REAL TIME HUMAN EMOTION DETECTION ON VIDEO CALL

BY

Md. Shourov Sarkar
ID: 221-25-119

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

Supervised By

Dr. S. M. Aminul Haque
Associate Professor
Department of CSE
Daffodil International University

Co-supervised by

Mr. Abdus Sattar

Assistant Professor and Coordinator M.Sc

Department of CSE

Daffodil International University

DAFFODIL INTERNATIONAL UNIVERSITY

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APPROVAL

This Thesis titled "**Real Time Human Emotion Detection on Video call**", submitted by Md.Shourov Sarkar, ID No: 221-25-119 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 M.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 17-01-2023.

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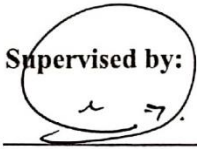Daffodil International University

External Examiner

Dr. Mohammad Shorif Uddin, PhD
Professor
Department of Computer Science and Engineering
Jahangirnagar University

DECLARATION

We hereby declare that, this project base thesis has been done by us under the supervision of **Dr. S. M. Aminul Haque, Associate Professor, Department of CSE and Mr. Abdus Sattar, Assistant Professor and Coordinator M.Sc,** 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.
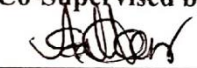
Supervised by:

Dr. S. M. Aminul Haque,
Associate Professor
Department of CSE
Daffodil International University

Co-Supervised by:

Mr. Abdus Sattar
Assistant Professor and Coordinator M.Sc
Department of CSE
Daffodil International University

Submitted by:

Shourov

Md. Shourov Sarkar
ID:- 221-25-119
Department of CSE
Daffodil International University

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We really grateful and wish our profound our indebtedness to **Dr. S. M. Aminul Haque, Associate Professor and Mr. Abdus Sattar, Assistant Professor and Coordinator M.Sc,** Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "*Machine Learning*" to carry out this project. His endless patience ,scholarly guidance ,continual encouragement , constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior draft and correcting them at all stage have made it possible to complete this project.

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Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

'Emotion detection on Video Calls' is a challenge when the device camera takes a video with a screen framerate. Then it will compare that photo with the video by using a dataset. We have taken this clue from online, like on Facebook. The information within the deep face was no longer considered in the sooner days. Still, it is increasing daily since Facebook customers upload images more often. It is a form of facial features machine. We have taken the data by taking the images from a video call. We have some collections of pics with some terms in our pre-educated databank. Here are a seven statistics like Surprised, happy, angry, neutral, fear, disgust, or sad. From the occupied picture, it will evaluate whether or not the photo is glad, unhappy, or something else. Initially, it will examine the perfect expression for it. When it is authentic, we can see the output of our device screen.

Whenever it is not, it will correspond with unhappiness, and if it does not work, it will evaluate again with neutral. If it fails again, it will determine different emotions. Furthermore, depending on that emotion, it gives results with accuracy. When accuracy is maxed, it indicates the Emotion result. We will take all the records and examine them with all the opportunities saved within the databank. When we are on a Video call but cannot see the face, it cannot detect any Emotions. At that time, it will give a message like "Face is less than we Need". Our undertaking is not complex. There is no flaw in this mission matching the expressions, and it will display the result.

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Introduction

1.1 Introduction

A facial look performs a critical function in spotting someone's temper. All those facial styles realize it can deliver us statistics approximately the emotional situations of a mortal. The public connects emotionally with others through knowledge of their country of mind. So, it is critical to hitting upon the emotions of others for our mortality.

From another point of view, At that time, we were knowledge-based. Our knowledge is multiplying. We can say that almost every second, we depend on the era. Many technological changes are coming; some are tough, and some are not. It takes work to come across Emotion. Although they have worked on it for many years, the result is inadequate. As facial expressions can explicit someone's temper, we use them because of the number one device in our devices. It is tough to discover a character based on facial expressions. We will create an interaction between people and computers due to recognizing mood primarily based on the Emotion of someone. We are developing a structure to pick out someone's temperament in that paper. To detect Emotion here, we are using the device camera and the framerate of an individual. Using the camera identifies the face structure and shows that the individual is happy, unhappy, or usual.

1.2 Motivation

Nowadays, many people feel different emotions in different situations in their life. Like people feel unhappiness, hurt, rage, and joy. Using this application, we can easily detect Emotions via video call, and it helps us understand many things about humans. If we want, we can use Emotion to identify awareness everywhere. Also, it can be used in the medical science non-science sector. Emotion recognition is an entirely new object that can express every human Emotion. Everyone knows every soul's emotions are up and down depending on the situation. So, we can benefit everybody from this project.

1.3 Objective

- To analyze human emotion.
- To update the satisfaction of the Framework.
- For creating any selection further workable.
- Can detect emotion on video calling.

1.4 Features

- Can apprehend facial outlook behaviour.
- We take a few second videos with a digital camera and then examine them with the dataset to come across temper.
- User-inviting and dependable application.

1.5 Expected Outcome

The final results of the Emotion detection venture are stated beneath: -

- Can perceive facial emotion reflation.
- It can recommend emotional names while talking with others in live video call mode.
- User-friendly and reliable application.

1.6 Project layout

The restriction from there is the illustrative overview of the responsibility sincerely with a figure that describes the whole challenge, element, and sky. The responsibility record carries 5 Chapters. A design of the comparative host of segments with a summary is observed done by phase representation beneath:

CHAPTER 1: INTRODUCTION (About the Project, Motivation, Objective, Features, Expected Outcome)

↓

CHAPTER 2: BACKGROUND (Introduction, Related Work, Scope of the Problem, Challenges)

↓

CHAPTER3: RESEARCH METHODOLOGY (Introduction, Methodology Execution Requirements for Application, About Library Function)

↓

CHAPTER 4: Output and Result (Introduction, Application, Expected Outcome, Final Result)

↓

CHAPTER 5: Social Impact
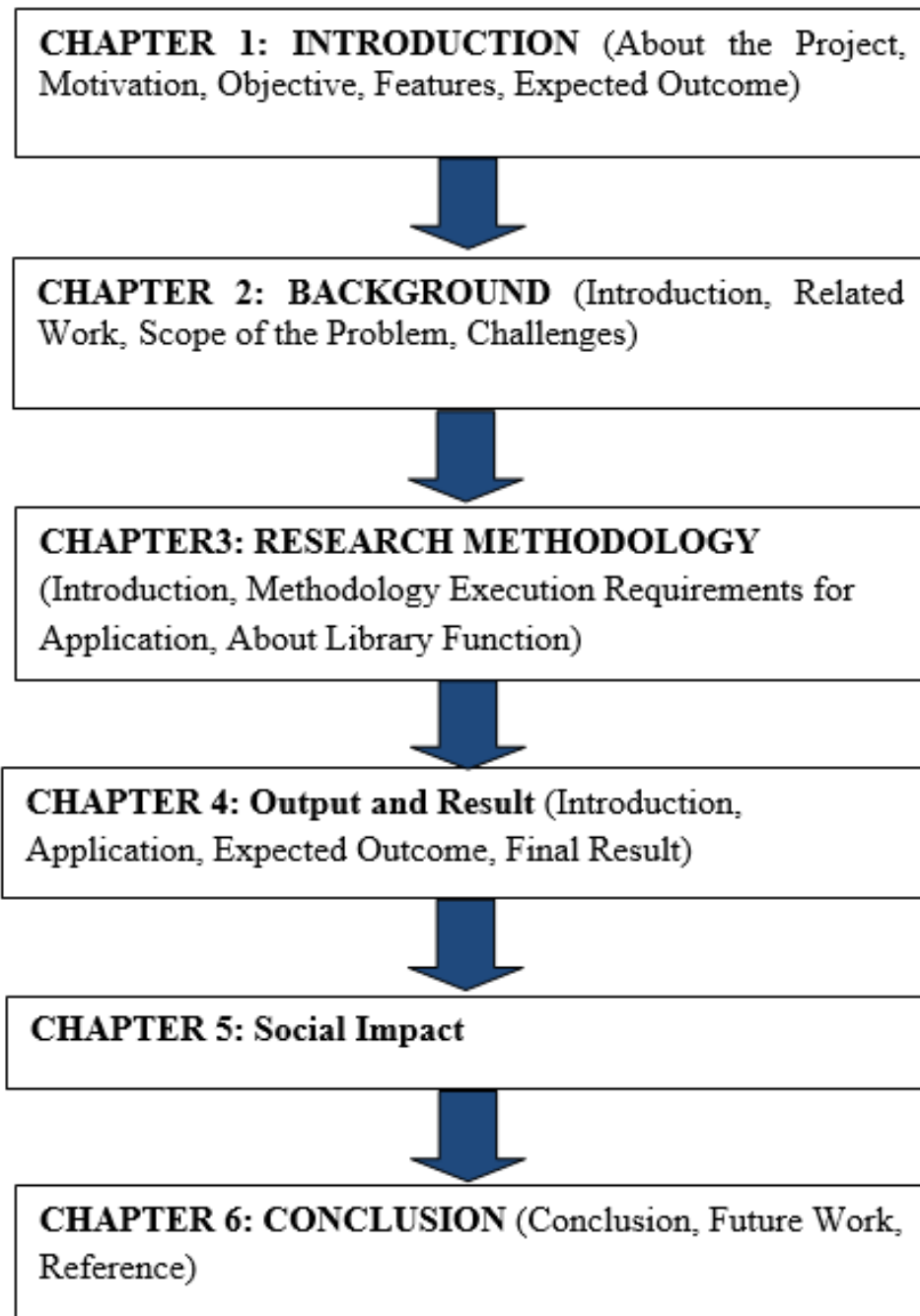
↓

CHAPTER 6: CONCLUSION (Conclusion, Future Work, Reference)

Fig 1.1: Outline the application

In 1.1 we can see the layout system. Which will give the chapter overview.

CHAPTER 2
Background

2.1 Introduction

Human feeling reputation performs a crucial role in interpersonal relationships. Emotion says much stuff they do not express using their mouth. Feelings are contemplated in talking, movements of the body, and facial language.

By the way, we can understand modern-day global delay or circuitously can rest on the laptop. However, computer systems do not have feelings and cannot study human thoughts, which could be very important. Emotion detection is developing massive turmoil in machinery, as several scholars and inventors have been running on it for eras. However, they just found the level of the result now. The uncertainty we effectively broaden it and can carry the many uprising. In this research, we want to announce individually fresh technologies. In this case, we will spotlight a few surveys of our work in keeping with this research. Facial languages are a shape of feeling, so we can procedure them to come across temper and procedure algorithms to discover the shape of faces, such as the part of the eyes, nose, eyebrows, and many others. After that, we integrate the portions entirely and stumble on whether or not a man or woman is unhappy, satisfied, worrying, or anything else. At that moment, we seized the whole data and examined it through all opportunities of humanoid feeling kept in our databank. This temper-finding era can aid clinical and psychological fitness, automation, and identifying offenders. Emotion detection is too helpful for certifying concealment.

2.2 Related Work

In Emotion detection, we try to locate an individual's emotions. In this research, our output suggests all people's feelings: happy, sad, and herbal. However, we noticed some emotion-hit-upon projects, which include:

- Instinctive emotion detection and chasing of track acoustic alerts.[3]

- Instinctive emotion detection from audio track information, and so forth.

In this project, we grind on a few current factors: audio alerts; here, we grind with a humanoid

face. We paint with picture purification, which expresses unhappiness, a person's happiness. This research expresses that our goal for this mission is to come across the emotion of the humanoid face through photograph purification. This venture is correspondingly time-absorbing regarding additional initiatives at present in this region.[9] This mission is likewise not steeply-priced as per no more extended use of steeply-priced units for the result. We are trying to make it easy as we can.

2.3 Scope of the Problem

Some issue we are discover:

➢ Must be needed Internet connection.

➢ Very tough to stand finding in shady mode.

➢ The camera Sensor works at a restricted distance for face finding.

➢ It Problematic to find emotion without a clear picture.

➢ It Problematic to find emotion in more than one human together.

➢ Sometimes this doesn't fit the expectancy level due to the device framerate.

➢ Occasionally it receives complicated to hit upon emotion while the facial languages aren't correctly stated.

2.4 Challenges

The device to talk to must be able to make video calls; the tool must have an internet connection and deploy apps on the device whilst speaking. This venture is mainly done for all sorts of humans, but the maximum suitable region for this is in scientific and technological know-how. This paper right here includes statistics about emotion Detection. With this undertaking, we will get statistics on human emotions and how they work under harsh and other situations. C. N. Moridis[4] they proposed online self-assessment tests but they didn't give any feedback about that mood. But in our article we are providing the solution of the problem like if when we know the mood of the video call user based on that emotion we can take action. A. V. Iyer[16] proposed music recommendation based on emotion. In here most challenging things is detecting mood and they solve which music is prefer for which mood. But we are solving the problem about Emotion detection on Video call.

CHAPTER 3
Research Methodology

3.1 Introduction

To complete our planned task correctly, we must perform a few obligatory necessities to run this undertaking. Here, we'll constitute a few primary necessities.

3.2 Methodology

In this research segment, we describe how we've used our application. Here we are building an average Desktop Work area utility for which we don't require any equipment since we're utilizing the webcam of the Desktop or PC and work with Display framerate. In this venture, first, we want to open our application; after that, we've to call the individual whose Emotions we wish to locate. When the person receives the decision, we should run the utility. After that, the software will take a few seconds, like a 20-second video with the webcam and take the framerate from Screen and on a par with the face framerate within the video with the databank. Then , by relating the video's face with the databank, the machine will provide us with the outcome if the man or woman inside the video name is Surprised, happy, angry, neutral, fear, disgust, or sad. Later receiving the result from the 20-second video, we used the rate to recognize which emotion is identified maximum, and by the maximum observed, we can display it in our Display. So that is how the machine goes to work. In our Analysis part we have 28,709 test data. Most of the collect from fer2013 dataset. Here we use 0-6 that's mean 7 emotion which is angary, Neutral, Disgust, Surprised, Fear, Sad, Happy. We using Two Algorithm. Which is Haarcasecade and CNN (Convolutional Neural Networks). As per maximum people use low range device that's why here we using miniXception-102 version. By Using that we get a suitable Accuracy. Our training accuracy is 0.9833 and validation accuracy is 0.8516. When we talk someone we can instantly see the emotion in percentage form. As the emotional changes, we can see the percentage increase and decrease on its side. So, we can easily say that we get a suitable Emotion.

3.3 Execution Requirements for Application

In Fig 3.1, At first Start the application then by using LoadHaar Cascade it will take 30 second video. Then capture Frame rate, it will convert to Graph after that Detect the Face and draw Rectangle try to detect Exception Emotion if not then Pass and again it will go Time Duration section. If, yes detect Emotion then store the Result make a list and at last by comparing dataset Show the Emotion Result.
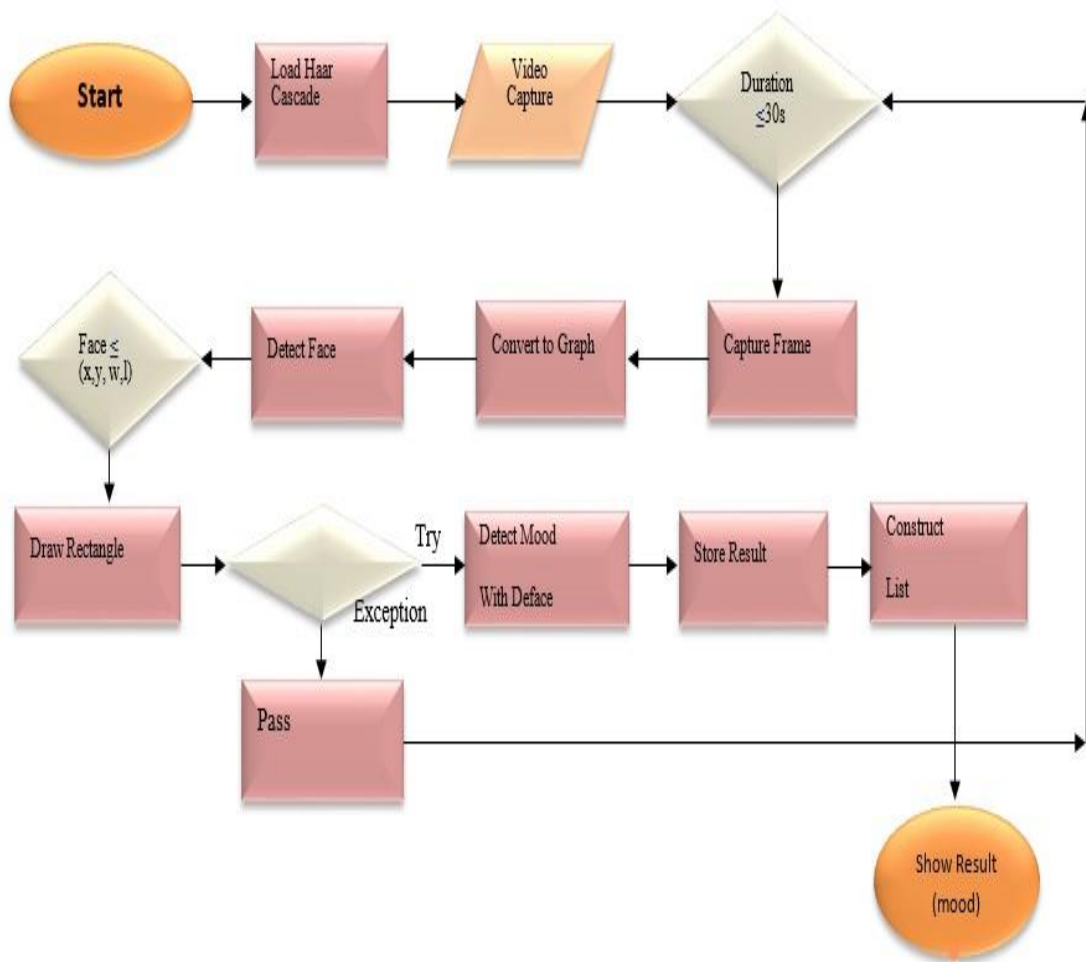

Fig 3.1: Flow Chart Diagram

3.4 Block Diagram for Application

In Fig 3.2, After Start the processing have to Open Webcam and take some second video or call someone and take some second video then Captured image from video then Compare with Knowledge base then if Happy matched or if Sad matched or if Neutral that's mean happy or sad not matched. Then calculate Frequency and Show emotion Result then End the process.
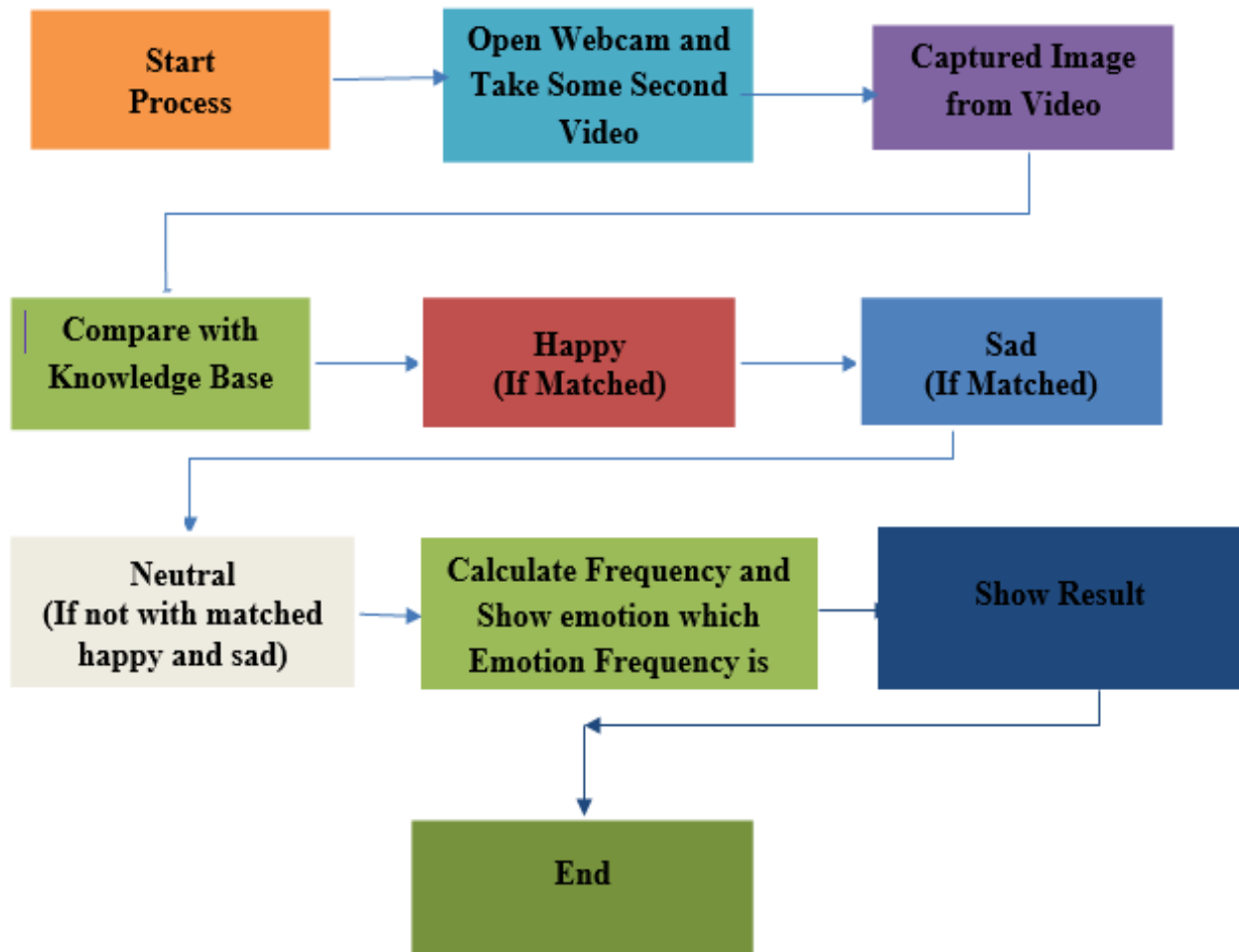

Fig 3.2: Application's Block Diagram

3.5 About Library Function

Our undertaking has been settled in python. As regards tamper finding, we use some library features those are:

1. Open cv
2. Deepface
3. FER2013
4. Keras
5. Pillow(PIL)
6. matplotlib
7. Haarcasecade Classifier (Single Person).
8. CNN Algorithm
9. Tkinter

OpenCV

OpenCV is an open-supply computer vision and Artificial Intelligence (AI) programming library. OpenCV changed into attempting to provide a familiar status quo to computer imaginative plus prescient packages and to recover the usage of gadget know-how in enterprise equipment. These amounts are frequently recycled to observe and change to faces, get devices, organization human workouts in cash owed, monitor camera modernizations, music shifting courses, loosen up 3-D models of factors, distract out 3-D rationalization clouds from top structure cameras, attach pictures alongside to form a high-quality widespread image of an entire scene, a word close to snapshots from a photo database, eliminate red eyes from pictures taken the use of streak, observe eye ranges of improvement, find a way to test plus to create markers to overlap it with expanding fact, through using formerly ahead OpenCV has within the track more outstanding than 47,000 entities of customer associating and estimate the amount of downloads overpowering 18 million. The library is developed widely in collaborations, assessment get-togethers, and using definite figures. It has C++, Python, Java, and MATLAB interfaces and assists Windows, Linux, humanoid and waterproof operating systems. OpenCV usually follows predictable imaginative, and visionary programs and encounters MMX and compass factor directions as soon as obtainable. A

completely-comprised CUDA and OpenCL interfaces region component through and massive has been effectively advanced.

DeepFace

DeepFace is a facial recognition and facial attribute evaluation tool for python. It is a hybrid facial recognition system that incorporates different models such as VGG-Face, Google Face Net, OpenFace, Facebook DeepFace, DeepID, and Dlib. The system was trained on over 4 million images and is capable of recognizing faces in modern images. Pre-trained models are commonly used in image recognition tasks because they are easier to use and typically have better results. The OpenCV approach is a modern method of face detection that uses feature pixels and the AdaBoost algorithm to detect faces. DeepFace uses reliable point detectors built on existing databases to guide the configuration of faces.

FER2013

For my dataset I am using Fer. Which is invented in 2013. FER2013 is a dataset of facial expressions that was published in 2013. The dataset consists of 28,709 images of faces, each labeled with one of seven different emotional expressions (angry, disgusted, fearful, happy, neutral, sad, and surprised). The images were collected from a diverse set of people, and the dataset is commonly used for training and evaluating facial expression recognition models.

Keras

Keras is an open-source deep learning library for Python. It is a user-friendly neural network library written in Python that provides a convenient way to define and train deep learning models. Keras allows for easy and fast prototyping, supports both convolutional and recurrent networks, and runs seamlessly on both CPU and GPU devices. It also supports multiple backends, including TensorFlow, Theano, and Microsoft Cognitive Toolkit (CNTK). One of the key features of Keras is its ability to quickly and easily build, train, and evaluate deep learning models, making it a popular choice among researchers and practitioners in the field of machine learning and deep learning.

PiL[ ]

Python Imaging Library (abridged as PIL) (in brisker versions referred to as Pillow) is a free and open-source more extraordinary library for the Python programming language which provides maintenance for commencing, monitoring, and frugal a massive array of photo document plans. Pad is a photo-control library that branched from PIL (Python Image Library) and has frozen its development. Although improved photo management (face acknowledgement, visual movement, and so forth) like OpenCV cannot be finished, targeted image getting ready, for sample, resizing (scaling), plus pivoting, besides coping with (intermediate sample), may be completed.

Matplotlib[ ]

Matplotlib is a comprehensive library for producing motionless, authorized, intelligent representations in Python. Matplotlib has specific matters vital and also complex objects viable. Matplotlib is a conspiracy library for the Python programming language and its arithmetical figure-manipulating extension NumPy. It offers us an editorial-organized API to implant conspiracies into submissions and the usage of an all-around valuable GUI device compartment.
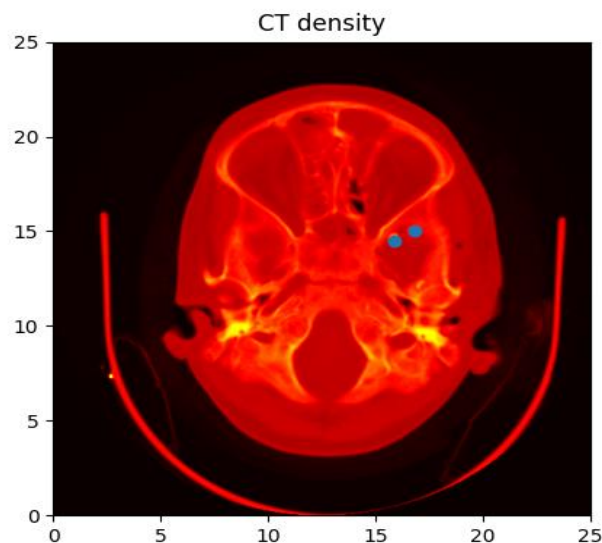

Fig 3.3: Sample of using imshow() to show a CT scan

In Fig 3.3, here we can see how to create Path and Pathpatch object through matplotlib's API.

Haarcasecade Classifier

Object Recognition using Haar consists of-based direction classifiers, a weighty ID approach projected by Paul Viola and Michael Jones in their paper, Fast Object Recognition using an Improved Cascade of Simple Features» in 2001. At this point, we can grind with the face region. Beginning the start, the evaluation wishes a lot of positives plus negatives to install the classifier. For this, the Haar climaxes in the under-representation are applied.
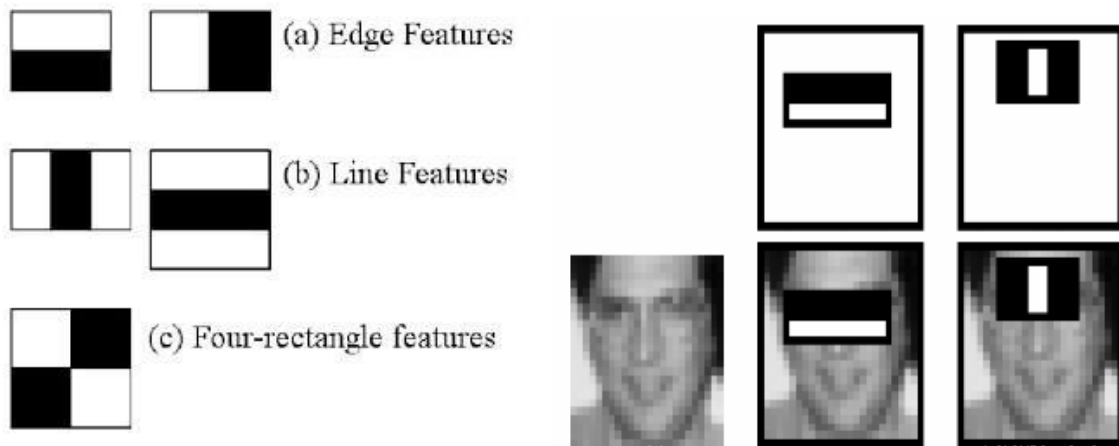

Fig 3.4: Haar Cascade

Subsequent to utilizing the Face overflow, the outcomes look like the underneath picture.
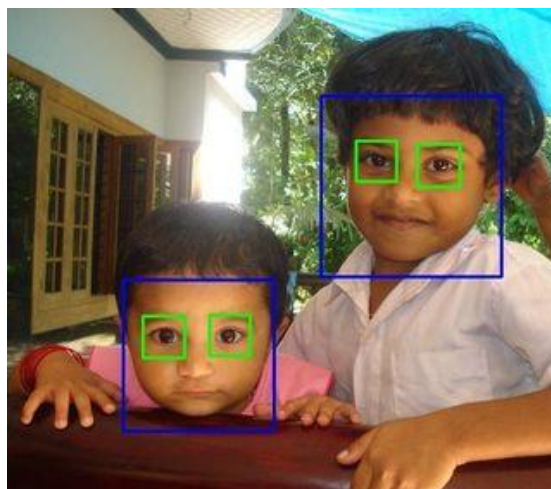

Fig 3.5: Face Cascade Result

In 3.4; 3.5 we can see the HaarCascade and Face Cascade Result.

CNN Algorithm

Convolutional Neural Networks (CNNs) are a type of deep learning algorithm that are commonly used for image and video recognition, as well as natural language processing. CNNs are designed to process data with a grid-like topology, such as an image. They are inspired by the structure of the visual cortex in animals, which is composed of small regions of neurons that are sensitive to specific sub-regions of the visual field, called receptive fields. The architecture of a CNN typically includes several layers such as convolutional layers, pooling layers, and fully connected layers[ ].

•The convolutional layers apply filters to the input data, which learn to recognize specific features in the image such as edges, lines, and shapes.

•The pooling layers reduce the dimensionality of the feature maps produced by the convolutional layers and make the representation more robust to small translations and distortions.

•The fully connected layers are used for classification or regression, they take the output of the pooling layers and perform the final computations to produce the output of the CNN.

The CNNs are trained using a variant of gradient descent optimization algorithm, where the weights of the filters are adjusted to minimize the difference between the predicted and true output. CNNs are particularly well-suited for image classification problems, and they have been used to achieve state-of-the-art performance on many tasks such as object detection, image segmentation, and facial recognition. Mini-xception is use to get better result from low range device.

Tkinter

Tkinter is the ordinary [GUI] library for Python. It is an abbreviation for "Tk interface". Tk was created as a [GUI] expansion for the Tcl prearranging language by John Ousterhout. It is Python's de-facto standard [GUI]. It's the main system incorporated into the Python standard library. The easiest technique to introduce Tkinter in a Windows climate is to download and introduce Active Python 3.8 from here. On the other hand, you can establish and enact a Conda climate with Python 3.7 or more noteworthy that is coordinated with the most recent form of Tkinter. In our paper we use it for Message box. After completing face detection we need to show the result that's why we need a Message box. By using that we can see our actual result on screen.

CHAPTER 4

Expected Outcome and Final Result

4.1 Introduction

This segment will describe the idea especially and its Outcome. For software, the frontal-stop conformation is the primary component because, after the beginning, a big part of the purchaser gets drawn by looking at the frontal end of the software. Frontal-give-up confirmation is essential for higher purchaser management for our submission, and we centre about it. Back-quit confirmation is also the principal issue for pushing away Info.

4.2 Application

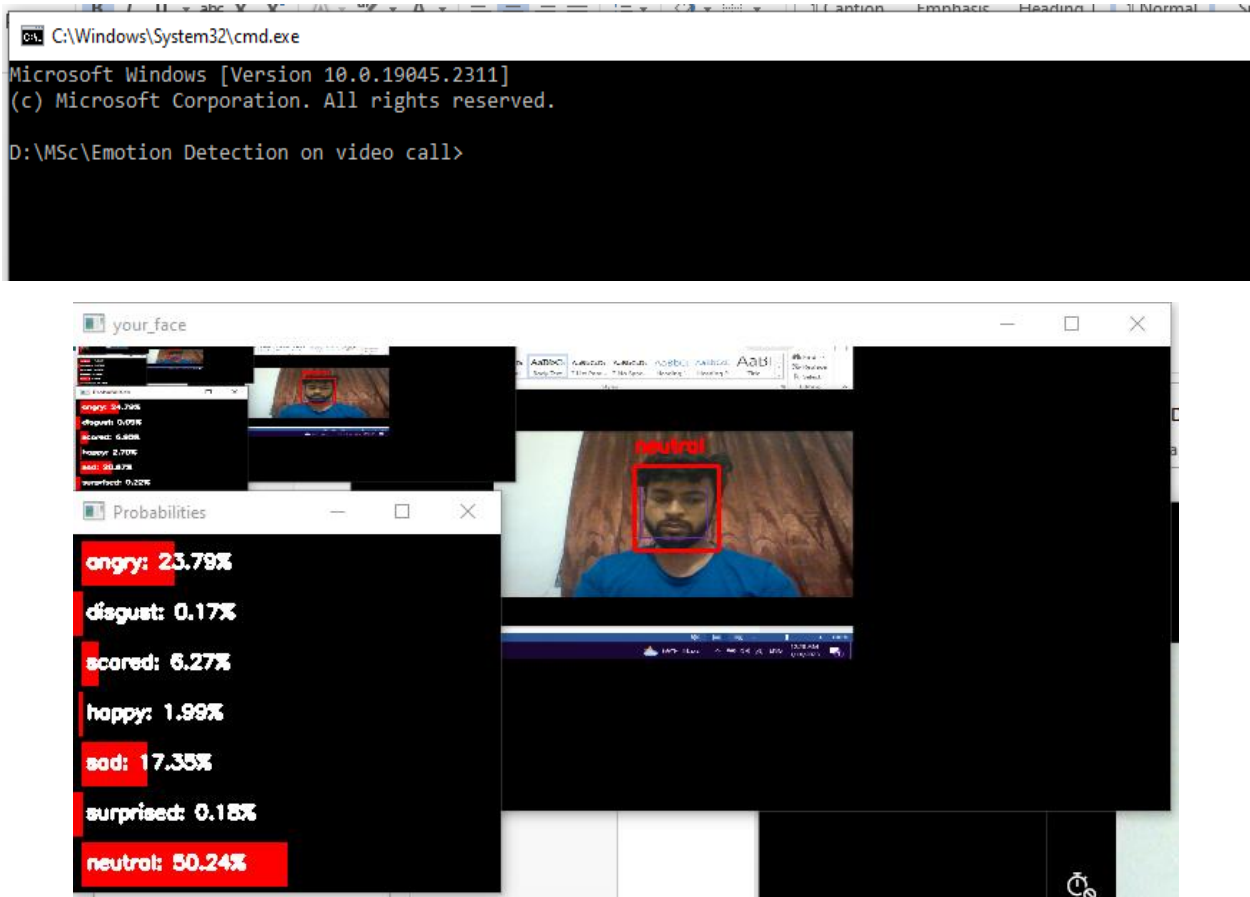Figure 4.1, Showing the Application command prompt.

Fig 4.1: Command prompt

The patron can see the command alternative when the client opens the utility. When given the command, the application will run and begin detecting the Screen, and the client can be geared up to arrive at the next step.

4.3 Expected Outcome

Figure 4.2: Showing the client screen while using web camera.

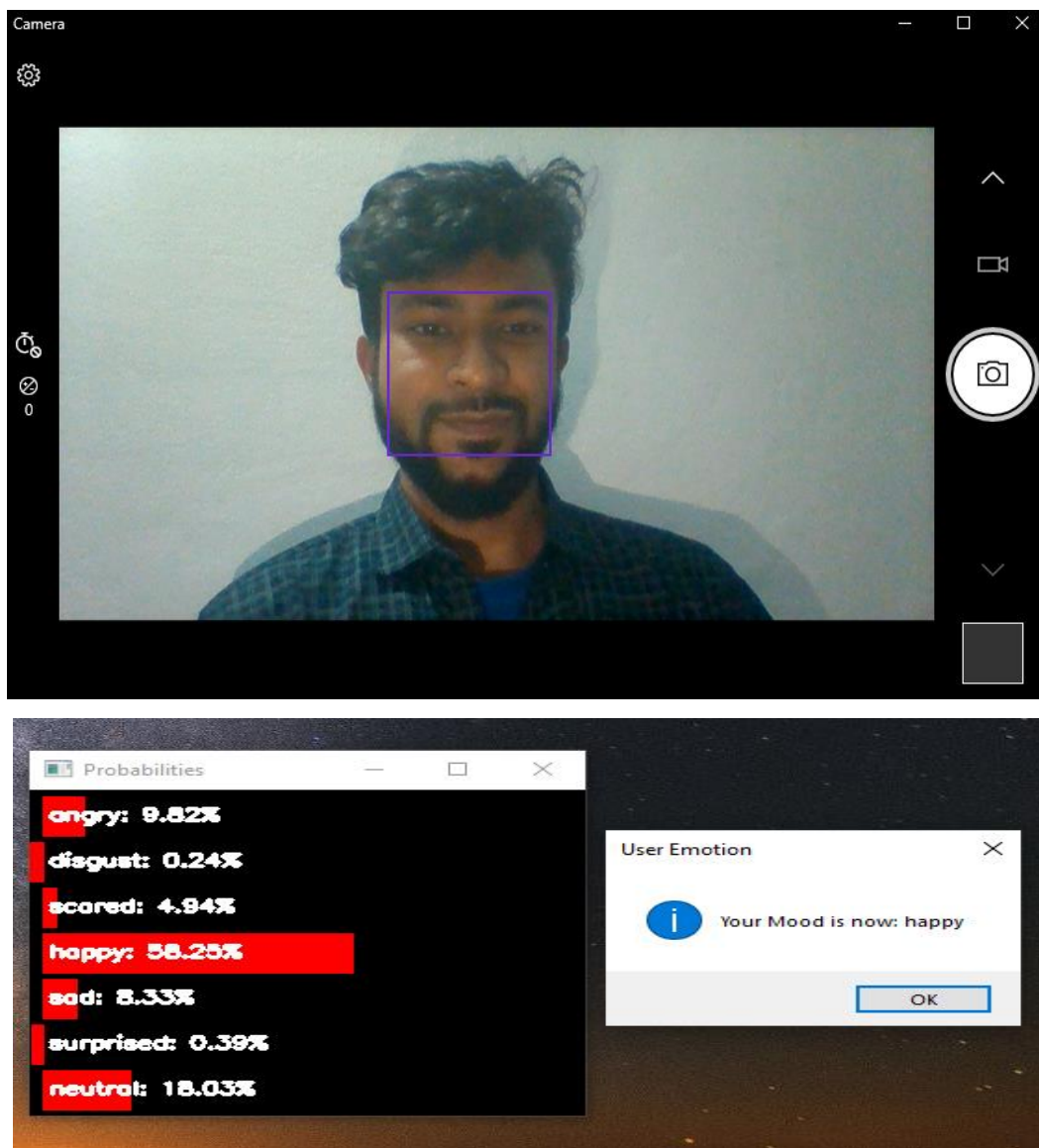The application will show the clients emotion on the clients facial expression or image.

Fig 4.2: Client screen on using web camera

4.4 Final Result

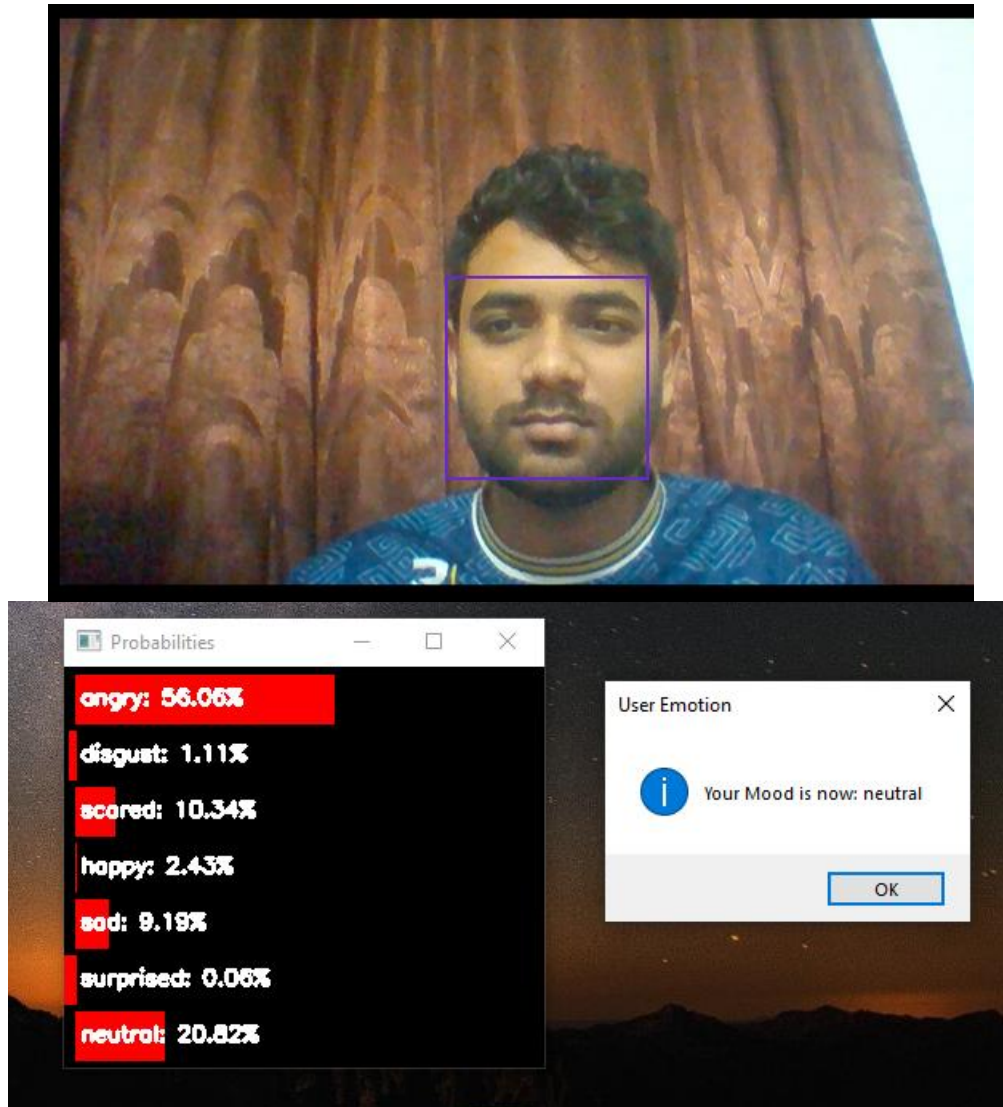Later acting the application, its results are stated beneath:

Fig 4.3: Neutral Mood

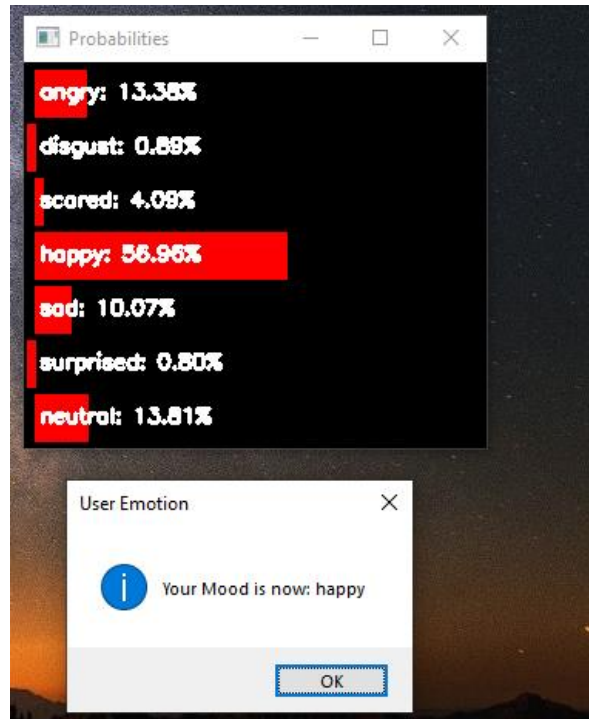Figure 4.3, Showing the emotion result is "Neutral".

Fig 4.4: Happy Mood

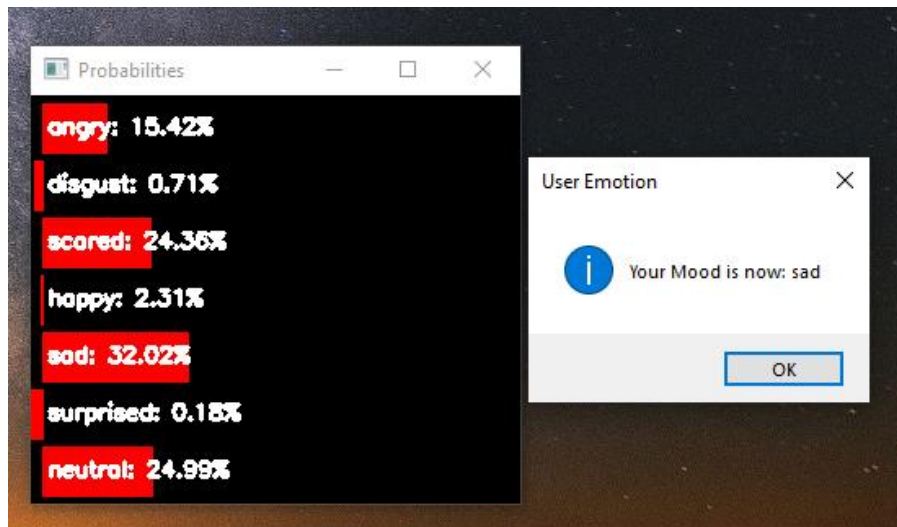Figure 4.4, Showing the emotion result is "Happy".

Fig 4.5: Sad Mood

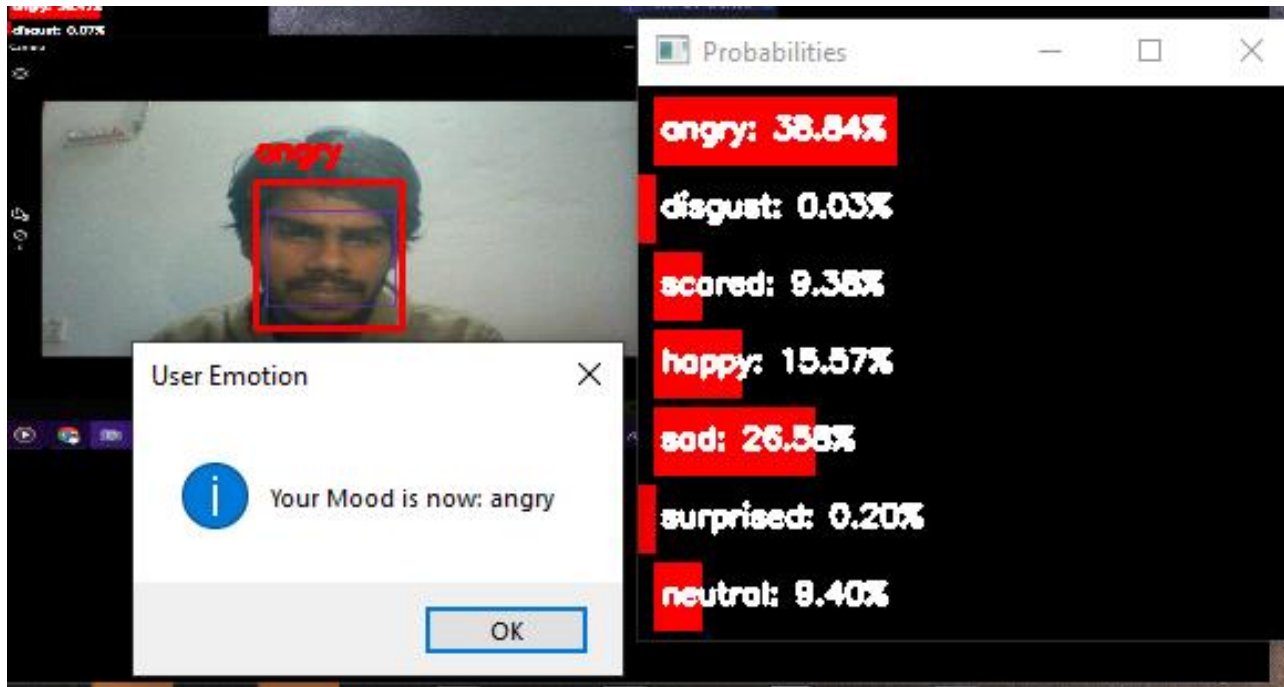Figure 4.5, Showing the emotion result is "Sad".

Fig 4.6: Angry Mood

In Fig 4.6, Showing the emotion result is Angry.

In Figure 4.7, our analysis part we are use almost 28,709 test data. Some of them Haapy; sad; angry; fear; disgust; surprised; neutral. From that data we get a chart that is given below :
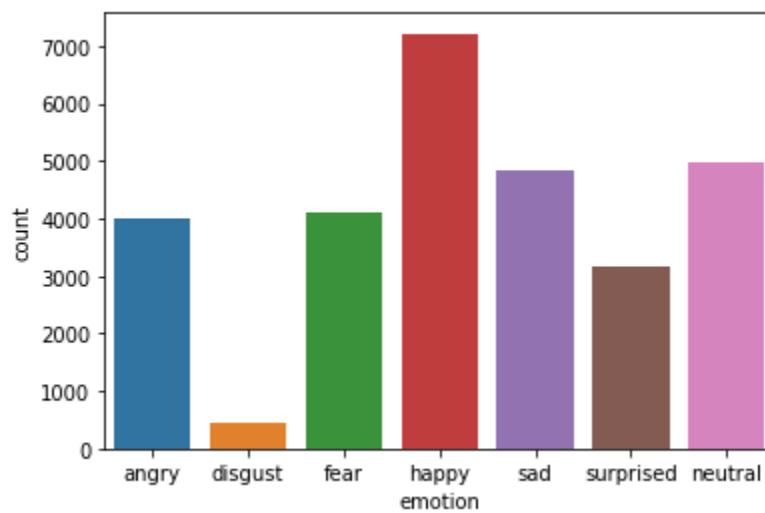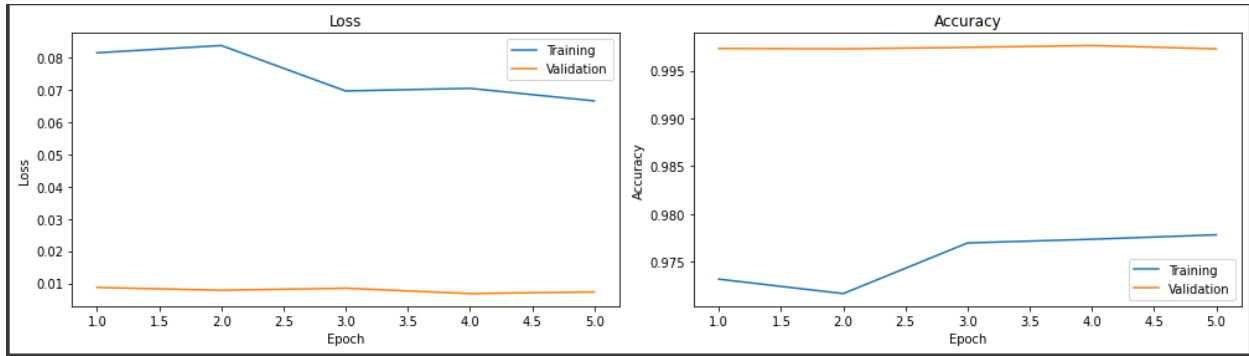

Fig 4.7: Emotion chart based on data

Fig 4.8: Accuracy chart based on data

In Fig 4.8 our Analysis part we have 28,709 test data. By Using that we get a suitable Accuracy. Our training accuracy is 0.9833 and validation accuracy is 0.8316.

Fig 4.9: Find out the Frequency of the Emotion

In Figure 4.9, Here I tried on my application about 51 people and saved their data. After receiving a few seconds of video, I got some emotions, out of which 20 were happy, 9 were sad, 6 were angry, 3 were scared, and 13 were neutral.
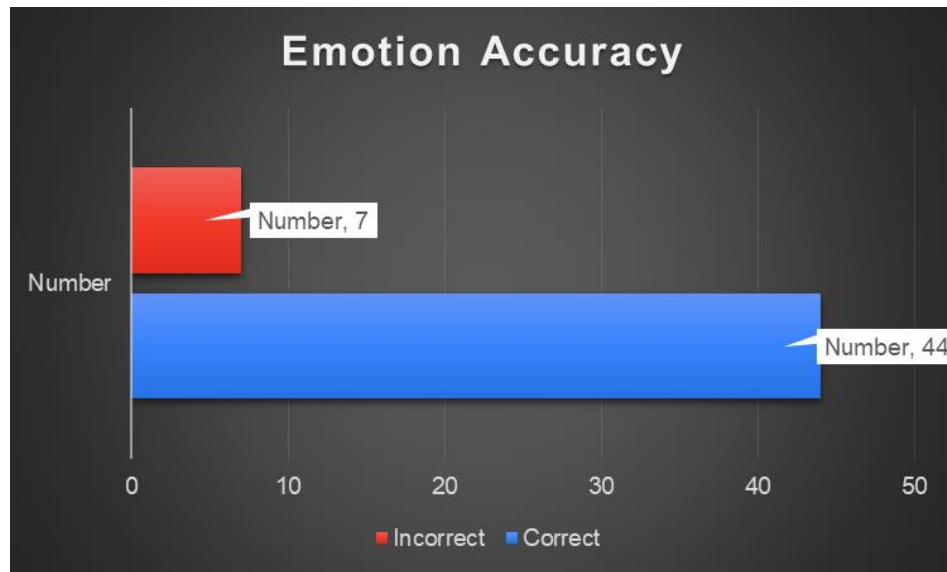

Fig 4.10: Emotion Accuracy among 51

Figure 4.10, it's the accuracy test among some people. Here I tried it out of about 51 people to see if the app was ok or not. Out of them, I got the wrong answer only 7. Because some of them had network problems, some had camera problems in video calls, and out of the rest, 44, I got the right answer.

CHAPTER 5

Social Impact

5.1 Social Impact

Emotion or Mood, anything we are saying, is always crucial for humankind. Detecting a person's feelings is continually tricky for a human to capture. There are several methods that emotion detection makes an impression on civilization. Suppose one recognizes that emotional speeches can affect public connections by giving information approximately in the expresser's brain. In this case, emotions can have influences repaying slight awareness of how they are connected, extended as the speeches bypass the essential statistics. Thus, the EASI hypothesis units that discharges of the very sensation conveyed using numerous open modalities have similar effects, assuming that others can see the passionate speeches. Such clean restriction situations aside, the EASI speculation offers that the community weakening approximation of emotions is virtually similar throughout easy-to-read manner and in this way of social influences of obsessive speeches is alike impartial of the straight network through it is created, so extended as the honest expression is precisely visible. However, additional examinations covered self-reviews of approaches or capability acknowledgements or coding of enthusiastic speeches as they arose in approximately constant public relations.

Ultimate, a few allotted reviews comprehend a mixture of research that decoratively collect emotional messages, emojis, photographs of facial cabinets, movie clips having facial, voiced, bearing looks, and keen demeanour, which are regarded in nearby and private collaboration. Finally, research has demonstrated that fans find from their central's appearances of shock instead of the rapture that their show is inadmissible versus great. However, those effects have been noticeable across ponders focused on different expressive manners, and no planned consequences of the express method ascended. As for the «perceptible» community effects of obsessive speeches, studies bolster the said advanced within the EASI hypothesis that behavioural responses to sincere expressions of trust upon the all-purpose significant great of complete emotion and inferential sequences are being fixed off by the eager speech. The well-known psychic valuation of complete emotion and inferential procedures in creating community feedback to obsessive declarations is, consequently, formed by using the observer's information-coping with suggestion and ability and utilizing the seeming rightness of the keen demonstration. For believing that

focusses on the community effects of obsessive speeches in the procedure, supportive preference introduction, management, and inspiration reveal that probable responses to keen declarations receipts on uplifted importance in looking ahead to behaviour reactions to obsessive speeches to the quantity that audiences are further encouraged and geared up to participate in in-depth information dealing with. These influences sum up through easy-to-read networks. Different analyses exhibit that whole of emotion reacts to keen speeches emerge as more excellent psychic of community responses inside the association and management backgrounds of the volume that spectators are much fewer encouraged or equipped to participate in detailed statistics coping with and in addition to watch the obsessive speeches as per extra fallacious. The existing script offers no symptoms in which the statistics guidance or noticed modesty varies depending upon the easy-to-read network via which a sense is reported. Toward position it evidently, there is no evidence of variance effects of emotions interconnected via numerous easy-to-read manner.

Regarding the interpersonal effects, many networks of keen communication are almost equal, on some occasions, to the quantity of the caption in their assets concerned. It is not indeed the situation that obsessive speeches always have comparable effects through various situations. In that case, variance responses that passionate declarations throughout the community events are more apparent as the general prominent the filled of emotion besides probable phases activated by the speeches than via the easy-to-read network concluded which the feel is emitted. At that point, the manner of apprehending the community impressions of keen declarations lies now not in searching for their properties through easy-to-read probable but bearing in mind the leading portion of facts managing and seeing modesty.

Using this scheme, we can understand whether the person we are talking to is happy or angry or sad, and we can talk to him accordingly. Let us say the person I am talking to is angry, but if I do not understand, if I talk to him in a funny or angry tone, it can be the opposite, but if I understand that he is angry or happy, then I talk to him that way. Tell me it would be better to talk. This would make much sense socially and benefit when someone is angry or frustrated. When we understand this, we can deal with them accordingly. When someone is angry, we say these related words to cool his anger, or when he is depressed, we want to bring him out of depression; when we know someone is happy or sad or angry, talking to him in that proportion reduces the frown in society. . In this way we can prevent quarrels, everyone can live in peace in the society.

CHAPTER 6

Conclusion

6.1 Conclusion

We have correctly completed our effort, and the subsequent are the vintages. Those are handy within the present structure. Consequently, this structure furnishes the computing device purchaser with a much less luxurious free, smooth-to-recognize specific-feeling discovery framework, which is undoubtedly beneficial to the customers. Because when we communicate with someone, if we apprehend his mindset or emotion, then we speak in that proportion. As a result, we will not quarrel with him, and the relationship will enhance. When someone's thoughts are sound, he can do the whole lot clearer, and with the aid of doing the whole thing clearly, peace will come to our society at some point. For converting the mindset framework, our packages are beneficial. Our applications' crucial little bit of leeway is understanding precise human feelings.

6.2 Future Work

In Future, we plan to feature several critical capabilities in this mission, and those capabilities will play a crucial function in human existence. So, our future work strategy is stated beneath:

- We will attempt to progress the safety of this plan.
- We will try to do it through a CCTV camera.
- We will use it in the psychological field.
- We will make an android application.
- In Future, we can make an IoT robot with this project.

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