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Real Time and Accurate Face Detection Application using Convolutional Neural Network Algorithm

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Abstract:- Face recognition is essential for many technologies around the world such as video monitoring, interaction between human machines and security systems. As per modern approaches to machine learning, deep learning related techniques give excellent results in terms of accuracy and processing speed in image recognition. Face recognition recommends a modified architecture of the Convolutional Neural Network (CNN) by collecting two standardization operations on 2 layers. The process of normalization which is normalization by batch introduces acceleration of the network. CNN architecture was used to remove distinctive face features and Softmax classifier was used to identify faces within fully connected layer of Convolutional Neural Network.

Keywords:- *Face Recognition, Deep learning Algorithm, Convolutional Neural Network algorithm, Stacked Auto encoder.*

I. INTRODUCTION

Face recognition is a mechanism by which a visual system identifies a particular person's face. This was an important human-computer interface device used in security systems, access-control, video monitoring, business areas and also in social networks such as Facebook. Later, rapid growth of AI, facial recognition has again drawn interest because of its anti-intrusive nature and Because of the main individual recognition method as measured against other biometric techniques. Face recognition can also be easily tested in an unpredictable situation, without the awareness of the user.

Standard approaches performed by shallow learning are faced with problems such as posture variance, facial displays, scene lighting, background photo difficulty, and changing of expression. There are different approaches to learning, such as the Convolutional Neural Network (CNN), the Stacked Auto Encoder and the Deep Belief Network (DBN). CNN is commonly used in facial detection and object recognition algorithms. CNN is a kind of artificial neural networks that use convolution techniques to derive the characteristics from the input data to maximize the number of features.

II. DEEP LEARNING ALGORITHM TECHNIQUES: CNN ALGORITHM

CNN Algorithm: Convolution Neural Networks is like a Deep Neural Network which makes use of Convolutional Layers as a network's first hidden layers. Such layers have an architecture built to make good utilization of the information gained on raw data from it's spatial structure present. Convolutional layers are based upon the principle of receptive local area (fields). On a convolutionary layer, each unit is a mapping of neighboring outputs from a region (field) from the previous layer. The key use of CNN on the methodology of facial recognition is that certain types of models are able to extracting spatial features from the images. Image data provide a friendly and helpful hierarchical decomposition: groups of nearby pixels may form outlines; groups of nearby outlines may form polygons, and many more, before complex visible patterns are formed. CNN typically uses a sequence of convolutional and pooling layers as a function of this rule, with the result of one becoming the input to another.

Recognition techniques are often categorized into two primary approaches:

A. Geometric:

The geometric connection between facial landmarks or, the spatial countenance configuration is developed. This implies that the face's foremost geometric features, just like the eyes, nose and mouth, is first found, then faces are categorized on the basis of varying geometric gaps and angles between various features.

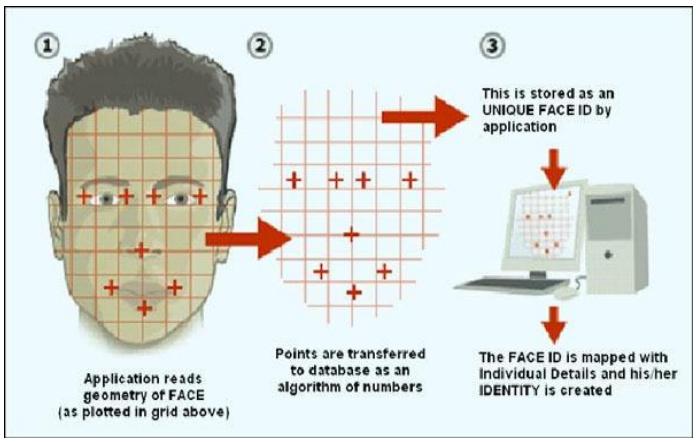

Fig 1:- Geometric approach of Face Recognition

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B. Photometric:

It is used to reconstruct an object's form from a variety of photographs captured under different lighting conditions . A gradient map determines the outline of the restored object which is created with an array of surface area

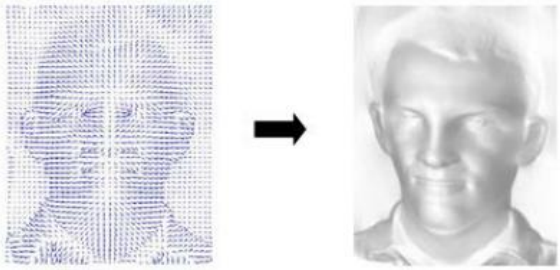

Fig 2:- Photometric approach of Face Recognition

III. ABOUT DATASET AND ATTRIBUTES

A. Face Dataset:

Database of Faces contains 900 pictures of 6 different individuals, with 150 images of each individual, using various poses in different lighting variations. All the pictures were 250 x 250 pixel grayscale resolution .

Fig 3

Images with different individual's faces such as closed and open eyes and smile or without smiling are shown in the database with certain information such as having beard or without beard, both with and without spectacles. All the images were taken over dark background with the subjects in an upward, frontal posture. Individual's forehead and hair can be observed in the relevant images. The facial condition against the direction of the camera is different from left to right and also from top to bottom. These images are 250 x 250 pixels in black and white.

IV. TRAINING PHASE

The CNN may also be a feed forward network consisting of layers which convert an input image from the primary pixel values to the last world-class scores by transmitting it layer after layer. The suggested CNN has Two convolution layers besides the data layer and source information, completely connected layers, ReLU layers, and a few overlapping pooling layers. Every layer has a variety of feature maps. Each map of the appearance holds one selected appearance extracted via a softmax filter and involves multiple neurons. After Preprocessing, the data layer contains the file. The convolutional network is divided into eight blocks:

- Faces from database was used as raw data. To increase the computing speed, every face was reduced in size to 224 x 224 pixel.
- The 2nd block is a sheet of 2D CNN with 16 function maps of 3×3 kernel dimensions. Rectifier linear unit (ReLU) was utilized as the activation function. This effect strengthened the sparse functionality of the entire network and prevented the dependency among all the neurons in passing parameters.
- For the MaxPooling layers, kernel of dimension 2×2 has been used and performance with probability of 0.25 has been removed. The down filtering layer used the max-pooling strategy that should have stored the usable details and cut back on the volume of data that required to be 1319 nalysed at the end. With all the same parameters as the above.
- The 2nd 2D CNN is used, but the number of function maps was increased to 32..
- we use MaxPooling layer and Dropout with the same value as in block C.
- The regular dense layer was used as next layer, providing separate neurons and using Relu as activation feature.
- The final dropout layer output was moved to the loss layer Softmax.
- The final resut was a categorized distribution of the 40 separate groups and the Softmax activation function . The Softmax regression is used as output layer for verification of the training development. We use the final Fully connected layer as the output for extraction of the features. We illustrate the activation values of the 2nd convolutional layer of the proposed CNN the pooling operation.

```
import cv2
import matplotlib.pyplot as plt
img=cv2.imread(files[69])
plt.imshow(img)
plt.title(class_map[np.argmax(targets[69])])
```

```
Text(0.5, 1.0, 'bhargav')
```

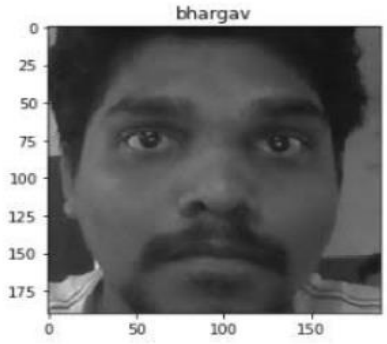

Fig 4

V. RESULTS AND ANALYSIS

Here, we classified the developed facial recognition library, concentrating on the procedures used to capture new faces, making the recognizer match the model to the data given, and then using the recognizer to predict its possibility of the identified faces when applied to new faces. The library's key class is the Recognizer module, decremented as below:

R= R (height, width, image-
directory, dataset-directory,
model-directory, mn-images)

Here R is Recognizer

Where the dimensions of the images to be fed into the network are parameter width and height, the channels are the depth of the pixels: One for grayscale, Three for RGB, respectively., dataset-directory is the path that will save the pre-processed data sets, model-directory is the path that will save the checkpoints of a network, image- directory is the path that will save the training photos, mn-images is the minimum number of photos of an individual to use, and these photos are also used for testing, i.e. for measuring the prediction.

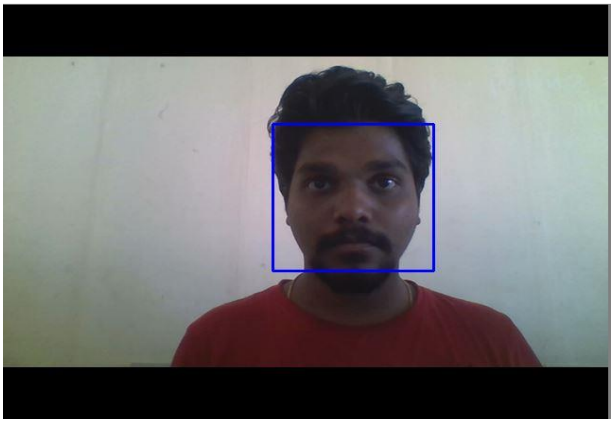

Fig 5:- Chosen image is given as input for face detection.

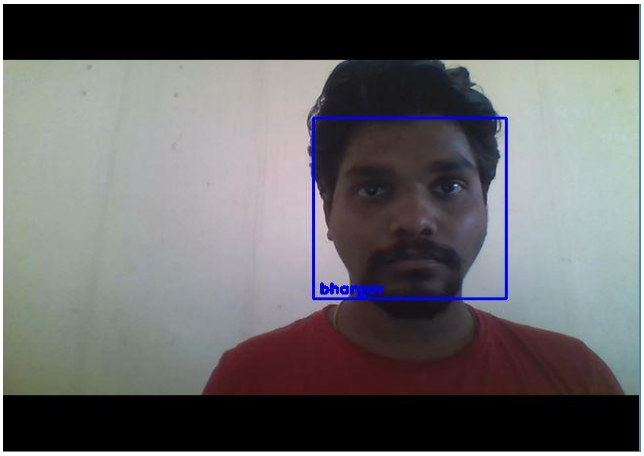

Fig 6:- Output image of a person along with his name.

VI. CONCLUSION

In this paper, I proposed a facial recognition library in Python, with the intention of broadly reducing the deployment complexity of facial recognition functionality in apps. I presented the outline of the most library functions, also as an outline of the overall architectural model of the interior CNN. Facial recognition does not remain a fully solved problem, with accuracies at the human level. In this perspective, the main contribution of this project is:

- To propose CNN architecture for facial recognition.
- Using the model proposed, created a general purpose facial recognition library for python.
- Analyzed library architecture on a wide scale scenario using a facial picture database the suggested library achieved greater accuracy on a wide scale. Often, by using a 90 percent confidence criterion.

At last, the performance analysis of the new CNN was provided. The cumulative score was measured using the various training photos and test pictures. The better results so far are obtained by the convolution neural networks (CNN). By using complicated models, accuracy ratings of 98 percent can be obtained. Notwithstanding this amazing performance, CNN's can't fully work without negative impacts. large training databases tend to high computing load and storage consumption, which then demands high processing power for practical use. In this application, the highest checked facial database contains 900 grayscale images with a resolution of 255 ×255 pixel. This dataset contained 6 different test images (persons).Developing better and faster equipment, dealing with the overwhelming amount of parameters is no longer an issue. It can be shown that any algorithm has specific advantages and disadvantages. Which algorithm is to be used is relies on the targeted application. We should use more specific types of classification for potential research it will be hard for the machine to identify and compare various classifiers.

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