

# **FINAL YEAR PROJECT REPORT ON FACE MOOD DETECTOR**

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This Report Presented in Partial Fulfillment of the Requirements for the Degree  
of Bachelor of Science in Computer Science and Engineering

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## **APPROVAL**

This Project titled “**Face Mood Detector**”, submitted by Md. Tariqul Islam ID no:151-15-5050, Umme Tabassum ID no:151-15-4902 and Md. Mehedi Hasan ID no:142-15-3993 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering (B.Sc) and approved as to its style and contents. The presentation has been held on November 21, 2018.

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## DECLARATION

We hereby declare that, this project “**Face Mood Detector**” has been done by us under the supervision of **Saiful Islam, Lecturer, and Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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Above all, we would like to thank all our friends whose direct and indirect support helped us in last six months to go ahead our Thesis. The thesis would have been impossible without their perpetual moral support.

## ABSTRACT

Modern world is changing in each pulse. New technologies are taking place in every sector of our day to day life. Image processing is one of the major pioneer in this changing world. With a single click many thing are taking place. Many things are possible with the help of an image. A text image can be converted from one language to another without any help from a human interpreter. One can also save his or her time to text someone with an image as a single image explains many things. Images are also used to identify a person on the social media and in many other web. For this fact Face Detection is getting very popular every day. With the help of Face Detection it is possible to identify a person very easily. What if one could tell what type of emotional state a person is in? It would help one to approach that person. For example if a person is sad can do something to make him or her feel happy and so on. In this project it has been searched that is it possible to identify a person is it possible to identify a person's emotional state. Then it has been also researched to suggest music on the basis of his or her emotion.

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# Chapter 1

## Introduction

### 1.1 Introduction

The human face is an important organ of an individual's body and it especially plays an important role in extraction of an individual's behavior and emotional state. As humans, we classify emotions all the time without knowing it.

Nowadays people spend lots of time with their works. Sometimes they forget that they should also find some time for themselves. In spite of their busyness if they see their facial expression then they may be try to do something different. For example, suppose if anyone see that his or her facial expression is happy then he or she will try to be more happier. On the other hand, if anyone see that his or her facial expression is sad then he or she will improve his or her mental condition. Facial expression plays an important role for detecting human emotion. It is a valuable indicator of a person. In a word an expression sends a message to a person about his or her internal feeling. Facial expression is the most important application of image processing. In the present age , a huge research work on the field of image processing. Facial image based mood detection techniques provides a fast and useful result for mood detection. The process of recognizing the expression of feelings through facial emotion was an interesting object since the time of Aristotle. After 1960 this topic became more popular , when a list of universal emotion was established and different system were proposed. Because of the arrival of modern technology our expectation goes high and it has no limitation. As a result people try to improve this image based mood detection in different ways. There are six basic universal emotions for human beings. These are happy, sad, angry, fear, disgust and surprise. From human's facial expression we can easily detect this emotion. In this research we will proposed a useful way to detect happy, sad and angry these three emotions from frontal facial emotion.

Our aim, which we believe we have reached, was to develop a method of face mood detection that is fast, robust, reasonably simple and accurate with a relatively simple and

easy to understand algorithms and techniques. The examples provided in this thesis are real-time and taken from our own surroundings.

## **1.2 Motivation**

In previous time, for psychologist, analyzing facial expression was an essential part. Nowadays image processing have motivated significantly on research work of automatic face mood detection. There are lots of depressed people lived in our society. Also lots of busy people those who do not know their present mental condition. So we try to develop such an application and by this application they will able to see their present mental condition.

## **1.3 Rational of the Study**

Image Processing is a useful method for performing different operations on an image to get a better image or to get some useful information from it. Normally image processing method consider an images as a two dimensional signals. Because of this usefulness of image processing, in our research we are dealing with this method. Mainly the project aim is to detect human's facial expression by applying image processing techniques and send them a massage about their internal feelings based on their facial expression. Those people who remain submerged in despair, this application is more beneficial for them. This application can get rid of their stress by playing music or jokes automatically. We hope that this application will bring a significant change of human life.

## **1.4 Research Questions**

During our research work, we faced different kinds of questions. Some types of questions was –

- Which platform will choose for development?
- Which facial parts will use for development?
- Is it able to take image form both saved image and instant image?
- Can it use both back and front camera?
- Can it detect multiple faces?
- Which database is used?
- Which procedure is followed for collecting data?
- Is database separate for different emotion?
- Can it able to show 100% accurate result?

## **1.5 Expected Output**

The outcome of face mood detection project is given bellow:-

- Can detect facial mood expression.
- It will suggest music or jokes.
- User friendly and reliable application.
- User can get rid of their mental depression and also release their tension.

## **1.6 Report Layout**

### **Chapter 1: Introduction**

We discuss about the motivation, objectives and expected outcome of the project in this chapter.

### **Chapter 2: Background**

In this chapter we have discussed all the research and their work and also discussed the scope of problems and which challenges that we faced.

### **Chapter 3: Research Methodology**

This chapter is about the working methodology such as which algorithms are used in for this project and also discussed data collection procedure and method and provides a statistical analysis about the project.

### **Chapter 4: Design Specification**

This chapter provides a clear idea about the internal and external work.

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### **Chapter 5: Experimental Results and Discussion**

In this chapter we provide the experimental result of all expressions and discuss the process of recognizing expression in descriptive analysis part.

### **Chapter 6: Summary, Conclusion and Implication for Future Research**

In this chapter we have discussed all the process in short and our target in future on this project.

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## **Chapter 2**

### **Background**

#### **2.1 Introduction**

In this chapter we will describe all the existing research work related to our idea and will discuss their works. We will find the strong and weakness of those research work.

We will find the difference between them and our research work and also talk about their limitations.

We will also describe the problem of our existing apps and why our apps is the best.

Lastly we will describe the challenges of our research work.

#### **2.2 Related works**

we have studied on some research work to determine the feasibility study of our apps and research work and also discuss about which kind of apps they are using to solve their daily life problem and what kind of features we can add to our apps.

Here we will explain the related research works.

Here the list of some research paper:

- Infant facial expression and cries [1]
- Emotion recognition by Dynamic HOG features [2]
- emotion based music player for android [3]
- Emotion recognition system for mobile application [4]
- Automatic Recognition of Facial Displays of Unfelt Emotions [5]
- An Emotion Recognition Challenge [6]
- Mood Prediction from Facial Video with Music “Therapy” on a Smartphone [7]
- Emotion based mood enhancing music recommendation [8]
- Face Analysis of Aggressive Moods in Automobile Driving Using Mutual Subspace method [9]

## 2.3 Comparative Study

We will compare our research work with another research works and applications. We are actually study that research work and try to learn about them. We studied so many things from that research work and find many things such as algorithm, accuracy of that apps etc. all this research work are emotions analysis.

- “Infant facial expression and cries” [1] in this paper author worked with infant emotions. Author work with infants eyes and mouth .author used clustering method, harmonic spectrum method. The accuracy of that Research is 75.2%.
- ”Emotion recognition by dynamic HOG features” [2] in this paper author elaborated an emotion recognition framework using dynamic dense grid-based HoG features. Proposed method performs better than static Uniform LBP implementation, used in the “baseline method” offered by the challenge organizers. The accuracy of emotion detection is 70%.
- “Emotion based music player for android “ [3]in this paper author worked with emotion. Author work with viola and jones algorithm, support vector machines (SVM) method.
- “Emotion recognition system for mobile application” [4] in this paper author work with facial emotions. Author use viola and jones algorithm .in this research author found 92.7% accuracy.
- “Automatic Recognition of Facial Displays of Unfelt Emotions” [5] in this paper author work with emotions. Author was worked with simulation theory and also work with felt and unfelt emotions. After testing 51% accuracy was gain.
- “An Emotion Recognition Challenge” [6] in this paper author used baseline method, principal component analysis (PCA) algorithm. The accuracy of this research work is 62.3%.
- “Mood Prediction from Facial Video with Music “Therapy” on a Smartphone” [7]This paper presents a prototype desktop version and a smartphone app which analyses the mood of a video and predict the user’s mood. The app can play songs and change the song according to the mood analyzed. Accuracy of this work is 60%.

- ”emotion based mood enhancing music recommendation” [8] The system captures user’s image using camera and detects his face. It then detects the emotion and makes a list of songs which will enhance his mood as the songs keep playing. EmoPlayer uses Viola Jones algorithm for face detection and Fisherfaces classifier for emotion classification. The accuracy of this system is 80%.

## **2.4 Scope of the Problem**

Many apps are found in google play store which was actually not detect emotion, but our apps is actually detect emotion.

Other apps are not suggested anything to improve emotions but our apps is suggest song and jokes to improve Emotions.

By took a photo or image we can easily detect another people emotions.

We can easily analyze another people’s emotions with the help of our apps. That’s we easily communicate with People.

## **2.5 Challenges**

Actually all work in the world has some challenges too. Our application has some challenges too.

We have to provide huge time to detect human emotions.

Another challenge is work with back camera. We face many difficulties with back camera of the android Phone.

## **Chapter 3**

### **Requirement Specification**

#### **3.1 Introduction**

Image processing is a technique that can convert an image into digital form and perform different kinds of operation on it for getting better image and useful information. Image processing technique used two types of method. These are analog and digital image processing. Analog technique can be used for hard copies and digital technique used for manipulating digital image. The purpose of image processing is divided into five groups. These are: visualization, image sharpening, image retrieval, measurement of pattern, image recognition. Visualization observe invisible object. Image sharpening that makes better image. Image retrieval finds interesting image. Measurement of pattern measures different objects of an image. Image recognition finds the difference of an image.

#### **3.2 Research Subject and Instrumentation:**

##### **3.2.1 PCA:**

In high-dimensional data, this method is designed to model linear variation. Its goal is to find a set of mutually orthogonal basis functions that capture the directions of maximum variance in the data and for which the coefficients are pairwise decorrelated. For linearly embedded manifolds, PCA is guaranteed to discover the dimensionality of the manifold and produces a compact representation. PCA was used to describe face image in terms of a set of basic functions or "Eigen face". Eigen face was introduced early on as a powerful use of principal components analysis (PCA) to solve problems in face recognition and detection. PCA is an unsupervised technique, so the method does not rely on class information. In our implementation of Eigen faces, we use the nearest neighbor (NN) approach to classify our test vectors using the Euclidean distance.

### **3.2.2 MPCA:**

One extension of PCA is that of applying PCA to tensors or multilinear arrays which results in a method known as multilinear principal components analysis (MPCA). Since a face image is most naturally array, meaning that there are two dimensions describing the location of each pixel in a face image, the idea is to determine a multilinear projection for the image, instead of forming a one-dimensional (1D) vector from the face image and finding a linear projection for the vector. It is through that the multilinear projection will better capture the correlation between neighborhood pixels that is otherwise lost in forming a 1D vector from the image.

### **3.2.3 Machine Learning Algorithms**

One of the most important applications of artificial intelligence is machine learning. It provides the application that can automatically learn and improve from experience without being apparently programmed. The learning process starts with observations or data. Such as, we can assume a good decision based on direct experience or instruction. The basic aim is to allow the device without human interruption.

Mostly machine learning algorithm is classified into two types. These are supervised and unsupervised learning.

#### **Supervised Machine Learning Algorithms:**

Supervised learning algorithms able to do different analysis with new data based on what it learned from the past and can also predict future event. The supervised learning algorithms create deduced function for predicting the starting analysis of known training data and output values. After some effective training the system makes a target for any new inputs. The system is able to compare its output with correct output and also find error for modification.

### **Unsupervised Machine Learning Algorithms:**

Unsupervised machine learning algorithms are used for training unclassified and those data which are not leveled. Unsupervised learning is able to describe a secret shape from unleveled data. This system can't provide proper output but it is able to take important decision from data set for describing secret shape from unleveled data.

### **Semi-supervised Machine Learning Algorithms:**

Semi-supervised machine algorithms lies between supervised and unsupervised learning. For training they use both leveled and unleveled data but in this training data there are a small amount of leveled data and a huge amount of unleveled data. By using this method the systems are able to develop learning exactitude. Normally semi-supervised learning algorithms are used when leveled data need proficient and relevant resource for training.

### 3.3 Data Collection Procedure:

For face mood analysis we need some data of human pictures for analyzing the mood. Following some procedure:

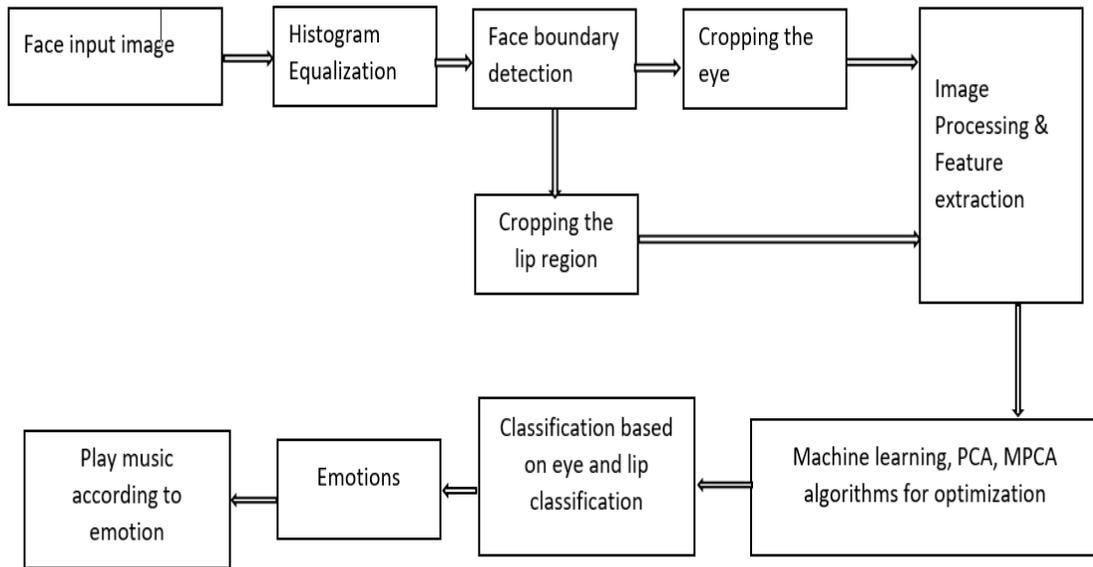


Figure 3.3.1: Block Diagram for Data Collection Procedure.

Select an image from camera or gallery as input. By PCA and MPCA analyze face boundary detection, cropping eye and lip. Then machine learning kit process it for further work which has train data and it is developed by google.

### Data collection methods:

- Direct image from camera.
- Take image from gallery

### Instrument to collect data:

- Camera
- Bluetooth
- SHAREit
- Email

### 3.4 Statistical Analysis:

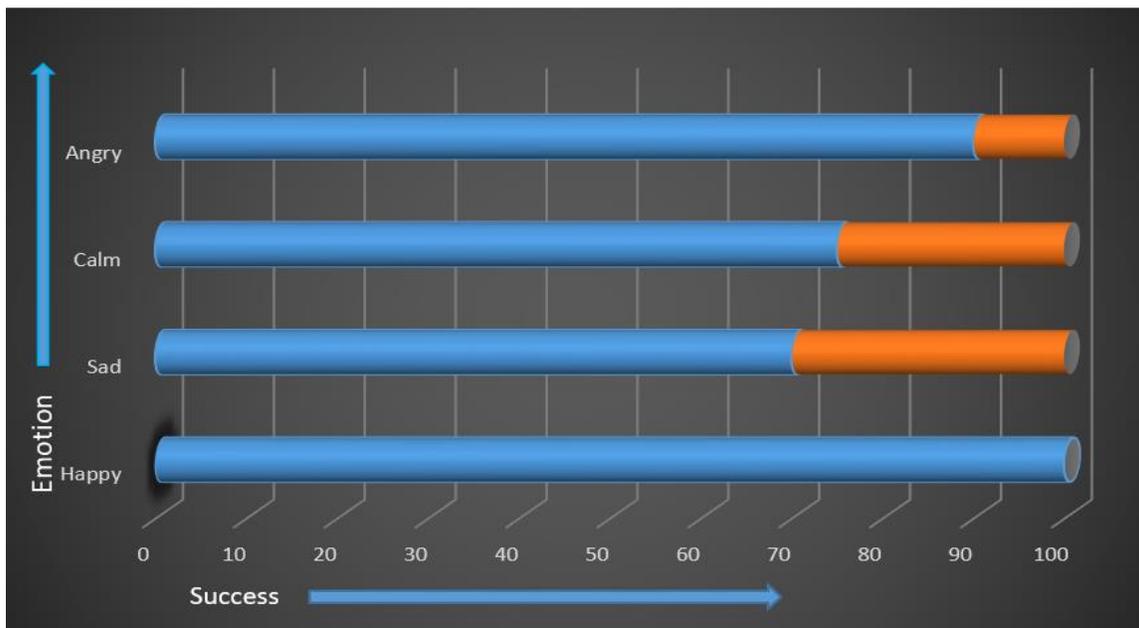


Figure 3.4.1 shows statistical overview.

If we see the above statistical overview, we can get a clear idea that our project gives almost perfect output about happy and angry facial expression. But it faces some problems to detect sad and calm facial expression. Sometimes it provides sad expression instead of calm and also sometimes provides the opposite output.

### **3.5 Implementation Requirements:**

For developing our project we use some software. These are given bellow:

- Android
- Html & CSS
- Firebase
- Google API

Android is a mobile operating system which is developed by google. It is the most useable Operating System and everyone can easily understand this. Html & CSS is used for design. Firebase is used for storing and synchronizing data. It provides a real time database. Google API is used for train data.

## Chapter 4

### Design Specification

#### 4.1 Introduction

In this chapter we will describe front-end and back-end design specification. For an application front-end design is the most important thing, because at first, most of the user becomes attracted by watching the front-end of an application. Front-end design is essential for better user service for our application and we focus on it. Back-end design is also the most important thing for storing data or information. For our application we also create back-end design. We create database where we store songs and user information of our application.

#### 4.2 Front-end Design

Some front-end designs of the project are given bellow.

##### 4.2.1 Home Page

Figure 4.2.1 shows the home page.



Figure 4.2.1: Home page

When user open the application the user can see the home page of the application. In the bottom part of the home page user can see a get started button. If the user is interested to go to the next step, user have to click Get Started button. By clicking Get Started button user will able to enter the next step.

## 4.2.2 Registration

Figure 4.2.2 shows the registration page.

For getting extra awesome feature you should register  
Please use email to register

Name

Email

Password

CANCEL REGISTER

By getting started you are agree with terms of services

For getting extra awesome feature you should register  
Please use email to register

Name  
Mehedi

Email  
mehedi15-3993@diu.edu.bd

Password  
.....

CANCEL REGISTER

By getting started you are agree with terms of services

Figure 4.2.2: Registration page

For going next step every user must be registered for the first time. No need to be registered every time. For registration user must be provide valid Name, Email address and password.

### 4.2.3 Input Process

Figure 4.2.3 shows the input process.

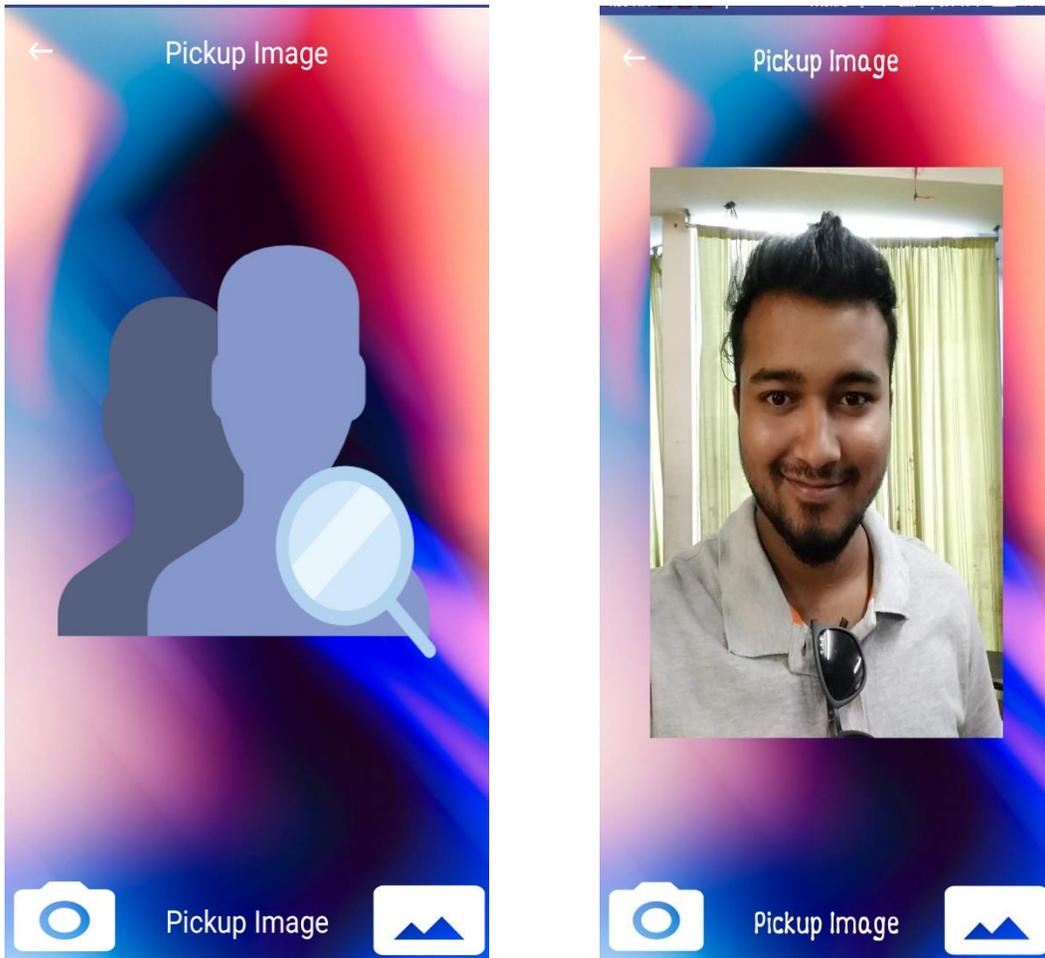


Figure 4.2.3: Input Process.

There are two options for input image. We can input image by using front and back camera of the application directly and also we can input image from gallery of the phone which image is already captured. And after that the image will show in the display.

#### 4.2.4 Output

Figure 4.2.4 shows the final result of an output.

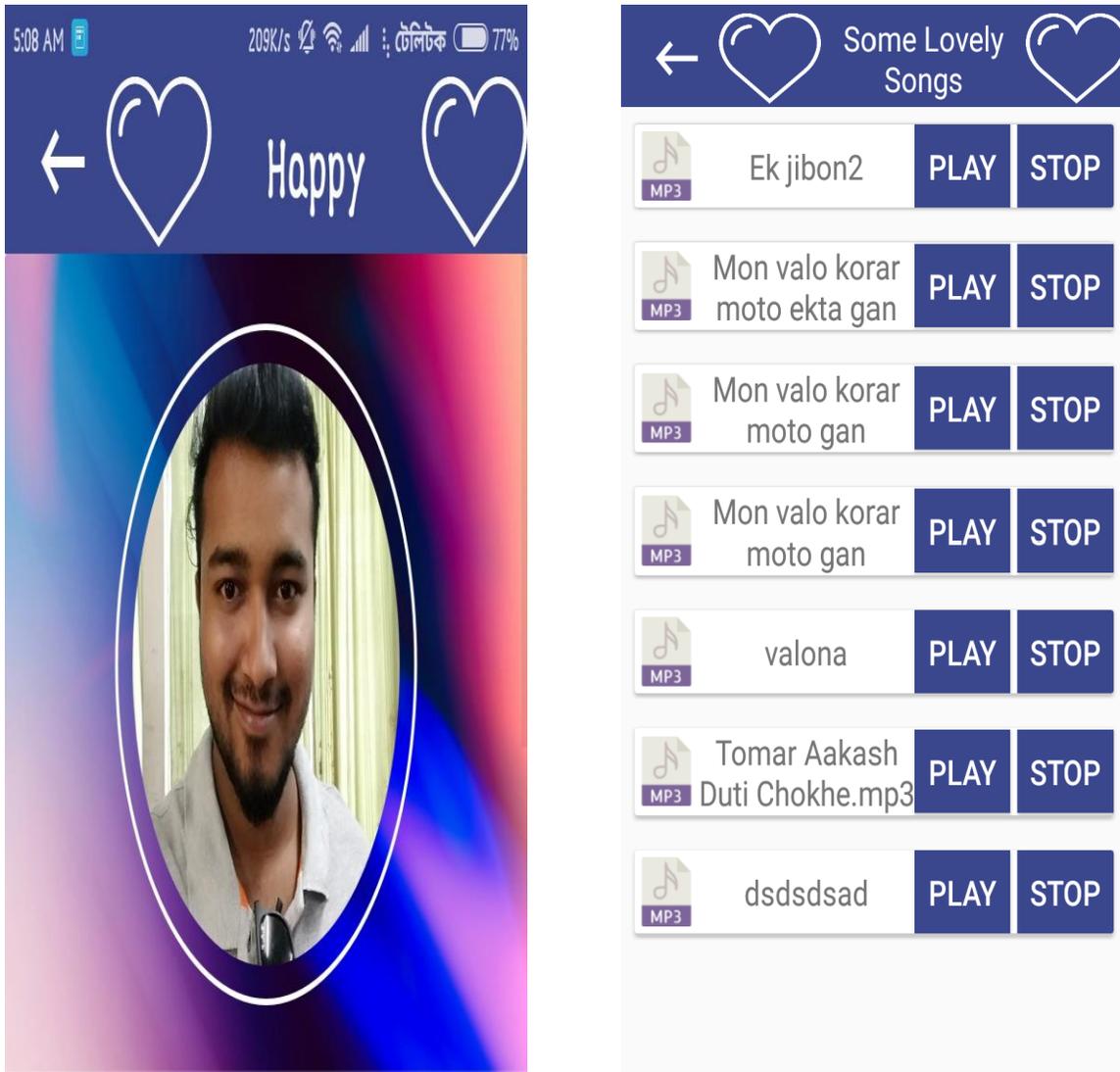


Figure 4.2.4: Output.

Based on user's facial expression (output) software automatically suggest music. So that user can improve his mental condition.

## 4.3 Back-end Design

Some back-end designs of the project are given bellow.

### 4.3.1 Home Page

Figure 4.3.1 shows the home page. Home page divided into three parts.

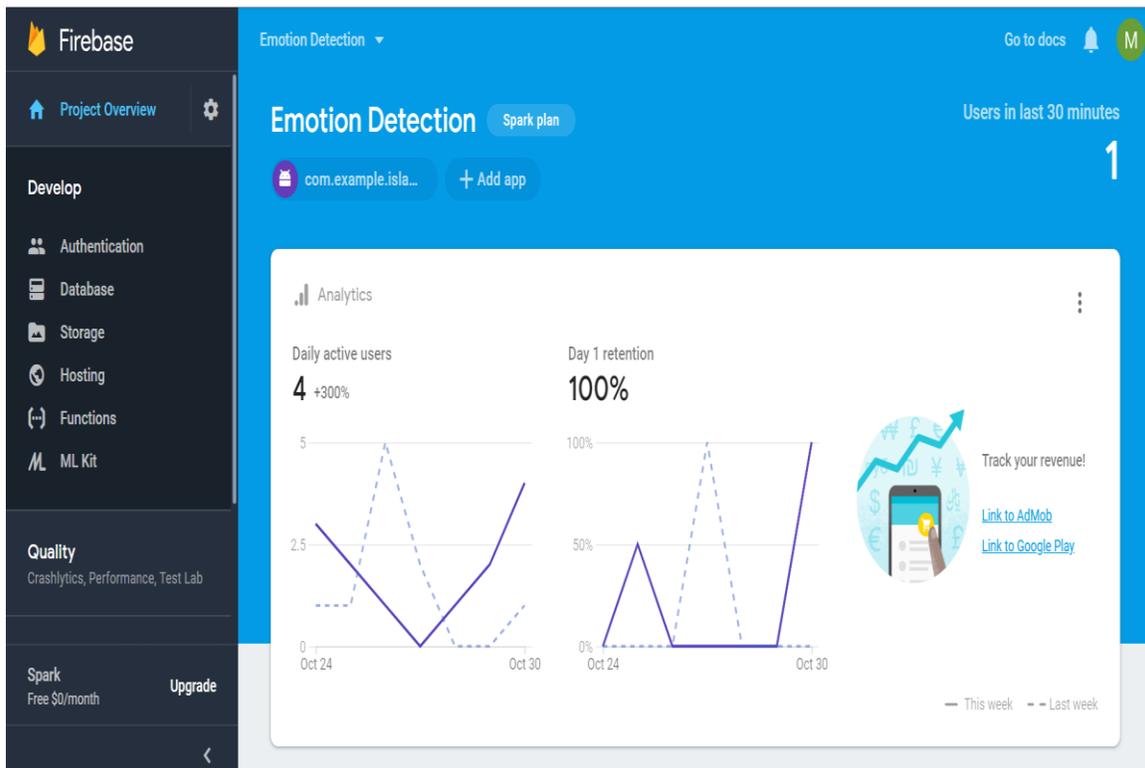


Figure 4.3.1: Home page

They are Authentication, Database and storage. Also can see how many users are active now.

### 4.3.2 Authentication

Figure 4.3.2 shows the authentication page.

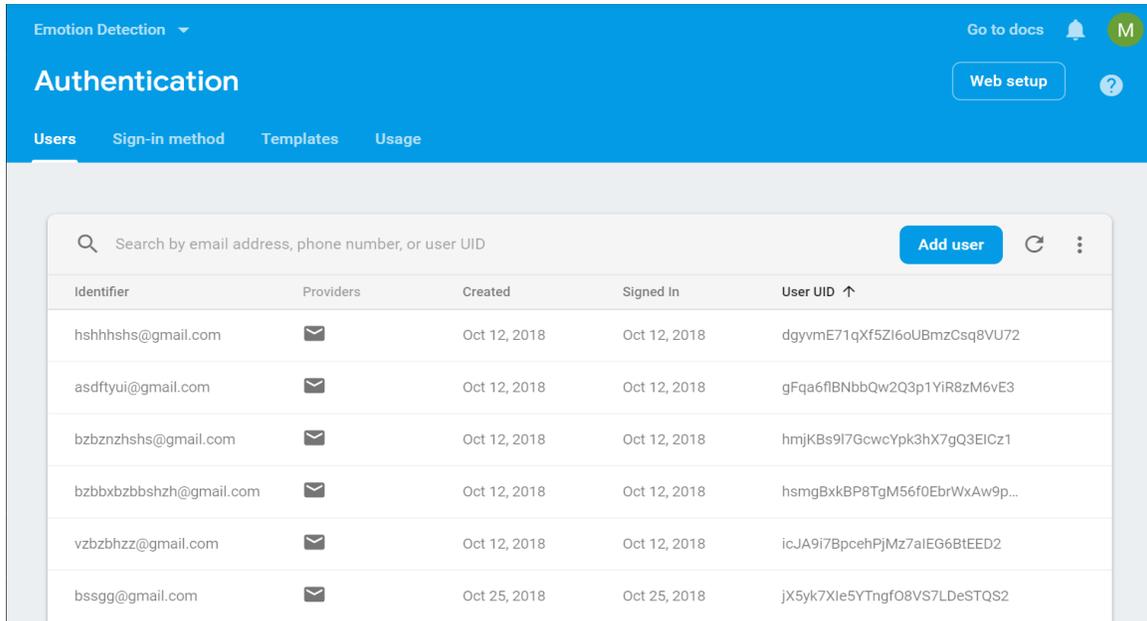


Figure 4.3.2: Authentication.

Authentication stores all the information of a valid user. Invalid users are not eligible in this page.

### 4.3.3 Database

Database is separated for each facial expression and different songs are stored for different emotions. All the process is given bellow.

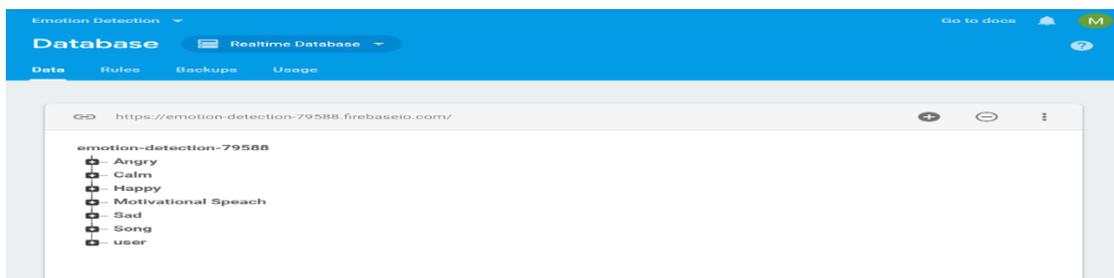


Figure 4.3.3.1: Database

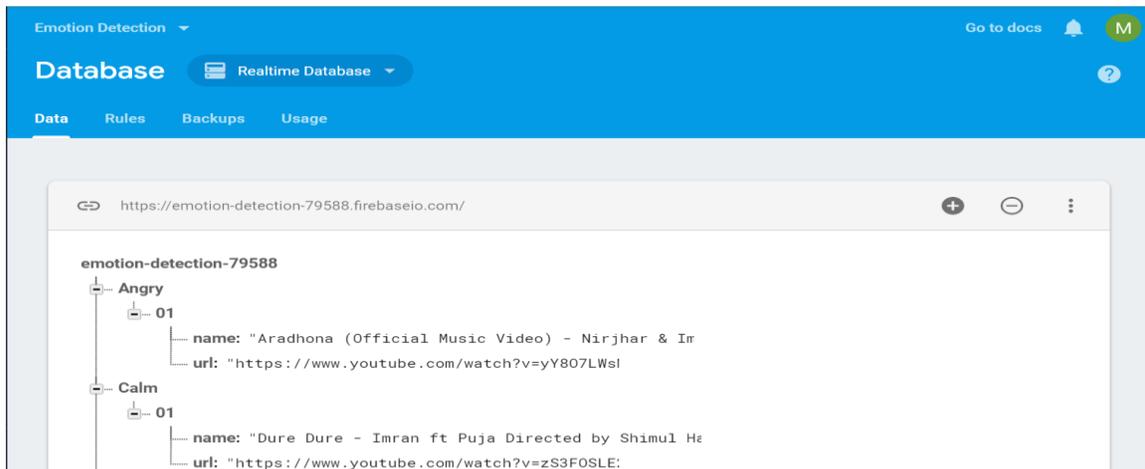


Figure 4.3.3.2: Database

Figure 4.3.3.2 shows that different songs are stored for angry and calm facial mood expression.

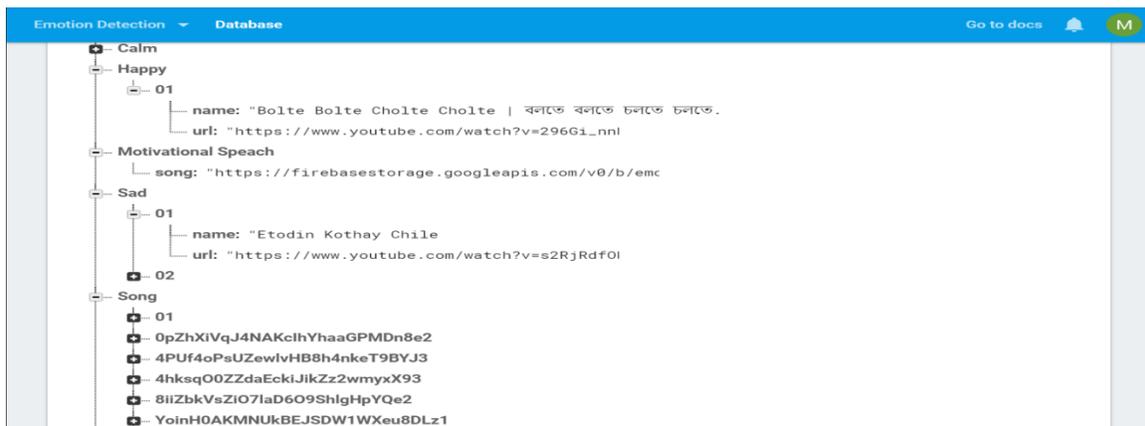


Figure 4.3.3.3: Database.

Figure 4.3.3.3 shows that different songs are stored for happy and sad facial mood expressions. And in the songs database there are some songs for all facial mood expression and some motivational speech for all facial mood expression.

### 4.3.4 Storage

Figure 4.2.4 shows song storage of the application.

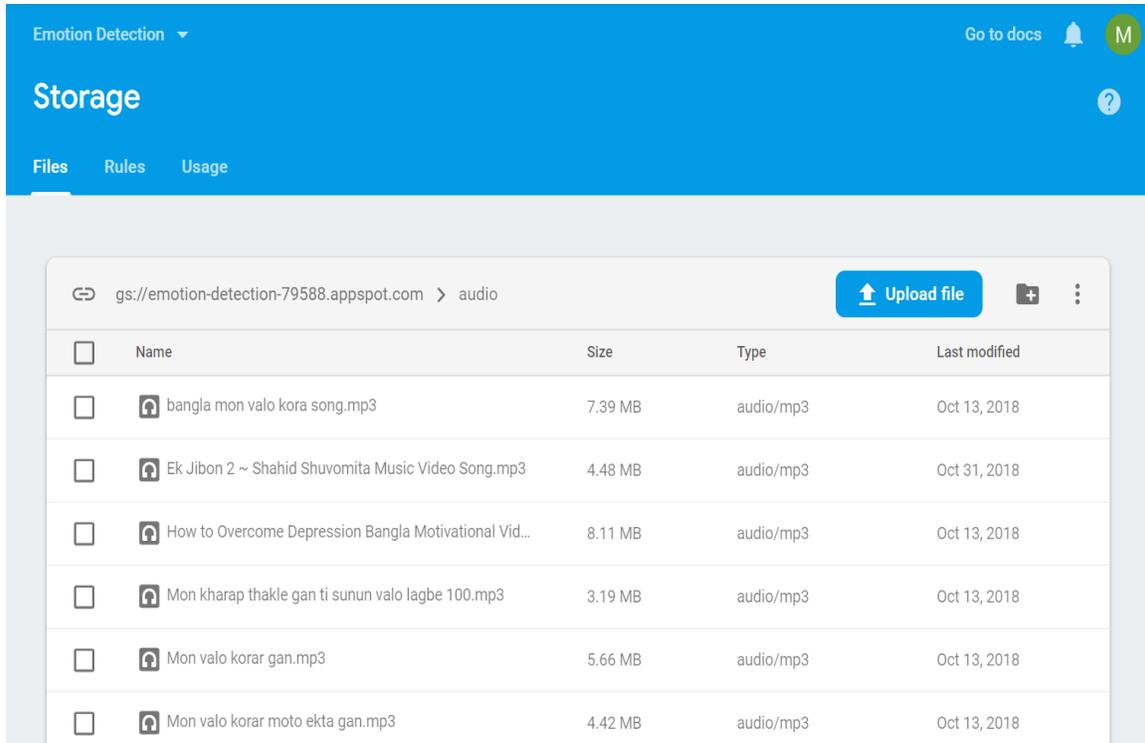


Figure 4.3.4: storage.

Figure 4.3.4 show the storage part. The admin will be able to update storage of the database (Admin can upload songs, motivational speech and other things).

## Chapter 5

### Experimental Results and Discussion

#### 5.1 Introduction

For this project as the database we are using firebase where data is stored. It is a cloud-hosted Real time database. It stores data as JSON tree format. Using machine learning language, PCA, MPCA easily can analyze facial mood expression. After analyzing facial mood expression it detect the face mood and provides almost 75.7% accurate result and suggest music based on facial mood expression.

#### 5.2 Experimental Results

After performing we found some results are given bellow.

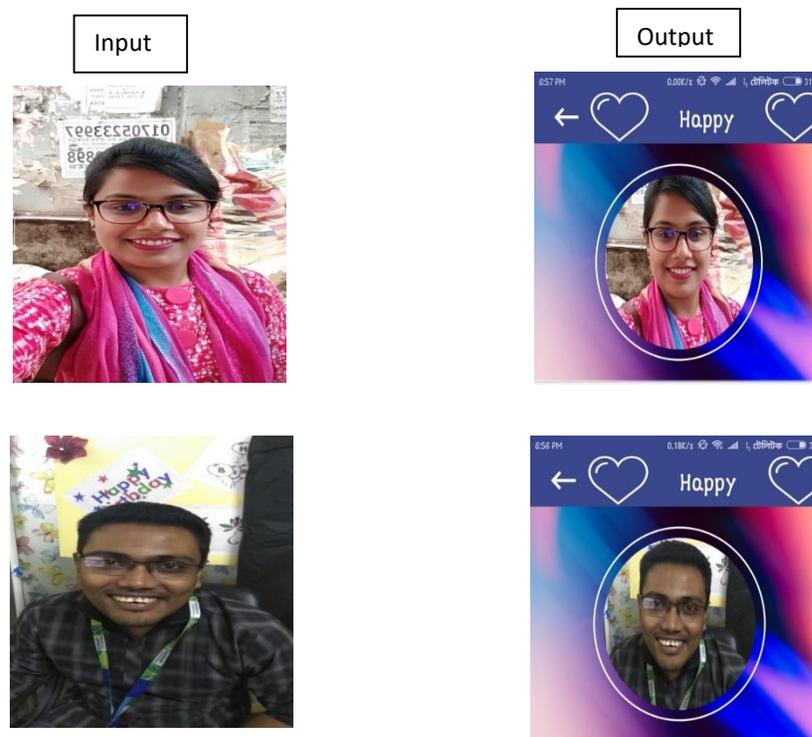


Figure: 5.2.1

Figure 5.2.1 shows the input and output of happy facial mood expression.



Figure: 5.2.2

Figure 5.2.2 shows the input and output of the sad facial mood expression.



Figure: 5.2.3

Figure 5.2.3 shows the input and output of calm facial mood expression.



Figure: 5.2.4

Figure 5.2.4 shows the input and output of angry facial mood expression

Table 5.2.5 Experimental Results

NO.	Expression type	Experiment NO.	Expected outcome		Percentage
			Yes	No	
1.	<b>Happiness</b>	<b>102</b>	<b>102</b>	<b>0</b>	<b>100%</b>
2.	<b>Calmness</b>	<b>110</b>	<b>77</b>	<b>33</b>	<b>70%</b>
3.	<b>Sadness</b>	<b>110</b>	<b>72</b>	<b>38</b>	<b>65%</b>
4.	<b>Anger</b>	<b>100</b>	<b>95</b>	<b>5</b>	<b>95%</b>

We survey on 100 to 110 people by the application. It provides accurate result for happy facial mood expression. And most of the time it provides all most accurate result for angry facial mood expression. But the application faces some problems for detecting calm and sad facial mood expression.

### 5.3 Descriptive Analysis

At first, user needs to take an image as input. For improving lost contrast, use histogram equalization by remapping the brightness value of an image. Then detect face boundary, cropping eye and cropping lip region by PCA and MPCA. Then it sends the image to machine learning kit (ML kit). Machine learning kit is recently developed by google which has trained data. It provides powerful feature and bear new information. That's why machine learning becomes most popular nowadays. Machine learning SDK can recognize text, detect faces, recognize landmarks, scan bar codes and leveling images. In this project we use ML kit for detecting face mood. It can detect happiness percentage. But applying some conditions, using ML kit we develop four facial expressions (Happy, Sad, Calm and Angry) and based on this facial expression it suggest music from database which is developed in firebase.

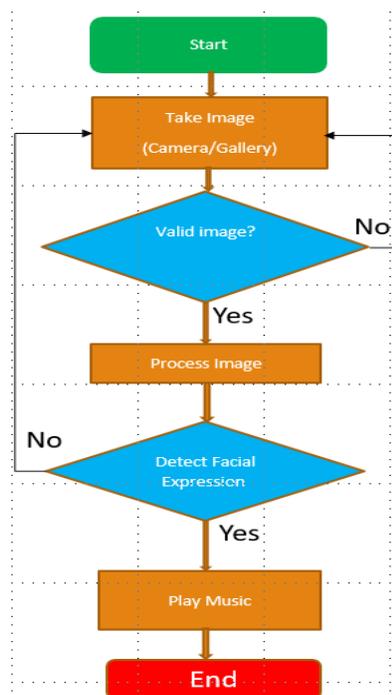


Figure 5.3: Flow chart of facial mood expression.

## **5.4 Summary**

After selecting an image as input PCA and MPCA analyze this image and send it to the machine learning kit for further work. Then using ML kit and applying some condition we get almost 75.7% accurate results about human's facial expression. Based on facial expression it automatically suggests music.

## **Chapter 6**

### **Summary, Conclusion, and Implication for Future research**

#### **6.1 Introduction**

In this chapter we are discussing about our summary of our study, conclusion of our work and also discuss for our future research work.

In summary part we are trying to discussing about the whole part of our project.

#### **6.2 Summary of the Study**

The human face is an important organ of an individual's body and it especially plays an important role in extraction of an individual's behavior and emotional state. Manually segregating the list of songs and generating an appropriate playlist based on an individual's emotional features is a very tedious, time consuming, labor intensive and upheld task. We are using 3 types of algorithm in our development. Such as PCA, MPCA, Machine learning language. We are working with human's eyes and mouth for emotion detection. We are working and testing many images to detect human's emotions. The accuracy of our research work is 80%.

#### **6.3 Conclusions**

We have successfully completed our work and the followings are the output. Those are available in current system. The system thus aim at providing android user with a cheaper free and user friendly accurate emotion detection system, which is really helpful to the users. For changing mood system our apps is really helpful.

The main advantage of our apps is to detect accurate human emotions and also suggest music and jokes for changing their mood.

#### **6.4 Future Work**

The future scope in the system would to design a mechanism that would be automatic playing music or videos based on the human facial mood. This system would be also helpful in music therapy treatment and provide the music therapist the help needed to treat the patients suffering from disorders like mental stress, anxiety, acute depression and trauma.

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- Etc...

## **APPENDIX**

### **Appendix A: Project Reflection**

Project reflection is the main theme of this appendix. We are trying to completing our project from 3 semesters. This is one kind of dream project for us. Many apps are found in google play store which can detect facial expressions but it's actually doesn't work properly. We try heart and soul to create the actual face mood detector apps which is really enjoyment apps for all people who are the really busy in their daily life. We try our best to give the android apps users. Our apps is very user friendly. One most interesting part of our apps is it can detect human's mood and also suggest music, video, jokes to remove depression.

Day by day humans are very busy in their daily life. For that reason people are suffering from disorders like mental stress, anxiety, acute depression and trauma. To avoid this type of disorder we are creating this funniest application.

### **Appendix B: Related Issues**

Many research work which is really helpful for our research work and project.

- Pantic and Rothkrantz proposed system which processes images of frontal and profile face view. Face boundaries have been found using Vertical and horizontal Histogram Analysis. Then, face contour is obtained by thresholding the image with HSV color space values.[10]
- Viola and jones algorithm
- a prototype desktop version and a smartphone app which analyses the mood of a video and predict the user's mood [7]
- "An Emotion Recognition Challenge" in this paper author used baseline method ,principal component analysis (PCA) algorithm[6]
- "Emotion based music player for android " in this paper author worked with emotion . author work with viola and jones algorithm, support vector machines(SVM) method .[3]
- Machine learning language
- Neural networks.

