



SMART ATTENDANCE SYSTEM USING FACE RECOGNITION TECHNIQUE

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Abstract

Currently, in most of the educational organizations attendance is being taken using conventional methods which is time consuming and is prone to human errors. These methods include signature of students on paper, calling their names in the classroom. Through these methods it gets really difficult to manage attendance of large number of students. As technology is evolving, new techniques and algorithms have been developed and optimised to improve face recognition and in the field of machine learning. The proposed model, uses these Machine learning techniques to take attendance with minimum human intervention. We are employing **Haar cascade classifier with OpenCV** to determine the positive and negative characteristics of the face(i.e. face detection) and **Convolutional Neural Network (CNN)** algorithm for face recognition and classification, all of which are implemented using **Python, Tensorflow and OpenCV libraries**.

KEYWORDS:- Convolutional Neural Network (CNN), Haar cascade classifier, Python, OpenCV, Tensorflow libraries, Database, Attendance of Student.

Introduction

Facial Recognition used in real-time for detecting and identifying faces. This technique is an advance image processing technology it consist of widespread usage. It can be used in organizations like schools, colleges and institutes to maintain and evaluate the attendance and to track the student performance. The conventional method takes more time and are complicated. Other methods that were introduced to replace manual way of taking attendance are:

1. Biometric
2. RaspberryPi, LBPH
3. Fingerprint sensor with Arduino UNO
4. NFC Technology
5. PCA, LBPH Classifier

The main aim of creating face recognition system is lesser human interaction, no confusion and lesser risk of error. The advantage of Automating the task of Attendance is that it saves time, cost-effective, precise and efficient.

The Face recognition model can be described in four steps. They are:

- I. Detection
- II. Alignment
- III. Extraction
- IV. Recognition.

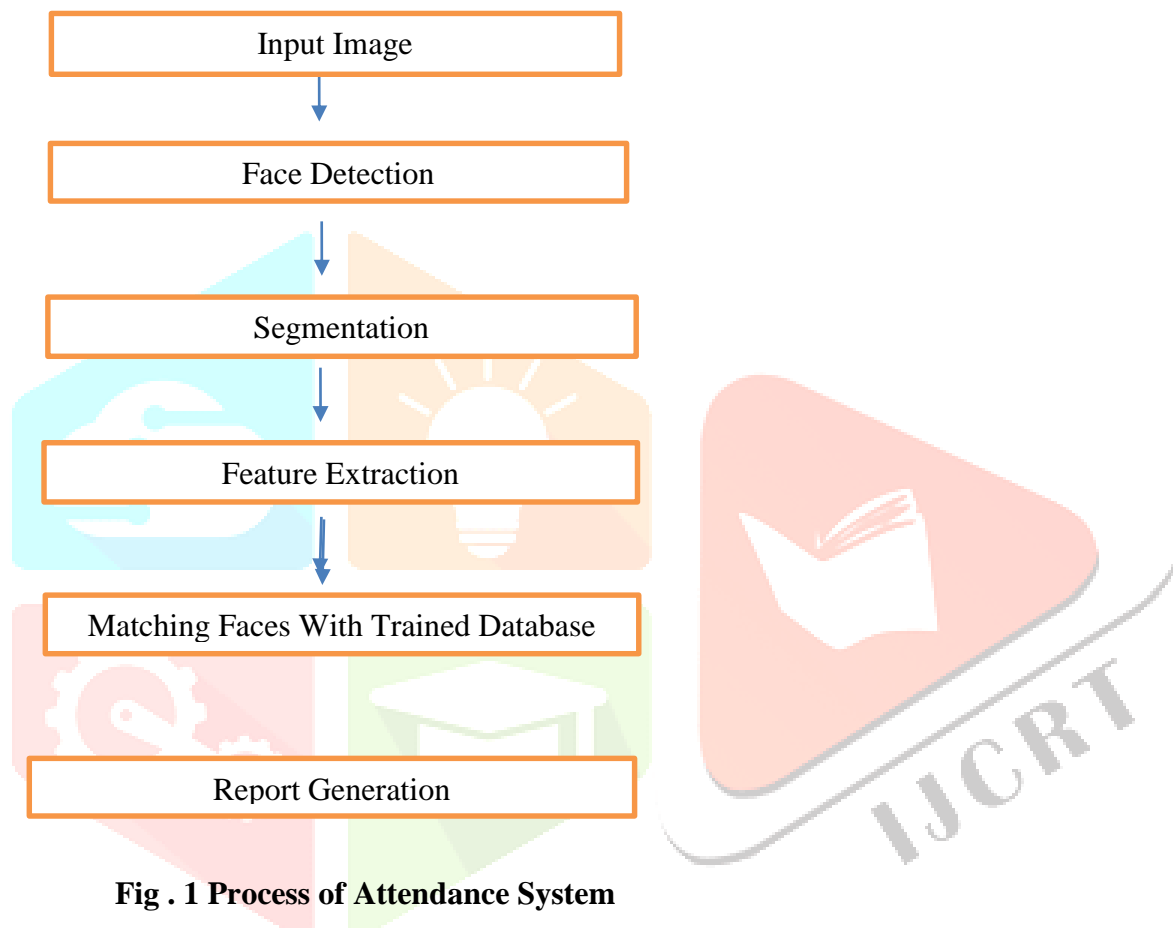


Fig . 1 Process of Attendance System

Face Detection: Used to identify human faces in digital.

Face Alignment: Normalize the face with in database using techniques such as photometrics and geometry.

Feature Extraction: Extract the numerical data from images and reduce duplication.

Face Recognition: Recognising the face by learning from the dataset.

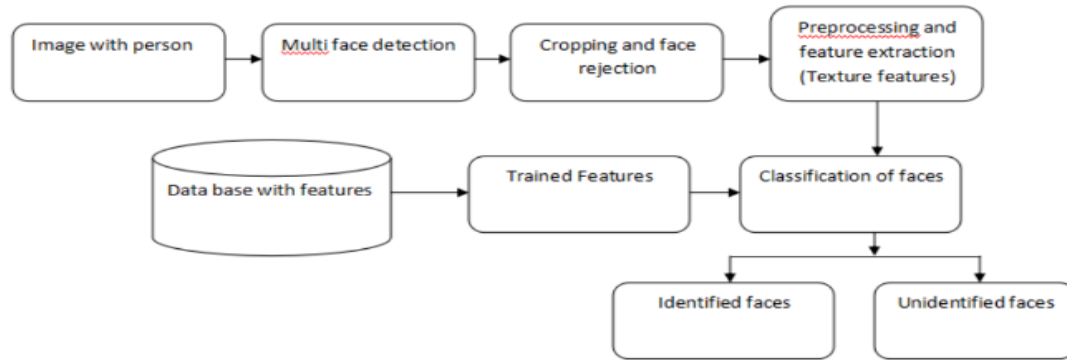
1. Literature survey

The International Conference on Cloud Computing and Data Engineering & Science Published the article “Real-Time Smart Attendance System using Face Recognition Techniques” by Shreyak Sawhney, Karan Kacker . The model focus on the use of face recognition to monitor the student attendance.The article was written by Rakesh Garg, , Shailendra Narayan Singh, Rakesh Garg.

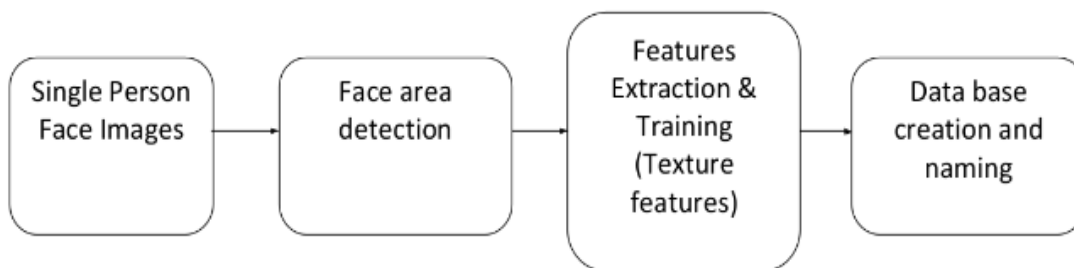
This model was developed using Eigenface values , Principle Component Analysis and CNN methods

2.Methodology

2.1 Proposed Architecture



2.2 Proposed System



OpenCV is known as Open-source Computer Vision, an object and face recognition library. It is used in Machine Learning, mostly in image processing. OpenCV contains pre-trained classifiers for different facial features and profiles like frontal face, eyes, smile and other expressions (i.e **Haar-Cascade Detection**)

- Here, in the model we used “haarcascade_frontalface_default.xml” file which is a pre-trained classifier for frontal face identification.

First, using webcam, we capture the student's video and then convert it into frames (images) where a face is identified with help of OpenCV pre-trained packages (Haar-Cascade classifier). The input images are labelled and stored in different folders with the folder name being the student's name and roll no. With help of Feature Extraction and python libraries like numpy, pandas, the images are converted into an array and each row has a class name. This dataframe or rather csv files will be the dataset and is stored in a database. Using this, we train the algorithm which is specifically designed according to the dataset. The classification model is designed using multi-class CNN algorithm which takes float values as input and returns the most probable class label. Using the trained system we can predict the face's label. Based upon the result of facial recognition, attendance is updated on the excel sheet.

2.3 Proposed Algorithm

Convolutional Neural Network: is an artificial neural network used for analysing and processing the visual images. CNN is efficient for processing images. CNN has multiple layers to identify the features of image which is given as input. These layers either zoom in or zoom out to learn more features. The main filter called as kernel is applied to image to generate the output. After successive layer the kernel increases the complexity to identify features that uniquely represent the output object.

OpenCV (Haar-Cascade Classifiers): These are pretrained xml files used to recognize features of a face like eyes, nose, smile, etc.

A. Face detection using Haar-cascade Classifier:

Haar- cascade was introduced by Viola and Jones, which helps in identifying images and objects. It starts from top region like eyes, eyes with darker than forehead, then goes to mouth so on. This haar cascade was trained with positive and negative images or objects which to helps to get desired output.

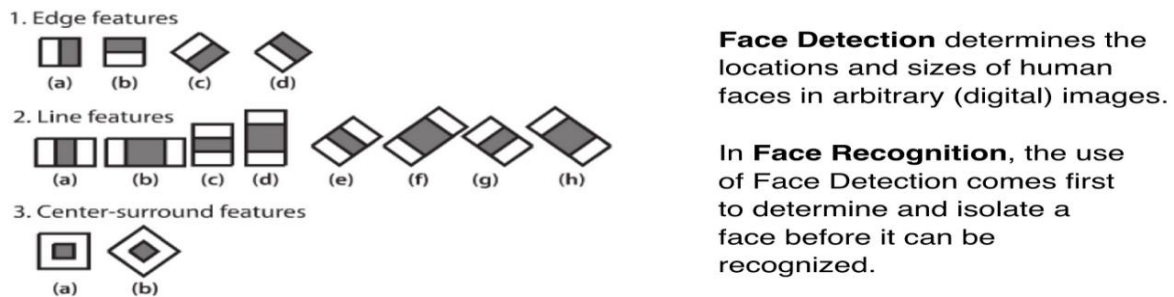


Fig. 2 Types of Haar Features

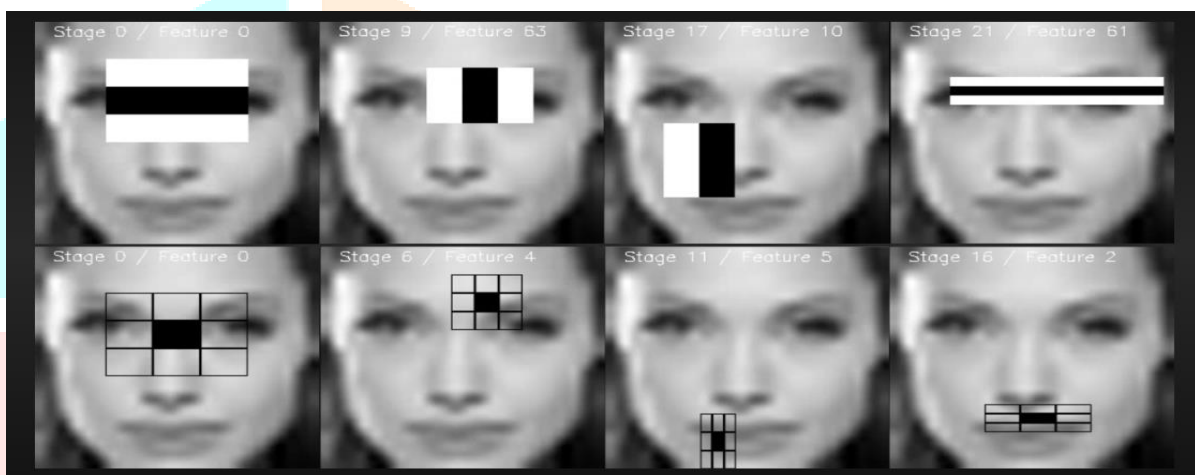


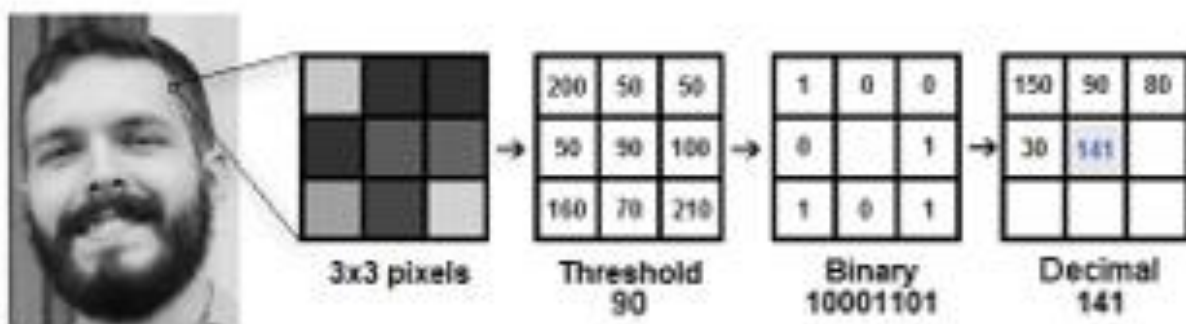
Fig. 3 Haar Features applied on an Image

B. Training the Algorithm, Convolutional Neural Network (CNN) :

Train the system with help of student faces and each student must have unique ID which helps in detecting the face from the given input.

C. Storing the attendance in an excel sheet: The predicted values are stored in an excel sheet for better understanding .

Step 1: Image is just a 3-dimensional array.



we need to process the dataset, Before training an image, we are converting each image into a NumPy array by processing the dataset. The image is represented by row of pixel values. NumPy package is an inbuilt function.

Step 2: Neural networks are like layers consists nodes it helps to evaluate the values based on weights(params or neurons).

Step 3: Convolution layer: It is mathematical operation used to recognize the image. The kernel filter n*n matrix over image pixel.

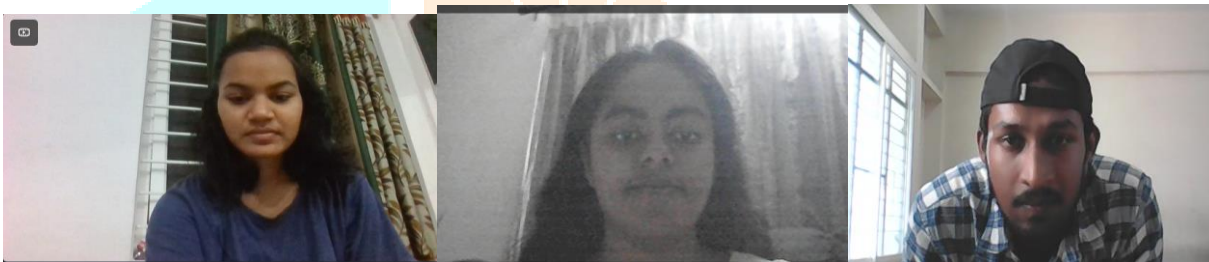
Step 4: Max Pooling operation: It involves a 2- dimensional filter sliding through each object to extract maximum features from object or image. Helps to reduces, the amount of computation.

Step 5: Flattening: Flattening operations are used for multidimensional output.

Step 6: Fully Connected Layer: This layer is responsible for predicting the result based on extraction.

Result

I. Dataset Creation



Class-1

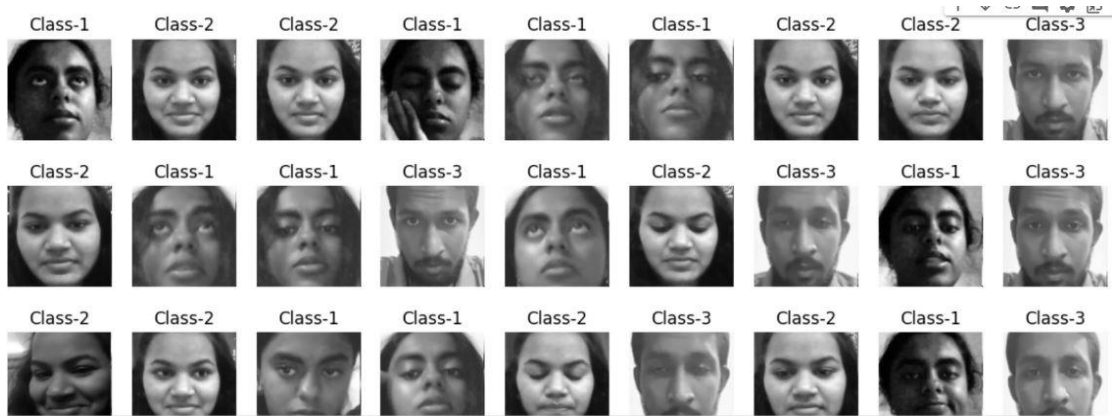


Class-2



Class-3

II. Recognizing the Student

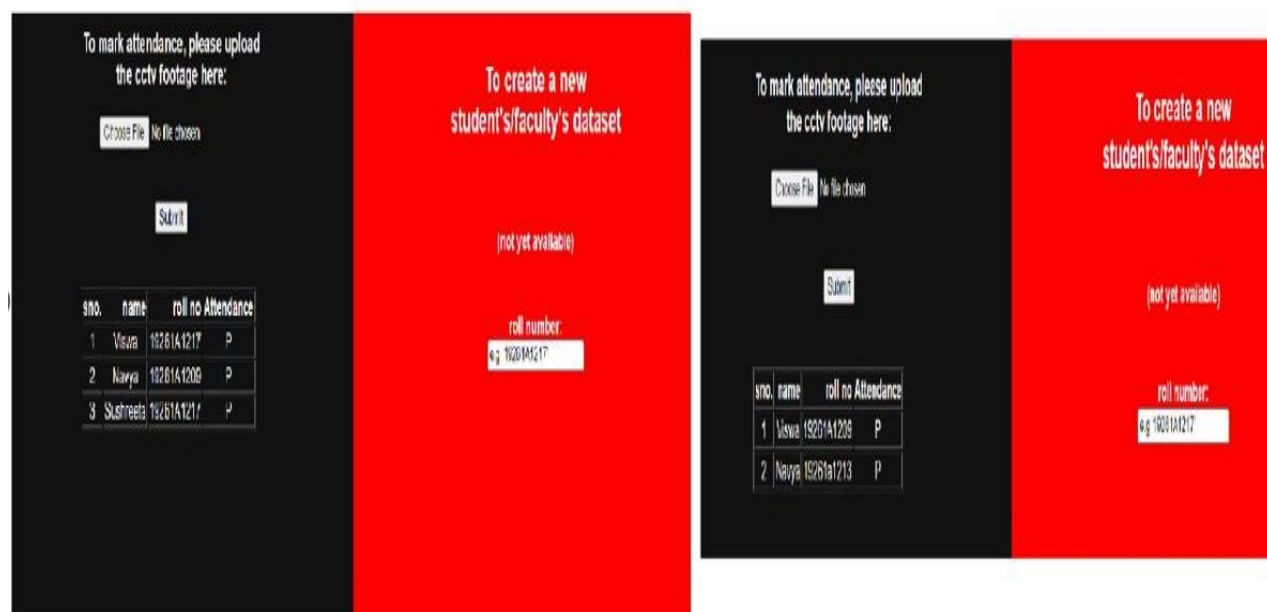


III. Excel Sheet Entry

	A	B	C	D	E	F	G
1	sno.	name	roll no	Attendance			
2	1	Viswa	19261A1217	P			
3	2	Navya	19261A1209	P			
4	3	Sushreeta	19261A1217	P			
5							
6							
7							

IV. Attendance Details In HTML Design

These are the outputs we got are based on the video (i.e. input) containing 3 students and different combinations of 2 students.





3. Conculsion

The smart attendance system using face recognition used to monitor the student attendance. This project helps to maintain the student database in efficient, effective way, and also avoid human interaction. This model helps to understand the algorithms. The results shows the system functionality how to deal with face prosing and room conditions. The capture face is encoded into pixels measurements and the identified face is accomplished under name and unique Id. The outcome is represented in excel sheet.

4. References

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