contrast to restore the original contrast of the image.

- **Pre-Processing**

Pre-Processing plays a key role in overall process. Pre processing stage enhances the quality of input image and locates data of interest by removing noise and smoothing the image. It removes redundancy from image without the image detail. Pre-Processing also includes filtering and normalization of image which produces uniform size and rotated image.

- **Segmentation**

Segmentation separates image into meaningful reasons. Segmentation of an image is a method of dividing the image into homogenous, self-consistent regions corresponding to different objects in the image on the bases of texture, edge and intensity.

- **Feature extraction**

The facial image obtained from the face detection stage forms an input to the feature extraction stage. To obtain real time performance and to reduce time complexity, for the intent of expression recognition, only eyes and mouth are considered. The combination of two features is adequate to convey emotions accurately. Finally, a corner point detection algorithm was used to obtain the required corner points from the feature regions.

- **Eye extraction**

The eyes display strong vertical edges (horizontal transitions) due to its iris and eye white. Thus, the Sobel mask is applied to an image and the horizontal projection of vertical edges can be obtained to determine the Y coordinate of the eyes.

- **Eyebrow and mouth extraction**

Two rectangular regions in the edge image which lies directly above each of the eye regions are selected as the eyebrow regions. The edge images of these two areas are obtained for further refinement. Now sobel method was used in obtaining the edge image since it can detect more edges than Roberts method. These obtained edge images are then dilated and the holes are filled. The result edge images are used in refining the eyebrow regions. The top, bottom, right most and left most points of the mouth are been extracted and the centroid of the mouth is calculated.

- **Application identification**

The Proposed system is tested and experimented against an in-built camera, thus the total cost involved in implementation is almost negligible. Average estimated time for various modules of proposed system.

- All those songs that are cheerful, energetic and playful are classified under joy.
- Songs that are very depressing are classified under the class sad.
- Songs that reflect attitude, ‘anger associated with patriotism’, and are revengeful are classified under anger.
- The category Joy-Anger is associated with songs that possess anger in a playful mode.
- Sad-anger category is composed of all those songs that revolve around the theme of being extremely depressed and angry.
- All other songs apart from these general categories falls under the ‘other’ category.
- When a user is detected with emotions such as surprise and fear, the songs from the other category are suggested.

4. RESULTS AND DISCUSSIONS

The following are the results obtained for emotion classification and the required output for identifying the application.

4.1 Emotion recognition output

The emotions are classified from the normalized confusion matrix and the accurate emotions are recognized by testing and training method.

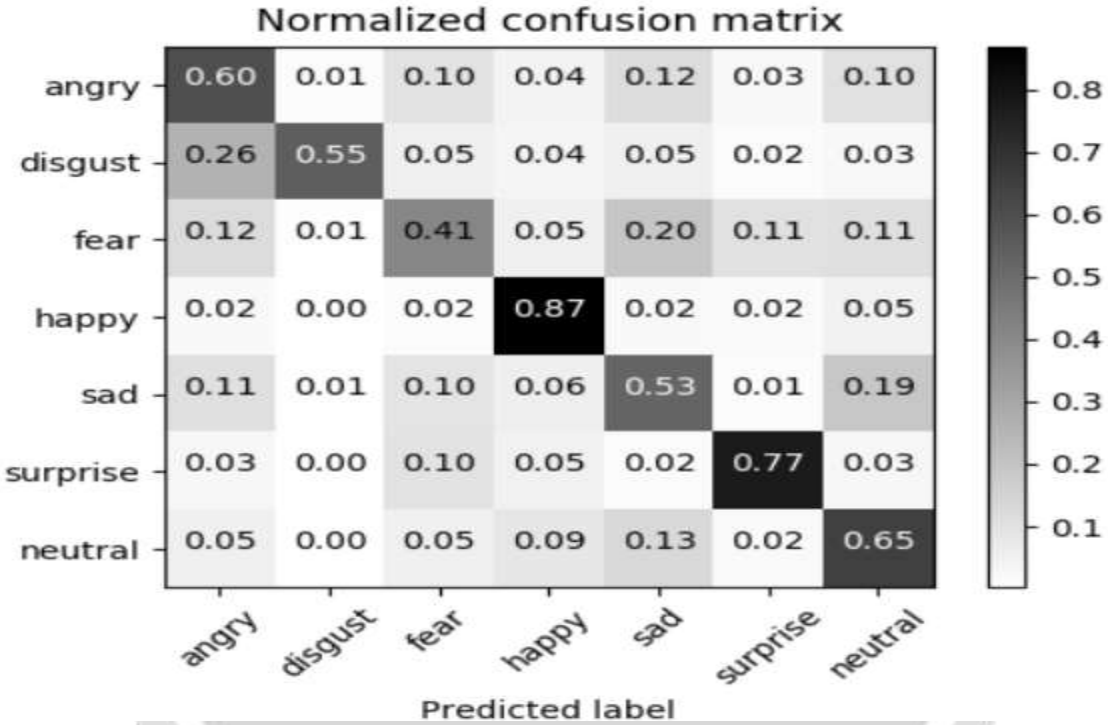

Fig-5: Normalized confusion matrix

The various emotions that can be recognized are

- Neutral
- Happy
- Sad
- Surprise
- Angry
- Fear

These emotions are classified according to the probability values which are obtained from the testing training data.

4.2 Output

Initially, the face is detected using a camera or webcam. The captured input undergoes pre-processing, edge detection, segmentation and feature extraction. The feature extracted values are the geometrical dimensions of every feature like eyes, nose, mouth, chin and eyebrows. These values are then analyzed to predict the accurate emotions. After the prediction of emotion the required applications are identified and displayed.

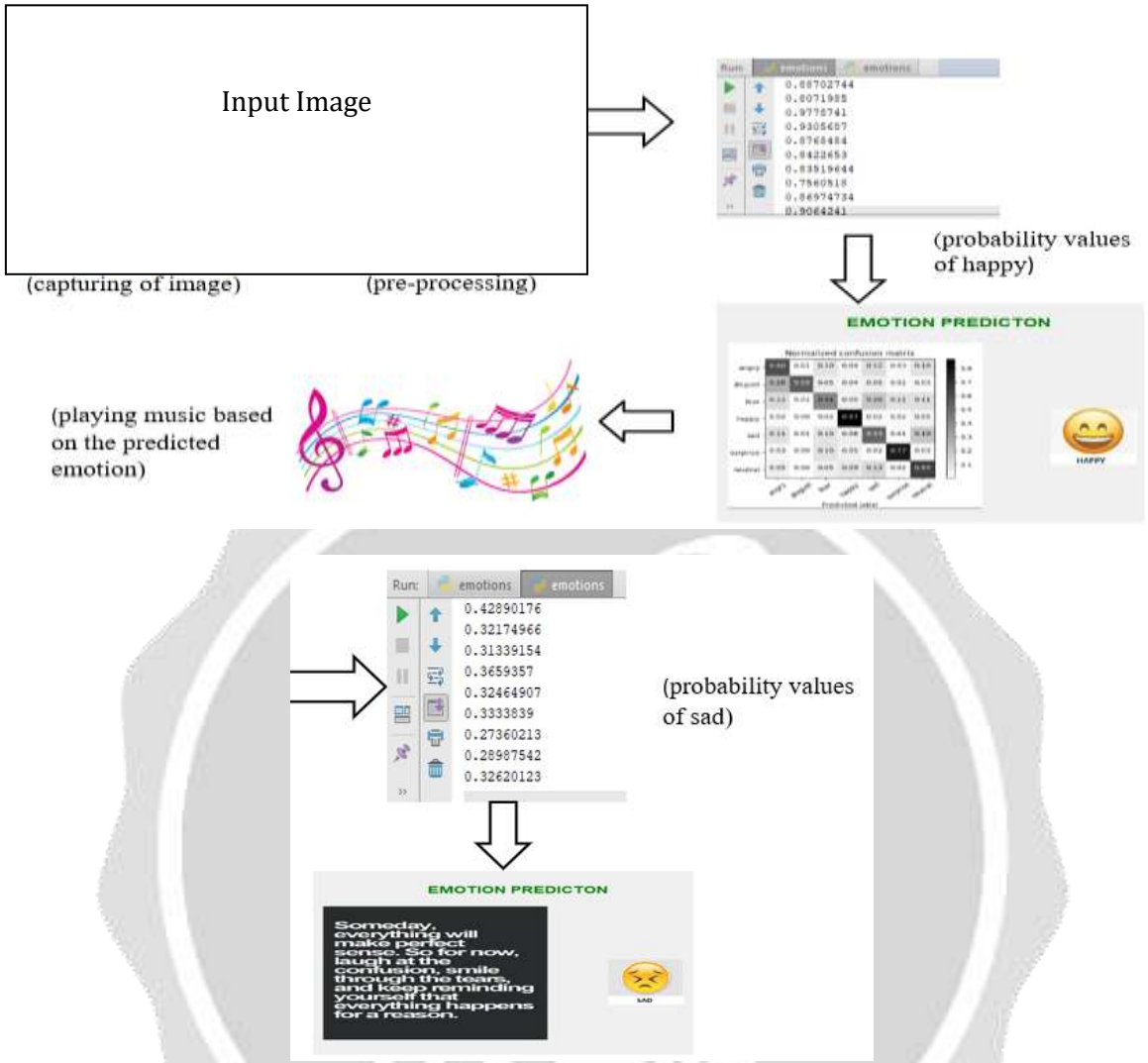

Fig-7: Flow of output

4.3 ANALYSIS

The remarkable achievement in emotion based application system is that it often needs multidisciplinary efforts such as emotion description, emotion detection, low level feature based classification and inference based recommendation. An emotion descriptor has been useful and effective in describing the application taxonomy. It describes the classification accuracy vs number of training samples of support vector machine and convolutional neural network. The overall acccuracy is computed on the basis of number of training samples. The training samples are used for the classification in both convolutional neural network and support vector machine.

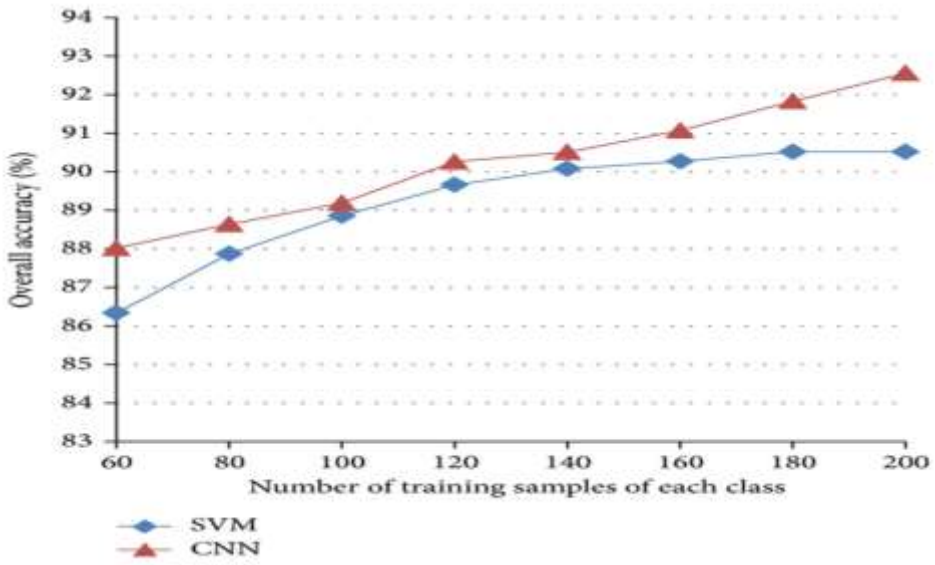

Chart-1: Comparison of accuracies

Thus the comparison of accuracies of Convolutional Neural Networks (CNN) and Support Vector Machine (SVM) shows that Convolutional Neural Network is more accurate. Hence Convolutional Neural Networks can be used for the classification of training samples.

5. CONCLUSION

The project presents a generic model to recommend applications based on the user emotions. The core of our proposed approach is to construct the recommendation model from music, for music plays an important role in conveying emotions of the users. The fundamental purpose of the system was to change or maintain the emotional state of the user and boost up the mood of the user by exploring music tracks or providing motivational quotes with specific attributes.

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