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Face Recognition System using Machine Learning in GUI

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Abstract: ***Face recognition system is an area of machine learning, in which a machine is trained to identify faces of person. This technique is used to identify or verify a person from digital images, videos or in real time This is basically used for security purpose in different aspects ie. attendance management system, face detection system in mobile phones, door locking system. In the short term face recognition technology will become more pervasive. It may be used to track individual movement across the world. The Paper discusses such an algorithm that can find the face of particular user using image processing technique, segmentation, localization, feature extraction and classification. A user friendly environment is created by using GUI in MATLAB. Here we used datasets of the facial image and extract the feature by using several Convolutionary neural network(CNN).This model recognizes facial image and also the expression of the face with different functanality.***
Keywords-Image, Pre-processing, Segmentation, feature extraction, Classification and GUI.

I. INTRODUCTION

Face recognition system is the process of identifying or verifying a human faces using machine learning approach. A machine that performs the various recognition task has to be trained so that the it can perform the task based on the training given with the past data sets with the known class labels. Numerous researches have been carried out but none of them has proposed a perfect approach to recognize human face. It has gained much advancement in the recent years due to more security features in this model. As humans have an exceptional ability to recognize people irrespective of their age, lighting conditions and varying expressions. The aim of paper is to design face recognition system which can match the human recognition rate approx 97 percent. Basically authentication is the process of recognizing or finding image from given set of facial images in the database. Authencation is basically of two types.[1].Biometric based authencation. [2].Non-biometric based authecation. For non-biometric based authencation it consists of some keywords ie. Key and card. Password, pins and keys are used for the identity feature in the non-bioametric based authencation. To diminish the curd of non-biometric based authentication biometric based authencation is introduced. Biometric authentication is the technique of identifying the person by his/her behaviour ie. movement of the psychological traits, cheekbone, width of face, height of face, eyes colour, eyes length.

Using these feature authentication becomes conveinent and more security feature is added to this system. This is because biometric traits cannot be stolen or forgotten and is very difficult to copy and manipulate. There are many technique have been developed for the face recognition. Face recognition have many applications ie. lockscreen in phone, information security, employee control, attendance management system in schools and colleges, social network application etc.

In this method face recognition system is basically categories into two types.[1].Face detection by using facial images present in the database of given datasets. In this only one image is present in the database related to that facial image.[2].Face extraction by using a group of people present in the database it will extract the image of the person from the group. This proposed idea is for second type of the systems, with varifying facial details, expressions of the face and angles. The convolutionary neural network algorithm is used to manipulate and gives best result for the facial images. CNN is used to represents an interesting method for image processing. CNN is used for image processing and classification for its high accuracy. CNN consits of 5 categories to distinguish face from the system: Face detection, Face expression, angles and classification. This method extracts facial features from the input images and apply them to neural network for extraction of the images.

II. LITERATURE SURVEY

There exists a many literature which gives the details stucture of face recognition system. Following section comprises of previous article and paper regarding face recognition. The comparative study of various face recognition technique ie. Principal component analysis (PCA),Linear discriminant analysis (LDA),and Support vector macine(SVM) are described by BHELE and MANKER. S meena kshi and D M urugan proposed the model by using PCA.PCA is used to reduce the dimension of feature vector in given input format. Brunelli and poggio[1] described a set of geometrical feature of facial images ie.ear, nose, lips, eyes and chin shape. They described that the recognition rate is 90 percent for 47 people in database. But however they showed that simple tempalate matching scheme shows 100 percent recognition for the same datasets.

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Wikott[2]uses and updated version of this technique and compare 300 faces from 300 different people and gives 97 percent recognition rate .

Syafeeza al.[3] Used 4-layer convolutional neural network for biometric based authentication system. They described proposed model can handle various facial images that contains pose, occulutions, illumination, expressions. Results shows an accuracy of 99.5 percent on AR.

Khalajzadeh et al.[4] Gives a hybrid system using CNN and Logistic Regression Classifier (LRC). Results showed enhance version of recognition rate than other methods.

III. PROPOSED METHODOLOGY

CNN is a type of deep neural network which can take an input image from the system and able to differentiate one image from other. This algorithm is introduced in the system to solve the problem of ordinary neural network. This model is proposed by using 6 layer of CNN which gives the accuracy of around 98 percent in the system. Main reason behind using CNN is that it does not requires any preprocessing. CNN has capability of geometric transformations ie. scaling, rotation, translation and conversion of image by different angles. CNN consists of features of pooling and sub pooling which is used to performs the convolution operation on the images. Pooling layers is used to reduce the size and the number of the parameter used in image recognition. Most ordinary feature of pooling MAX pooling is used. MAX pooling is a sample-based discretization process. The main of MAX pooling is to reduce the dimensionality and representation of the images and also allowing for assumptions to be made about features of the givem images. Below fig 1. shows the dimensionality reduction of images.

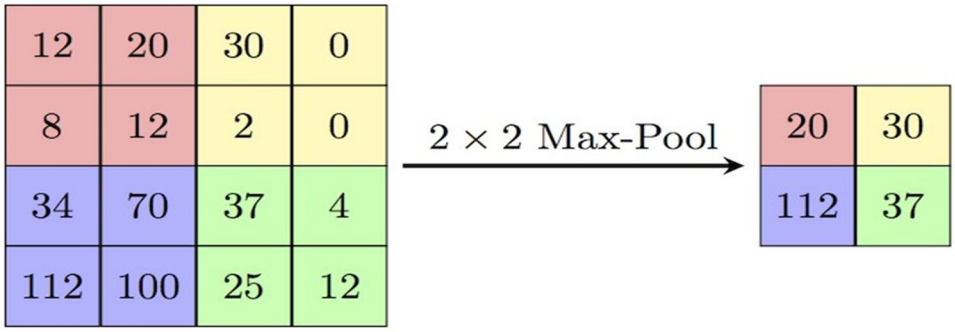

Fig 1. MAX Pooling

The most common function of Convolution neural network RelU is used for feature extraction and manipulation of data sets. Relu function is also called Activation function. This is most commonly used function in neural network. Relu is a max function(y,0) with input y. Below diagram fig 2. shows the graph of Relu function.

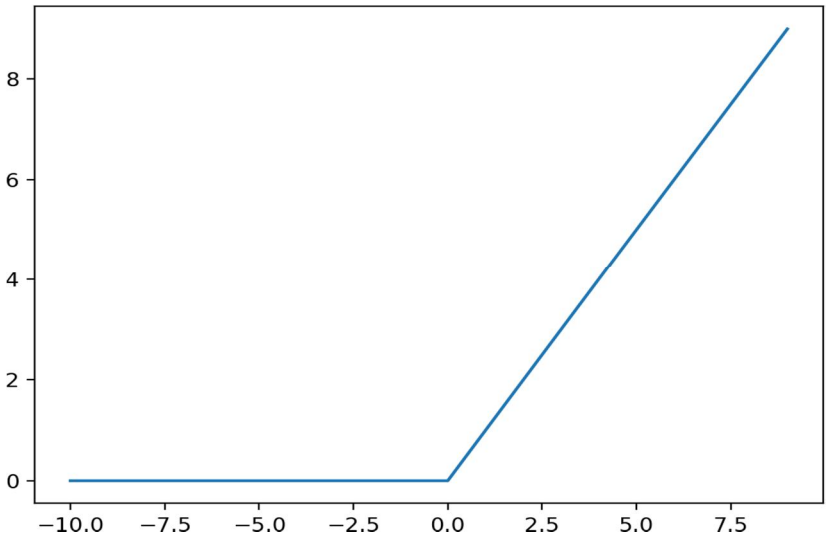

Fig 2. Rectified linear unit(Relu)

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CNN describes and the differentiate between convolution layers and pooling layers convolution layer is core building block of CNN network.

A x,y = f(E x,y ⊗U x,y + Q x,y) (1)

and for pooling layer:

D x,y = f(E x,y ⊗U x,y + G Q x,y) (2)

where f is activation function and G is matrix. Below is the diagram of CNN which describes both convolution layer and max pool layer.

There are different phases of convolution neural network for recognition system

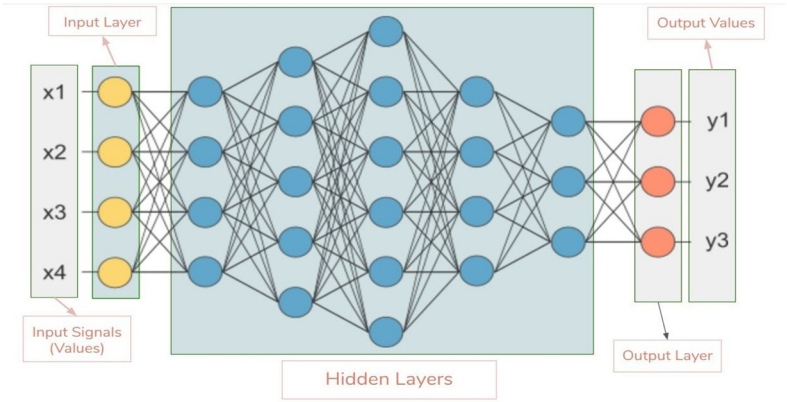
A. Preprocessing

Preprocessing phase provides the basic level of abstraction in the face recognition system. The main concern of Image pre-processing is an enhacement of image that have unwanted twisting. In this first approach the frontal face and height width of the face(eyes, nose, mouth) is used for extraction of image. In this it take image as input and extract the other feature. It also extract the change in the height width of facial image which describes the emotions of the face.

Fig 3. Facial Image

B. Learning

6-layer Convolution neural network is used for the learning process of facail images from the datasets of the images. In this group of facial images is used in CNN network as input and after that algorithm is applied to extract the feature of images.



From the above fig. x1,x2,x3,x4 are used as an input signal it does not have any weight and biased value. System after taking input signals the extraction phase is done in the hidden layer. In our image there are 5 hidden layer in which one layer have 4 neurons, 2nd layer have 5 neurons,3rd layer have 6 neurons,4th layer have 4 neurons and last layer which gives output to the next layer contains 3 layer.

Last one is the output layer which takes input from last layer of input layer eg. Y1,y2,y3,y4 are the ouput format of the facial images.

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C. Accuracy Details

This method is tested on Kaggel database which consists of 50 images of human face. Along with that there are 150 different emotions of faces so total of 200 facial images are tested in this proposed method.T he expressions are categorized into different parts ie. Happy, face, sad, sleepy, surprised, hungry, face in dark/dim light. These categories are described into 40 classes. The complete datasets are defined into two categories of the machine learning. The proposed idea is executed on python 3.5.2(64 bit).different packages of python is used for training and preprocessing of facial images from database ie. Opencv is used for preprocessing phase, and for creation and training of datasets tensorflow packages of python is used. After implementing above features in the system the accuracy of 97.15 percent. Below diagram shows the accuracy of implemented model.

Method	Accuracy
Geometrical traits	92
Eigen faces[32]	96
PCA[29]	Orientation 97,Scale variation 68
Mixture-distance[20]	96

Fig 4. Accuracy details of implemented model.

Comparison of implemented model with other previously defined methods. Below Diagram shows the comparison of models.

Name researchers	Method	Accuracy
Blangeret al.[13]	CNN	96.14
Priya Gupta	CNN	97.10
Xu et al.[8]	Wavelet-BP	93
Proposed model	CNN	97.15

Fig. 5 Comparison from other methodology.

IV. RESULT AND CONCLUSION

The use of cascade and input feature of faces instead of raw inputs makes the model more accurate and also the complexity of the implemented model decreases. Instead of using covets CNN is used which makes the implemented process faster. There are different categories of images is used ie. Sleepy, happy, sad, emotion, sleepy which makes the model more reliable and lighter. This model is used for both face recognition as well as it will detect emotion of that particular face too.

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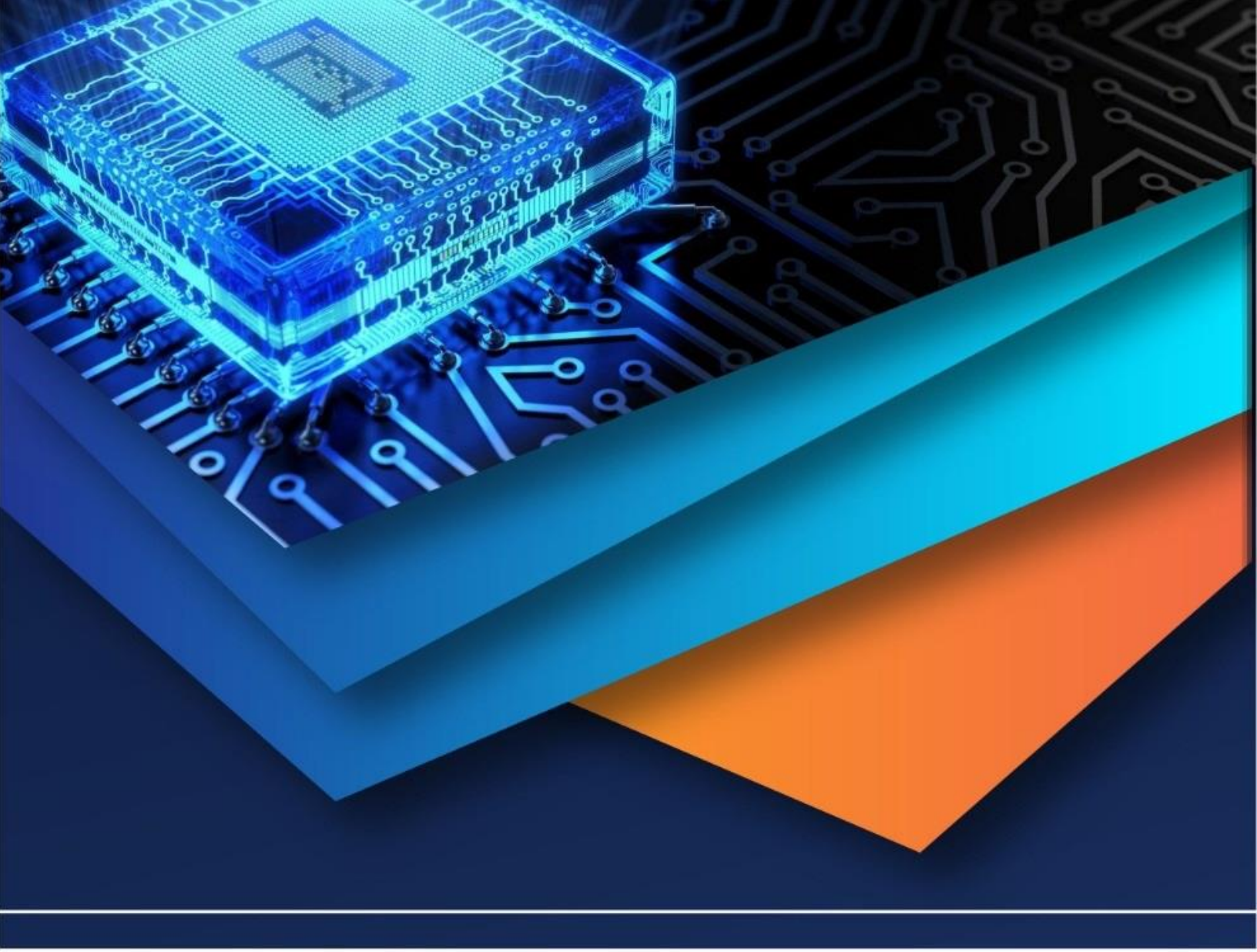

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