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Face Recognition and Emotion Detection

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Abstract*: This *Face recognition and facial emotion detection is new era of technology. It's also indirectly defining the level of growth in intelligence, security and copying human emotional behaviour. It is mainly used in market research and testing. Many companies require a good and accurate testing method which contributes to their development by providing the necessary insights and drawing the accurate conclusions. Facial expression recognition technology can be developed through various methods. This technology can be developed by using the deep learning with the convolutional neural network or with inbuilt libraries like deepface. The main objective here is to classify each face based on the emotions shown into seven categories which include Anger, Disgust, Fear, Happiness, Sadness, Surprise and Neutrality. The main objective here in this project is, to read the facial expressions of the people and displaying them the product which helps in determining their interest in it. Facial expression recognition technology can also be used in video game testing. During the video game testing, certain users are asked to play the game for a specified period and their expressions, and their behavior are monitored and analyzed. The game developers usually use the facial expression recognition and get the required insights and draw the conclusions and provide their feedback in the making of the final product. In this project, deep learning with the convolutional neural networks (CNN) approach is used. Neural networks need to be trained with large amounts of data and have a higher computational power [8-11]. It takes more time to train the model.[1]

***Keywords*: face recognition, emotion detection, neural network deepface**

I. INTRODUCTION

This Emotion recognition is the process of identifying human emotion. People vary widely in their accuracy at recognizing the emotions of others. Use of technology to help people with emotion recognition is a relatively nascent research area. Generally, the technology works best if it uses multiple modalities in context. To date, the most work has been conducted on automating the recognition of facial expressions from video, spoken expressions from audio, written expressions from text, and physiology as measured by wearables.

II. METHODOLOGY

An In this paper, deep learning with the convolutional neural network approach is used. The Keras Application Programming Interface and OpenCV framework were used [12]. OpenCV is used for the automatic detection of faces and drawing bounding boxes around them. OpenCV consists of many pretrained classifiers for face, eyes, smile etc. The model here is trained with the dataset used in the ICMR (International Conference on Machine Learning). This dataset can be taken from the Kaggle website. All the images of the dataset are of size 48*48. To select some images from every category, utility function can be used [3].

Fig.1. Training Dataset

Fig 1 Tranining Dataset Example

1) Building the VGG Model for emotion detection
2) Training of the VGG model efficiently so that it can recognize the emotion
3) Testing of the model in real-time using webcam

A. The Dataset

It is composed of images that are handwritten digits (0-9), split into a training set of 50,000 images and a test set of 10,000 where each image is of 28 x 28 pixels in width and height. This **dataset** is often used for practicing any algorithm made for image classification as the **dataset** is fairly easy to conquer.

B. Training Of The VGG Model Efficiently So That It Can Recognize The Emotion

VGG models are a type of CNN Architecture proposed by Karen Simonyan & Andrew Zisserman of Visual Geometry Group (VGG), Oxford University, which brought remarkable results for the ImageNet Challenge.
They experiment with 6 models, with different numbers of trainable layers. Based on the number of models the two most popular models are VGG16 and VGG19.

C. Testing Of The Model In Real-Time Using Webcam

Fig 1 shows the facial expressions datasets of different people. We need to check the class imbalance problem before modeling and perform the data augmentation and check which class has lesser data and provide more of the data of the minority class. So, the number of images contained in each section should be checked [21-23]. These command lines can be used for this purpose, for expression in os.listdir("train/"):print(str(len(os.listdir("train/" + expression))) + " " + expression + " images")The training data should be set based on expressions. Dataset is split into 80% training and 20% test. During training, the loss of the neural network is minimized using the mini batch gradient descent[24-25]. In the paper, two data generators are used. One is for the training and the other is for testing

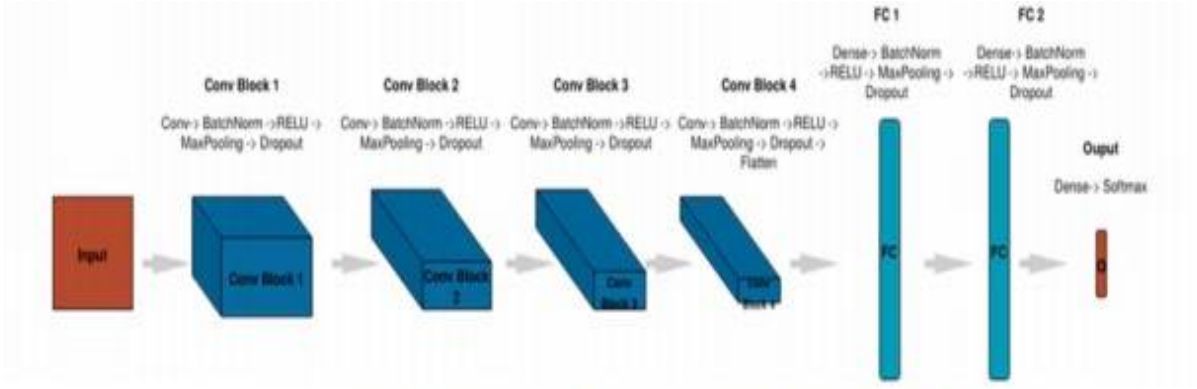


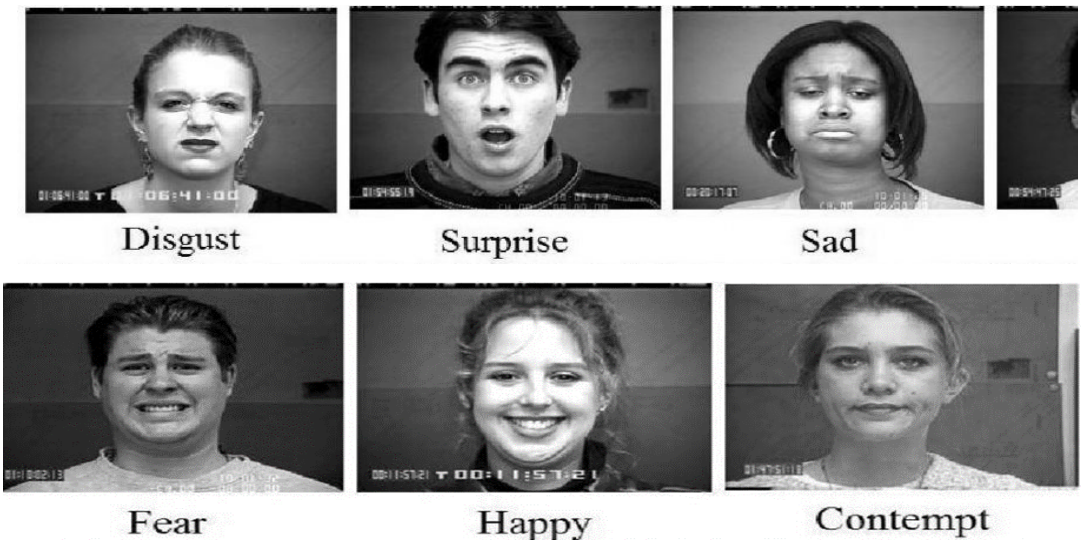
Fig.2. Creating the Convolutional Neural Network (CNN)

. Convolutional Neural Network

Fig.2shows the creation of CNN Network In the convolution block1, the data will be convoluted, and batch normalization is performed, and activation is done using the RELU activation function. Then, the Max pooling is performed, and dropout is done. The same process is done in the block2 and block3. In block4, the same process takes place, but at the end flattening is done. In the FCl (fully connected layer), the data will be passed to a dense function and batch normalization is performed and activation is done using the RELU activation function. Then, the Max pooling is performed, and dropout is done. This repeats even for FC2.At the output, dense function is performed and SoftMax is applied. By this process, size decreases from layer to layer and it finally chooses one out of the seven classes. Flask web application is used to view the output. Flask is a web framework, which provides us with tools, libraries and technologies that allow us to build a web application. This web application can be some web pages, a blog, a wiki or go as big as a web-based calendar application or a commercial website. In this project flask web framework is used to create web page where our output will be detected.

III.RESULT AND DISCUSSION

Validation of the designed network is done using different real facial expressions in which the faces are detected and bounded by a box and the facial expressions are named accordingly which are shown below.
(The Image is example, Similar to the project output)



IV.CONCLUSIONS

This Facial expression recognition is done using deep learning with the convolutional neural network approach CNN and automatic detection of faces and drawing bounding boxes around them are done using different data set's. The activation is done using the RELU activation function in the work. The validation is done with the real time images with different expression. The proposed model gives the correct expression name using the trained CNN network.

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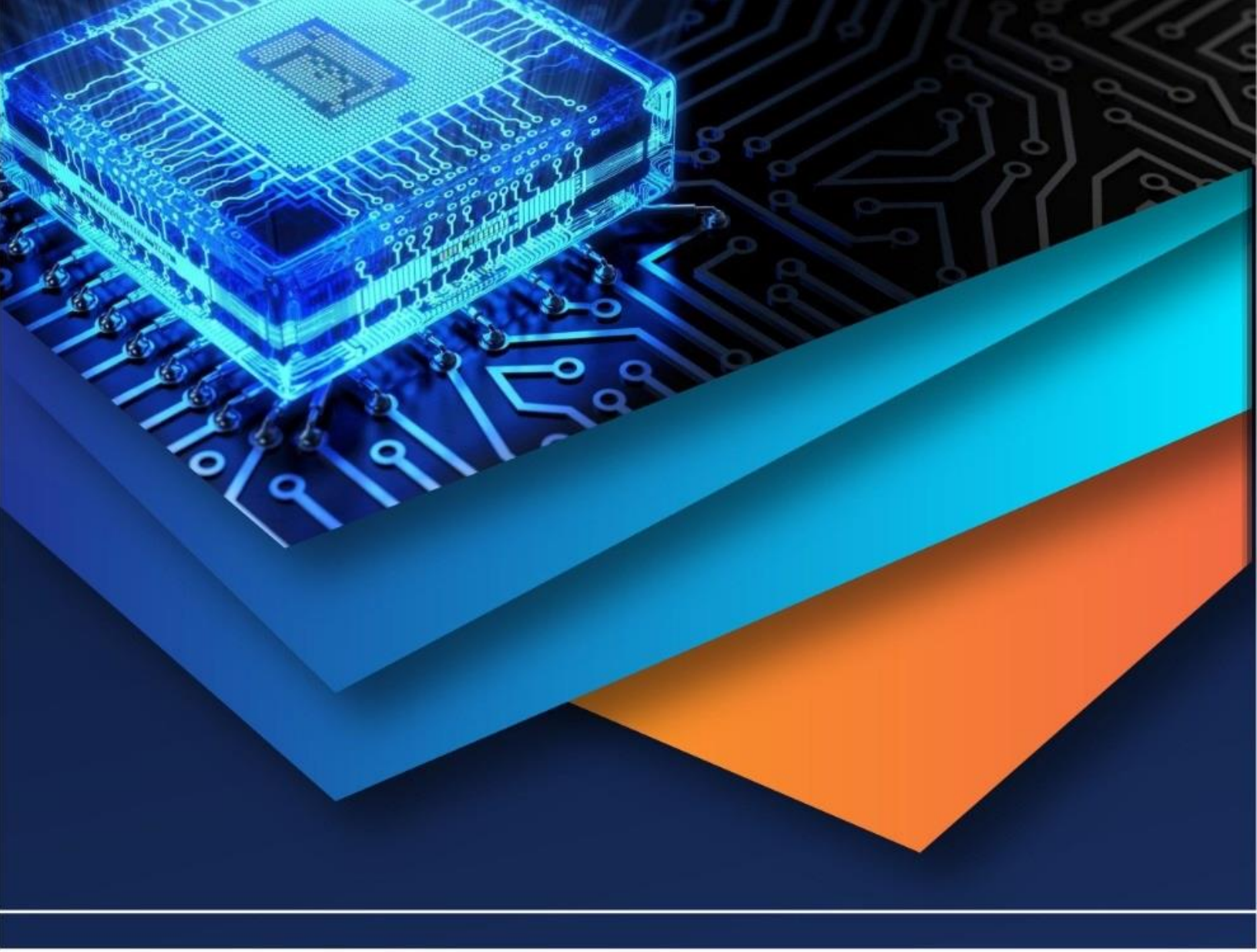

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