ISSN: 2278-4632
Vol-12 Issue-11 No.02 November 2022

FACE RECOGNITION USING CNN

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Abstract

One the most challenging task is detecting faces in complex background. In this application, face recognition using deep learning is performed. Convolutional neural network (CNN) is used as deep learning algorithm which classifies the obtained/ captured face with more than 95% accurately. The obtained detail is saved in Ms-Excel with person name, time with date. CNN shows better performance compared with state of art machine learning techniques such as support vector machine, decision tree classifier, etc. Graphical user interface (GUI) is designed with python software to get easy understanding of library attendance management system.

Keywords : Face recognition , deep learning , CNN, GUI , hidden layers , machine learning.

I. Introduction

Face recognition is recognising or confirming a person's identification from their face. It analyses patterns based on a person's facial features, compares the features, and saves the final features. A facial recognition system is a touchless method of managing students, faculty and visitors, unlike other biometric systems like fingerprints that collect identity through touch.

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Face recognition is nothing but identifying the person details using facial features. Proposed method in this application is based

ISSN: 2278-4632
Vol-12 Issue-11 No.02 November 2022

on face recognition using deep learning algorithm. Deep learning algorithms helps in getting more precise results compared to state of art machine learning techniques Deep Learning Uses CNN for designing face recognition application.

Deep learning is a class of machine learning algorithms that (pp199–200) use a cascade of many layers of nonlinear processing units for feature extraction and transformation. Each successive layer uses the output from the previous layer as input. The algorithms may be supervised or unsupervised and applications include pattern analysis (unsupervised) and classification (supervised). That is based on the (unsupervised) learning of multiple levels of features or representations of the data. Higher level features are derived from lower level features to form a hierarchical representation. That is part of the broader machine learning field of learning representations of data. Learn multiple levels of representations that correspond to different levels of abstraction;

The levels form a hierarchy of concepts. Use some form of gradient descent for training these definitions have in common

(1) Multiple layers of nonlinear processing units and

(2) The supervised or unsupervised learning of feature representations in each layer, with the layers forming a hierarchy from low-level to high-level features.

II. Literature Survey

This project aims to provide a theoretical framework and a vocabulary that can be used to explain and examine the relationship between recognition and other components of face processing, as well as how humans recognise familiar faces. Faces can provide seven types of information, including facial speech codes, expressions, names, identity-specific semantics, visually derived semantics, and structural and visual information. Structure encoding techniques produce descriptions appropriate for face recognition, facial expression, and facial speech analysis software by a functional paradigm. Name codes are extracted after obtaining identity-specific semantic codes from person identification nodes.

This section gives an overview on the major human face recognition techniques that apply mostly to frontal faces, advantages and disadvantages of each method are also given. The methods considered are eigen faces (eigen features), neural networks, dynamic link architecture, hidden Markov model, geometrical feature matching, and template matching. The approaches are analyzed in terms of the facial representations they used.

Automatic face recognition has been extensively studied over the past decades in

ISSN: 2278-4632
Vol-12 Issue-11 No.02 November 2022

various domains (e.g., 2D, 3D, and video) resulting in a dramatic improvement. However, face recognition performance severely degrades under pose, lighting and expression variations, occlusion, and aging. Pose and lighting variations along with low image resolutions are major sources of degradation of face recognition performance in surveillance video[1].

This paper presents a novel and efficient facial image representation based on local binary pattern (LBP) texture features. The face image is divided into several regions from which the LBP feature distributions are extracted and concatenated into an enhanced feature vector to be used as a face descriptor. The performance of the proposed method is assessed in the face recognition problem under different challenges. Other applications and several extensions are also discussed[2].

In this paper, we propose a novel descriptor for face recognition on grayscale images, depth images and 2D+depth images. It is a compact and effective descriptor computed from the magnitude and the direction difference. It can be concatenated with conventional descriptors such as well-known Local Binary Pattern (LBP) and Weber Local Binary Pattern (WLBP), to enhance their discrimination capability[3].

A face recognition algorithm based on modular PCA approach is presented in this paper. The proposed algorithm when compared with conventional PCA algorithm has an improved recognition rate for face images with large variations in lighting direction and facial expression. In the proposed technique, the face images are divided into smaller sub-images and the PCA approach is applied to each of these sub-images[4].

Face recognition is the simplest person identification method. Face has been has been chosen as modality for person identification owning to its simplicity in implementation as well as being a non-invasive method in achieving results. Besides its popularity, face recognition still faces issues on its accuracy[5].

III. Existing System and Limitations

There are many ML techniques are used for face recognition like ML techniques such as SVM, KNN, NB, RF.ML related face recognition techniques has fewer limitations as ,

A) On huge dataset it can’t work perfect

B) Time complexity

C) Many preprocessing algorithms are required

ISSN: 2278-4632
Vol-12 Issue-11 No.02 November 2022

IV.Proposed Method

Fig. 1 displays the block diagram for the suggested CNN recognition method. In three steps, the algorithm is carried out as follows,

1. The source photos are resized to 16x16x1, 16x16x3, 32x32x1, 32x32x3, 64x64x1, and 64x64x1.
2. Create an eight-layer CNN structure with a convolutional, max pooling, convolutional, max pooling, convolutional, max pooling, and convolutional layer as its first layer.
3. After extracting all the features, classify the data using the softmax classifier.

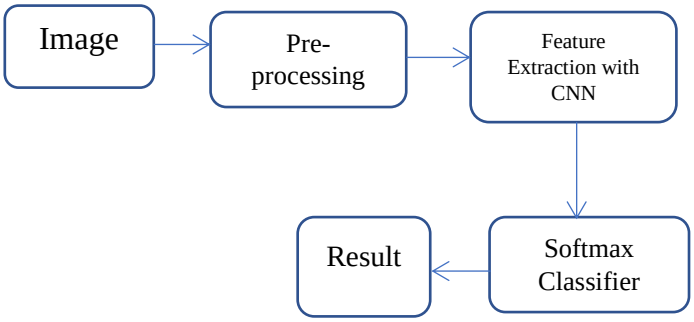

Fig.1. the block diagram for proposed algorithm

- Above figure shows block diagram of proposed methodology, which shows total five steps. As mentioned in proposed block diagram, following steps are used for face detection,

a) Real Time Video

b) Detect the face from frame

c) Train CNN classifier

d) Test CNN classifier

e) Mark attendance in MS-Excel and check performance of CNN algorithm.

In first step, the input frame is considered as image and face detection algorithm is used as finding the face part from input frame. The detected face part from input frame is considered as facial features. Detected facial features from image are used for training the classifier. CNN algorithm will get train using saved images in database.

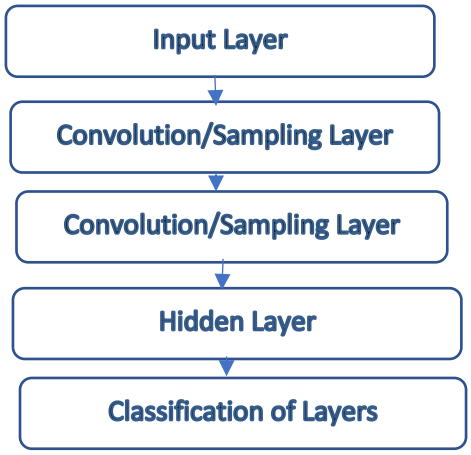

Fig.2 Structure of CNN layers

Input layer is used at the starting which is compete input to the network. This input provides complete matrix format data to the network. while 2nd layer is used as convolution /sampling layer. Features of an image can be extracted using convolution layer while sampling layer is used for resizing the data. Hidden layer has multiple layers which means that activation function is not required separately. Classification layer

ISSN: 2278-4632
Vol-12 Issue-11 No.02 November 2022

consider entropy loss calculations which helps in comparison.

V. RESULT ANALYSIS

run project to get below screen which represents GUI for proposed methodology.

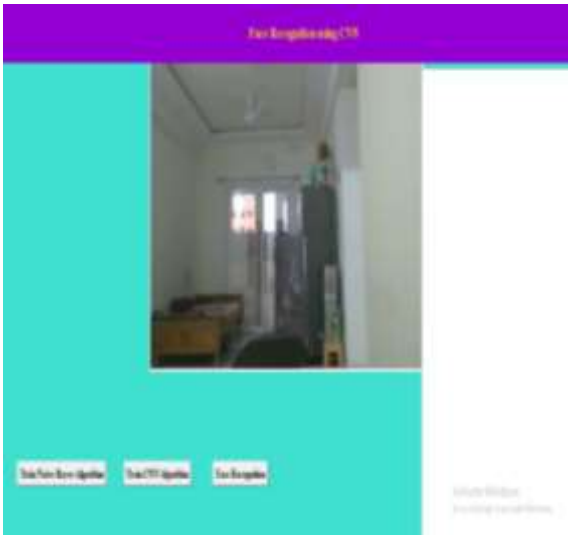

Fig.2. Run.bat file execution

In above screen webcam will run continuously and to train Naïve Bayes now click on 'Train Naïve Bayes Algorithm' button and get below output

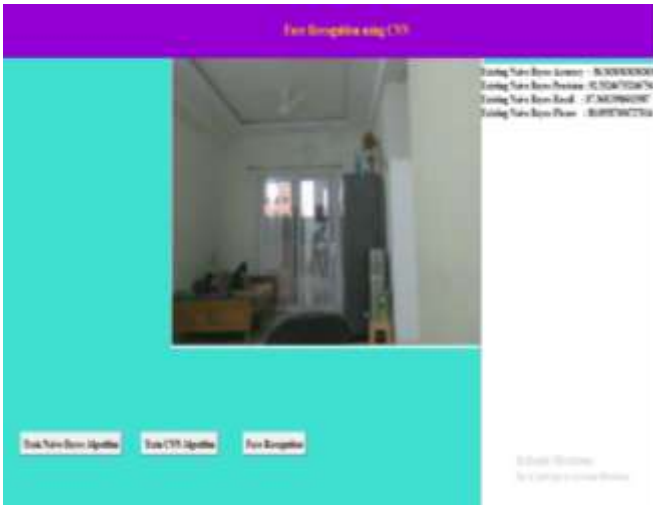

Fig.3.Trained naïve Bayes

In above screen with Naïve Bayes we got 86% accuracy and now click on 'Train CNN Algorithm' button to get below output

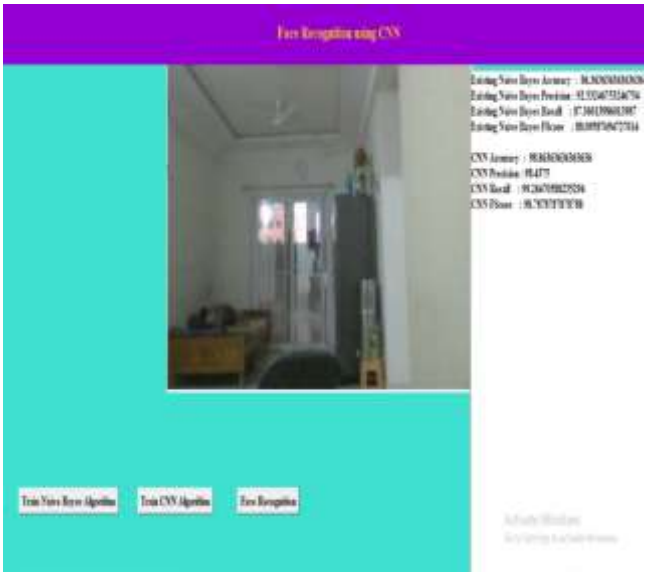

Fig.4.Train CNN algorithm

In above screen with CNN we got 98% accuracy and now show person face in webcam and then click on 'Face Recognition' button to get below recognition output

Fig.5.Face recognition output

ISSN: 2278-4632
Vol-12 Issue-11 No.02 November 2022

In above screen showing person image in webcam and then click on 'Face Recognition' button to get below output

Fig.6.Prediction Probability

In above screen in blue colour text we can see person recognized as 'Person 6' and in text area we can see prediction probability % as 0.93.

Similarly, you can recognized all persons given in dataset and application may recognized output side persons also and for that we need to set some thresholds. While testing you note down prediction probability of dataset persons and unknown persons and based on those values will put some constant threshold. For example if prediction probability > 0.95% then only recognized else display unknown person.

Conclusion

Face recognition in complex background is a challenging task which is handled in this application using deep learning. There are many traditional techniques have been used for Face Recognition. By studying fewer techniques and their limitations, in this application deep learning is used which gives very high accuracy than traditional algorithms such as SVM, KNN, Decision tree algorithms. In deep learning CNN algorithm is used for improving performance and for getting higher accuracy. With the help of accuracy comparison, we found that CNN has higher accuracy than state of art techniques.

Future Scope

Future work could focus on applying IOT , saving attendance in XL-sheet , masked face recognition , attendance management ,etc.

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Vol-12 Issue-11 No.02 November 2022

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