MOOD DETECTION USING FACE RECOGNITION

Project report submitted in partial fulfillment of the requirement for the degree of Bachelor of Technology

in

Computer Science and Engineering/Information Technology

By

(Angana kaushal (161385)) , (Yashwin singh Guleria(161378))

Under the supervision of

(Dr.Himanshu Jindal)

to

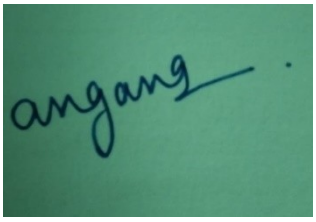
Department of Computer Science & Engineering and Information Technology

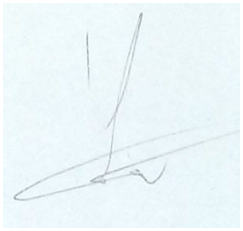
Jaypee University of Information Technology Waknaghat, Solan-173234, Himachal Pradesh

CERTIFICATE'S DECLARATION

WE hereby declare that the work presented in this report entitled **" Mood Detection using Face Recognition"** in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering/Information Technology** submitted in the department of Computer Science & Engineering and Information Technology**,** Jaypee University of Information Technology Waknaghat is an authentic record of my own work carried out over a period from August 2019 to December 2019 under the supervision of **Dr.Himanshu Jindal (**Asst. Professor , Department of Computer Science& Engineering and Information Technology**).**

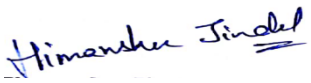
The matter embodied in the report has not been submitted for the award of any other degree or diploma.





Angana Kaushal, 161385 Yashwin Singh Guleria,161378

This is to certify that the above statement made by the candidate is true to the best of my knowledge.



(Supervisor Signature)

Dr..Himanshu Jindal

Asst. Professor

Department of Computer Science& Engineering and Information Technology

Dated:

Acknowledgement

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Date:

ANGANA KAUSHAL

YASHWIN SINGH GULERIA

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ABSTRACT

These Human facial expressions convey tons of data visually instead of articulately. countenance recognition plays an important role within the area of human-machine interaction. Automatic mood recognition system has many applications including, but not limited to and this is implemented by live stream by human behavior understanding, detection of mental disorders, and artificial human expressions. Recognition of facial expression by computer with high recognition rate remains a challenging task.

Two popular methods utilized mostly within the literature for the automated FER systems are supported geometry and appearance.

Facial Expression Recognition usually performed in four-stages consisting of the following of pre-processing, face detection, feature extraction, and expression classification.

In this project we applied various methods to spot the key seven human emotions: anger, disgust, fear, happiness, sadness, surprise and neutrality.

CHAPTER-1

INTRODUCTION

1.1 Introduction

Emotional information is very important way of information transmission in interpersonal communication. It can convey a lot of information which words cannot convey. 54% of emotional information is communicated through the facial expressions. The information contained in face accounts for a considerable proportion in image understanding. Facial expression recognition is that the process of extraction and classification about countenance information by computer. Facial expressions are examined for identifying the basic human mood like anger, fear, disgust, surprised, happiness, sadness. Facial expression is a crucial channel for human interaction and may be applied in many real applications.

It consists of basic parts,namely,face detection,face recognition,facial expression feature extraction,expression classification.

1.1.1 Face Detection

Face detection involves separating image windows into two classes; one containing faces and tarning the background. it's difficult because although commonalities exist between faces, they will vary considerably in terms aged , complexion and countenance . a perfect face detector would therefore be ready to detect the presence of any face under any set of lighting conditions, upon any background. The face detection task are often weakened into two steps. the primary step may be a classification task that takes some arbitrary image as input and outputs a binary value of yes or no, indicating whether there are any faces present within the image. The second step is that the face localization task that aims to require a picture as input and output the situation of any face or faces within that image as some bounding box with (x, y, width, height).

The face detection system are often divided into the subsequent steps:-

1. Pre-Processing: to scale back the variability within the faces, the pictures are processed before they're fed into the network. All positive examples that's the face images are obtained by cropping images with frontal faces to incorporate only the front view. All the cropped images are then corrected for lighting through standard algorithms by making them suitable for comparision.

2. Classification: Neural networks are implemented to classify the pictures as faces or nonfaces by training on these examples. We use both our implementation of the neural network and also the Matlab neural network toolbox for this task to makesure the processs is doe correctly. Different network configurations are experimented with to optimize the results.

3. Localization: The trained neural network is then wont to look for faces in a video of the algo and if present localize them during a bounding box.

There are two predominant approaches to the face recognition problem: Geometric and photometric .Many different algorithms and approaches were developed, three of which are given approaches as below.

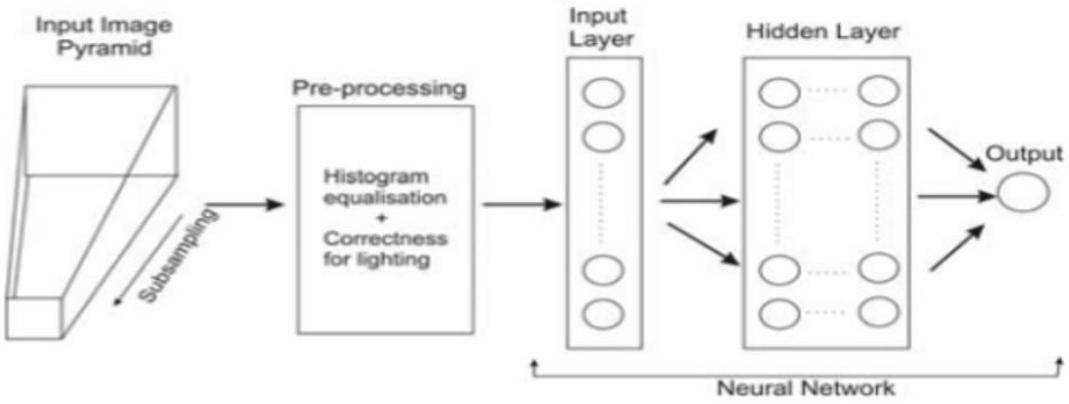


Fig: Face detection algorithm

Fig(I)

1.1.2 Face Recognition

Recognition algorithms are often divided into two main approaches:

1. Geometric: is predicated on geometrical relationship between facial landmarks, or in other words the spatial configuration of countenance meaning that the most geometrical features of the face like the eyes, nose and mouth are first located then faces are classified on the idea of varied geometrical distances and angles between features.

2. Photometric stereo: wont to recover the form of an object from variety of images taken under different lighting conditions. the form of the recovered object is defined by a gradient map, which is formed from an array of surface normals .

Popular recognition algorithms include:

1. Principal Component Analysis using Eigenfaces, (PCA)

2. Linear Discriminate Analysis

3. Elastic Matching using the Fisherface algorithm

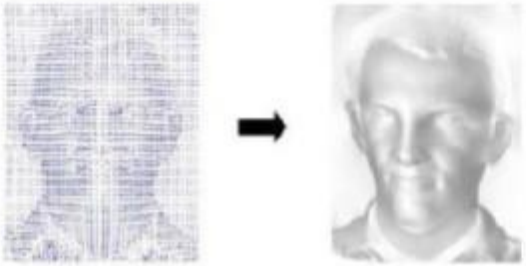


Figure 2 -Photometric stereo image.

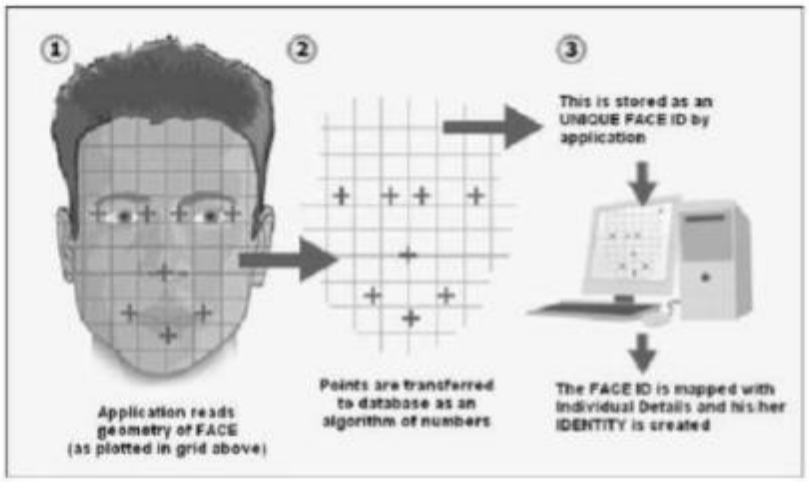


Figure 3 - Geometric facial recognition.

Fig.(II)

1.1.3 Facial Expression Feature Extraction

Facial expression recognition has many possible applications which includes such as psychological research, improved human computer interaction and signing translation. a completely unique countenance recognition system supported hybrid face regions (HFR) is investigated. The expression recognition system is fully automatic, and consists of the subsequent modules these modules are such as : face detection, facial detection, feature extraction, optimal features selection, and classification and other indeterminants. The features are extracted from bothwhole face image and face regions (eyes and mouth) by using video using

log Gabor filters. Then, the foremost discriminate features are selected supported mutual information criteria. The feature extraction is extremely important to the entire classification process. If inadequate features are used, even the simplest classifier could fail to realize accurate recognition. In most cases of countenance classification, the method of feature extraction yields a prohibitively sizable amount of features and subsequently a smaller sub-set of features must be selected consistent with some optimality criteria.

1.1.4 Expression Classification

Expression classification is employed to extract the countenance of a user (only one user at a time from a webcam) like sad or happy.

Methods for classifying facial expressions is:

-Use opencv to detect the face within the image

-Use inbuilt SVM implementation.

1.2 Problem Statement

To create a system software which is capable to detect the user's face and also detect the mood of the user according to the particular analysis on the image of the face of the user with regarding to the data set that defines the expressions of the face. The mood detection would be on live video basis which will stream the live mood of the user with respect to time and will give output as per live video stream showing the user the current mood according to the algorithm used.

Also, the data would compare it with the database installed and with the computations result in the output from comparing the features of the user.

1.3 Objectives

The major objectives of our present project are as follows:

- To recognize a platform to develop a software tools such as php, java, dot net and many others

- To design the algorithms.

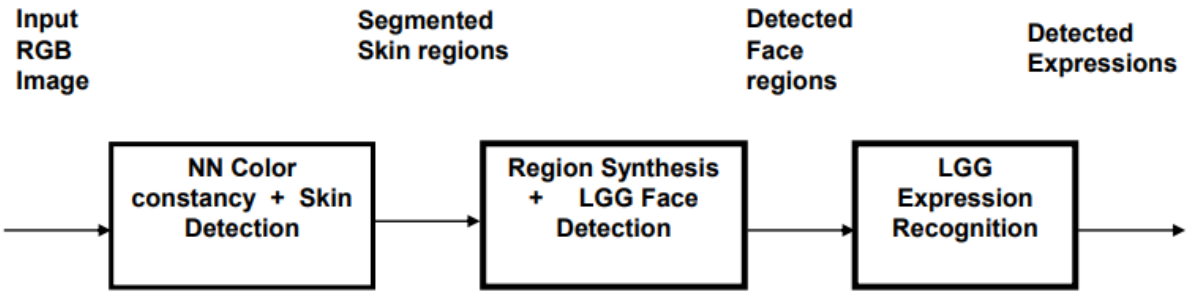
- To determine a face from a picture and as well as a vide.

- To create a binary image and train the data sets from databases such as fer2013.

- To detect human emotions using the comparisons from the data

- To be able to improve the algorithms so than it can be used for other research purposes.

1.4 Methodology



Fig(III)

1. Analysis of the problem statement in the system.
2. Gathering of the requirement specification to run software in system
3. Analysation of the feasibility of the project.
4. Development of a general layout and diagrams.
5. Reading previous research paper to get data of work being done.
6. Choosing a model for model development the algorithm.
7. Analyzing the various dfficulties.
8. Starting the coding .
9. Installation of software like ANACONDA.
10. Developing an algorithmas per requirement.
11. Analysation of algorithm by guide to verify errors.
12. Coding as per the developed algorithm in PYTHON
13.Studying datasets
14. Selection of dataset for the comparison of images
15.Coding for the image processing on python platform on anaconda
16.Verification and testing phase.
17.Making accuracy verifications .

CHAPTER – 2

LITERATURE SURVEY

The objective of this literature review is to provide depth knowledge of face and mood detection.

a) Deep Neural Network for Human Face Recognition

by Dr. Priya Gupta, Nidhi Saxena, Meetika Sharma, Jagriti Tripathi

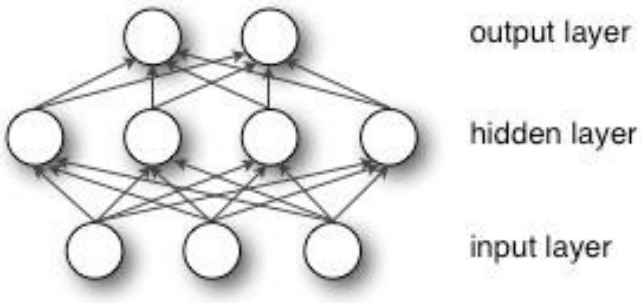
Face recognition (FR) system identifies a face by matching it with the facial database image data by converting the current image to binary code it's gained great progress within the recent years thanks to improvement in design and learning of features and face recognition models. The techniques utilized in best face recognition systems may depend upon the appliance of system.

Face recognition systems is divided into two categories:

- Find an individual from his image during a large database of facial images , These systems returns the small print of the person being looked for . Often just one image is out there per person. it's usually not necessary for recognition to be wiped out real time.
- Identify an individual in real time. These are utilized in systems which permit access to a particular group of individuals and deny access to others. Multiple images per person are often available for training and real time recognition is required, the proposed idea is for the second sort of systems with varying facial details, expressions, and angles. It remains an open problem to seek out a perfect facial feature which is strong for FR in unconstrained environments .

A Neural Network is human brain inspired algorithm designed to acknowledge pattern in numerical datasets. the important world data for instance image, text audio, video etc; must be transformed into numerical vectors to use neural nets. A neural network consists of various layers and a layer is formed from multiple nodes The weighted sum of input file is calculated and counting on some threshold biases the output for the node is decided

. The mapping of input to output is performed by some activation function. A Deep Neural Network (DNN) may be a feed forward Artificial Neural network (ANN), with multiple hidden layers and better level of abstraction.



Fig(IV)

The steps performed for facial recognition on data sets are : Preprocessing,Learning,Classification.

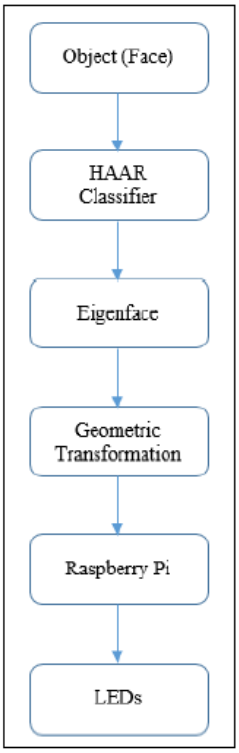
The use of haar cascade for extracting facial features and feeding them instead of raw pixel values helps in decreasing the complexity of neural network based recognition framework as the number of redundant input features has been decreased. Though one additional step of extraction of facial features from each image is added, still the process is better for small datasets.

b) A review of Face Recognition Based Car Ignition and Security System

by Ketan J. Bhojane, S. S. Thorat

The face recognition based car ignition system replaces the car ignition by replacing the key with specific user face this leads to AI. The paper is proposing facial recognition system by embedding face detection and face tracking system algorithm and there is a strong need for robust and efficient face detection algorithm. An efficient car security program should be sensible, competent and reliable. So to prohibit vehicles stealing from thieves, owners of the automobiles are facing towards technology as an anti-robbery system.

Detecting faces in images is a fundamental task for realizing surveillance systems or intelligent vision-based human computer interaction. In order to capture the face image accurately, many face detection methods have been proposed, such as discriminating feature analysis and Support Vector Machine (SVM) classifier for face detection,



Fig(V)

In this mainly the use of Haar feature has been used to detect and recognize the face of the confirm and detect the face of the user so as to achieve the secure environment for ignition and accessing the car a typical rectangular haar features.

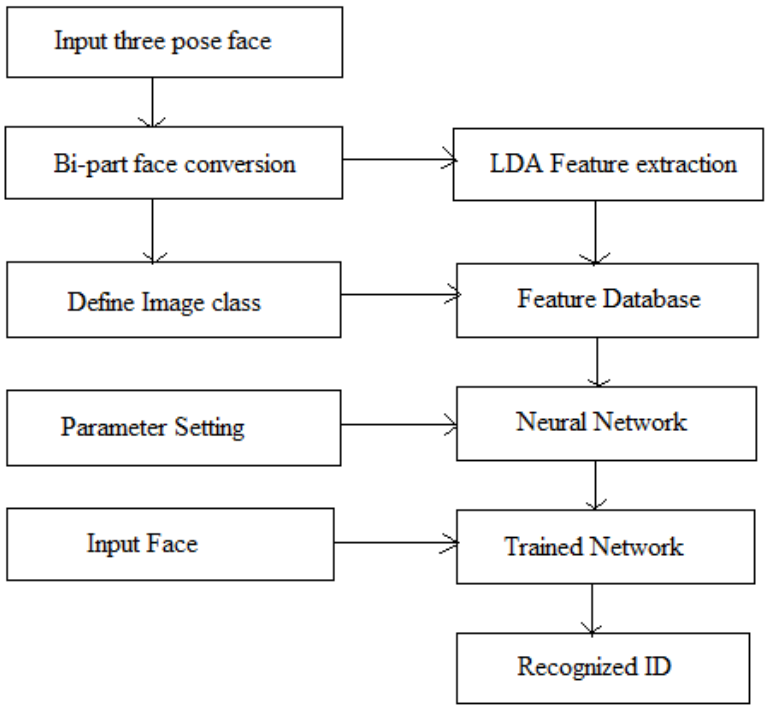
c) Face Recognition with Partial Face Recognition and Convolutional Neural Network

by Shraddha Arya , Arpit Agrawal

Biometrics is a system in which we used to recognize human on the basis of its unique physical or behavioral characteristics of a human being which only belong to a single human being.

Deep learning provides a different way to obtain a special feature representations from a dataset without relying on hand-crafted descriptors. Biometric security systems based on facial characteristics face a challenging task due to variable personal facial appearance and expressions of subjects traced to factors things as pose, illumination, expression and aging.

It is widely used to find linear combinations of features in the picture while preserving class separability, Unlike PCA, LDA tries to model the variation in between classes. Linear Discriminant Analysis (LDA) is most commonly used as dimensionality reduction technique in the pre-processing step for pattern-classification and machine learning applications.



Fig(VI)

The three step process is proposed to work where in first phase the face images are partitioned into multiple face parts this step is termed here as the pre-processing of images. Secondly the images are processed for feature extraction thus the LDA algorithm is proposed to implement. Finally the neural network is proposed to perform training on extracted face features and classes and the trained model is used for recognizing the faces.

d) A Review on Face Recognition Techniques

by Varsha D. Patil

The review uses methodology of face recognition techniques like Principle Component Analysis(PCA), Linear Discriminant Analysis(LDA), Local Binary Pattern(LBP), Haar cascade classifier, etc.

Face recognition is from the face detection. Face recognition has main two task-verification & identification. Face verification means a 1:1match that compares a face image against a template face image. Face identification means a 1: N problems that compare a query face image against all image templates.

Orthogonal transformation is the part of statical procedure which make a set of uncorrelated linear variables known as principal components. In principal component analysis recognition, feature space given eigenfaces, the reduction in dimensionality of original image data takes place. But principal component analysis has large computation and low discrimination power problems which gets eliminated in linear discriminant analysis.

Algorithm followed by Principal Component Analysis is as follows:

Get data→Subtract the Mean→Find Covariance Matrix→Find eigen values and eigen Vectors→Choose large feature component.

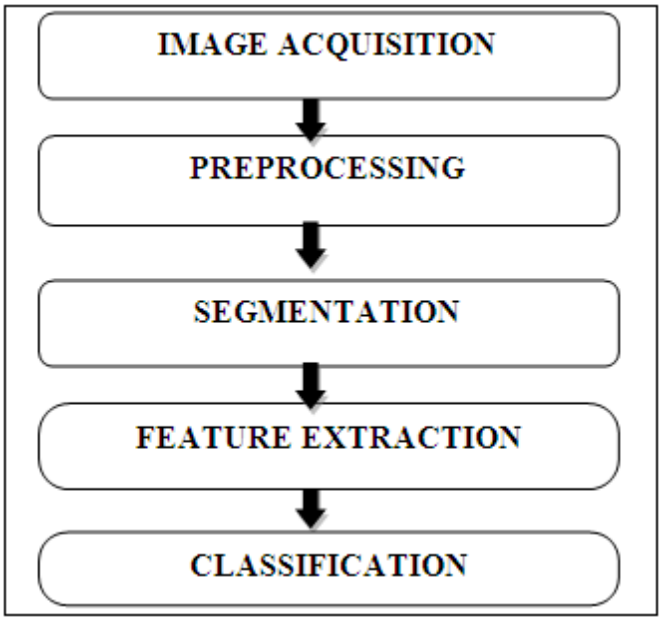
Applications are as follows:

Payments,Access and Security, Criminal Identification, Verification, Health care.

e) Automatic Emotion Recognition Using Facial Expression

by Monika Dubey, Prof. Lokesh Singh

Emotional aspects have huge impact on Social intelligence like communication understanding, deciding and also helps in understanding behavioral aspect of human.The paper presents brief introduction of countenance ,six universal facial expressions and features,gives brief detail on comparative study of popular techniques proposed earlier for Automatic Facial Emotion Recognition System, includes phases of Automatic Facial Emotion Recognition System and includes Applications of Facial Emotion Recognition System.



Fig(VII)

Emotions are thanks to any activity in brain and it's known through face, as face has maximum sense organs. Hence human facial activity is taken into account . the target of this research paper is to offer brief introduction towards techniques, application and challenges of automatic emotion recognition system.

f) Facial Expression Recognition

by Neda Firoz

The paper presents an expression recognition method by manifesting the facial characteristics through false geodesic distance and remodeling the facial expressions in the 3D space and verifies this method being able to identify different expressions from static facial images in a more effective and remarkable manner. The algorithms demonstrate that this method achieves better results of expression recognition than traditional methods and shows stronger robustness to changes of illumination. Facial Expression can deal with the studies related to psychology, driver state surveillance,

patient monitoring etc. In the developed countries the hospitals use the facial expression tool to study the emotional states of patients who are deaf dumb or blind , or in many cases the patients who are not able to explain their emotional state due to injury, disease etc. This
can help the doctors to monitor them and regulate the medications and proper care.

Flowchart of the method

Skin Color Segmentation →Face Detection→ Eyes Detection→ Lip Detection→ Apply Bezier Curve on Lip→ Apply Bezier Curve on Eye →Database and Training →Emotion Detection

Algorithms of building distance features. (1) Defining moving steps. (2) Extracting Patches. (3) Recording matching area. (4) Recording matching scale.

The thesis is basically focusing on static images which can be stored in the database, and further analysis can be done via the tool. The further research can be done on video based image extraction and the algorithms can be developed using the current algorithm as a source referred as genetic algorithm.

g) Emotion AI, Real-Time Emotion Detection using CNN

by Tanner Gilligan, Baris Akis

The ability to confidently detect human emotions can have a wide array of impactful applications,and therefore emotion recognition has been a core area of research in computer vision.

Approach:

_ Build Dataset: Collected labeled facial expressions data sets from multiple sources,and processed their labels and images into a common format. Then introduced custom images of yourselves and a friend to further enrichthe data set.

_ Pre-process Images:Run facial-detection software to extract out the face in each imageThen re-scaled the croppings, and manually eliminated poor images. As a preprocessing step for the CNN, also apply Gaussian filter to the images, and subtract the mean-image of the training set from each image. In order to get more out of our limited training data, also augment the images to include reflections and rotations of each image, with the hope that it would improve robustness

_ Construct CNN: Utilize pre-trained versions of Alex Net and Le Net in Cafe on AWS, where re-train the first and last layer. Also experiment with various learning rate methods and parameters in order to generate a non-divergent model.

_ Develop real-time Interface: Open CV allows us to get images from our laptop's webcam. Then extract the face as before, pre-processed the image for the CNN, and sent it to AWS. On the server, a script would run the image through the CNN, get a prediction, and the results would be pulled back to local.

One future area of work is to create a user interface where users can iteratively train the model through correcting false labels. This way the model can also learn more from real world users

who express various emotions in different ways. In addition, including a layer in the network that

accounts for class imbalance could provide addition improvements over the results.

h) Mood Detection based on Facial Expressions

by Mrs. Ashwini Pansare, Mrs. Monali Shetty

This paper proposes a system using Pulse Coupled Neural Network (PCNN) for detecting facial features which are responsible for portraying the facial expression. This information is then passed to a trained Convolution Neural Network (CNN) which is responsible for the classification of expressions in six categories as happy, sad, neutral, fear, disgust, angry and surprised.

Mood detection is a challenging problem as it involves 3 sub problems 1) face detection 2) facial expression feature extraction and 3) expression classification to identify mood.

The approach used in proposed work is 1) Capture a frame showing the subject‟s face from a pre-recorded video or a webcam feed. 2) Process the image frame to standardize it by adjusting the colour-scale, brightness and resolution. 3) Pass the image through the Pulse Coupled Neural Network (PCNN) to extract features of facial expressions. 4) Pass the positional information of the features to a convoluted neural network (CNN) for classification of human mood as happy, sad, surprised, angry ,neutral.

Algorithms:

1) Create database by storing images of person showing varied facial expressions.

2) Training stage: i) Pre-process the image.ii) Create Pulse Coupled Neural Network (PCNN) iii) Apply the pre processed image to constructed Pulse Coupled Neural Network (PCNN). iv) Apply the output of PCNN to Convolution Neural Network (CNN). v) Continue training the CNN till desired accuracy is achieved

In order to provide input to PCNN, the user has a choice of using webcam feed as input. In this case, the webcam stream gets recorded when user presses key ,and stops when user presses another key. In case the webcam feed is not open, the user can choose to load a stored video file.

Eight steps are required in system operation, which does not seem prompt enough and further optimization may need to be taken if it were to be used for video processing.

The issue of universal emotion recognition causes difficulties due to ambivalent psychological and physical characteristics of emotions that are linked to the traits of each person individually. Therefore, this field of research will remain under continuous study for many years to come because many problems remain to be solved in order to create an ideal user interface or at least improve recognition of complex emotional states.

i) Convolutional Neural Networks for Facial Expression Recognition

by Shima Alizadeh,Azar Fazel

The goal is to classify each facial image into one of the seven facial emotion categories considered. Train the CNN models with different depth using gray-scale images. In addition to the networks performing based on raw pixel data, we employed a hybrid feature strategy by which we trained a novel CNN model with the combination of raw pixel data and Histogram of Oriented Gradients (HOG) features. Also present the visualization of different layers of a network to show what features of a face can be learned by CNN models.

The input into our system is an image; then, we use CNN to predict the facial expression label which should be on these labels: anger, happiness, fear, sadness, disgust and neutral. The developed model gives the user the freedom to decide about the number of convlutional and fully connected layers, as well as the existance of batch normalization, dropout and max-pooling layers. Along with drop out and batch normalization techniques, we included L2 regularization in our implementation. Furthermore, the number of filters, strides, and zero-padding can be specified by user, and if they are not given, the default values are considered. In order to classify the expressions, mainly we used the features generated by convolution layers using the raw pixel data. As an extra exploration, we developed learning models that concatenate the HOG features with those created by convolutional layers and give them as input features layers provided into Fully Connected (FC) layers.

Comput the correlation matrices for the shallow and deep networks,thedeepnetworkresultsinhighertruepredictionsformostofthelabels. It is interesting to see that both models performed well in predicting the happy label ,which implies that learning the features of a happy face is easier than other expressions. Additionally ,these matrices reveal which labels are likely to be confused by the trained networks. In addition to correlation matrices, we computed the accuracy of each model

for every expression. .The results demonstrated that deep CNNs are capable of learning facial characteristics and improving facial emotion detection.

j) Mood Detection Based on Physical Parameters Using Machine Learning

by Sumit Uthale, Akash Mahor

In this paper we propose the design of a mood detection system which can be employed to predict the mood of a user by examining three physiological signals collected from the user viz. pulse rate, skin conductance, and finger temperature. These are collected with the help of sensors such as pulse sensor, Galvanic Skin Response sensor, and TMP102. The sensors are controlled using an Arduino Uno which, in return sends the data to a Raspberry Pi model B working as a server. To predict the mood based on the selected physical parameters, a machine learning algorithm called Support Vector Machine (SVM) is applied.

We have a somatic and autonomous nervous system. All the body postures, gestures, facial expressions, tone of voice are controlled by the somatic nervous system. All these features can be masked easily. Nowadays the trend in technology is largely tilted towards developing applications because they are easy to use and comfortable for masses.

The study of emotions and their changes has some important advantages in developing emotional intelligence by opening doors to a vast area of research and by developing abilities to help us better understand automatic reactions of the human body to external as well as any internal changes. Understanding the reaction of a person not only helps us improve our social relationships, but also detect and evaluate their emotions better. Another approach that has been successful in detecting emotions is through Electroencephalography(EEG) signals. The activities in our brain produce different kinds of electrical as well as magnetic signals. EEG can be considered as a direct and simple method to record the electrical activities in the brain. It is a measure of voltage as the function of time resulting from the current flow within the neurons of the brain. The

Mood Detector application has been proposed to predict the mood of a user by examining 3 physiological signals (pulse, skin electro-conductivity and temperature) with the help of a machine learning algorithm which will be trained with data recorded from the users. The device used for recording the physiological signals can be improved in order to reduce it to smaller dimensions, so it can be made into a wearable, just like a fitness bracelets used by the athletes

k) Feature Selection and Feature Extraction in Pattern Analysis

by Benyamin Ghojogh, Maria N. Samad.

There are two main categories of methods , i.e., feature selection and have extraction. The reduction criterion usually either improves or maintains the accuracy or simplifies the model complexity. Filter methods are supported two concepts “relevance” and “redundancy”, where the previous is arXiv:1905.02845v1 7 May 2019 dependence (correlation) of feature with target and therefore the latter addresses whether the features share redundant information. Consistency-Based Filters (CBF) use a consistency measure which is predicated on both relevance and redundancy and may be a selection criterion that aims to retain the discrimination power of the info defined by original features . In feature selection, many algorithms apply correlation metrics to seek out which feature correlates most to the target. These algorithms single out features and don't consider the combined effect of two or more features with the target. In other words, some features won't have individual effect but alongside other features they provide high correlation to the target and increase classification performance.

Filter methods select the optimal features to be passed to the training model, i.e., classifier, regression, etc. Wrapper methods, on the opposite hand, integrate the model within the feature subset search. during this way, different subsets of features are found or generated and evaluated through the model.

The feature selection and extraction methods are useful for various applications like face recognition, action recognition, gesture recognition, speech recognition, medical imaging, biomedical engineering, marketing, wireless network, organic phenomenon , software fault detection, internet traffic prediction, etc. the variability of applications of feature

selection and extraction show their usefulness and effectiveness in several real-world problems.

l) Literature Review of Feature Extraction Methods for Classification of EEG Signals

by Prince Kumar Saini , Maitreyee Dutta

EEG may be a unique technique which may be wont to interface the human brain with outside environment via electrical signals generated from EEG device. These electrical activities develops inside the brain which is produced by the physical task or strong imagination to regulate desired object. It involves the spatial mapping of electrodes and special functions which are mapped to the varied regions of our brain to urge a specific or desired signal for the specified application. There are various limitations in EEG data acquisition system the primary one is that the electrical activities that are recorded from the outer layer of brain called scalp which contains noise because the results of disturbances and electrical movement of electrodes so we've to get rid of the noise factor and therefore the second is that it depends upon the amount of electrodes that are used. If we apply larger number of electrode then also signal degradation occurs which decreases the BCI performance therefore the selection of optimum number of channel that fitted to both accuracy and performance is required .

Principal component analysis (PCA) may be a well-established method for feature extraction and dimensionality reduction. the essential approach in principal components is theoretically rather simple. The central idea of PCA is to transforms data linearly into a low-dimensional subspace by obtaining the maximized variance of the info . The resulting vectors are an uncorrelated orthogonal basis set. The principal components are orthogonal because they're the eigenvectors of the covariance matrix, which is symmetric. Principal component analysis and independent component analysis (ICA) of the EEG data were wont to obtain feature vectors from the Gaussian method from the weighted concept from each feature vector. These feature vectors were the inputs to the classifiers. Two dimensional mapping technique is employed for activity based selection of features which are located within the primary and sensory motor regions of the brain.

The output feature vectors thus obtained are given as input to 2 classifiers, viz. linear discriminant analysis (LDA) and quadratic discriminant analysis (QDA).These two methods are then compared and located that the LDA gives normal accuracy and QDA gives better accuracy than other methods and depending upon this research an efficient feature extraction method also can be utilized in addition with proposed method for the comparison of results. There are some desires from the user and BCI system like future training of the user for estimated EEG signal, system should have the improve signal processing unit to handle inferiority signal and development of accurate EEG signal block such it can allow the simulation based analysis.

m) Mood Detection from Physical and Neurophysical Data Using Deep Learning Models

by Zeynep Hilal Kilimci

Nowdays computers, phones, tablets, sensors, and cloud services are a part of our private and public domains all round the world within the last decades. These devices gather many parameters about their users including mobility (walking, running, and climbing) information, sleep time, and places where the users visited. Moreover, new developments in technology integrate these devices to the biological body of their users, and this creates online information about citizenry accessible by everywhere the planet . Many countries have strong regulations for users who work on critical positions. they frequently got to take Neurophysical Testing (NPT) to make sure psychological state is sweet to avoid risks counting on stress. the appliance period of NPT is typically one a year or twice which isn't sufficient. Measuring such risks should be a neighborhood of daily operation which may be easily realized with intelligent and integrated devices. Neurophysical parameters are keystroke parameters while physical parameters are heartbeat, motion, energy, and sleep utilized in this work. Physical and neurophysical parameters are consolidated as a novelty presented by the study. One year data are collected from 15 users to demonstrate the effectiveness of this work. The aim of the study is to seek out a relation between these parameters and users' moods.

We got to propose the usage of the combination of physical and neurophysical features to predict the mood of users For the aim of detecting the mood of user, both conventional machine learning algorithms and deep learning techniques are employed and classification performances of every model are compared.To demonstrate the contribution of proposed model, a customized data gathering platform is made and data should be collected for one year.

n) Mood Swings: An application to track, understand and share emotions for people who need to control mood swings

by Yulia Gershfeld

However, mood could also be a changeable entity that's sometimes hard to manage . Nowadays mood swings are affecting an outsized number of people and should have great influence on all sphere of life. the matter is that even most confident and calm people can get overwhelmed with their emotions and will have troubles controlling their mood swings. this may cause anger attacks, depression or hyper activity.

Using mobile technologies in healthcare isn't a replacement phenomenon. Recent studies shows that the variability of mobile applications exist that aim presenting, recording and analysing mood. However, the majority of them are developed without scientific background and are not supported by a search project and thus cannot guarantee the qualified help to their users. The list of the smartphone applications for mood tracking is kind of long. This might indicate demand in those on the market. All the prevailing applications are often grouped into several categories. there's also sort of mobile applications that include recording mood as a functionality of a way bigger self-tracking applications in conjunction with weight, nutrition, medication and exercise tracking. Developing the appliance with a scientific background eliminates unnecessary functionalities of the appliance , focusing attention of the user on research proved important functions of the appliance . this allows , consistent usage of the appliance , user engagement and satisfaction from using the appliance therefore improving effectiveness and quality of data collected and analysed by such an app. Finally, the foremost purpose of scientifically developed application is to help user solve their problem

controlling mood swings, while commercial applications aim to attract as many users as possible to understand the commercial benefits from the number of users.

CHAPTER-3

SYSTEM DEVELOPMENT

1)Anaconda

It is a free and open source distribution of the Python and R programming languages for data science and machine learning related applications this application is used for various programming techniques as a platform for creating algorithms mostly it is used for AI these days by using python language.The system is manganed by conda. It is used by over 6 million users all over the world for free of cost for innovation purposes and programmings , and it includes more than 250 popular packages which are suitable for various platforms (Operating systems) such as Windows, Linux, and MacOS.

2) Spyder

Spyder (also called as Pydee) is an open source cross-platform integrated development environment used for scientific programming in mostly Python. Spyder itself consists of NumPy, SciPy, Matplotlib and IPython, and also other open source softwares. It iswas released under the MIT license. It is used with many plugins, it includes support for interactive tools for data inspections and embeds Python codes for quality assurance and self-examination gadgets, such as Pyflakes, Pylint and Rope. It is available cross-platform through Anaconda, on Windows with WinPython and Python (x,y), on macOS by MacPorts, and on major Linux deliveries such as Arch Linux, Debian, Fedora, Gentoo Linux, openSUSE and Ubuntu.

Features of Spyder are as follow:

- editor with syntax stress and self-examination for code conclusion
- It support for manifold Python comforts (including IPython)

- It has aptitude to discover and edit variables from a user interface

Available plugins in sypder are as follow:

- It can do analysis for a static code with Pylint
- It can do code profiling
- It also has Conda Package Manager

- Hardware requirements(recomended)
    a. Processor : Intel CORE i5 processor with minimum 2.2 GHz speed.
    b. RAM : Minimum 4 GB.
    c. Hard Disk : Minimum 500 GB
- Software Interfaces
    a. Microsoft Word 2003
    b. Database Storage : Microsoft Excel
    c. Operating System : Windows10

3.2 PLANNING :

The steps we followed while developing this project are-:

1. Analysis of the problem statement in the system.
2. Gathering of the requirement specification to run software in system
3. Analysation of the feasibility of the project.
4. Development of a general layout and diagrams.
5. Reading previous research paper to get data of work being done.
6. Choosing a model for model development the algorithm.
7. Analyzing the various dfficulties.
8. Starting the coding .
9. Installation of software like ANACONDA.
10. Developing an algorithmas per requirement.
11. Analysation of algorithm by guide to verify errors.
12. Coding as per the developed algorithm in PYTHON

13.Studying datasets

14. Selection of dataset for the comparison of images

15.Coding for the image processing on python platform on anaconda

16.Verification and testing phase.

17.Making accuracy verifications .

3.3 DESIGN :

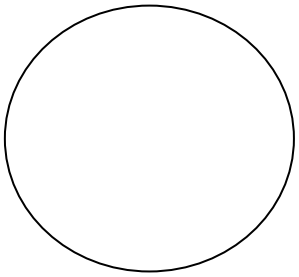
Data flow diagram:

A data flow diagram is a diagram which shows how data is processed inside a system which is based on inputs and outputs. Graphic symbols are used to symbolize the flow of data, data sources and destinations, and wherever data is stored. Data flow diagrams are frequently used as an initial step toward reforming of a system. These diagrams also provide a graphical representation of a system at any particular state of any algorithm, creating an simpler understandable system which helps to understand the system designing. A general overview of a system is represented with a context diagram, also known as a level 0 DFD, which shows a system as a single process.

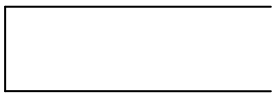
A level 1 diagram provides much further with the details in a diagram representing more of the data transformation in the process of the program, focusing on a system's main functions. level 2 or higher level diagrams illustrate a system's functioning with further more details than the level 2 diagram detail. It's very rare if a data flow diagram goes beyond the level 2 scenario as of the increasing complexity which makes it much further difficult to understand making it ironically wasting its caliber as a communication tool.

Data flow diagram units:

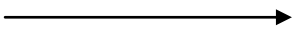
External Entity



Process



Data Store



Data Flow

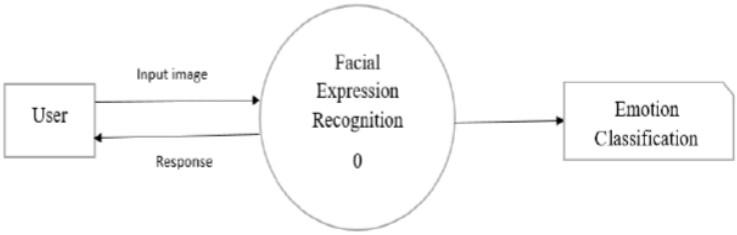
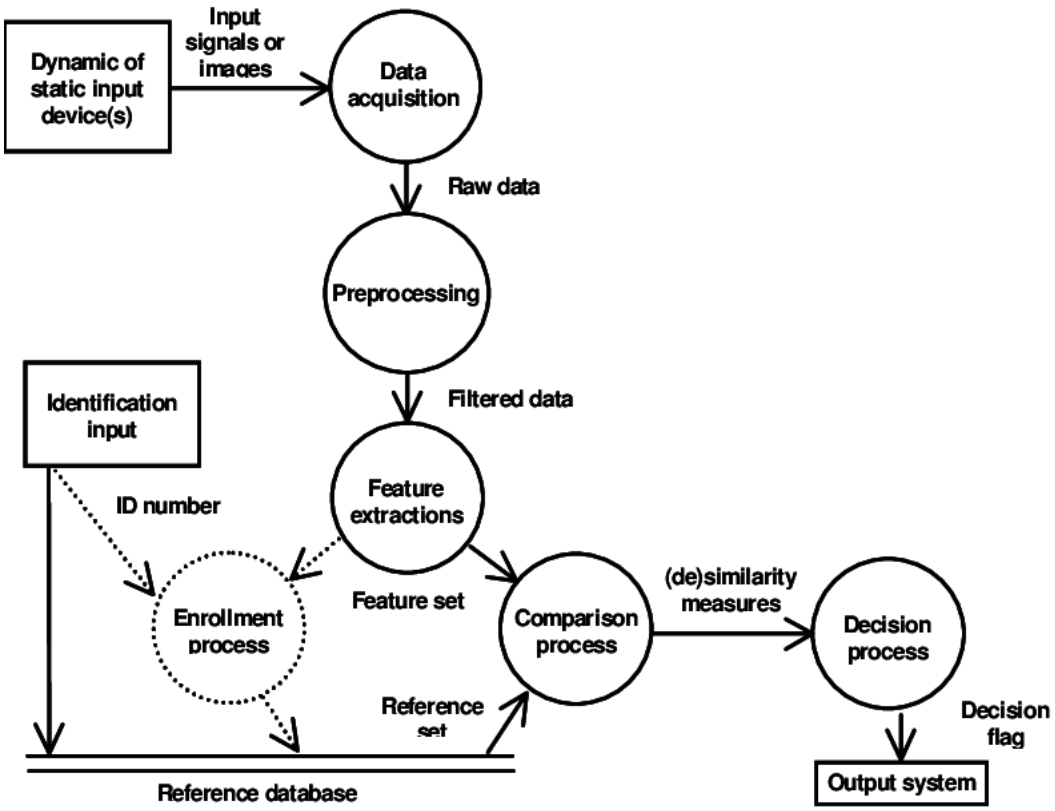


Fig.(VIII)



Fig(IX)

3.4 MODEL

We propose two models which we haveevaluated as per their exactness and rundown of different parameters. The models are planned with making thesimplest accuracyover measure of limitations ratio.Dropping the volume of cutoff points help us to defeat two significant issues. In the first place, the utilization of little convolution neural systems reduce us from moderate exhibitions in equipment compelled frameworks such robot stages. What's more, second, the decrease of parameters gives a much better speculation under an Occam's razor system. Our first model depends on the idea of wiping out totally the completely associated layers. The subsequent engineering consolidates the cancellation of the completely associated layer and in this manner the consideration of the joined profundity savvy divisible convolutions and lingering modules. The two structures were prepared with the ADAM streamlining agent .

Following the past engineering patterns, our underlying design utilized Global Average Pooling to totally evacuate any completely associated layers. This was accomplished by having inside the last convolutional layer an identical number of highlight maps as number of classes, and applying a softmax actuation capacity to each decreased element map.

Our underlying proposed design is a standard completely convolutional neural system made out of 9 convolution layers, ReLUs , Batch Normalization and Global Average Pooling. This model contains around 600,000 parameters. it had been prepared on the IMDB sexual orientation dataset, which contains 460723 RGB pictures where each picture has a place with the class "lady" or "man", and it accomplished an exactness of 96% during this dataset.

We additionally approved this model inside the FER-2013 dataset. This dataset contains 35,887 grayscale pictures where each picture has a place with in any event one of the ensuing classes {"angry", "nauseate", "dread", "cheerful", "miserable", "shock", "neutral"}.

For programmed FER frameworks, different sorts of customary methodologies are examined. The shared characteristic of those methodologies is identifying the face area and separating geometric highlights, appearance highlights, or a crossover of geometric and appearance includes on the objective face. For the geometric highlights, the association between facial segments is utilized to develop a component vector for preparing [22,23].

Grimier and Lee utilized two sorts of geometric highlights dependent on the position and edge of 52 facial milestone focuses. To start with, the edge and Euclidean separation between each pair of tourist spots inside an edge are determined, and second, the space and edges are deducted from the comparing separation and points inside the principal casing of the video succession.

For the classifier, two strategies are introduced, either utilizing multi-class AdaBoost with dynamic time traveling, or utilizing a SVM on the helped highlight vectors.

The appearance highlights are generally separated from the overall face locale distinctive face areas containing contrasting kinds of information [25,26]. For instance of utilizing worldwide highlights, Happy used a region parallel example (LBP) histogram of different square sizes from a worldwide face locale on the grounds that the element vectors, and grouped different outward appearances utilizing an important part investigation (PCA). Despite the fact that this strategy is executed progressively, the prevalence exactness will in general be debased on the grounds that it can't reflect nearby varieties of the facial segments to the element vector.

Dissimilar to a worldwide component based methodology, diverse face districts have various degrees of significance. for example , the eyes and mouth contain more data than the temple and cheek. Grimier extricated area explicit appearance includes by isolating the entire face district into space explicit nearby areas.

Significant nearby districts are resolved utilizing a gradual inquiry approach, which winds up during a decrease of the component measurements and an improvement inside the acknowledgment precision.

CHAPTER-4

PERFORMANCE ANALYSIS

The algorithm of the end product was analyzed to check and verify the products efficiency and accuracy in various conditions with 4 different people ,each with a variation of lighting conditions to check what type of results would vary for different type of users in different type of conditions.

To Store this statistical experimental data we used the Excel 2007,for making analysis of the data further.

The data we got from the experiment was laid into a table format as below:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		I/P Expression							O/P Expression						
2	Sno	happy	sad	neutral	fear	angry	surprised	disgust	happy	sad	neutral	fear	angry	surprised	disgust
3	1	1							1						
4	2					1							1		
5	3		1							1					
6	4			1							1				
7	5				1								1		
8	6			1							1				
9	7	1							1						
10	8				1							1			
11	9					1							1		
12	10				1							1			
13	11	1							1						

Fig(X)

In this statistical experimental data the Input expressions are the expressions entered by the one of the user/tester, while on the right hand side is the data that was triggered by the algorithm and declared on the screen. The data states in code where as the “1” refers to the declared value .

On the left hand side of the input expression ‘1’ ins the value entered by the user and the‘1’ on the right hand side states the output by the algorithm.

For example, The data 1 for user 1, Sno-01 gave an expression of happy and got a algorithmic value of happy, which is true.

From the data above we can make an analysis of the accuracy of the software per command input of the user into the algorithm to that of what algorithm gave an output to. In the data set we took a values of 100 tests for 4 different conditions and people.

This further led to 100 values of output by the algorithm, now by doing the analysis of all the expressions and calculating the percentage of correct answer given by the algorithm we get the following correlation matrix that provides the accuracy of every expression on the system algorithm.

Happy	0.809524	0.095238	0.047619	0	0.047619	0	0
sad	0	0.666667	0	0.333333	0	0	0
neutral	0	0.086957	0.608696	0.086957	0.217391	0	0
fear	0.095238	0	0.095238	0.666667	0.095238	0.047619	0
angry	0.1	0	0	0	0.9	0	0
surprised	0	0.090909	0	0	0.090909	0.818182	0
disgust	0.181818	0	0.090909	0.181818	0.090909	0	0.454545
	happy	**sad**	**neutral**	**fear**	**angry**	**surprised**	**disgust**

Correlation matrix for the accuracy of the software with respect to Emotions detected in various light conditions

Fig(XI)

The accuracy of the algorithm to all the expressions present in the experiment we can conclude the accuracy :

The percentage of correctness of

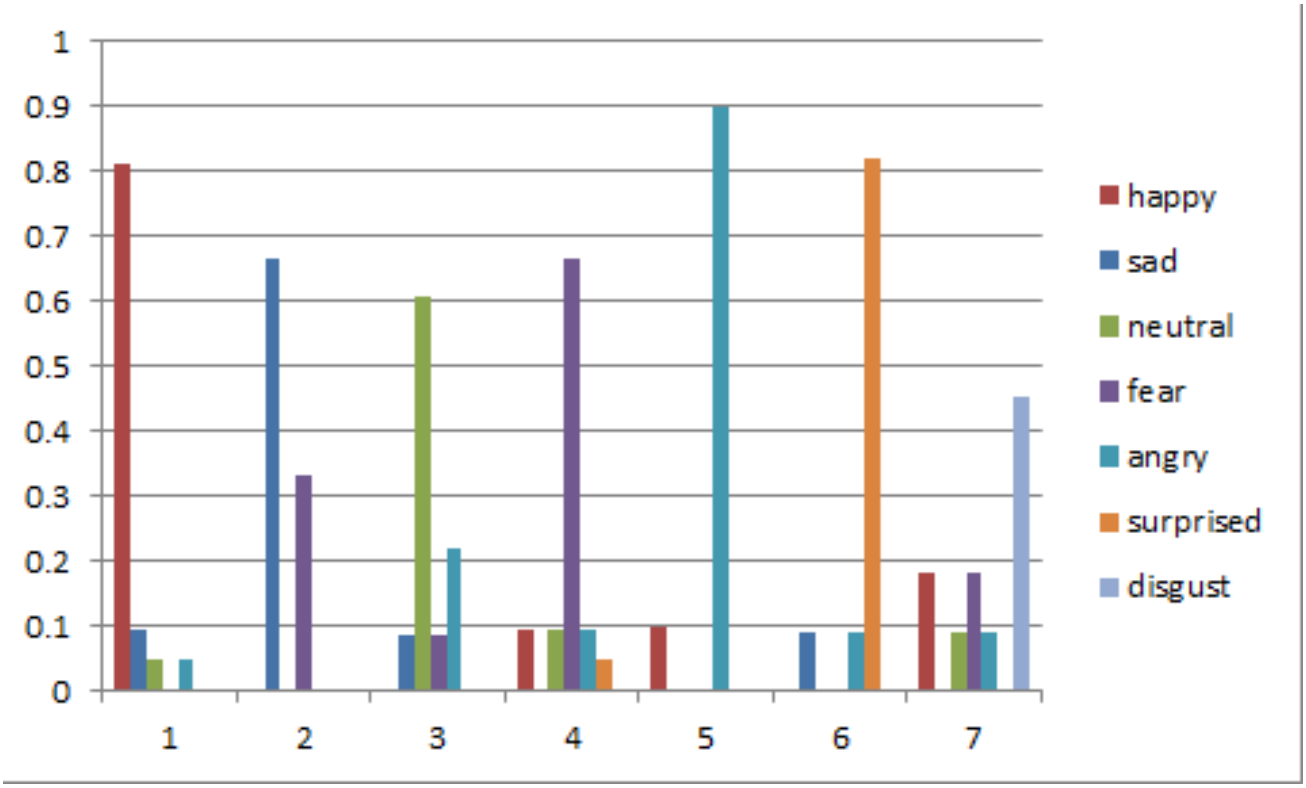
1. Happy=80.9524%
2. Sad=66.66667%
3. Neutral=60.8696%
4. Fear=66.6667%
5. Angry=90%
6. Surprised=81.8182%
7. Disgust=45.4545%

Over all accuracy of the software calculated is 70.3469% accurate when we use a statistical experimentation for the algorithmic inputs and outputs.

The accuracy of the algorithm lies around 70%, now we need to find out where the algorithm lacks and what are the wrong outputs presented by it and what are their values.

To show that the graph below shows that the values of the expressions

1. Happy
2. Sad
3. Neutral
4. Fear
5. Angry
6. Surprised
7. Disgust



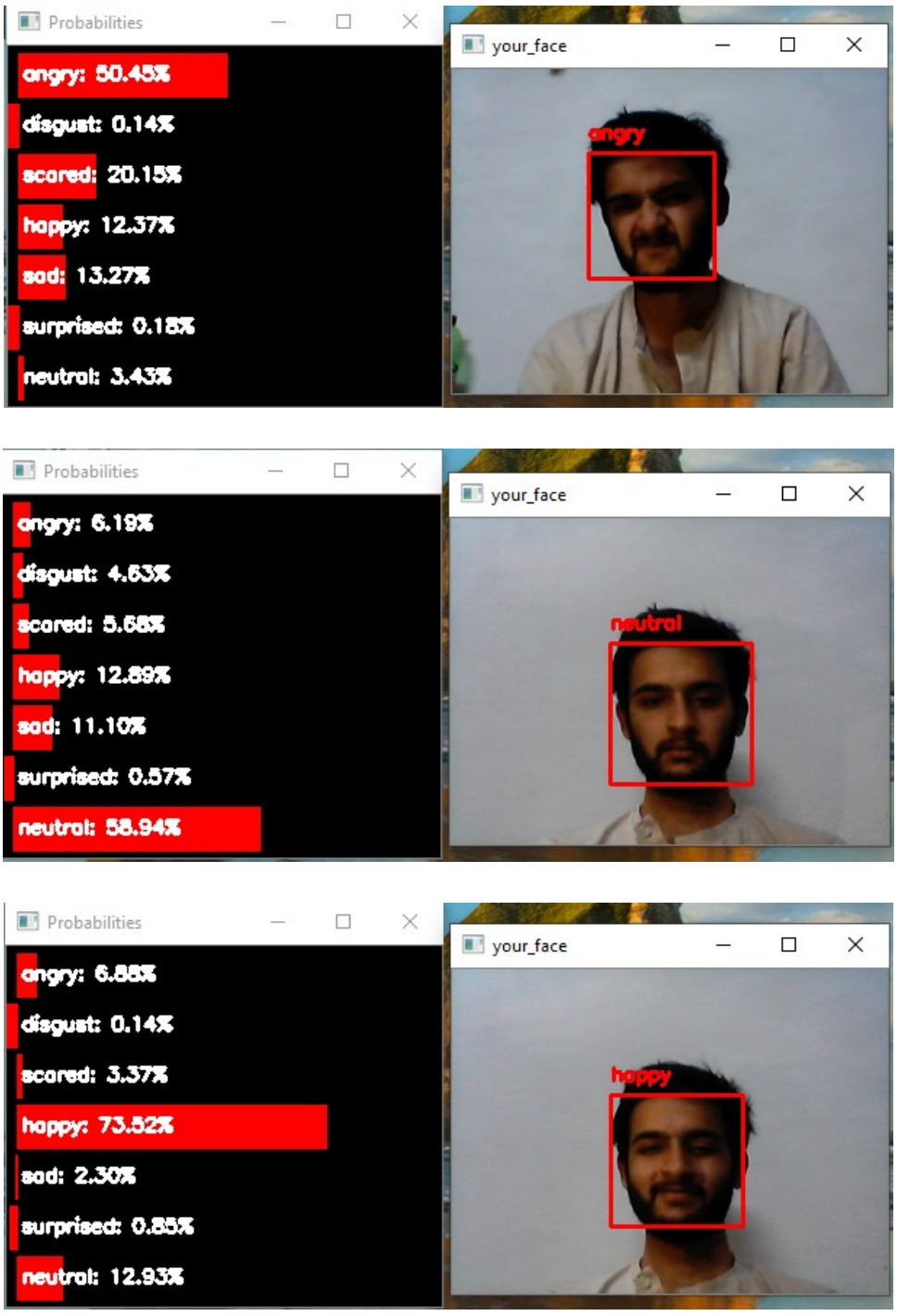
Fig(XII)

According to the graphical representation of the statistical experiment, it states that in the 1 (happy) expression gave a above 80% for the correct rest about 9.5% for sad and 4.7% for both neutral and angry. Hence the algorithm is having some issue in declaring the value of happy with some mixed data, while the 80% criteria is still a better than satisfactory result.

Also in the other cases as in 2(sad) 66.67% is the accuracy which is 2/3 of their corrections and mixing data with mostly fear 33.34 %.In 3(neutral) 60% is the accuracy while data un-matching is around 40% with 8.6of sad, 8.6 of fear 21% angry. In fear the incorrections are9.5% of happy,9.5% of neutral and 9.5% of angry and 4.7% of surprised. In angry there is only 10% of incorrections all in happy. In surprised 9.09% in both sad and angry. In disgust 18.18% in both happy and fear, while 9.09% in neutral and angry.

Results output of the final algorithm are given below

(All these outputs are taken screenshots from a live video analyzer of the mood detection system.)



Fig(XIII)

CHAPTER-5

CONCLUSION

5.1 CONCLUSION

In this case, at the point when the model predicts inaccurately, the right name is frequently the second in all likelihood feeling. The outward appearance acknowledgment framework introduced in this examination work contributes a strong face acknowledgment model dependent on the mapping of conduct qualities with the physiological biometric attributes. The physiological qualities of the human face with significance to different appearances, for example, joy, bitterness, dread, outrage, shock and appall are related with geometrical structures which reestablished as base coordinating format for the acknowledgment framework.

The conduct part of this framework relates the demeanor behind various articulations as property base. The property bases are estranged as uncovered and concealed classification in hereditary algorithmic qualities. The quality preparing set assesses the expressional uniqueness of individual faces and give a flexible expressional acknowledgment model in the field of biometric security. The plan of a novel uneven cryptosystem dependent on biometrics having highlights like various leveled bunch security kills the utilization of passwords and shrewd cards rather than prior cryptosystems. It requires an extraordinary equipment bolster like all different biometrics framework. This exploration work guarantees another heading of research in the field of unbalanced biometric cryptosystems which is exceptionally alluring so as to dispose of passwords and keen cards totally. Test investigation and study show that the progressive security structures are powerful fit as a fiddle recognizable proof for physiological characteristics.

In this venture in looking at all the past models. In any case, we have to improve in explicit zones like-

- number and setup of convolutional layers
- number and setup of thick layers

- dropout rate in thick layers

In any case, because of absence of profoundly arranged framework we were unable to go further into thick neural system as the framework gets exceptionally moderate and we will attempt to improve in these regions in future.

We might likewise want to prepare more databases into the framework to make the model increasingly precise yet again assets turns into an obstruction in the way and we additionally need to improve in a few zones in future to determine the mistakes and improve the exactness. Having analyzed methods to adapt to demeanor variety, in future it might be researched in more profundity about the face grouping issue and ideal combination of shading and profundity data. Further examination can be set down toward allele of quality coordinating to the geometric elements of the outward appearances. The hereditary property advancement structure for facial expressional framework can be concentrated to suit the prerequisite of various security models, for example, criminal recognition, legislative classified security penetrates and so on.

5.2 FUTURE SCOPE

The face acknowledgment are regularly tried utilizing physiological signs, in light of the fact that the physiological signs are firmly co-identified with human feelings. These signs are not controllable by people. the most signals on which outward appearances are capable are temperature, breath, skin conductance, and heart work. The effective yield are regularly delivered utilizing physiological signs.

5.3 APPLICATION CONTRIBUTIONS

Feeling acknowledgment is utilized in the public eye for a spread of reasons. Full of feeling, which spun out of MIT, gives AI programming that makes it progressively effective to attempt to assignments recently done physically by individuals, basically to gather face and vocal demeanor data related with explicit settings where watchers have assented to share this data. for example , instead of rounding out a long overview about how you are feeling at each point viewing a scholarly video or promotion, you'll agree to have a camera watch your face and hear what you state, and note during which parts of the experience you show appearances like weariness, intrigue, relationship, or grinning. (Note this doesn't infer it's perusing your deepest emotions - it just peruses what you express ostensibly.)

- Other utilizes by Affective incorporate helping youngsters with mental imbalance, helping individuals that are oblivious in regards to peruse outward appearances, helping robots interface all the more insightfully with individuals, and checking indications of consideration while driving trying to fortify driver wellbeing.

- A patent documented by Snapchat in 2015 depicts a method of separating information about groups at open occasions by performing algorithmic feeling acknowledgment on clients' retagged selfies.

- Emotient was a new business which applied feeling acknowledgment to understanding grimaces, grins, and different demeanors on faces, in particular AI to foresee "mentalities and activities bolstered outward appearances". Apple purchased Emotient in 2016 and utilizes feeling acknowledgment innovation to strengthen the passionate insight of its items.

- nViso gives ongoing feeling acknowledgment to web and portable applications through a continuous API.Visage Technologies AB offers feeling estimation as an area of their Visage SDK for showcasing and research venture and comparative purposes.

- Eyeris is a feeling acknowledgment organization that works with installed framework producers including vehicle producers and social automated organizations on coordinating its face examination and feeling acknowledgment programming; additionally like video content makers to help them measure the apparent adequacy of their short and long structure video inventive.

Numerous items likewise exist to total data from feelings imparted web based, including through "like" button presses and by means of tallies of positive and negative expressions in content and influence acknowledgment is progressively used in certain sorts of games and PC game , both for instructive purposes and to offer players increasingly regular command over their social symbols.

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APPENDICES

Algorithm :

```
from keras.preprocessing.image import img_to_array
import imutils
import cv2
from keras.models import load_model
import numpy as np

# parameters for loading data and images
detection_model_path = 'C:/Users/YASHWIN/Anaconda3/Lib/site-packages/cv2/data/haarcascade_frontalface_default.xml'
emotion_model_path = 'C:/Users/YASHWIN/Desktop/Emotion-recognition-master/models/_mini_XCEPTION.102-0.66.hdf5'

# hyper-parameters for bounding boxes shape
# loading models

face_detection = cv2.CascadeClassifier(detection_model_path)
emotion_classifier = load_model(emotion_model_path, compile=False)
EMOTIONS = ["angry" ,"disgust","scared", "happy", "sad", "surprised","neutral"]


#feelings_faces = []
#for index, emotion in enumerate(EMOTIONS):
  # feelings_faces.append(cv2.imread('emojis/' + emotion + '.png', -1))

# starting video streaming
cv2.namedWindow('your_face')
```

```
camera = cv2.VideoCapture(0)
while True:
    frame = camera.read()[1]
    #reading the frame
    frame = imutils.resize(frame,width=300)
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    faces = face_detection.detectMultiScale(gray,scaleFactor=1.1,minNeighbors=5,minSize=(30,30),
flags=cv2.CASCADE_SCALE_IMAGE)

    canvas = np.zeros((250, 300, 3), dtype="uint8")
    frameClone = frame.copy()
    if len(faces) > 0:
        faces = sorted(faces, reverse=True,
        key=lambda x: (x[2] - x[0]) * (x[3] - x[1]))[0]
        (fX, fY, fW, fH) = faces
                # Extract the ROI of the face from the grayscale image, resize it to a fixed
28x28 pixels, and then prepare
            # the ROI for classification via the CNN
        roi = gray[fY:fY + fH, fX:fX + fW]
        roi = cv2.resize(roi, (64, 64))
        roi = roi.astype("float") / 255.0
        roi = img_to_array(roi)
        roi = np.expand_dims(roi, axis=0)



        preds = emotion_classifier.predict(roi)[0]
        emotion_probability = np.max(preds)
        label = EMOTIONS[preds.argmax()]
    else: continue
```

```
    for (i, (emotion, prob)) in enumerate(zip(EMOTIONS, preds)):
            # construct the label text
            text = "{}: {:.2f}%".format(emotion, prob * 100)

            # draw the label + probability bar on the canvas
           # emoji_face = feelings_faces[np.argmax(preds)]


            w = int(prob * 300)
            cv2.rectangle(canvas, (7, (i * 35) + 5),
            (w, (i * 35) + 35), (0, 0, 255), -1)
            cv2.putText(canvas, text, (10, (i * 35) + 23),
            cv2.FONT_HERSHEY_SIMPLEX, 0.45,
            (255, 255, 255), 2)
            cv2.putText(frameClone, label, (fX, fY - 10),
            cv2.FONT_HERSHEY_SIMPLEX, 0.45, (0, 0, 255), 2)
            cv2.rectangle(frameClone, (fX, fY), (fX + fW, fY + fH),
                    (0, 0, 255), 2)
#    for c in range(0, 3):
#        frame[200:320, 10:130, c] = emoji_face[:, :, c] * \
#        (emoji_face[:, :, 3] / 255.0) + frame[200:320,
#        10:130, c] * (1.0 - emoji_face[:, :, 3] / 255.0)


    cv2.imshow('your_face', frameClone)
    cv2.imshow("Probabilities", canvas)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break
camera.release()
cv2.destroyAllWindows()
```

The dataset:

We utilized two principle datasets to mentor our models: FER-2013 and CK+ . The FER-2013 dataset comprises of 28,000 named pictures inside the preparation set, 3,500 named pictures inside the improvement set, and 3,500 pictures inside the test set.

Each picture in FER-2013 is named together of seven feelings: cheerful, tragic, irate, apprehensive, shock, appall, and impartial, with glad being the preeminent common feeling, giving a pattern to arbitrary speculating of 24.4%. the photos in FER-2013 contains both presented and unposed headshots, which are in grayscale and 48x48 pixels.

The FER-2013 dataset was made by social affair the aftereffects of a Google picture search of each feeling and equivalent words of the feelings. The CK+ dataset highlights a sum of 5,876 marked pictures of 123 people. Out of those pictures, we utilized 4,113 pictures for preparing, 881 for dev, and 881 for test. Each picture is marked with one among seven feelings: upbeat, pitiful, irate, apprehensive, shock, appall, and disdain. Pictures inside the CK+ dataset are totally presented with comparative foundations, generally grayscale, and 640x490 pixels.

Despite the fact that the FER-2013 and CK+ database both have comparatively named feelings, we found when building up our model that it had been anything but difficult to acknowledge very high correctnesses on the CK+ dataset (as against FER-2013). this is frequently probably on the grounds that the CK+ dataset was presented, had less people and less assorted variety than FER-2013.

Consequently, we concentrated more on improving our model's presentation on the FER-2013 dataset, as the more extensive scope of unposed pictures all the more firmly mirrored the photos we may see while moving the aptitudes over to continuous.

MOOD DETECTION USING FACE RECOGNITION

ORIGINALITY REPORT

17%	10%	4%	12%
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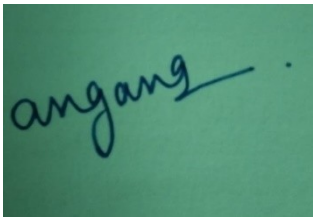

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