REAL TIME FACIAL EMOTION RECOGNITION FOR ELDERLY CARE USING CNN

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***Abstract*-The process used for identifying human emotion is the FER(Facial Emotion Recognition).This emotions shows a good sense of inside feelings. They can be caused of positive experiences or else by negative experiences. Emotions can be detected by using various technologies. Nowadays, there are increasing demand for emotional cloud computing. In this paper, we applied deep learning method (convolutional neural networks) to identify the key seven human emotions: anger, disgust, fear, happiness, sadness, surprise and neutrality.Different labels are given for each labels which are already trained in python. This labels are used to identify emotions.Android application allows user to install the application in their phone.A web camera is used to identify emotions of the parent.If it shows sad then the registered person will get notified the presence of an intruder with the person's picture. This paper focus on FER for elderly people.**

Keywords-Convolution neural network(CNN), deep learning ,Facial emotion recognition(FER), Elderly care.

I. INTRODUCTION

Nowadays we are more concerned about our security hence this model accelerate the security of our parents. Facial emotion recognition for elderly is one of the aid to care them. There are different kinds of emotions that one can make. This emotions persist from seconds to minutes. Emotions are a result of inside feelings. They can be a sign of scary experience or a happy moment. Facial emotion is the best way of communication during our hard times. Humans tend to constantly analyse the expressions of other individuals to whom they chatter. FER can be employed in many other applications such as detecting the emotion of the driver and to act accordingly also activate the music playlist by detecting the persons mood.

This paper shows implementing FER for elderly care using CNN which is deep learning algorithm and is used for image classification. The system consist of :image processing, face detection, normalization and emotion recognition that comprises of seven emotions such as : anger, disgust, fear, happiness, sadness, surprise and neutrality.

II. PROPOSED SYSTEM

Our system is used to analyse the facial expressions using Convolution Neural Network(CNN) architecture. This system simply consist of a camera which is connected to the application of the person who wishes to monitor their parents far apart. When the camera detect a new face, save the image and recognise the facial expression of the monitored person. Notify care taker if the expression is not happy or clam. Based on this conclusion if it is an intruder and a notification is sent to the person who is using the application along with the captured image and expression.

The system is mainly developed for elderly people. This application provide a daily updates of the parent's emotion which in-turn help to provide security for the same. The system is already trained with seven expressions and each of them have their own labels.

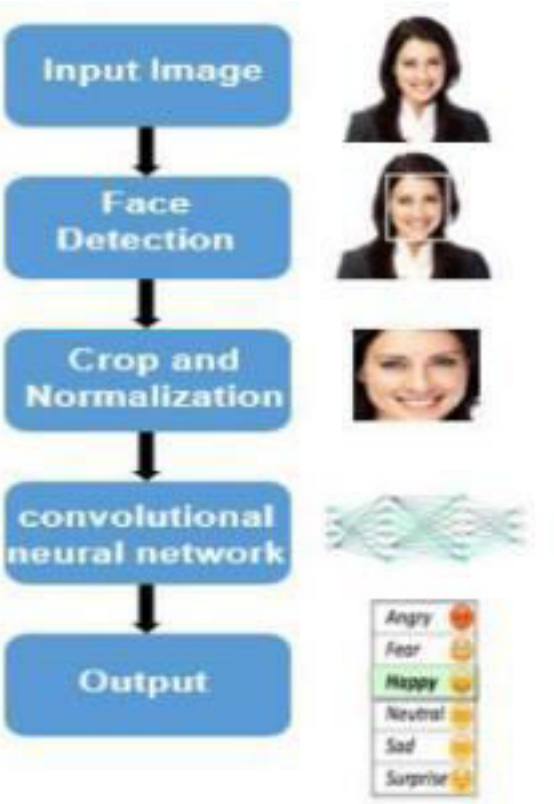

Fig 1 : The structure of our facial expression recognition system.

In deep learning CNN is a classification deep network. CNN are normalized version of multilayer perception. CNNs take different approach towards normalization : they lead to the Hierarchical pattern in data and get together more complex patterns using simpler and small patterns. CNN were stimulated by biological process.

A CNN consists of input and output layers ,also a multiple hidden layers. The hidden layers of CNN contains a sequence of convolution layers that group with dot products.

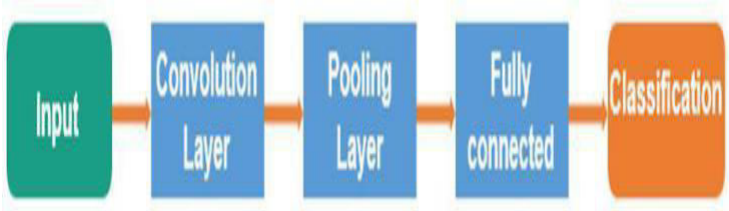

Fig 2 : CNN architecture

A) CONVOLUTION LAYER : The first layer to take out characteristic from an input image. The main aim of Convolution in case of ConvNet is to take out characteristic from the input image. Convolution protect contiguous correlation with pixels by swotting image characteristic using small quad of input data. It carry out a dot product linking two matrices, where one is the image and other is the kernel.

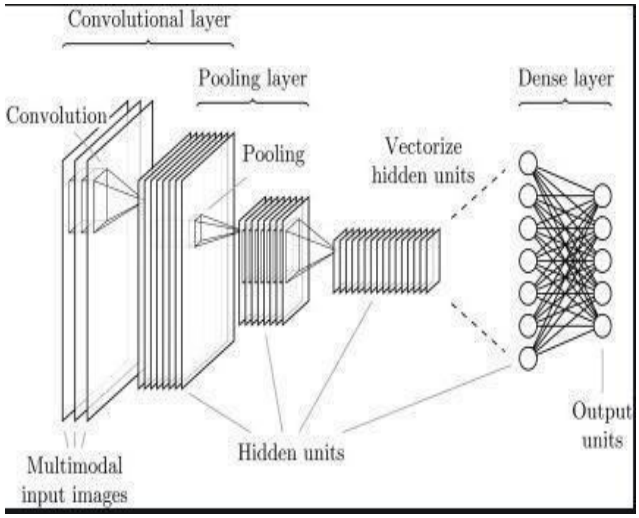

Fig 3 : Feature of Convolution layer

B) POOLING LAYER: This layer turn down the proportions of each characteristic map but retain main details. It is classified into different types : Max

Pooling, Average Pooling and Sum Pooling. The purpose of Pooling is to gradually decrease space size of the input depiction and to build the network constant to small modification. We took, top of the block as single output to Pooling layer.

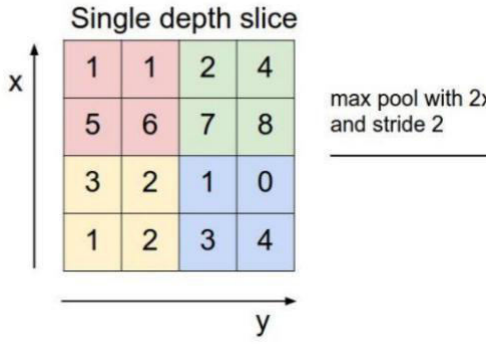

Fig 4 : Feature of Pooling layer

C) FULLY CONNECTED LAYER :

The goal is to use the output of the convolution layer and the pooling layer for grouping the input image into various sets found on the training data . So the other two layers act as attribute removal from the input image.

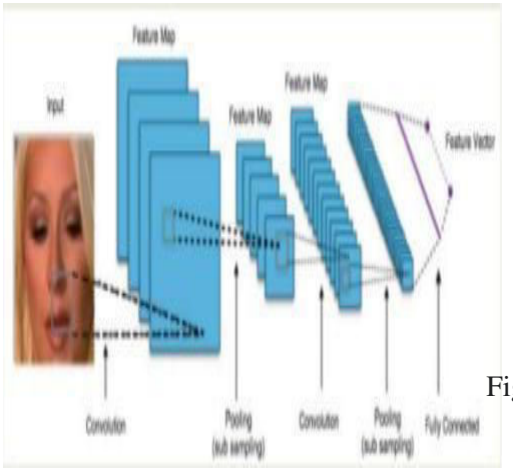

Fig 5 : CNN model.

It consist of both with four convolution and pooling layers to pull out the characters and two fully connected layers , it captures totally seven emotions. The input image will be back and white face image with 48*48. For each convolution layer we use 3*3 and for pooling layer we use 2*2. Both have a stride of 2 . So we initiate the non linearity in the model , use Rectified Linear Unit (ReLU) .

$R(z) = \max(0,z)$

Where R(z) is zero when z is less than zero and R(z) is equal to zero when z is greater than or equal to zero.

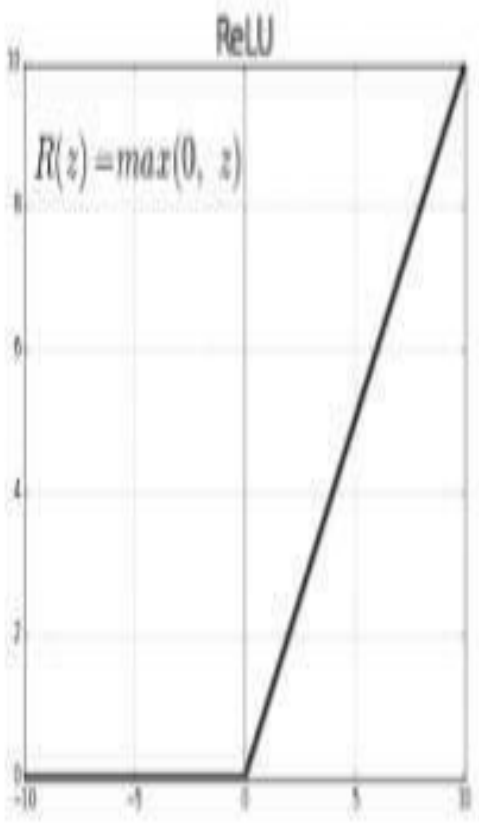

Fig 6 :ReLU function

TABLE I CNN CONFIGURATION

Layer type	Size	Stride
Data	48x48	-
Convolution 1	3x3	2
Max Pooling 1	2x2	2
Convolution 2	3x3	2
Max Pooling 2	2x2	2
Convolution 3	3x3	2
Max Pooling 3	2x2	2
Convolution 4	3x3	2
Max Pooling 4	2x2	2
Fully Connected	-	-
Fully Connected	-	-

Table constitutes the network layer.

III. IMPLEMENTATION DETAILS

To construct our CNN model we use FER18 database as shown in Fig 7 . It was created by Google search API. The database automatically renormalize the pixels 48*48. The FER18 database hold 35886 images with seven expressions labelled .

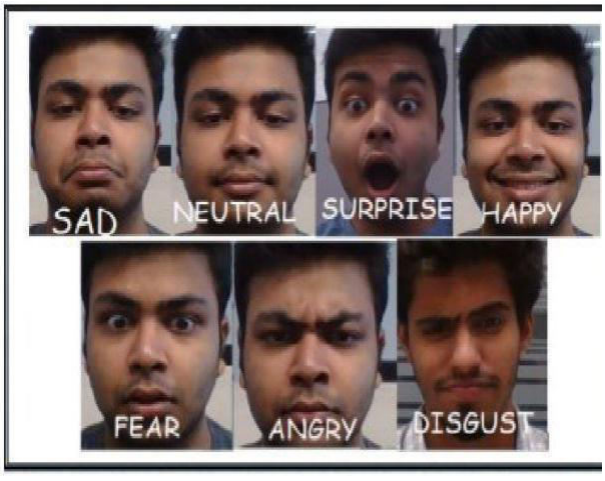

Fig 7 : Predictions made by model of facial recognition.

In this model we uses Open CV which is a python library used to capture live frames from web camera and to detect faces based on Haar Cascades method. It is achieved by **Adaboost**.

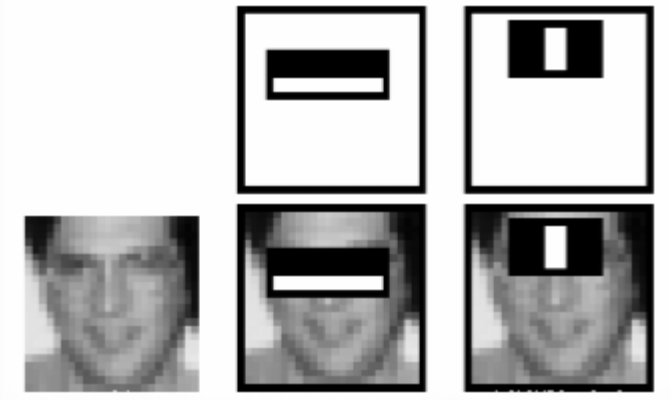

Fig 8.Face Detection using Haar Cascades

In this figure,the first one shows how to detect eyes and the second one shows how to detect nose. Top row depicts two good features. The first feature selected seems to direct on the property that the region of the eyes is more darker than the region of the nose and cheeks. The second feature chosen relies on the property that the eyes are darker than the bridge of the nose.

This CNN model is built using Tensorflow, Keras which is a high-level API. The Keras deep learning library come up with a sophisticated API for loading, preparing, and augmenting image data.It deals with the pre-processing of the input image.

To train our CNN model we divided the database into 80% training data and 20% test data. At each epoch, Keras checks if our model produce output better than the models of the previous epochs. In this case, the new best model weights are stored in a file. This will allow us to load directly the weights without having to re-train it if we want to use it in another situation.

IV. EXPERIMENTAL RESULTS

We have trained our CNN model using prior database which contains seven emotions(happiness, anger, sadness,

disgust, neutral, fear and surprise).Here,the face is detected using Haar Cascade classifier and the image is resized to 48×48 pixels.Then it is converted to gray scale and given as input to CNN. We tested the model and it shows 80% accuracy.

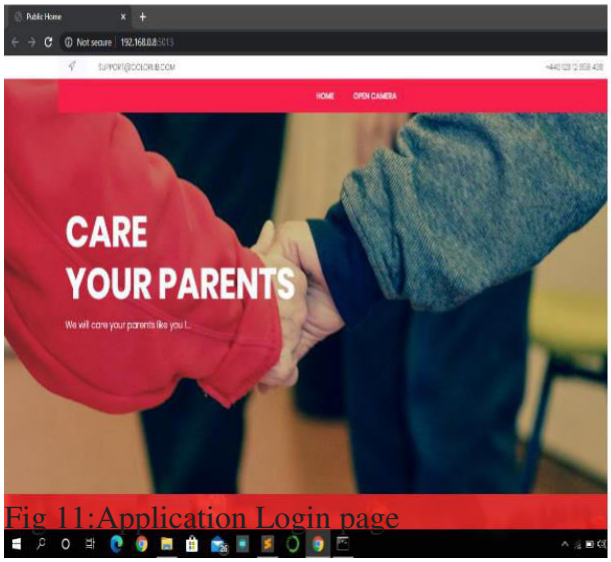

Fig 9:Shows the webpage

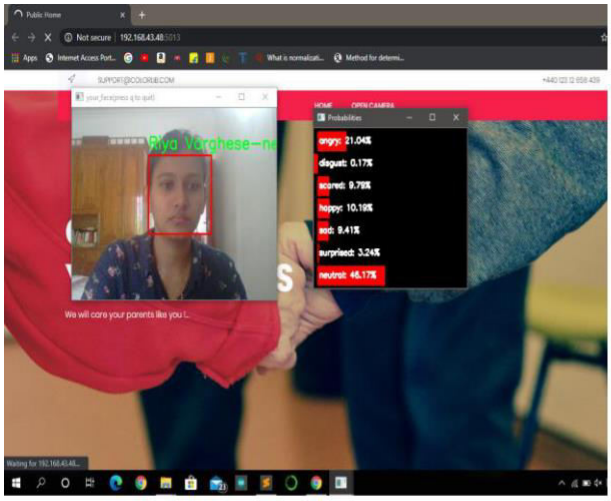

Fig 10:Emotion is detected

The above figure shows the emotion recognized and the canvas which contains seven emotions. This canvas shows a red bar for the detected emotion which depicts the probability of the emotion that is shown in the webcam.

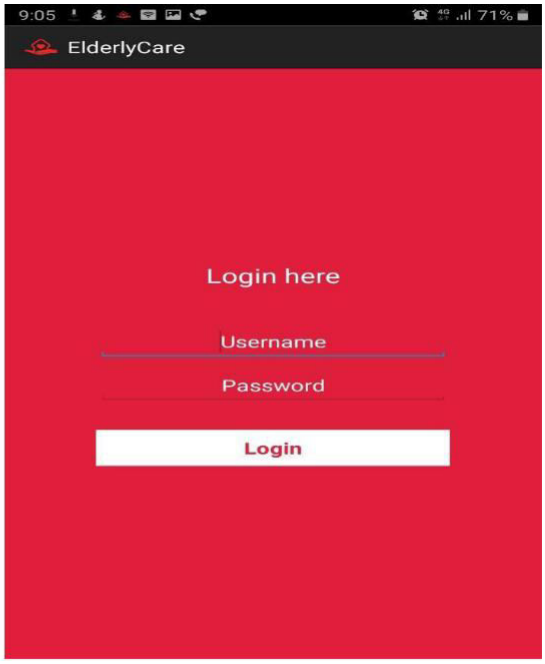

Fig 11:Application Login page

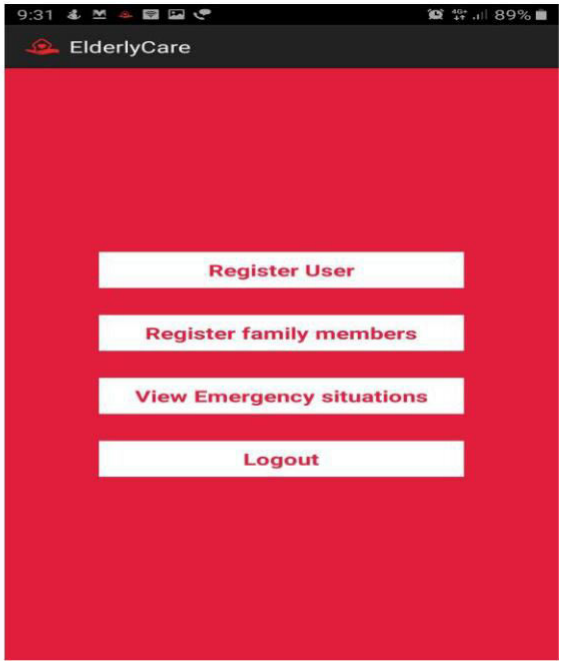

Fig 12:User can select from menu

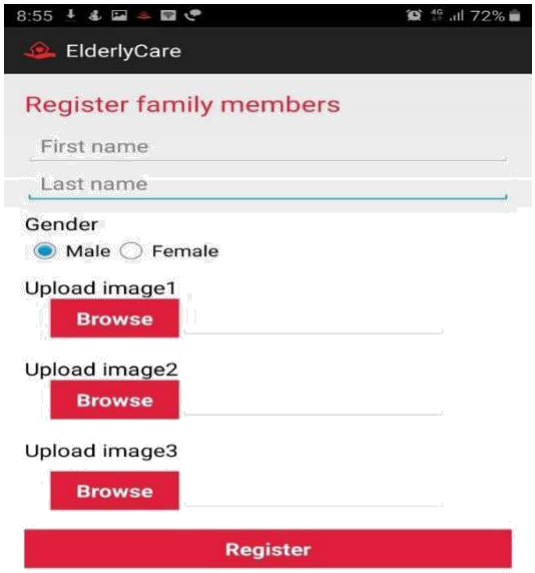

Fig 13:Registration page

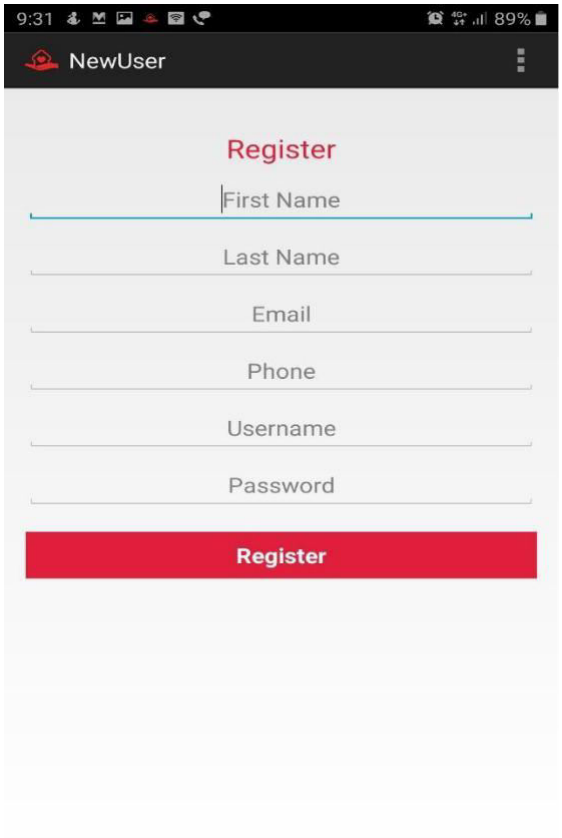

Fig 14:New User Login

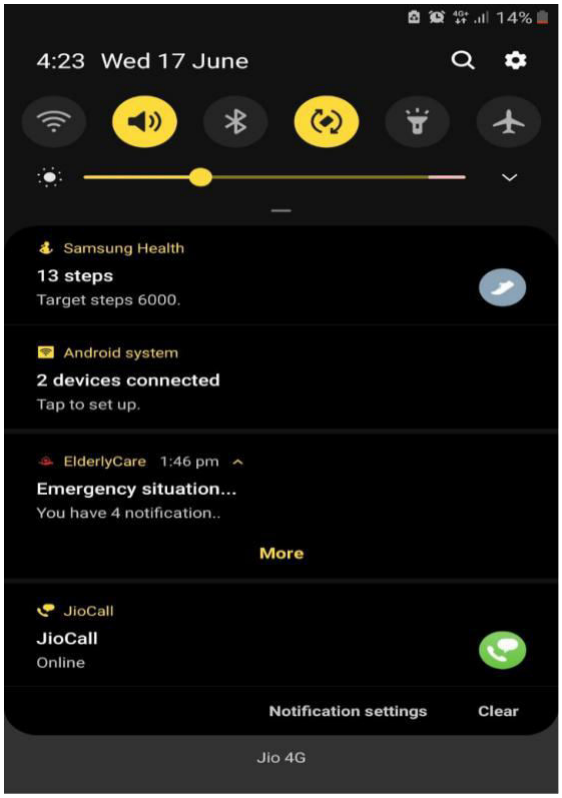

Fig 15:Notification received to the care taker

V. CONCLUSION

In this paper,a CNN model for elderly people. Seven emotions are detected by the FER system. The face of registered people is detected by using Haar-like detector and then they are classified them into seven facial expressions: surprise, fear, disgust, sad, happy, angry and neutral. Our FER system provides security to the elderly people. In the future, if emotional oriented deep-learning algorithms can be developed and combined with additional Internet-of-Things sensors then it is expected that FER can improve its current recognition rate including even spontaneous micro-expressions, to the same level as human beings.

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