Face Recognition & Attendance System

CSE 523 Machine Learning

Group Name: Code Rockers

Sushan Bhojak[1],
Priya Bhoraniya[2], and
Dhruvanshu Parmar[3]
Ahmedabad University,
sushan.b[1], priya.b[2], dhruvanshu.p[3] @ahduni.edu.in

Abstract -

In this project, the Open CV based face recognition approach has been proposed. This model integrates a camera that captures an input image, an algorithm for detecting face from an input image, encoding and identifying the face, marking the attendance in a spreadsheet and converting it into PDF file**.** Face recognition presents a difficult issue in the field of image investigation and computer vision. The security of data is turning out to be extremely huge and troublesome. Surveillance cameras are as of now normal in air terminals, Offices, University, ATM, Bank and in any areas with a security framework. Face recognition is a biometric framework used to distinguish or confirm an individual from a computerized image. Face Recognition framework is utilized in security. Face recognition framework ought to have the option to consequently recognize a face in an image. This includes extricating its elements and afterward remembering it, paying little heed to lighting, articulation, enlightenment, maturing, changes (interpret, pivot and scale image) and posture, which is a troublesome undertaking. This paper contains three segments. The primary area depicts the normal techniques like all holistic matching method, feature extraction method and hybrid methods. The subsequent segment depicts applications with models lastly the third area portrays the future exploration headings of face recognition.

Keywords

Face-detection, OpenCV, camera, attendance, face recognition, spreadsheet, HOG and SVM.

INTRODUCTION

Attendance upkeep is a critical capacity in every one of the foundations to screen the exhibition of the students. Each foundation does this on its own as it would prefer. A portion of these foundations utilize the old paper or record-based frameworks and some have embraced systems of programmed attendance utilizing some biometric strategies. A facial recognition framework is a computerized biometric programming which is appropriate for deciding or approving an individual by performing examinations on designs in light of their facial appearances. Face recognition frameworks have updated obviously in their administration over the new years and this innovation is currently tremendously utilized for different goals like security and in business tasks. Face recognition is a strong field of exploration which is a computer based advanced innovation. Face recognition for the plan of stamping attendance is a clever use of the attendance framework. It is broadly utilized in security frameworks and it tends to be contrasted with other biometrics like unique mark or eye iris recognition frameworks. As the quantity of students in an instructive foundation or representatives at an association build, the requirements for instructors or to the association likewise increase the confusion of attendance control. This venture might be useful for the clarification of these sorts of issues. The quantity of students present in an auditorium is noticed, every individual is distinguished and afterward the data about the quantity of students who are available I kept up with.

Literature Survey

Our main goal is the faces in the captured images are detected and compared with the images in the database and the attendance is marked. So here image processing concept is used and for image processing we are using OpenCV with OpenFace library as it is the most efficient and open-source library. The edge orientations

are counted for HOG extraction in a local neighborhood of an image.

Image processing for faces can be further divided into three sections.
(1) Face detection
(2) Face extraction
(3) Feature extraction
(4) Face recognition

For image processing we are using histogram of oriented gradients to detect faces with a combination of face landmark estimation. to achieve face extraction to deal with posing and positioning of an image.OpenFace with its pre learned C- NN the implementation of face feature encoding is possible here 128 measurements of each face gets embedded. The idea of reducing complicated raw data like a picture into a list of computer-generated numbers comes up a lot in machine learning. To create our final result SVM classifier is employed to decide between input image and test image.

Implementation

We use the HOG+SVM classifier for face detection and recognition. Histogram of oriented gradients (HOG) is a feature descriptor that is often used to extract features from image data. It is widely used in computer vision for object detection. The HOG descriptor focuses on the structure or the shape of an object. It is better than any edge descriptor as it uses magnitude as well as angle of the gradient to compute the features. For the regions of the image it generates histograms using the magnitude and orientations of the gradient. Let's look at some important aspects of HOG that makes it different from other feature descriptors:

- The HOG descriptor focuses on the structure or the shape of an object. Now you might ask, how is this different from the edge features we extract for images? In the case of edge features, we only identify if the pixel is an edge or not. HOG is able to provide the edge direction as well. This is done by extracting the gradient and orientation (or you can say magnitude and direction) of the edges
- Additionally, these orientations are calculated in 'localized' portions. This means that the complete image is broken down into smaller regions and for each region, the gradients and orientation are calculated.
- Finally, the HOG would generate a Histogram for each of these regions separately. The histograms are created using the gradients and orientations of the pixel values, hence the name 'Histogram of Oriented Gradients'

Process of calculating HOG can be divided into three steps:

1) Preprocess the data

In preprocessing the data, we use X, Y coordinates to draw the bounding box. Bounding box coordinates are (x,y,h,w). Here h is height and w are Width. Then we crop the image accordingly and then we have to resize that image where the height is double than width that works well in the machine learning algorithm in this particular case so we resize to 64x128. So, this is preprocessing that crop out the face which we want to detect.

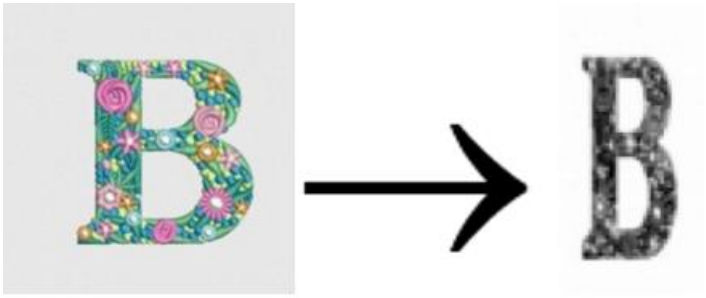

Figure 1

2)calculating gradients:

Gradient is a directional change in the image intensity. We get pixels which change in the image intensity. As we can see wherever image intensity is changing from background to the ear of the cougar and the mouth of the cougar… that part intensity is higher and rest of the part intensity is low so this highlights where the image intensity suddenly changes and that part we are interested in capturing.

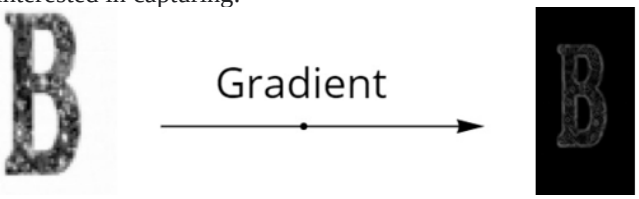

Figure 2

3)calculating the magnitude and orientation for each pixel value:

After obtaining the gradient of each pixel, the gradient matrices are divided into 8x8 cells to form a block.Using this image the histogram is extracted by Grid X and Grid Y parameters. This is done by splitting the image into multiple grids. As a block contains 64 different values. This normalization is done to reduce the effect of changes in contrast between images of the same object. From each block. A 36-point feature vector is collected. In the horizontal direction there are 7 blocks and in the vertical direction there are 15 blocks. So the total length of HOG features will be : 7 x 15 x 36 = 3780.

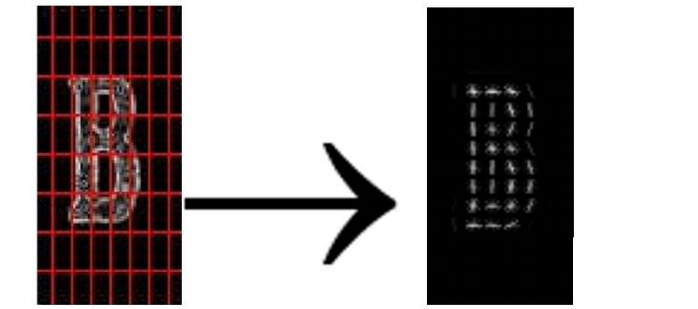

Figure 3

SVM Classifier:

SVM maps training examples to points in space so as to maximize the width of the gap between the two categories. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall. Here SVM is working as linear classifier but with additional complexity it can work as nonlinear classifier as well.

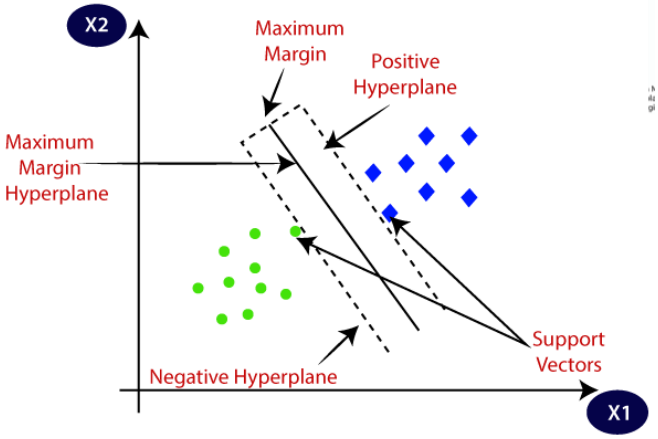

Figure 4

Results:

The interface for the Smart Attendance System has been created. Using the interface, the images of the individual students are recorded and stored in the training dataset. Simultaneously their information is stored in the database i.e., excel sheet. Finally, the images of the students are being tracked and recognized.
Here we can see in Figure 5 that out program detect the face and recognize it from the face dataset.

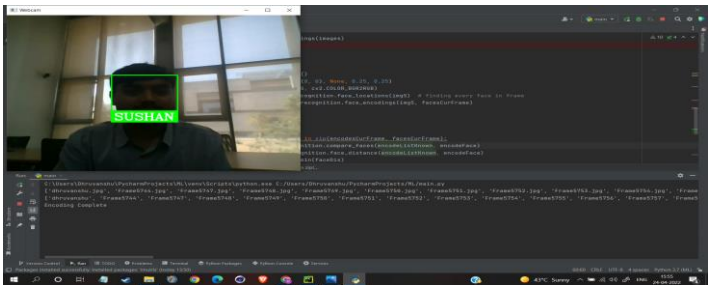

Figure 5

In Figure 6, we can see that multiple images of students are being tracked and recognized at the same time.

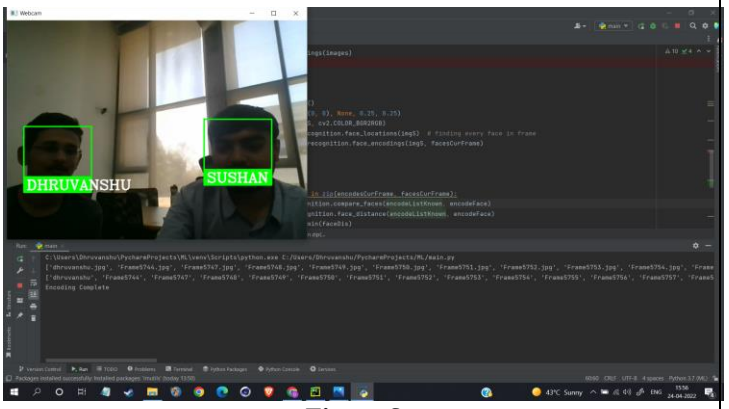

Figure 6

In Figure 7 and 8, Faces which are recognized, it's data collect in separate spreadsheet with time.

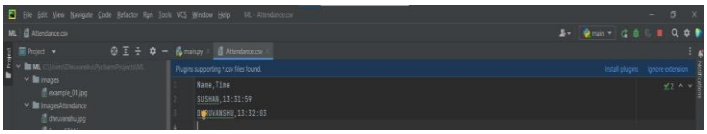

Figure 7

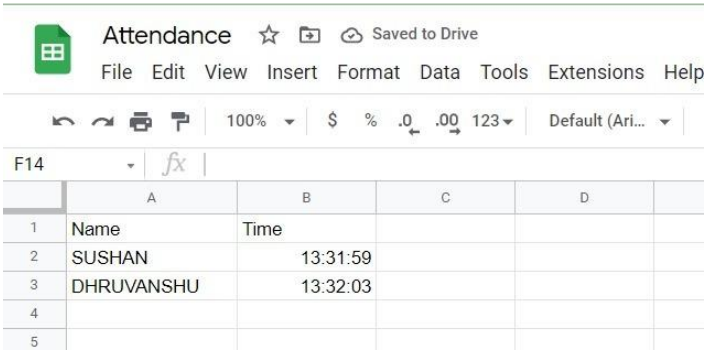

Figure 8

Conclusions:

Face recognition is a revolutionary innovation that has a lot of potential. Face recognition may help companies save time and resources, as well as generate new revenue streams, if done correctly. These applications usually work in controlled environments and recognition algorithms can take advantage of the environmental constraints to obtain high recognition accuracy. Our model supports face detection and recognition on real time webcam fed with time stamping and name from dataset and providing csv file of output, drawbacks of frontal image side processing only while supporting multiple faces and side angles of faces.

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AUTHORS' INFORMATION

Sushan Bhojak, AU1940200, B.Tech Computer Science and Engineering, Ahmedabad University. **Priya Bhoraniya,** AU1940173, B.Tech Computer Science and Engineering, Ahmedabad University. **Dhruvanshu Parmar,** AU1940166, B.Tech Computer Science and Engineering, Ahmedabad University.