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HUMAN COMPUTER INTERACTION
(CSE4015)

J COMPONENT

TITLE: Emotion Based Content Delivery for Rehabilitation Centers Using DCNN

SUBMITTED TO: DR. SWARNALATHA P

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Aim

The aim of this project is to develop a "Emotion Recognition" system using Deep Convolutional Neural Network (DCNN) in real time. This system is developed using DCNN, which offers greater accuracy compared to the general Convolutional Neural Network (CNN). Humans have several facial expression and all are dynamic in nature. The end goal of this project is to develop a system that predicts the emotion of the end-user in real time, dispatch the data and share the location of the person.

Abstract

Deep Neural Networks (DNNs) outperform traditional models in numerous optical recognition missions containing Emotion Recognition which is an imperative process in next-generation Human-Computer Interaction (HCI) for behavioural description. Existing facial emotion recognition methods lag in terms of high accuracy and are not sufficient and not practical in real-time applications. This work proposes the use of Deep Convolutional Neural Network (DCNN) method for Facial emotion recognition in Images. The proposed network architecture consists of Convolution layers by which the model extracts the HAAR features from the input facial image and by using the deep convolutional neural network the temporal dependencies which exist in the images can be considered during the prediction.

Keywords: Human Computer Interaction, Emotion recognition, Deep convolutional neural network, HAAR classifier, mobilenet classifier, Deep learning, Feature extraction.

Applications: Rehabilitation centres, Personal security, juvenile detention centres, therapy, PTSD trauma centres, specially-abled kids schools or habitation centres.

Introduction .

Humans use facial expressions to point out their emotional states. However, countenance recognition has remained a challenging and interesting problem in computer vision. Extensive possibilities of applications have made emotion recognition ineluctable and challenging within the field of computing . the utilization of non-verbal cues like gestures, body movement, and facial expressions convey the sensation and therefore the feedback to the user. This discipline of Human–Computer Interaction places reliance on the algorithmic robustness and therefore the sensitivity of the sensor to ameliorate the popularity . Sensors play a big role in accurate detection by providing a really high-quality input, hence increasing the efficiency and therefore the reliability of the system. Automatic recognition of human emotions would help in teaching social intelligence within the machines. This paper presents a quick study of the varied approaches and therefore the techniques of emotion recognition. The survey covers a succinct review of the databases that are considered as data sets for algorithms detecting the emotions by facial expressions. Later, mixed reality device Microsoft HoloLens (MHL) is introduced for observing emotion recognition in Augmented Reality (AR). a quick introduction of its sensors, their application in emotion recognition and a few preliminary results of emotion recognition using MHL are presented.

As the years of intensive research and development elapsed, computers became rather more powerful than before. Recently, newer algorithms and techniques are being developed for image pre-processing, feature extraction, and powerful classification methods. Facial recognition has becomes a major feature for industries leading in mobile phones, security chains, etc.

The objective of the Deep Convolution Neural Network is to identify the visual input and predict the corresponding character. It is used to figure out an image and understand how pixel elements are arranged in an image. It could be holding the input image, deducting a weight matrix and the input convoluted to specify features from the image without considering about the dimensional arrangement and decreasing the number of specifications from the visual input. The

convoluted images have lesser pixels when compare to an original input. It is definitely decreasing the number of parameters needed to train the network. Facial emotion recognition involves the process of interpretating the visual input and then print the corresponding predicted emotion. When it comes to visual real-time facial analysis the task is difficult to process due to the complexity in the image in face size, brightness of the room, etc. In the proposed system the scanned image is pre-processed and segmented into paragraphs, paragraphs into lines, lines into words and words into character image glyph. Then we perform feature extraction methods to extract features from these character image glyph to extract the features such as character height, width, number of horizontal and vertical line patterns, horizontally and vertically oriented curve patterns, circles, number of slope lines, image centroid and special scripts.

Objectives

As stated above the goal of this project is to predict the facial emotion of the end-user, and the data which is captured is then dispatched via an e-mail sharing the location of the user. The project objectives are discussed below in detail,

1. Recognize the current emotion of the user.
2. Import and integrate the modules for accessing the user's webcam.
3. Initiate the session and allot the memory fragments- collection of continuous frames from the video captured to recognize faces, classification and prediction of emotions in real-time.
4. Merging the data with sub-modules and forming a customized hybrid module.
5. Storing the data captured (facial emotion of user) indicating the status of the user's emotion in a file.
6. Finding location of the person.
7. If the emotion isnt normal mail the emergency contact with location and data stored.
8. For Rehabilitation centre display contents to the user such that the user's emotion is always in control

Literature Survey

Facial emotion recognition is the process of detecting human emotions from facial expressions. The human brain recognizes emotions automatically, and software has now been developed that can recognize emotions as well. This technology is becoming more accurate all the time, and will eventually be able to read emotions as well as our brains do. AI can detect emotions by learning what each facial expression means and applying that knowledge to the new information presented to it. Emotional artificial intelligence, or emotion AI, is a technology that is capable of reading, imitating, interpreting, and responding to human facial expressions and emotions. Understanding contextual emotion has widespread consequences for society and business. In the public sphere, governmental organizations could make good use of the ability to detect emotions like guilt, fear, and uncertainty. It's not hard to imagine the TSA auto-scanning airline passengers for signs of terrorism, and in the process making the world a safer place.

Facial expression recognition(FER) deals with the process of identifying face expressions associated with human emotions that are displayed when a person exhibits an emotion. FER is believed to have several applications especially in the fields of medicine, human computer interaction, surveillance, etc. where recognition of a person's emotion based on the facial expressions is vital. The process of detecting emotions from face expression generally involve two fundamental steps mainly feature extraction and emotion recognition [1]. There have been research studies in the field of FER by using DCNN models as the base for developing the system. The research study that worked on the Child Affective Facial Expression (CAFE) dataset and the Extended Cohn Kanade (CK+) dataset by Adish Rao explored the possibility of developing an emotion recognition technique that works for both adults as well as children by identifying the differentiating features. The proposed model used an integrated DCNN architecture that incorporated facial landmarks to predict the emotions. This research focused on the estimation of the optimal facial landmarks that were needed in order to obtain desirable results for a FER system [2]. However the use of DCNN for FER systems comes with a bottleneck. DCNN is considered to be the optimal approach for most effective and efficient facial emotion recognition systems. However, DCNN based approach has its own downside. The use of DCNN for FER systems need to be properly implemented in order to overcome the bottleneck that arises due to stability and

infinite feasibility problems. These problems arise when we deal with human faces of different races. Researchers have been able to overcome this issue by using a novel feature extraction method for such bottleneck conditions [3]. Apart from FER systems recently researchers have also began working on speech emotion recognition (SER) using DCNN. The drawbacks on SER systems is the time that needs to dedicated to annotate the data can be exorbitant, thus when the model which is trained on such limited data samples fails to perform on newer data samples. The study can also be associated to the case of FER where there is a possibility of getting wrong predictions, but by using active learning (AL) approach we can select active samples using greedy sampling and uncertainty methods to train the model and evaluate the performance [4].

Apart from traditional approaches to develop a FER system using DCNN models Ismail Shahin and set of researchers proposed a text and speaker independent emotion recognition system that used a novel classifier. The model proposed was a hybrid architecture that composed a hybrid cascaded gaussian mixture and deep neural network (GMMDNN) model in a single architecture. The researchers used the Speech database (from the Arabic U.A.E Database) that consisted six unique emotions. The proposed architecture was tested against traditional emotion classifiers like SVMs (support vector machines) and MLPs (Multilayer Perceptron) classifiers and the results proved that the hybrid model outperformed the traditional classifiers with a perform accuracy of 83.97%. The same model when tested with databases with noisy conditions also performed significantly better [5]. Developing a FER system is hectic but to program an automated FER system can be challenging as well. Recent breakthrough in the field of computer vision have supported the improvements in FER systems drastically. Particularly the DCNN based approach has shown substantial changes and improved results, the reason that DCNN can outperform Convolutional Neural Network based facial analysis classifiers is due to two key factors a. the traditional CNN architecture involves tuning of parameters to tolerate mixture and complementarity in results, b. the classification rule embedded in FER developed using CNNs lack quality. Thus, when training the model on a posterior probabilities allow capture of non-linear dependencies among classification rules [6]. Using FER for surveillance involves recognizing facial emotions from video files. To extract facial features from video frames we tend to make use of the local characteristics (landmarks) to produce geometric-based facial features that help to discriminate between the various emotion expressions. A study

conducted by Amr Mostafa involved the development of a FER system for the BioVid Emo database [7] using machine learning classification algorithms such as random forest (RF), recurrent neural network (RNN), etc.

Face recognition is of great importance to world applications like video surveillance, human machine interaction and security systems. As compared to traditional machine learning approaches, deep learning based methods have shown better performances in terms of accuracy and speed of processing in image recognition. The leading edge innovation of countenance Recognition framework is that the consumer satisfaction estimation. MFER, a completely unique procedure is proposed during this paper for identifying consumer satisfaction levels. The model must anticipate client's behaviour within the dynamic cycle. As stated before the traditional facial emotion recognition systems help only with the classification of basic emotions, and these fundamental emotions are limited to express only restrained and contrasting emotions.

Researchers have been working on newer methods to develop models that can understand and interpret complex facial emotions, one such approach is discussed by Yong Yang and fellow researchers by making use of valences or the concept of thresholds for each class of emotions [8]. They worked on an arousal-valence continuous emotion space model, to enhance existing emotion recognition systems. In their approach they have used arousal reflects that corresponds to the emotional intensity of the person, the main purpose of using the valences is to classify positive and negative emotions. This approach assigned values from -1 to 1 for each emotion based on its intensity and the trained the model using an integration of CNN for extracting the features from the facial data and using support vector regression(SVR) model to predict the emotion. The experimental results from their research showed that their approach exhibited better recognition result than the traditional methods.

Deep Convolutional Neural Network (CNN) may be a special sort of Neural Networks, which has shown exemplary performance on several competitions associated with Computer Vision and Image Processing. A number of the exciting application areas of CNN include Image Classification and Segmentation, Object Detection, Video Processing, Tongue Processing, and Speech Recognition [9]. The powerful brain of deep CNN is primarily thanks to the utilization of multiple feature extraction stages which will automatically learn representations from the info. The supply of an outsized amount of knowledge and improvement within the hardware technology has accelerated the research in CNNs, and recently interesting deep CNN

architectures are reported. Several inspiring ideas to bring advancements in CNNs are explored, like the utilization of various activation and loss functions, parameter optimization, regularization, and architectural innovations [10]. However, the many improvements within the representational capacity of the deep CNN is achieved through architectural innovations. Notably, the ideas of exploiting spatial and channel information, depth and width of architecture, and multi-path information science have gained substantial attention. Similarly, the thought of employing a block of layers as a structural unit is additionally gaining popularity.

Methodology

The goal of this project is to capture the face of the user and predict the emotion of the user by analysing the facial expressions from the captured image. Human emotions are very difficult for computers to understand due to the fact that the overall expression for the same emotion differs from person to person based on the face. This difference could be due to the fact that every person has a different face structure and some might not display the emotions prominently compared to others. In general, there are 7 types of human emotions that are recognised universally namely anger, happiness, disgust, fear, sad, surprise and neutral.

Preparing the dataset: First we need to prepare a dataset with which we train the model. The Model we will be using contains different datasets of faces for example CK+ dataset and some images. Once the dataset is fixed we then train the model by passing the train dataset through the convolutional layers. Once the model is trained we will test with model with test inputs which is the real-time feed from the user's webcam, the trained model will be able to recognize emotions from the input image.

Detecting faces: The system gets the user's face from the webcam feed which is then passed onto the model for predicting the emotion. The emotion from the user's face is predicted using HAAR cascade classifier, which is a course work in OpenCV that is used for object recognition. HAAR classifier are mainly used for face recognition. When the image is passed to the HAAR classifier the image is changed to grey -scale and is resized to a similar size as the images in dataset. A HAAR

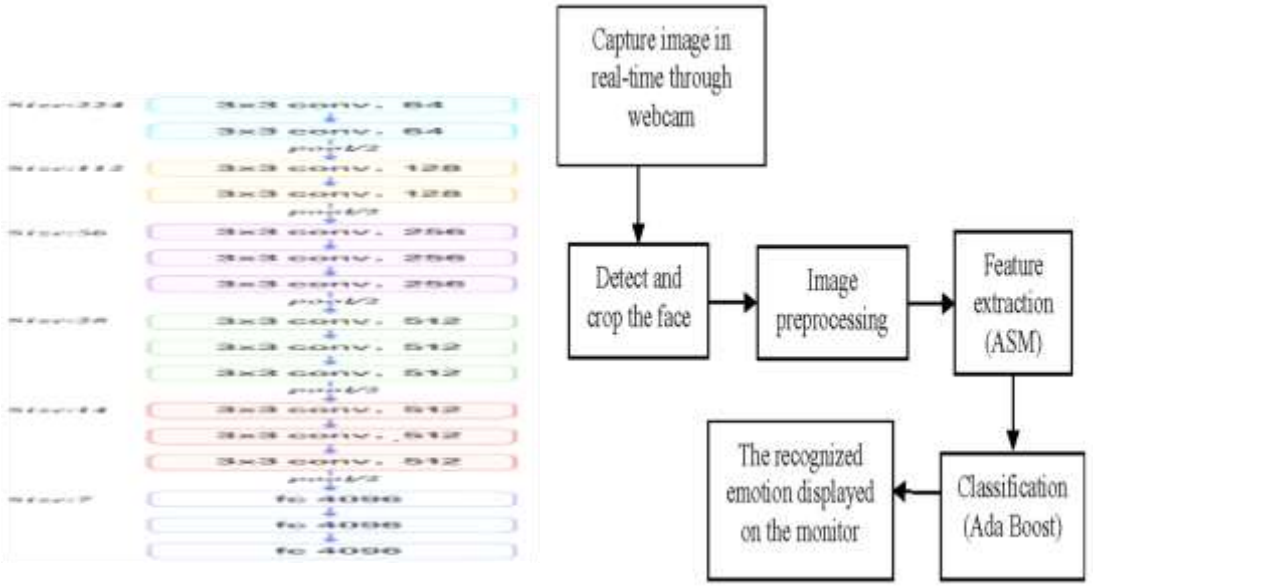
course is fundamentally a classifier which is used to detect specific objects from the source.

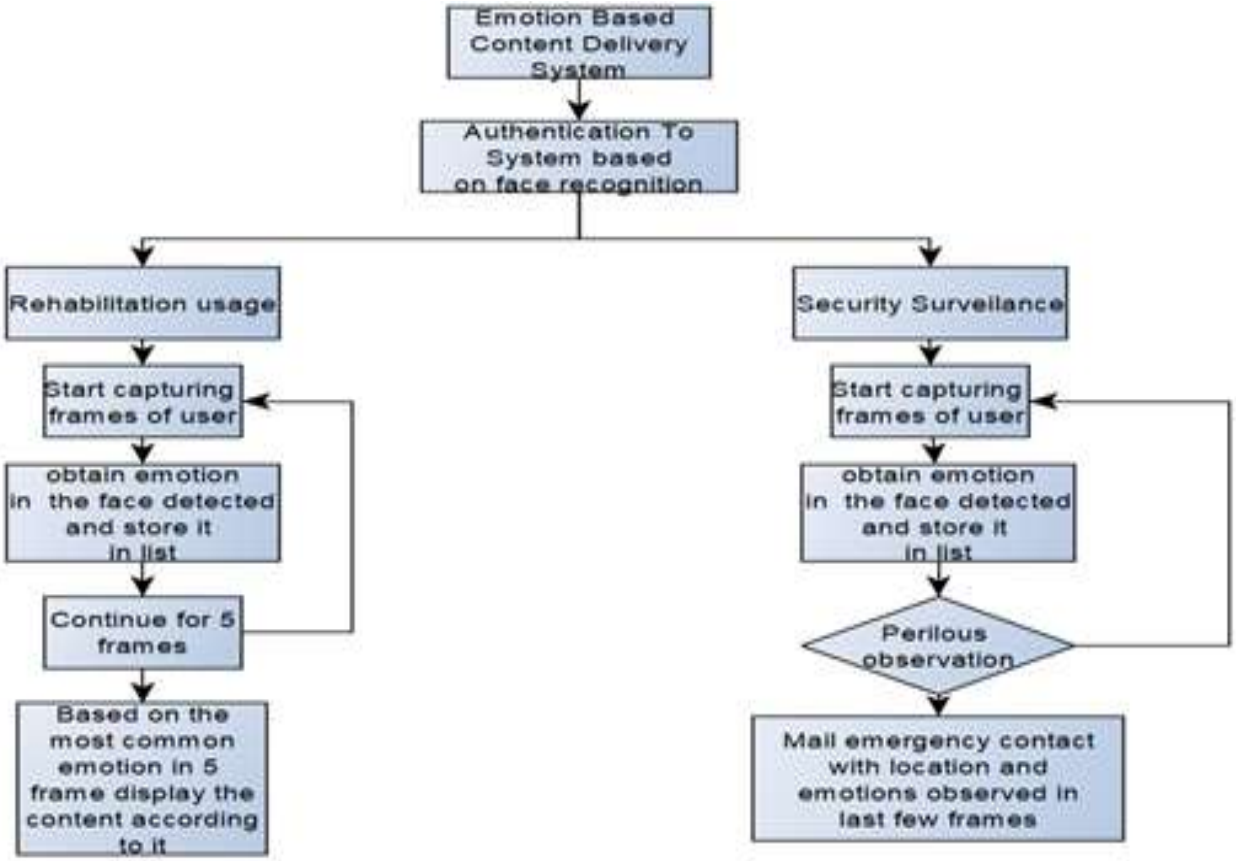
Swapping emotions in place of face: This is the most important step that is to recognize the emotion from the captured image and it involves placing the appropriate emotion over the face of the person according to their emotion. The HAAR cascade function returns the coordinates of the face detected and these coordinates can be used to place the emotion of the person at the correct place.

Parsing the data and emotions: We will parse the data frame-by-frame and the output will be produced in the form of a text file that will contain emotions captured frame-by-frame from the input. Now, we will set a limit for certain emotion like fear for which it sends the data if the limit is crossed.

HAAR classifier: By using HAAR cascade classifier we will be able detect the face from the image and then by using keras model's Deep Convolutional Neural Network we can classify the emotion recognized from the user's face. The model's prediction is then analysed for particular emotion is shown by a person for certain number of times in our case its fear, it sends a mail to the other person that he/she is in some danger with their location and their emotion statistics for a certain period of time. With this we can able a convey a message to another person, without any words and convey our emotions to them.

System Architecture (Block Diagram)





System Requirements

The project includes a web interface which will have access to the user's webcam. The image is captured via the webcam and then inputted to the model. The result from the model triggers an email which shares the user's email based on the predicted emotion.

Software Requirements

The project consists of two modules mainly which are the model and the web interface.

The software requirements of the facial emotion recognition model is developed using python the packages that are needed are listed below,

- Python 3.8
  - OS
  - Numpy (version- 1.20.1)
  - Geocoder (version- 0.6.0)
  - Keras (version- 2.4.3)
  - OpenCV (version- 4.5.1)
  - Tensorflow (version- 2.4.7)
  - Gmplot (version- 1.4.1)
  - Email (version- 0.6)
  - Smtplib (version- 3.9.4)

- Operating System: MacOS, Windows or Linux

The software requirements of the web interface are listed below,

- Django

Hardware Requirements

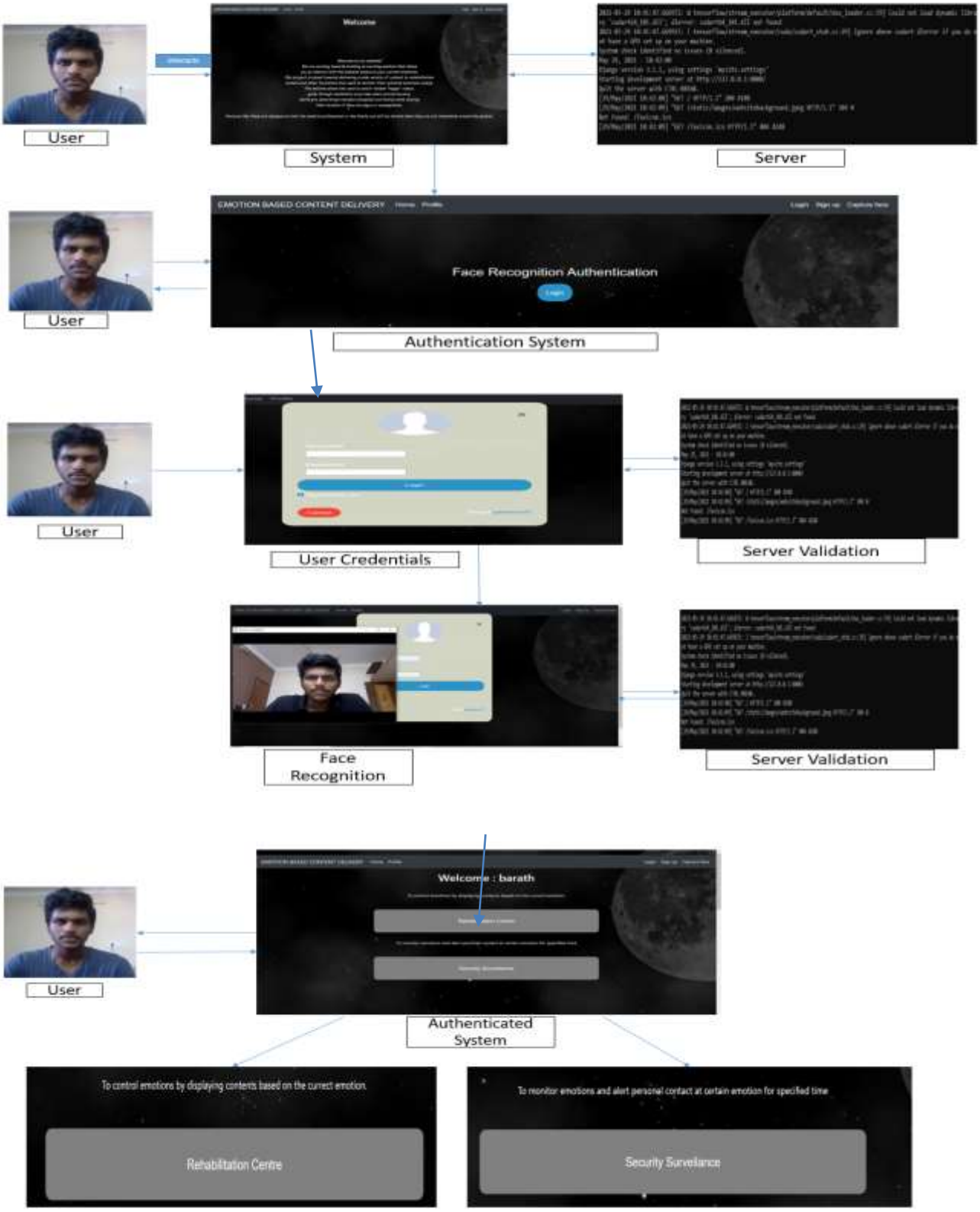
- System Hardware:
  - Core i7 or AMD ryzen 7 processor (or above)
  - 16GB of ram
  - 4-6GB of VRAM (Graphics memory)

- Web cam (either built-in or external)

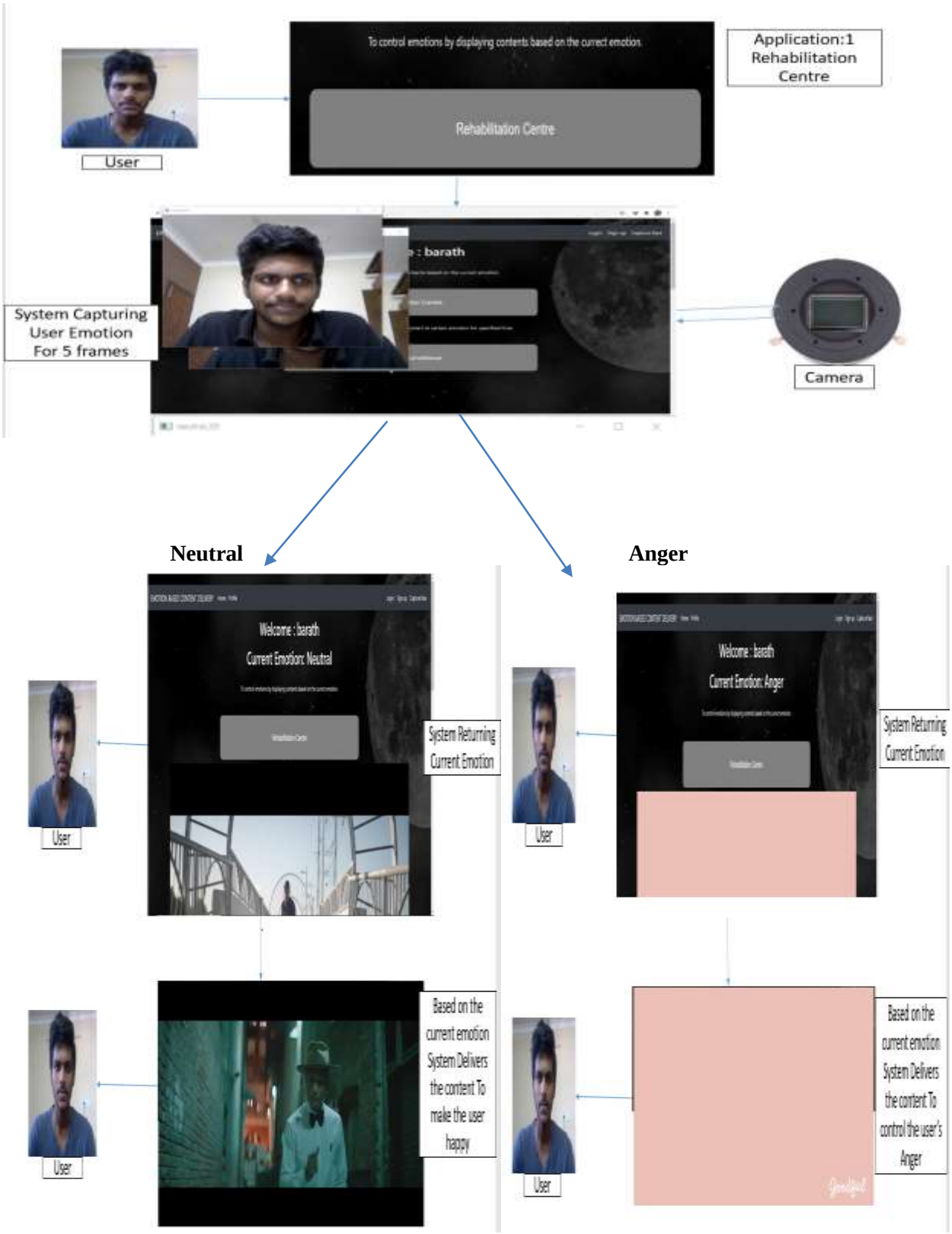
Contribution Details

NAME	CONTIBUTION
Roshini Thangavel	Programmed the HAAR feature extraction from the input image for processing, also collected the dataset required for training the model.
Bharath Surendar I	Formulated the system architecture and developed the basic structure of the model. Programmed the components for the required for the image capturing.
Sri Siddarth Chakaravarthy	Documentation and literature Survey for getting additional information regarding the project. Studied the previous methods used for the facial recognition methods and the drawbacks.

HTA and Interaction Design



Application 1:



Here there are 7 emotions possible, where two are highlighted here

Application 2:

Design Principles

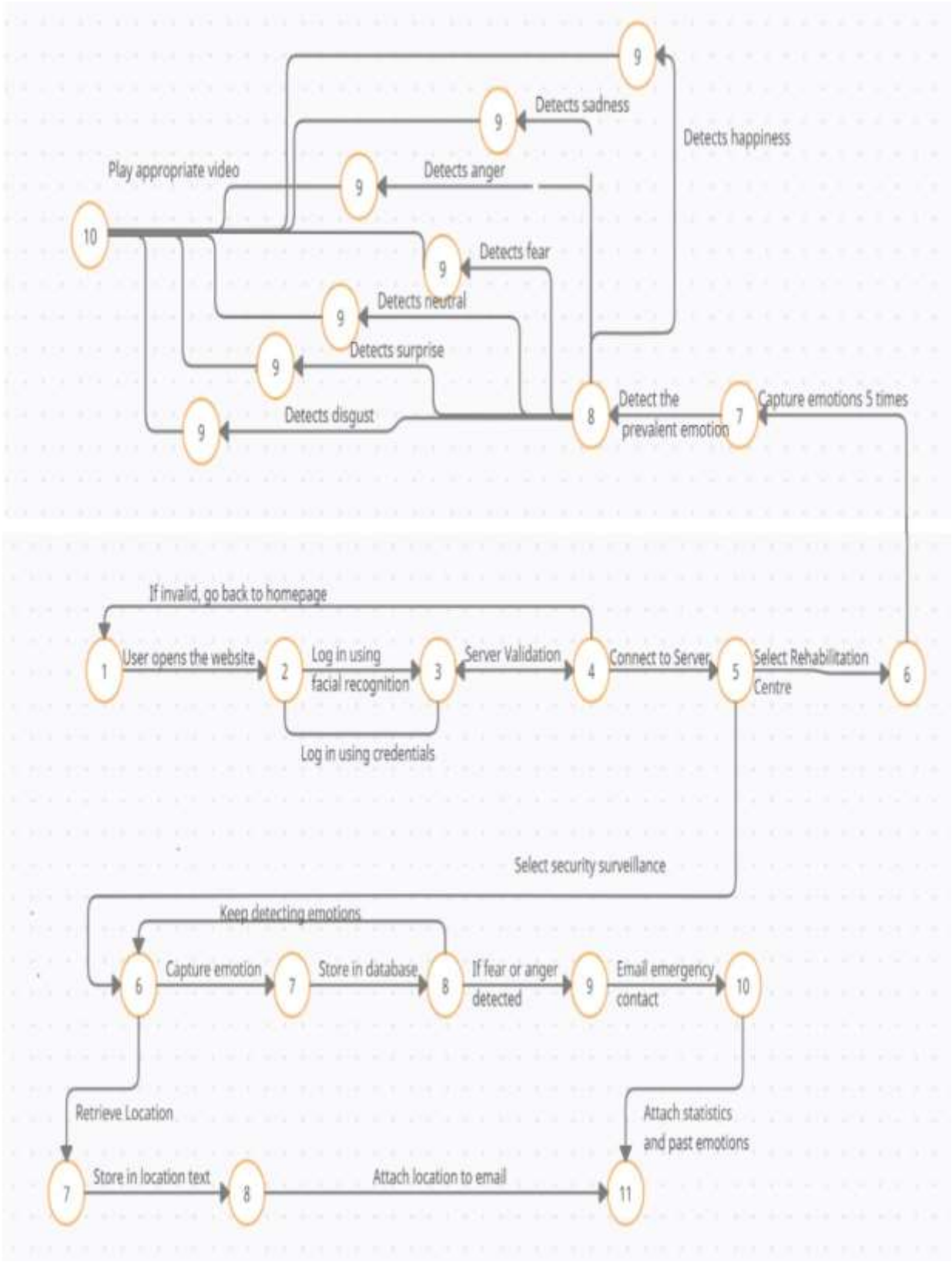
Visibility of system status	*The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.* **Explanation:** In our project the user is fully aware of all the interactions that happen with the system in the form of notification messages and is constantly informed about the interface while interacting. The control response ratio is also kept to a minimal (that is the time the user selects the option and system's response). The camera enable message is sent to the user when the system is in ready state so that the user is made aware of the interaction cycle has begun.
Match between system and the real world	*The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.* **Explanation:** Our project has simple instructions that can easily be interpreted by users and we have avoided the use of technical terms so that users can understand the working of the system and the options/features provided instantly. The interface used here allows users to smoothly transition to the system with ease and be able to understand its usage without much difficulty.
User control and freedom	*Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.* **Explanation:** The user interface in this project enables users the option of reverting any option they have selected by simply

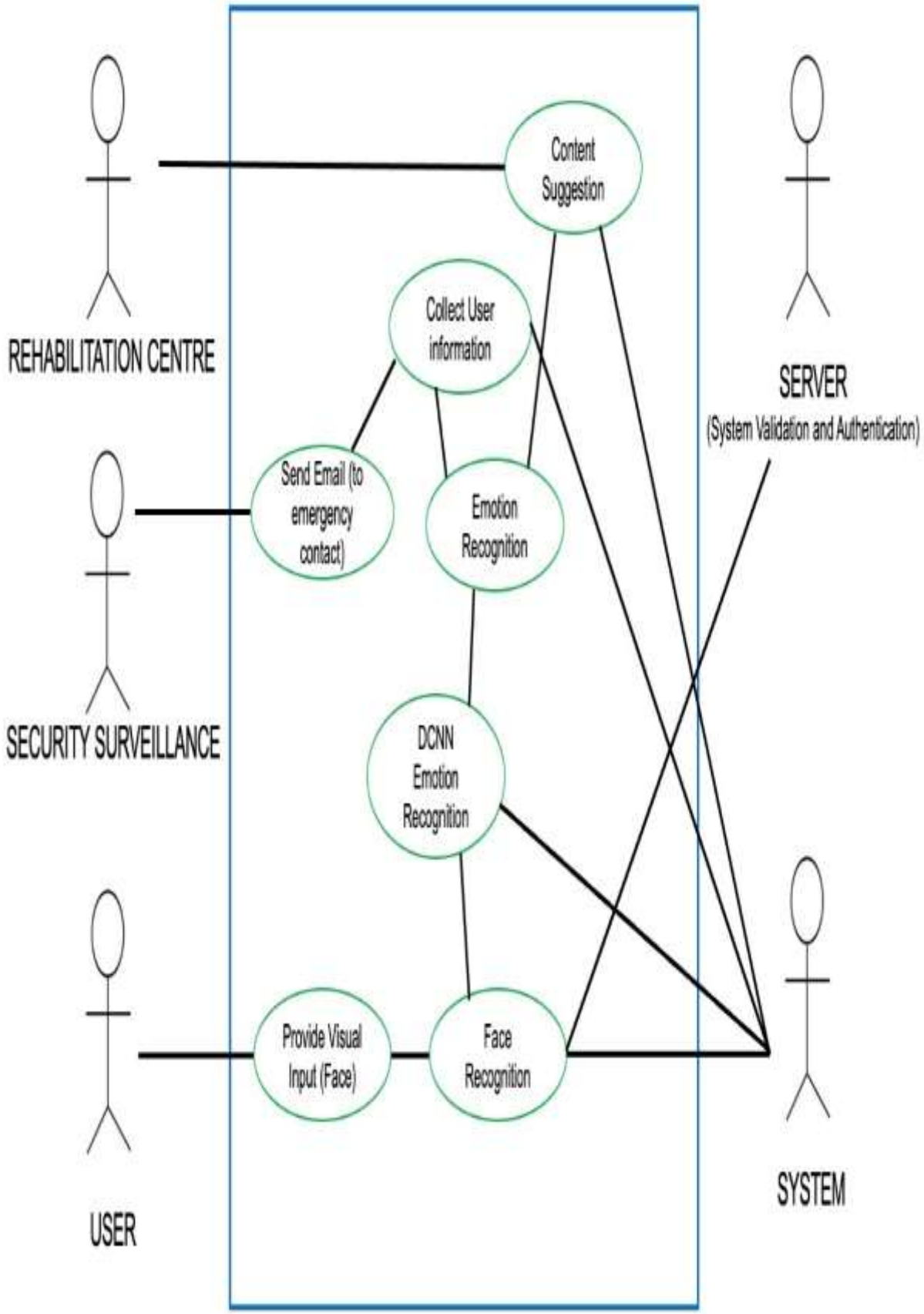
	going back to the “home page”. Users can also interrupt the facial capture by disabling the camera and the system will not proceed further. The user is in control of any decision made and can also change it when needed one can choose to stop interacting an time rather than be forced or trapped by the interface into inaction.
Consistency and standards	*Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.* **Explanation:** The interface has unique interpretation of each option in the menu and the consistency in dialogue as well as in visual elements is achieved by specifying and adhering to a dictionary of words / labels/ symbols/ colours which together form a ‘ standard’ that the users need to follow for using the system.
Error prevention	*Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.* **Explanation:** Error messages are set in places in the system interface and are notified to the user in case an error occurs. Possible errors have been anticipated and appropriate messages have been used for each unique error so that users can revert the changes according to the error. “Login”, “face capture” show error messages if the user has given the wrong credentials or if the user has disabled the camera preferences for the system respectively.
Recognition rather than recall	*Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be*

	visible or easily retrievable whenever appropriate. **Explanation:** The interface includes reduction on cognitive load during the interaction which ensures that the users are not asked to rely on means and methods that extract human cost. This interface does not require specialized training and use of memory to operate.
Flexibility and efficiency of use	*Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.* **Explanation:** Once a user becomes adept at using an interface they can even use the application as part of their normal usage and can have perform system tasks faster. The interface allows experienced users to take full advantage of all the features available. The interface is flexible and makes it possible for the user to adopt quicker dialogues through shortcuts. The user feels efficient as well as proficient.
Aesthetic and minimalist design	*Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.* **Explanation:** The interface design of the system is "minimalistic" to avoid visual clutter as it only adds to inefficiency however impressive it is visually. The interface in this project is simple and clean with no major design implementations so as to have elegant user interface that is preferred and appreciated by users.
Help users recognize, diagnose, and recover from errors	*Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.*

	Explanation: All interactions to the user via the system does not involve any form of technical terms and all the messages conveyed to the user are in simple terms so that the user that understand the flow of the system. Once the emotion is predicted the user can see the text with the predicted emotion and the system gives the content based on the emotion and in other case it sends an alert message to the emergency contact.
Provision of Help and documentation	*Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.* **Explanation:** The interface has the option of help menu where the user can view the working of the system and can learn the system's applications. This is to assist the user learn and understand the dialogue between the user and the system or understand where what went wrong or aid recall during memory lapses due to long usage time gaps. Adequate support system when the user wants and at the point where the user wants it is made available for the users.

Communication and Collaboration




REHABILITATION CENTRE
SECURITY SURVEILLANCE
USER
SERVER
(System Validation and Authentication)
SYSTEM
Content Suggestion
Collect User information
Send Email (to emergency contact)
Emotion Recognition
DCNN Emotion Recognition
Provide Visual Input (Face)
Face Recognition

Testing

In our project we have 4 major modules those are

- Face recognition
- Application 1 – Rehabilitation Centre
- Application 2 – Security Surveilance

Test Case ID	T01		
Priority	High		
Description	To test the face recognition module		
Module	Login		
Prepared By	Bharath Surendar I	**Date Prepared**	25 – May – 2021
Reviewed / Updated	Bharath Surendar I	**Date Reviewed**	25 – May – 2021
Tested By	Bharath Surendar I	**Date Tested**	25 – May – 2021

Test Cases

Sl. No.	**Test Scenerio**	**Input Condition**	**Expected Result**	**Actual Result**
1	C1 – User login with valid data and correct face match	Username – barath Password – barath123	User should login into the application	User login into the application
2	C2 – User login with invalid data and invalid face match	Username – abcdef Password – abcdef123	User should not login into the application, and an error message should appear.	Error message: “Invalid Username or Password”
3	C3 – User login with empty data.	Username – Password –	User should not login into the application, and an error message should appear.	Error message: “Please Enter username and password”

4	C4 – User login with valid data and invalid face match	Username- barath Password- barath123	User should not login into the application, and an error message should appear	Error message: “no data match in the database”
Test Case Result			Pass	

Test Case ID	T02		
Priority	High		
Description	To test the Rehabilitation centre application		
Module	Rehabilitation Centre		
Prepared By	Bharath Surendar I	**Date Prepared**	25 – May – 2021
Reviewed / Updated	Bharath Surendar I	**Date Reviewed**	25 – May – 2021
Tested By	Bharath Surendar I	**Date Tested**	25 – May – 2021

Test Cases

Sl. No.	Test Scenerio	Input Condition	Expected Result	Actual Result
1	C1 – User is exhibiting neutral emotion	Major Emotion Captured - Neutral	Show current EmotionNeutral Play Video1	Current Emotion: Neutral Content Delivered: Video1
2	C2 – User is exhibiting Happy emotion	Major Emotion Captured - Happy	Show current Emotion Happy Play Video1	Current Emotion: Happy Content Delivered: Video2
3	C3 – User is exhibiting Sad emotion	Major Emotion Captured - Sad	Show current Emotion Sad Play Video3	Current Emotion: Sad Content Delivered: Video3
4	C4 – User is exhibiting Surprised emotion	Major Emotion Captured - Surprise	Show current Emotion Surprise Play Video4	Current Emotion: Surprise Content Delivered: Video4

5	C5 – User is exhibiting Disgust emotion	Major Emotion Captured - Disgust	Show current Emotion Disgust Play Video5	Current Emotion: Disgust Content Delivered: Video5
6	C6 – User is exhibiting Anger emotion	Major Emotion Captured - Anger	Show current Emotion Anger Play Video6	Current Emotion: Anger Content Delivered: Video6
7	C7 – User is exhibiting Fear emotion	Major Emotion Captured - Fear	Show current Emotion Fear Play Video7	Current Emotion: Fear Content Delivered: Video7
8	C8 – No face recgonized	No face Captured	Error Page	Error
Test Case Result			Pass	

Test Case ID	T03		
Priority	High		
Description	To test the Security Surveilance application		
Module	Security Surveilance		
Prepared By	Bharath Surendar I	**Date Prepared**	25 – May – 2021
Reviewed / Updated	Bharath Surendar I	**Date Reviewed**	25 – May – 2021
Tested By	Bharath Surendar I	**Date Tested**	25 – May – 2021

Test Cases

Sl. No.	Test Scenerio	Input Condition	Expected Result	Actual Result
1	C1 – User is exhibiting neutral emotion	Major Emotion Captured - Neutral	No Response	No Response
2	C2 – User is exhibiting Happy emotion	Major Emotion Captured - Happy	No Response	No Response

3	C3 – User is exhibiting Sad emotion	Major Emotion Captured - Sad	No Response	No Response
4	C4 – User is exhibiting Surprised emotion	Major Emotion Captured - Surprise	No Response	No Response
5	C5 – User is exhibiting Disgust emotion	Major Emotion Captured - Disgust	No Response	No Response
6	C6 – User is exhibiting Anger emotion	Major Emotion Captured - Anger	Mail the emergency Contact with location details like address and map, record of users emotion captured previously	Mailed the emergency Contact with location details like address and map, record of users emotion captured previously
7	C7 – User is exhibiting Fear emotion	Major Emotion Captured - Fear	Mail the emergency Contact with location details like address and map, record of users emotion captured previously	Mailed the emergency Contact with location details like address and map, record of users emotion captured previously
8	C8 – No face recgonized	No face Captured	Error Page	Error
Test Case Result			Pass	

Web Integration Testing using Django testing tool:

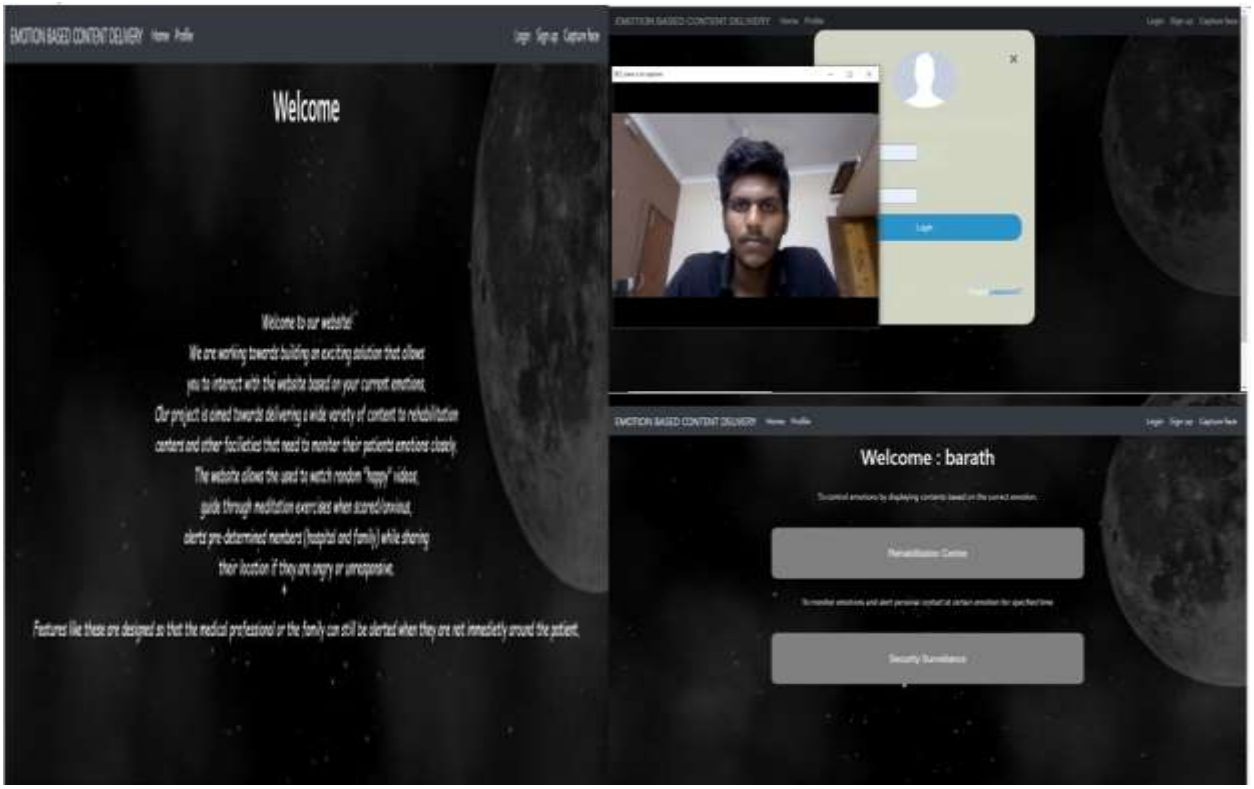
TestUrls — test_takeimg_url_is_resolves

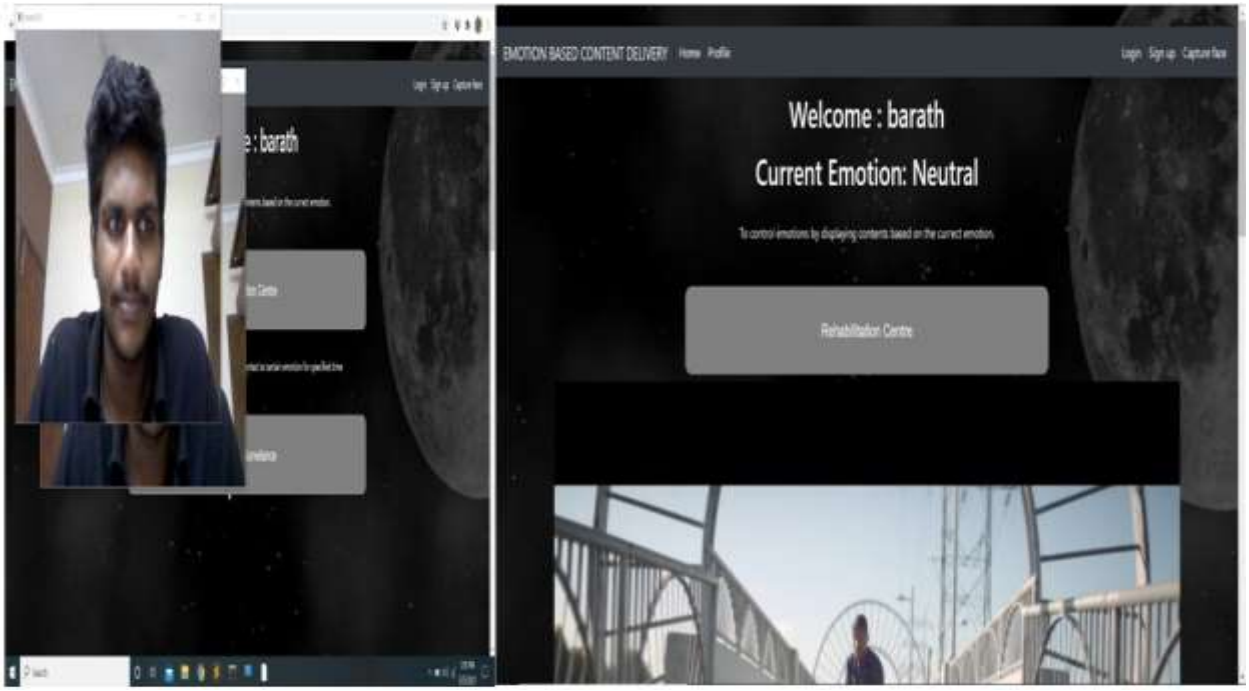
```python
from django.test import SimpleTestCase
from django.urls import reverse,resolve
from pages.views import home,about,base,register,index,profile,common,takeimg,index1
class TestUrls(SimpleTestCase):
    def test_home_url_is_resolves(self):
        url=reverse('home')
        print("Hi testing home url")
        self.assertEquals(resolve(url).func,home)
    def test_about_url_is_resolves(self):
        url=reverse('about')
        print("Hi testing about url")
        self.assertEquals(resolve(url).func,about)
    def test_base_url_is_resolves(self):
        url=reverse('base')
        print("Hi testing base url")
        self.assertEquals(resolve(url).func,base)
    def test_index_url_is_resolves(self):
        print("Hi testing index url")
        url=reverse('index')
        self.assertEquals(resolve(url).func,index)
    def test_register_url_is_resolves(self):
        url=reverse('register')
        print("Hi testing register url")
        self.assertEquals(resolve(url).func,register)
    def test_profile_url_is_resolves(self):
        url=reverse('profile')
        print("Hi testing profile url")
        self.assertEquals(resolve(url).func,profile)
    def test_common_url_is_resolves(self):
        url=reverse('common')
        print("Hi testing common url")
        self.assertEquals(resolve(url).func,common)
    def test_takeimg_url_is_resolves(self):
        url=reverse('takeimg')
        print("Hi testing takeimg url")
        self.assertEquals(resolve(url).func,takeimg)
```

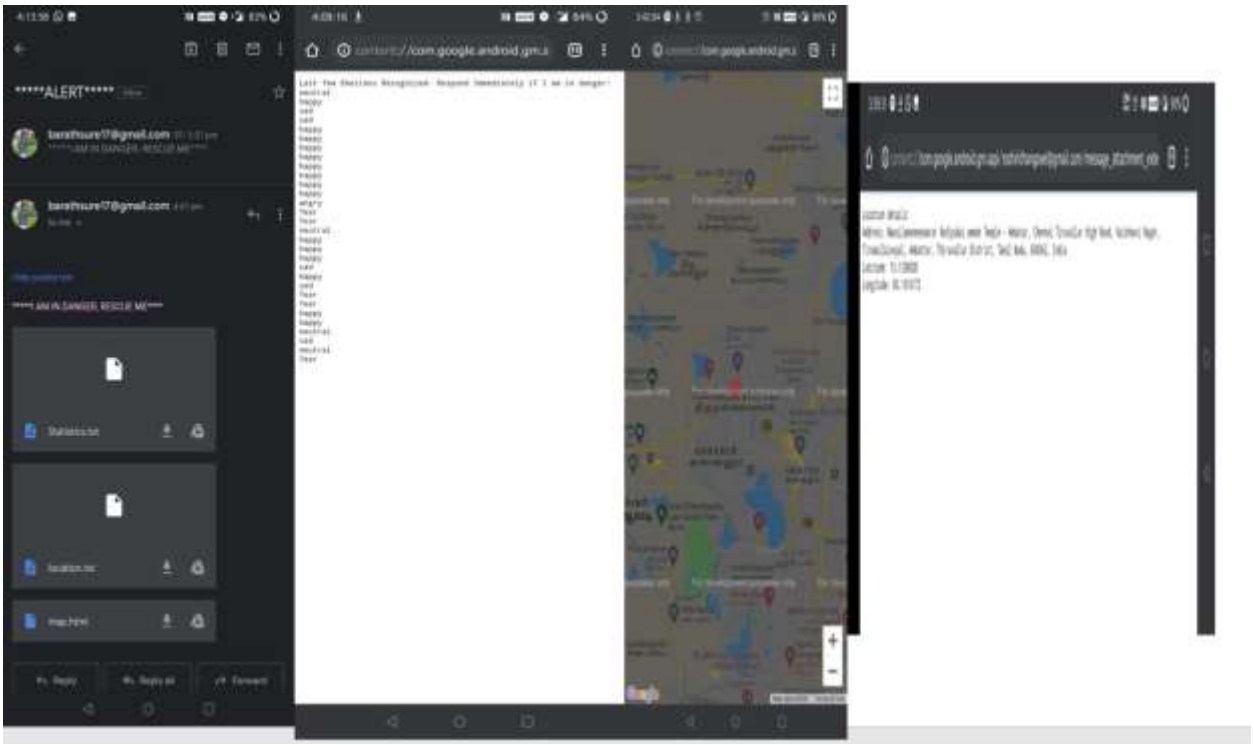
```
(base) c:\software\mysite>python manage.py test pages
System check identified no issues (0 silenced).
Hi testing about url
.Hi testing base url
.Hi testing common url
.Hi testing home url
.Hi testing index url
.Hi testing profile url
.Hi testing register url
.Hi testing takeimg url
.
----------------------------------------------------------------------
Ran 8 tests in 0.010s

OK
```

Results

After developing the classification model and the interface we have got the system working as expected and extracted its full application. As seen in Figure the emotion detection program has been integrated into a website for easy use in rehabilitation centres and other facilities. This program can be accessed using the UI as shown in Figure by the centres to log in and access the patient information. The patients input (their image) and output (response based on the emotion) will be visible as seen in Figure. The website has been designed especially for rehabilitation centres of drug and alcohol abuse victims who are recovering to monitor their moods and emotions and provide a rapid response whenever necessary. This system not only keeps track of all the emotions detected on the patient but also provides an apt response based on the emotion to help the patient in their recovery process. In the case of an emergency, where the patient is facing an adverse emotion, the system triggers an emergency response email with all the information necessary to the registered contact to be able to take the necessary measures. This response includes an email with the location of the patient, the map of the location, as well as the past emotions faced by the patient as seen in Figure.




EMOTION BASED CONTENT DELIVERY
Home
Profile
Login
Sign up
Capture Face
Welcome : barath
Current Emotion: Neutral
To control emotions by displaying contents based on the correct emotion.
Rehabilitation Centre


*****ALERT*****
barathsure17@gmail.com
barathsure17@gmail.com
***** AM IN DANGER, RESCUE ME*****

Comparisions between various models available

Accuracy between models

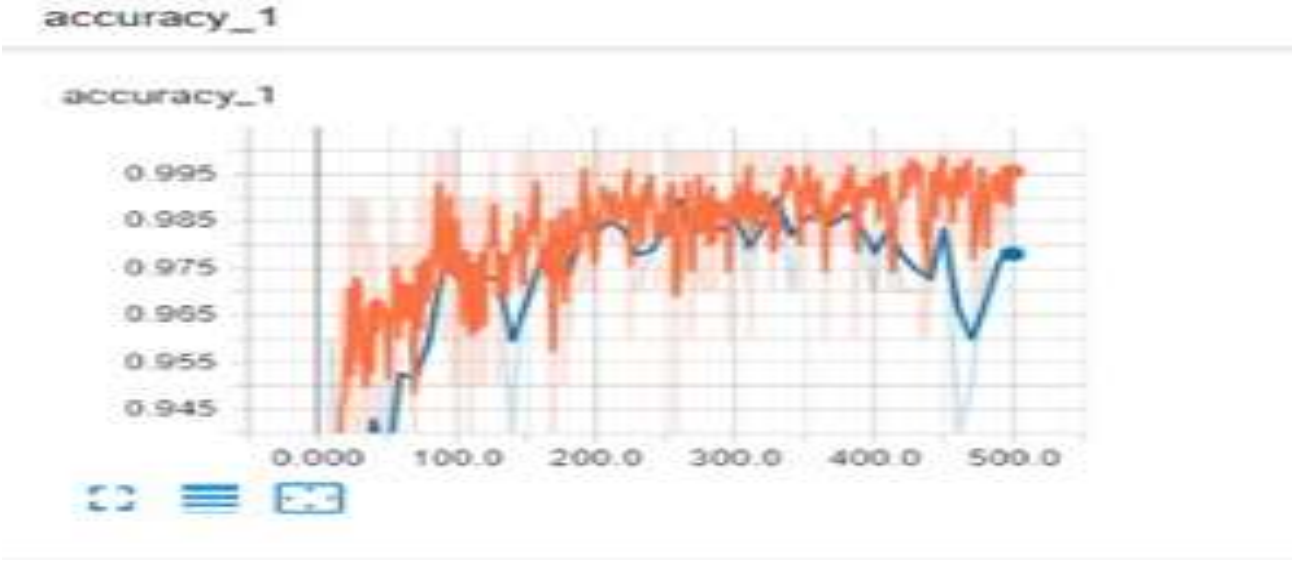
MODEL	IMAGE NET ACCURACY	MILLION MULT ADDS	OTHER PARAMETERS (in millions)
VGG16	71.5%	15300	138
GOOGLENET	69.8%	1550	6.8
MOBILENET	70.6%	569	4.2

Tensorflow network comparison(based on classification time)

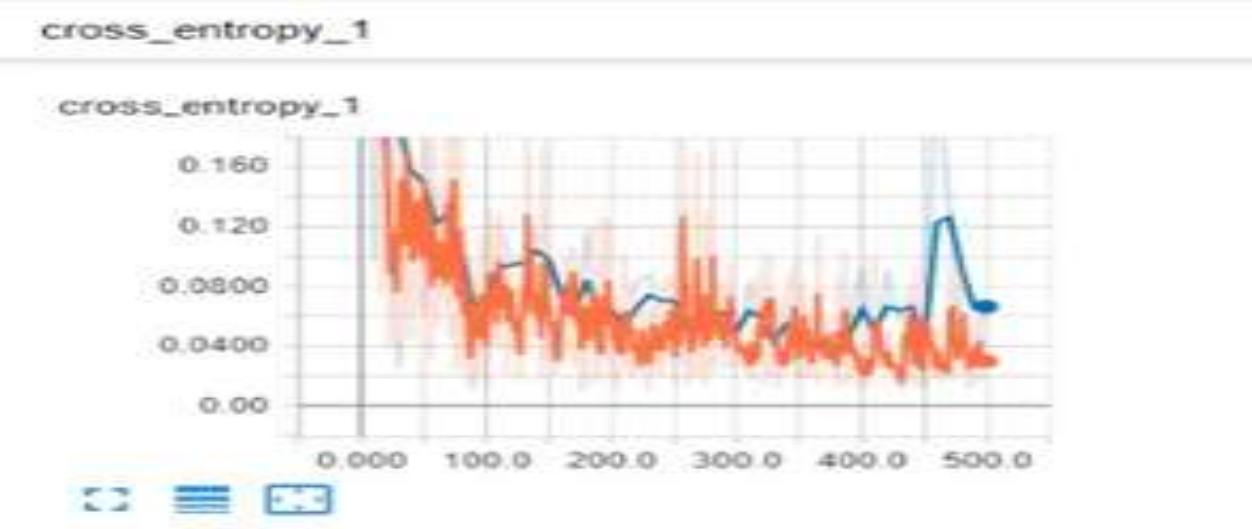
NETWORK	CLASSIFICATION TIME (TENSOR FLOW 1.5)	CLASSIFICATION TIME (TENSOR FLOW 1.8)
DenseNet201	658	628
InceptionV3	175	184
ResNet	301	299
MobileNet	131	135

While training, the performance of the model can be viewed and analysed using TensorBoard in the local host which is shown in the below figure. The accuracy and other detailed statistics can also be analysed and visualized by using the TensorBoard.

Accuracy and Cross Entrophy



Accuracy of the model



Cross Entrophy of the model

The two graphs represent the accuracy and cross entropy. The accuracy graph depicts how well the model is classifying in the training phase. we can see that the accuracy gradually increases (orange line represents the accuracy for the training data and the blue line indicates the accuracy of the validation data). Whereas the second half of the system shows the cross entropy which represents the learning of the model the network weights gets updated as the training gets processed. Here the cost function is decreased. Cost function represents the difference between the actual and the predicted outcome. The Following graphs shown above are tracked down during the training process and in order to visualize these graphs we have used tensor board.

Conclusion :

Human emotions can describe a lot about what a person is feeling at the moment. By this research we were able to develop a user-interface in form of a website, where a user can login and we can predict the emotion expressed by the user currently. The Interface gives two options, one based on the current emotion it podcasts some video to make the user happy all the time and some other videos to control their current emotion. Other is if the person is in perilous condition it alerts the user's personal contact with location and emotions recognised for specific period of time.

The purpose of a Deep Convolutional Neural Network based facial emotion classifier is to apply the proposed system to real-time use. We believe that our model can be used in rehabilitation centres to monitor patients and to see that they do not do take any impulsive decisions. We can also extend the use of emotion detection to recommender systems such song suggestion or movie suggestion based on the mood the user is in. The main motive would be to help overcome the social trauma that the current generation of social media elements caused on the users

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