

# FACE RECOGNITION STUDENT ATTENDANCE SYSTEM USING DEEP LEARNING

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## Abstract

As we all know nowadays in any academic organization recording a student attendance plays a very important role in judging a performance of each students. Current biometric methods for attendance system is too impertinent to follow, as labour involved in this method is time consuming. So to overcome this problem this paper has introduced a stress-free non-intrusive way of taking attendance in the class using face recognition technique. This system consists of 2 phases that is enrollment and verification phase. During enrollment, a camera was used to acquire facial images that were stored in a database. During verification, facial features extracted from acquired face images and stored picture were compared using HOG algorithm and CNN. After successfully recognizing the student face the proposed system will update the attendance of that particular student in csv file. So this system helps in maintaining time management in a successful way by eliminating manual calling, marking and entry of attendance.

**Keywords** -Face Recognition, HOG Algorithm, CNN, Csv, Attendance

## I. INTRODUCTION

Numerous Organizations utilize participation frameworks to record when understudy begin and halt to work, and the division where the work is performed. A few organizations moreover keep point by point records of participation issues such as who calls in debilitated and who comes in late. An participation framework gives numerous benefits to organizations. There was a time when the participation of the understudies and

workers was checked on registers. When it comes to schools and colleges, the participation observing framework may be a awesome offer assistance for guardians and instructors both. Guardians are never uninformed of the constancy of their children within the course in the event that the college is utilizing an participation observing framework. The registers may effortlessly be misused by understudies and in case data was sent to the guardians, there were tall chances that sends may be made to vanish some time recently guardians indeed saw them. With the checking framework in put, the data can effectively be printed or a delicate duplicate can be sent specifically to guardians in their individual e-mail accounts. Regularly, a great biometric framework has two stages; the enrolment stage and the acknowledgment stage. Enrolment includes getting the biometric characteristic of an person, putting away the highlights in a database as well as an identifier to empower the characteristic to be related with the person. The acknowledgment stage includes procuring the biometric characteristic, extricating the identifier and checking the database to see in the event that there's any coordinate. Confront acknowledgment has various merits over other biometric strategies. Most of the other biometric shapes require a few shape of activity by the client. In any case, confront acknowledgment can be done without the inclusion of the client due to the reality that confront pictures can be procured from a separate by a camera. Within the conclusion, confront acknowledgment is completely non-intrusive and so does not uncover the user to germs which will be predominant in a framework that has numerous client. Amid the enrollment prepare, the picture

test of each understudy is taken and least of 5 picture test ought to be taken totally different point to urge most extreme exactness and prepare this picture test utilizing SVM , At long last this test pictures are put away in information base. Amid the confirmation prepare, video of all the understudies is taken and confront of each understudy is identified and compared with the test pictures put away in information base utilizing HOG algorithm.

**II.METHODOLOGY**

The system consists of a camera that captures the images of the students and sends it to the image enhancement module. After enhancement the image comes in the Face Detection and Recognition modules and then the attendance is marked on the database server. At the time of enrolment, templates of face images of individual students are stored in the Face database. Here all the faces are detected from the input image and the algorithm compares them one by one with the face database. If any face is recognized the attendance is marked on the server from where anyone can access and use it for different purposes.

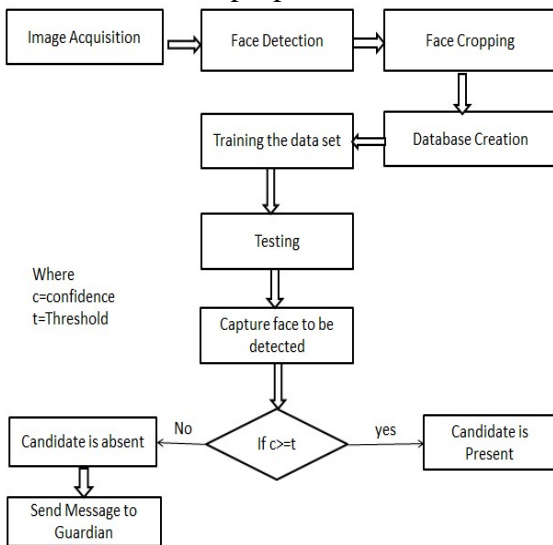


Figure1: Methodology of attendance system

**A. Histogram of Oriented Gradients:**

A histogram of inclined gradients (HOG) is a description of a feature used in computer vision and image processing for object detection. An important concept behind the histogram is the definition of gradients designed so that the appearance of an object and the location within an image can be explained by the distribution of gradients by force or edge indicators. The image is divided into small connected circuits called cells, and with pixels within each cell, a

histogram of fine-tuning is compiled. Definition is a combination of these pages[5].

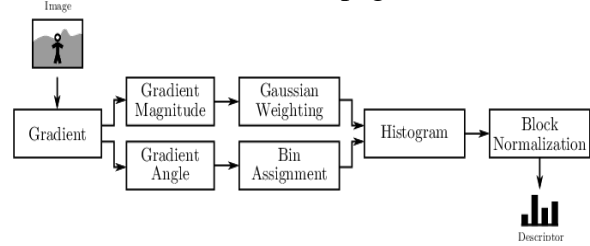


Figure2: Block diagram of HOG-SVM algorithm

**1. Gradient computation:** The first step in calculating the acquisition of multiple image processing inputs before verifying color-correct and color gamma. The most common method is to use a concentrated 1-D marker, an understanding mask extracted from one or both squares directly and vertically And this method requires filtering the color or intensity data of the image with these filter kernels[4]:

$$[-1, 0, 1] \quad [-1, 0, 1]^T$$

**2. Orientation binning:** The second step of calculation creates cell histograms. Each pixel within a cell produces a weighted histogram channel based on values based on the values found in the gradient combination. The cells themselves can be rectangular or radial in shape, and histogram channels are evenly distributed over 0 to 180 degrees or 0 to 360 degrees, depending on the gradient "unsigned" or "signed" [4].

**3. Descriptor blocks:** Descriptive HOG is then an installed computer for generic genetic component from all restricted regions. Blocks are usually spaced, meaning that each cell contributes more than the final definition. Two major geometries are present: R-HOG blocks of dots and C-HOG blocks are round. R-HOG blocks are usually square grids, represented by three parameters: the number of cells in each block, the number of pixels per cell, and the number of channels per histogram of each cell. HOG (C-HOG) circular blocks are available in two variants: single-cell, medium-sized and intermediate cell-divided. In addition, these C-HOG blocks can be defined by four parameters: the number of angular and radial barrels, the radius of the middle barrel, and the expansion factor of additional radial radiation [6].

**4. Block Normalization:** Inventors Dalal and Triggs explored four different ways to prevent approval. Let it be an unusual veteran containing all the histograms in a given block,  $\|v\|_k$  to be its normal  $k = 1, 2$  and  $e$  to always be

small (exact value, hopefully, not important). Then a normal thing would be one of the following:

$$\text{L2-norm: } \frac{v}{\sqrt{\|v\|_2^2 + e^2}} \quad (1)$$

**L2-hys:**L2-norm followed by clipping (limiting the maximum values of  $v$  to 0.2) and renormalizing (2)

$$\text{L1-norm: } \frac{v}{\sqrt{\|v\|_1 + e}} \quad (3)$$

$$\text{L1-sqrt: } \sqrt{\frac{v}{\|v\|_1 + e}} \quad (4)$$

HOG definitions can be used for object recognition by providing them as features in a machine learning algorithm. We used HOG adjectives as features in the vector support machine (SVM)[6].

**B. Support-Vector Machine:**The support machine creates a hyperplane or set of hyperplanes in the upper or lower extremities, which can be used for splitting, retrieval, or other functions such as player acquisition. In fact, the best distinction is found in a hyperplane with a very high distance to the training area of the data of any class (so-called active line), because it is usually a great distance, which reduces the classification generalization error. Separation of images can be done and using SVMs. Research results show that SVMs achieve higher accuracy than standard search than the traditional query analysis scheme after three to four rows of response. This is also true of image-sharing systems, including those that use the modified version SVM using a given method[2].

**C. Convolutional Neural Network:** In-depth learning, authentic neural network (CNN, or ConvNet) is a category of deep neural networks, widely used to analyze visual images.

CNN is trained to detect and detect facial images, and the LRC (Logistic regression classifier) is used to distinguish features learned by a sentencing network. Inserting the output feature using CNN in standard data causes the system to face the face in line with a different light. The LRC which is a racist category is used to classify the extracted features of facial images [1].

**Working:**Separating an image into small connected circuits called cells, and in each cell inserts a histogram of gradient directions or orientation of the pixels within the cell. discretize each cell into angular barrels according to the gradient. The pixel of each cell

contributes to the weight gain in its corresponding angular bin. Groups of adjacent cells are considered to be regional regions called blocks. The collection of cells in a block is the basis for group selection and the general arrangement of histograms. A typical group of histograms represents a block histogram. The set of these block histograms represents descriptor [7].

Using this algorithm in deep learning technique we train each students face and creating database of each student using his or her name or USN(University Seat Number).That images are converted in to pixel value vector. After the training of input data i.e. student face data now the faces should be recognized in the input video of the classroom. Video is made up of numbers of frames. So here considering the frames for the face recognition. Here we take at-least 25 frames in each second of the video and we apply face testing algorithm. Here all the student faces are compared with the trained vector data. If matching occurs then the recognized student name or USN will update in the csv file and attendance is recorded.

We got around 82-85% of accuracy using this technique and there is no face recognition of unknown person.

### III. RESULT

We are comparing our result with the PCA and LBPH algorithms which is also a good algorithm for face recognition. Here S1-S6 are the original trained images of students. Second and third column indicates the recognized faces using different algorithms. Third column indicates the recognition using HOG-SVM algorithm. S5 is not recognized using the implemented algorithm and also in other two algorithm. There is an improvement of 8.75% face recognition rate using the implemented algorithm when compared with PCA and LBPH based face recognition algorithm.

Table1: Comparing with other methods

| Original student face data | PCA | LBPH | HOG-SVM (CNN based) |
|----------------------------|-----|------|---------------------|
| S1                         | S1  | S1   | S1                  |
| S2                         | S2  | S2   | S2                  |
| S3                         | S1  | S2   | S3                  |
| S4                         | S4  | S3   | S4                  |
| S5                         | S6  | S3   | S6                  |
| S6                         | S6  | S6   | S6                  |

Firstly, Training the student faces using deep learning technique and then comparing with the input classroom video frames for the recognition of student.

```

project@project-VirtualBox:~$ python3 face_recognition_video.py
/home/project/data/cousins/cousins.jpg
/home/project/data/pras/pras.jpeg
/home/project/data/cousins/cousins.jpg
/home/project/data/pras/pras.jpeg
/home/project/data/ni/ni.jpeg
/home/project/data/su/su.jpeg
/home/project/data/dee/dee.jpeg
Writing frame 1 / 178
Writing frame 2 / 178
Writing frame 3 / 178
Writing frame 4 / 178
Writing frame 5 / 178
Writing frame 6 / 178
Writing frame 7 / 178
Writing frame 8 / 178
Writing frame 9 / 178
Writing frame 10 / 178
Writing frame 11 / 178
Writing frame 12 / 178
Writing frame 13 / 178
Writing frame 14 / 178
Writing frame 15 / 178
Writing frame 16 / 178
Writing frame 17 / 178
Writing frame 18 / 178
Writing frame 19 / 178
Writing frame 20 / 178
project@project-VirtualBox:~$ python3 face_recognition_video.py
    
```

Figure3: Trainingoffaces

In below figure there are 5 students are present to the class. So we are obtaining 5 recognized student faces with their names or USN (university seat number). Also their attendance is updated in the csv file. We obtained around 85% accuracy in attendance.

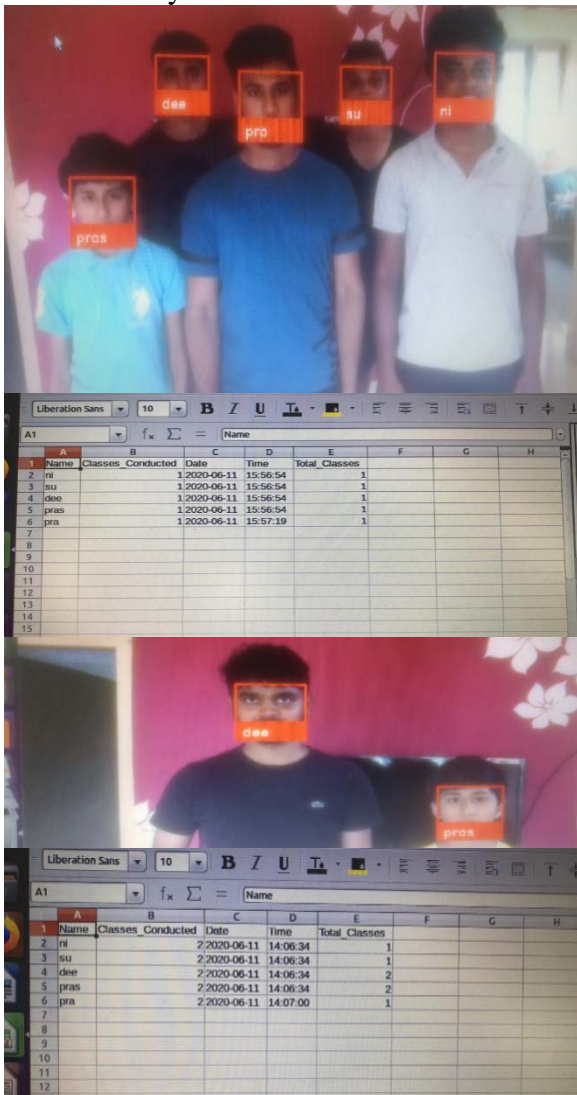


Figure4: Face recognition attendance system result

**IV.CONCLUSION AND FUTURE WORK**

We have found that there are many broad waysfor example, biometric, based RFID and other boring and unproductive ones. So overcoming the above framework is a better and more stable arrangement from each furnace of time and safety. We have therefore accomplished the creation of a strong and unlimited participation framework to make the algorithm management image point to the face of the class and identify the right individuals to look at the present ones [3].

The same project can be used for a number of security applications where authentication is granted to access the rights of a particular program. It can be used to identify criminals involved in unauthorized business. A face recognition algorithm can be developed in relation to the use of functional resources so that the project can detect the number of multiple faces at a time which can make the system much better. Many types of project can be built and used for home security and personal or organizational benefits. For security reasons, we may use the discovery and monitoring system. To identify victims at bus stations, train stations in 7 other public places, we can use this program. This will be useful to the police.

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