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# SMART MUSIC PLAYER THAT IS BASED ON REAL-TIME FACIAL EXPRESSION IN REAL TIME

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***Abstract:*** Human emotions play an important role in what's going on in one's life. Human beings use their emotions use facial expressions to express their feelings to each other. Usually, we also use their hand gestures and tone of voice as one of the representative to express one's feelings. Sometimes human beings tend to change their mood because of other people by their alternative ways. Human beings are endless advanced machines they have the best prediction of level with high power of accuracy. Human mood is mandatory to determine the current mood of an individual person. They have the curve of smile, eyes, cheeks, even forehead. When human beings are sad or angry, they tend to spend their time with friends or close one or may be by listen to music. Music is one of the flair thing that clams human being anatomy and brain. Taking all these two ingredients and mixing them together our project dealt with predicting the emotion of the individual person through their facial expressions with playing music according their current mood. In our project, we provide individual songs according to user current mood or for the betterment of mood.

**Key Words:** Human emotions, Expressions, Music, Mood, Betterment.

## I. INTRODUCTION

In human beings face is the most important organ for an individual person. Through that people will tend to express as well as identify emotions for themselves while communicating each other. Music plays one of the vital role in keeping human beings an individual with a peace of mind and it is art of living which completes the happiness of human being. Music is great tool which turns out the stress, tensity. Music is always boon to an individual person of it's mindset. With this advance of technology manual work tends to be in the last line automation of gaining attention. In our proposed system, it aims to predict the human emotion of an individual person which will be the input by end user. In this regards, the end user will be asked whether they were willing to listen songs according their current mood or betterment of their mood which will be followed by playing songs over Youtube. In our system, we purely takes respective individual moods i.e, Happy, Sad, Angry, Neutral, or Surprise. This system offers an intelligent agent it will categorizes all types of emotions as different collections which will play songs eventually and recommends appropriate playlists to the user through their current mood or of their choice for betterment of their mood.

## II. OBJECTIVES OF THE STUDY

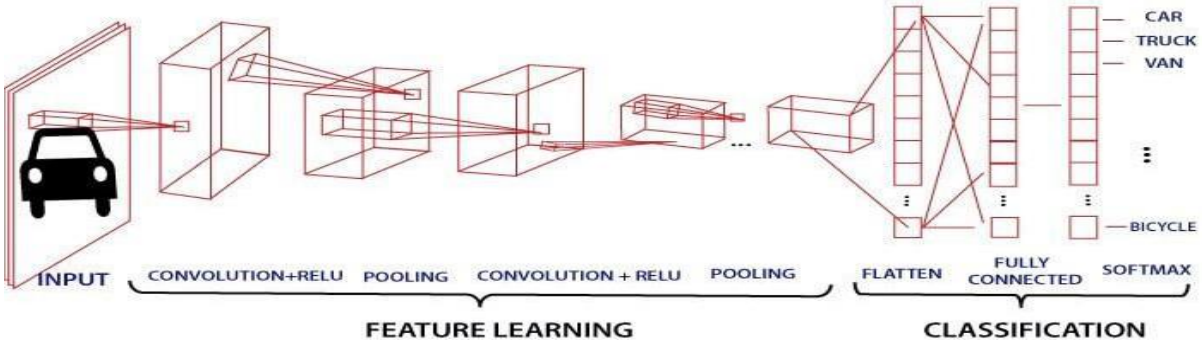
**[1].** We came across many applications that are serve solutions and assistance for the music playlist creation recommendation.
**[2].** To provide more facility and the solutions to the music creation and recommendation of music an numerous technique approaches have followed in our proposed system.
**[3].** To determine the approached and developing the current state of human emotion and playing through the mood determined by the system.
**[4].** Our proposed system mainly focuses on playing and recommending the songs according to end user current mood or betterment of the mood.

## III. RESEARCH ON PROPOSED METHODOLOGY

### CNN ALGORITHM

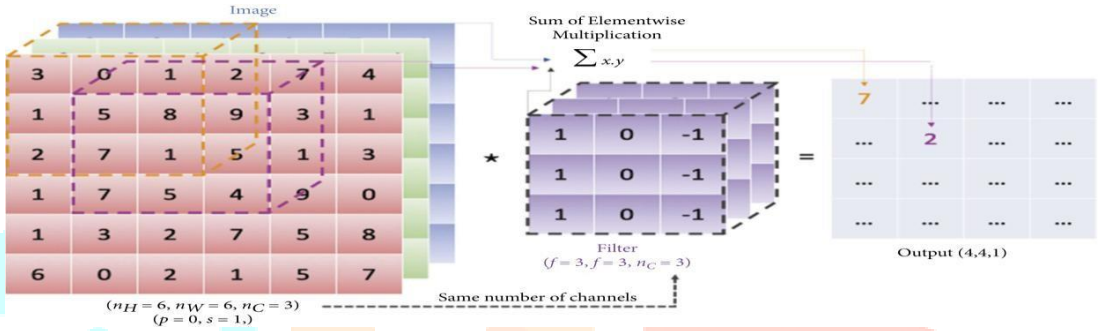
Convolutional Neural Network is one of the main important algorithm that categories the image classification and image extraction in neural networks. These Convolutional neural networks that are widely in Scene labeling, objects detections, and face recognition, etc., CNN takes an image as input, which will classifies and process under a certain category such as Voice, image, object etc. The System sees an image as an array of pixels that depends on the resolution of the image. According to an image resolution, it will see as **h * w * d**, where h= height w= width and d= dimension. For example, An RGB image is **6 * 6 * 3** array of the matrix, and the grayscale image is **4 * 4 * 1** array of the matrix.

In CNN, each input image will passes through a sequence of convolution layers along with pooling, fully connected layers, filters . After that, it will apply the max function to classify an object extraction with probabilistic values 0 and 1.




**Convolution Layer**

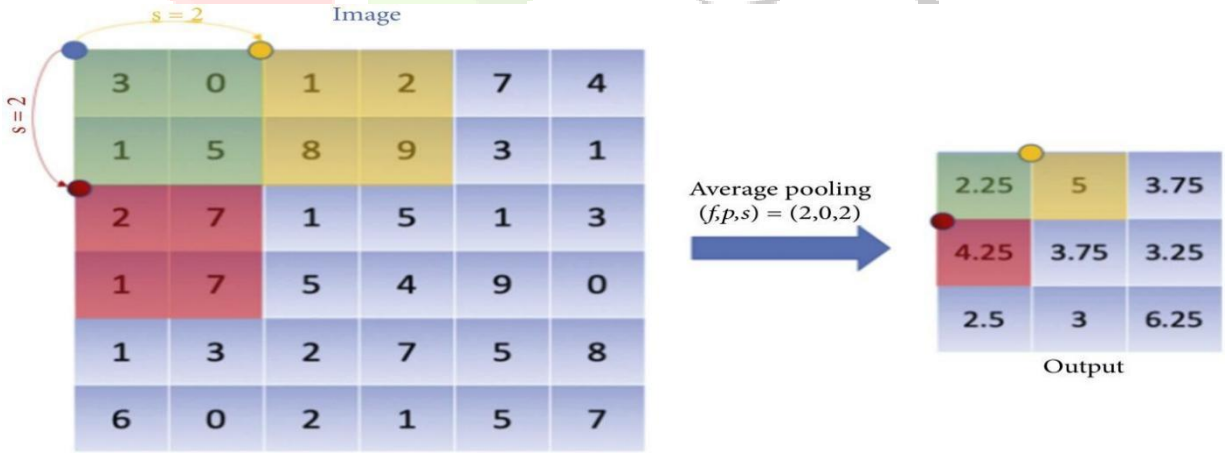
This convolutional layer represents CNVL which is the key for construction block of neural networks. The main goal of this layer is to take the features from image's. In a considerable image, a tiny section is taken and passed through all points in the big image. At the time of passing the data at every point of time, they are convoluted within a single time. In this each small section which includes over the big image called kernel or filter. This activation function creates map into the output image. The following is the activation map of sustained input data.




In this typical convolutional layer, the operations that are shown in the figure denotes the input image by where the height, the width size of the feature map and number of channels respectively.

**Pooling Layer**

This layer depicts the max pooling operation. These layer sub sampling which means simply down sampling the image and it also reduces the dimension of each activation function. But it keeps most information that is necessary. Therefore, a single output produced by sub sampling of smallest region of convolutional layer output. The max pooling, average pooling and mean pooling are pooling techniques which are used in the convolutional layer to determine the image features. The main aim of this layer is achieving faster convergence and generalization, robustness.



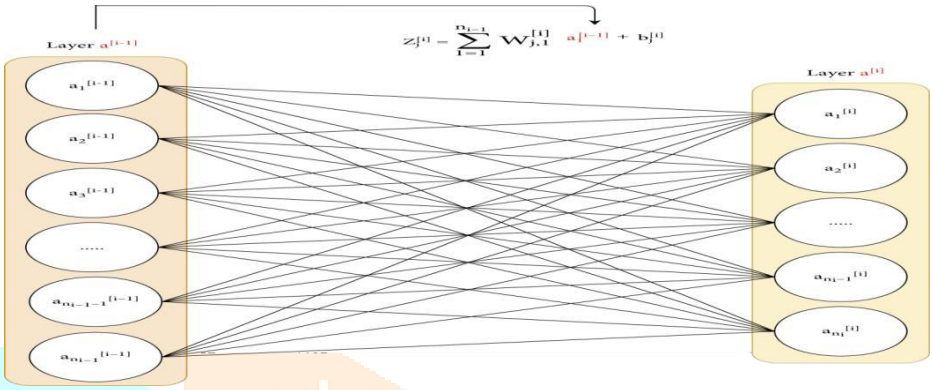
There are some alternatives to CNNs which allows to further decrease of the parameters.

**Rectified Linear Unit Layer**

This rectified linear unit layer is also called as ReLU activation layer. This layer is non linearity activation function which is applied in feature extraction function by convolutional layer. Also, it is an operation which replaces all the negative values by zero.

**Fully Connected Layer**

Fully connected layer depicts the FCL , it provides finite number of neurons that are takes one vector as input and return another. For example, we consider a node as an layer and the output is defined as equation in the following figure.




**The Batch Normalization Layer**

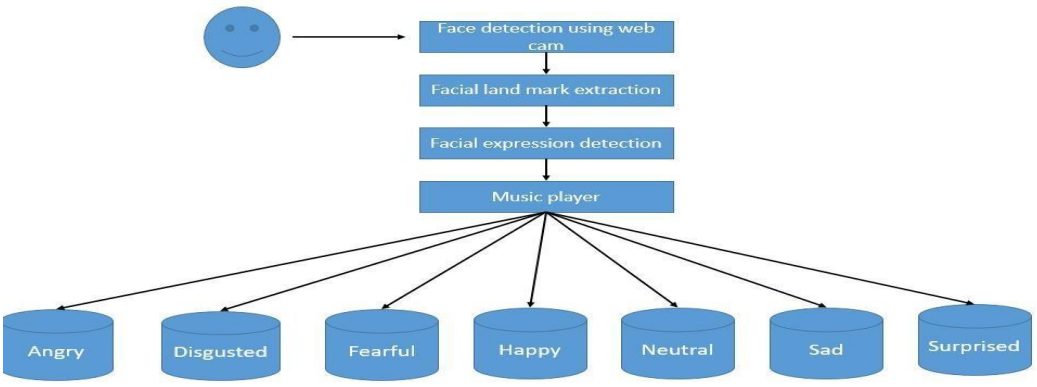
For reducing the training time of any CNN and initializing the sensitivity network, we often use the batch normalization layer. In the batch normalization layers, the activators are calculated using balance factor and it's scale factor. During training process these factors are learnable things renovated to the most suitable values.

**Softmax and Classification Layer**

This classification layer is the last layer habitually used in CNN. Softmax function is utilized generally in CNNs in order to match non normalized values of the previous layers for proving distribution of predicted scores. Where the softmax function refers to the output provided according to each input vector values.

## IV. SYSTEM DESIGN

In proposed system design , we are describing the overall features of the software is that are concerned with defining the requirements and establishing the high level of the system. During architectural design, the different web pages and their interconnections are identified and designed. The important software components that are identified and decomposed into processing modules and conceptual data structures and their interconnections among the modules are identified. The following figure describes the modules that are identified in designing the proposed system.



**ALGORITHM**

**Step 1:** The user provides input to the system through webcam of the user.

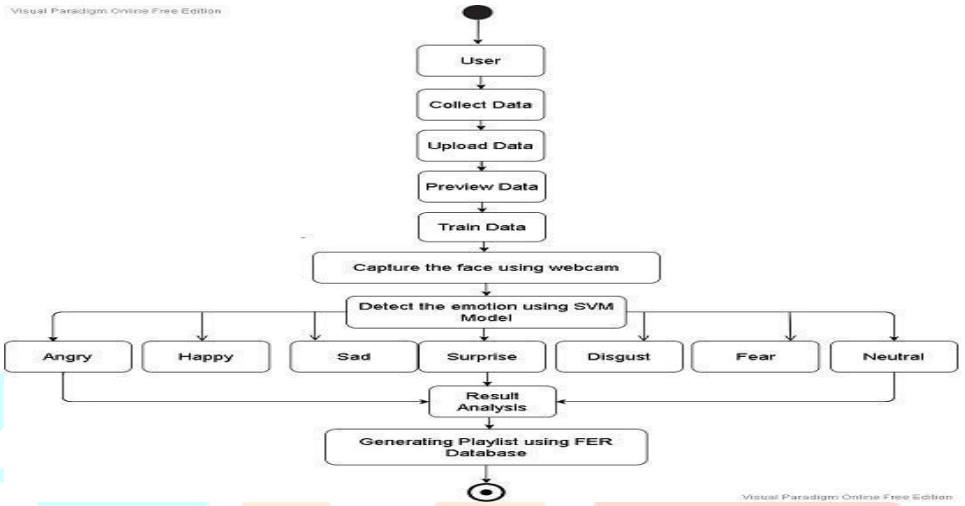
**Step 2:** The image gets analyzed by our model and gets classified as an happy, sad , neutral or angry emotion.

**Step 3:** The trained datasets get extracted and detected with the data provided by end user.

**Step 4:** The playlist or songs are played according to the user current mood or betterment of current mood..

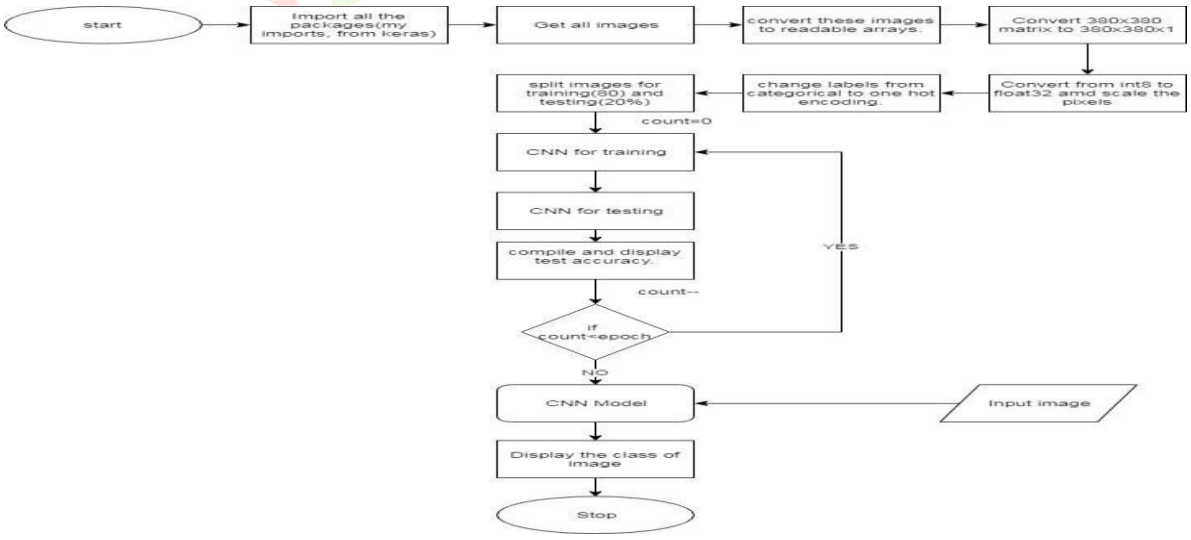
**Step 5:** The music gets played to boost the user's mood after successful detection of the sentiments.

**Flow Chart:**




## V. SYSTEM IMPLEMENTATION

For implementing face identification we use OpenCV, HAAR Cascades. HAAR feature based cascade is effective for object identification. The face can be identified in two ways. First one from static method and another one is dynamic or webcam feed. HAAR Cascades is used for both methods. OpenCV's HAAR Cascades is pre-trained classifiers to identify faces. For static face identification, first we need to load the XML classifiers. For real time face identification the image is sent through the Dlib face identifier library if it doesn't identified it will change to OpenCV's HAAR Cascades. Face identification works by computing HOG feature and SVM. For emotion identification, we use CNN algorithm. First we require all the packages throughout the module are imported. After this, all images from dataset are read from file. Here, In this work depth of the image is 1 and the input is a grey scale image.



**SYSTEM ANALYSIS**

In this analysis the users were given some instructions as what to be done to perform the prediction of the emotion expressed which provided the following results. Sometimes, the user inner emotion is sad and facial expression is happy it results fail case. The values are given Table and the result is shown in the following figure.

**Table.** Result Accuracy of Facial expressions of user

| | Anger | Disgust | Fear | Happiness | Sadness | Surprise |
|---|---|---|---|---|---|---|
| Anger | 92.5 | 2.5 | 0 | 0 | 5 | 0 |
| Disgust | 0 | 96.67 | 1.67 | 0 | 1.67 | 0 |
| Fear | 0 | 0 | 92 | 8 | 0 | 0 |
| Happiness | 0 | 3.08 | 1.54 | 95.38 | 0 | 0 |
| Sadness | 6.67 | 0 | 3.33 | 0 | 87.67 | 3.33 |
| Surprise | 0 | 0 | 2.5 | 0 | 2.5 | 95 |

**COMPARISION BETWEEN PREVIOUS MODELS AND PROPOSED SYSTEM**

Compared to previous systems this proposed study proposes a Human face emotion and song playing either according to the current mood of the user. The image is captured through web camera. after taking the picture the captured frame of the image is then converted into a grey scale image and classifier algorithm converts the image where an individual features are extracted from the face. The emotion of user gets detected and recognized with the help of patterns and then making decisions will help the user to get his betterment of mood. The following Table-IV it shows the overall performance of the classifier comparison of previous and proposed systems.

Table IV. Overall Performance of the Classifier

| Classifiers | Categories | Precision | Recall | F1-Score |
|---|---|---|---|---|
| KNN | Happy | 0.77 | 0.93 | 0.84 |
| | Crying | 0.50 | 0.45 | 0.47 |
| | Sleeping | 0.94 | 0.57 | 0.71 |
| SVM | Happy | 0.77 | 0.83 | 0.80 |
| | Crying | 0.45 | 0.45 | 0.45 |
| | Sleeping | 0.88 | 0.70 | 0.78 |
| Proposed CNN Model | Happy | 0.83 | 0.94 | 0.88 |
| | Crying | 0.82 | 0.83 | 0.82 |
| | Sleeping | 1.0 | 0.93 | 0.96 |

**VI. RESULT AND DISCUSSION**

Even though the proposed model has been trained on combined dataset, it has been successful to achieve validation accuracy of 96.24%. This model has succeeded to maintain higher and nearly equal recognition rate for each class as well as it can classify geometrically displaced face images.

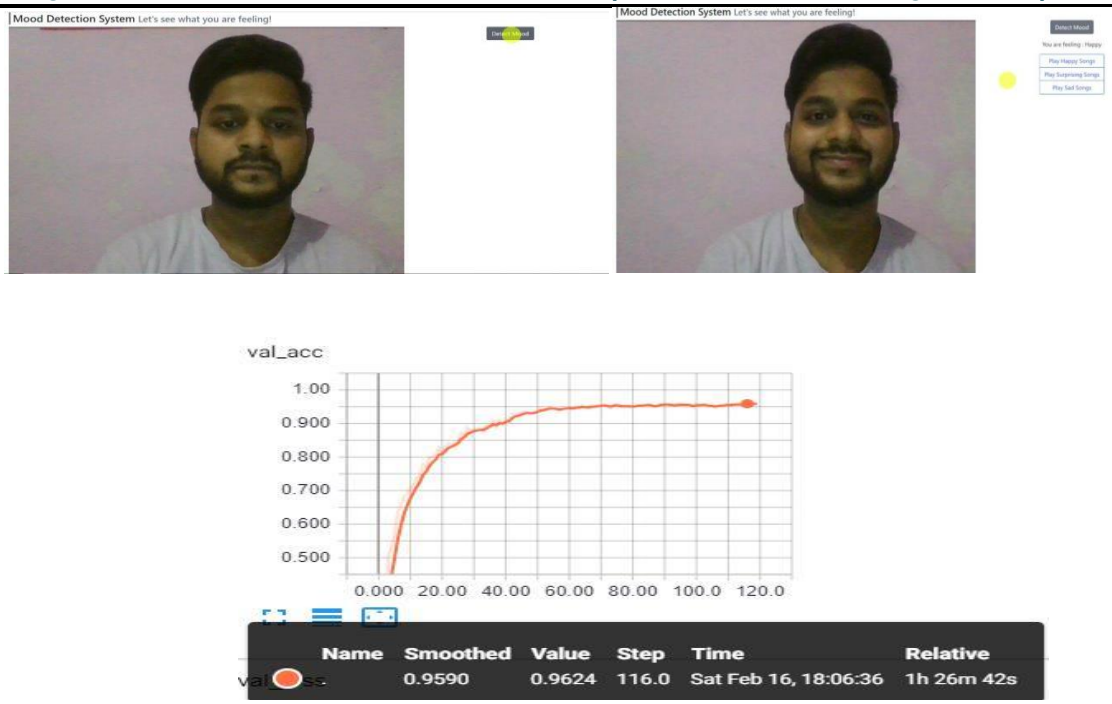



**Figure.** Real Time Evaluation of Model Training.

## VII. CONCLUSION

In this paper, we have discussed that how our proposed system recommend music based on facial expression using machine learning algorithms. The proposed system is also scalable for recommending music based on facial expressions by using techniques after collecting data. The system is not having complex process to recommend music that the data like the existing system. Proposed system gives genuine and fast result than existing system. Here in this system we use machine learning algorithms to recommend music based on real time facial expression. This proposed system is developed with the help of a Machine learning module in Python Script. We have used OpenCV, TensorFlow, Keras, Web Browser and of course Python Scripting to develop this automated system. This will eventually help the person and calm the user mood appreciate to their wise choice that will help him to improve their mood. The songs will be played with a particular emotion playlist according to the emotion detected.

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