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# Face Recognition Attendance Monitoring System

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***Abstract:*** ***As we know attendance is the crucial part in colleges, schools, corporate offices etc. Attendance plays an important role for keeping track of student's record. Mostly attendance is taken manually in most of the colleges and schools. The manual attendance process involves taking attendance by calling the name or by signing the attendance sheet. This manual process is very time consuming and it is difficult to maintain the attendance record. Due to this drawback of manual attendance system, there is a need of automated attendance system. Here facial recognition plays an important part for automated attendance system. This suggested study focuses on face detection algorithm to provide automated attendance system. This proposed system uses Histogram of Oriented Gradients (HOG) and Deep Convolutional Neural Network for face detection and face recognition respectively to build automated attendance system.***
***Keywords: Attendance System, Face Recognition, HOG, CNN, Facial Landmarks, Open CV.***

## I. INTRODUCTION

Today Recording someone's presence through their attendance is crucial for every organization. The checking of attendance correlates with the academic performance in educational institute. Being present in an organization is evidence that a person is honouring their commitment to that agency or organization. In an institution where more than 100 students are studying in a class, it becomes very difficult to maintain the attendance record of such a large number of students. since the conventional method of monitoring class attendance requires a considerable amount of time and is vulnerable to errors and proxy attendances. To be able to accelerate and give time efficiency in this digital age, a change from this lack is necessary. We can effectively implement this face recognition-based system to mark the attendance by recognizing the faces of class students. Face recognition allows us to keep track of attendance for every person present in a company. Regular attendance has a significant role in quality monitoring and performance assessment in current academia. Numerous techniques, including Machine Learning and Deep Learning, are used in this face recognition to analyse and capture photos of people's faces. Persons in real time images can be detected and identified using many facial recognition systems and also facial recognition is a Biometric method. The presented approach focuses on recognition of students faces by comparing the student faces from the database, and marking the attendance of the student whose face is recognized. An email will be sent to the parents of the absent students. Here HOG is used for finding the faces and a deep learning model is used to recognize the face.

## II. LITERATURE REVIEW

1) *Attendance Management System using Facial Recognition [1]*: This system focuses on automating attendance system by using HOG and neural network. It consists of four steps as finding all faces, posing and working faces, encoding faces and finding the person's name from the encodings.
2) *Smart Attendance System using Dlib Pre-Trained Neural Network [5]*: This system solves the problem of face recognition using HOG and SVM classifier. The main task of the system is to recognise the users face and automatically mark the time of recognition directly in the google sheet. The accuracy of the system is 95.23%.
3) *Real Time Face Recognition Based Attendance System for University Classroom [3]*: Presented system not only mark the attendance but make an excel sheet to keep the record safe. First an HD 1080p camera captures the face images and then after noise reduction, HOG technique used to detect facial features. This system claims an accuracy of 77.38% for face recognition.
4) *Non-Contact Temperature Detection, Face Mask Detection, and Attendance Updation System using Facial Recognition Technique [4]*: To Mark the attendance of the individual employees swiping cards or biometrics are used. This can be easy medium for exchange of infection. This system dispenses sanitizer on arrival and also uses HOG algorithm for face recognition and updates the employee attendance. This system has an accuracy of 96.67%.
5) *Design of an E-Attendance Checker through Facial Recognition using Histogram of Oriented Gradients with Support Vector Machine [2]*: E-attendance checker using a facial recognition system was implemented. This system uses HOG and Support Vector Machine(SVM) for face recognition and detection. This system has an accuracy of 95.65% and can detect and recognize up to 37 students.

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6) *An approach towards development of automated attendance system using face detection and recognition [6]*: In this system software integrates face detection, image processing and face recognition approach to come up with a consolidated attendance system. The HOG approach is employed for the face detection mechanism and LBPH method is chosen for face recognition. This system has an accuracy of 91.75%.
7) *Class attendance management system using face recognition [7]*: The system is based on Raspberry Pi that runs Raspbian (Linux) Operating System installed on micro SD card. By facing the camera, the camera will capture the image then pass it to the Raspberry Pi which is programmed to handle the face recognition by implementing the Local Binary Patterns algorithm LBPs. The system has 95% accuracy with the dataset of 11 person images.
8) *A smart technique for attendance system to recognize faces through parallelism [9]*: In this system first classroom image has been in use and after that image is kept in data record. For the images that are stored in the database it applies system algorithm which includes steps such as, histogram classification, noise removal, face detection and face recognition methods. So by using these steps it detect the faces and then compare it with the database. The attendance gets marked automatically if the system recognizes the faces.
9) *Automated Attendance System using Machine Learning Approach [8]*: This system uses Viola-Jones and HOG features along with SVM classifier are used to acquire the desired results. Various real time scenarios need to be considered such as scaling, illumination, occlusions and pose. The problem of redundancy in manual records and keeping attendance is solved by this system. Quantitative analysis is done on the basis of PSNR values.
10) *Automatic Attendance Management System Using Face Detection [10]*: In this method the camera is fixed in the classroom and it will capture the image, the faces are detected and then it is recognized with the database and finally the attendance is marked. If the attendance is marked as absent the message about the student's absent is send to their parents. This system uses eigen faces for facial recognition.

## III. METHODOLOGY

This section deals with the steps required for face detection and face recognition. The work includes Six phases: Creating database and its training, Face Detection, Facial landmarks estimation, Encoding Faces, Finding person's name from the encodings and Sending attendance record to parent.

1) *Creating database and its training*: In this first step the facial images of the students are stored in the database. Based on this facial images, features are extracted using a deep convolutional neural network model.
2) *Face Detection*: For detecting the faces from the images histogram of oriented gradients(HOG) approach is used. This approach deals with four steps:

a) *Image Pre-processing:* In this step, the image is bring down into width to height ratio of 1:2. The image size should be of 64x128. The image is then divided into 4x4 or 8x8 cells.
b) *Calculating Gradients:* In this step gradient values are calculated for both x and y direction. Gradient magnitude and gradient orientation is calculated for each pixel.

Gradient Magnitude = $\sqrt{[(G_x)^2+(G_y)^2]}$
Gradient Orientation = $\tan^{-1}(Gx / Gy)$

c) *Building Histogram:* In this step a histogram is built using the values of gradient magnitude and gradient orientation. This step outputs a 1x9 matrix.
d) *Normalization:* In this step four cells of 4x4 or 8x8 are grouped together getting a 1x36 matrix. After that the matrix is normalized.

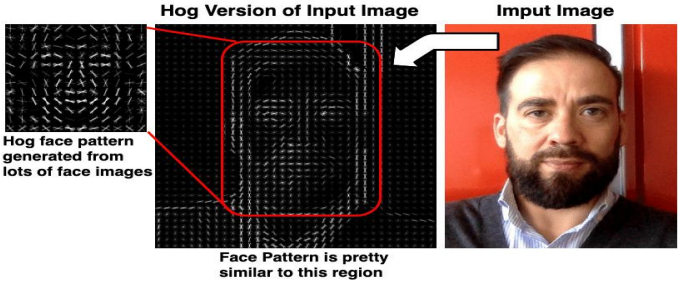


Fig 1: HOG Gradients

3) *Facial Landmark Estimation*: The HOG method deals only with the frontal face detection. If the faces is in different directions, then it is difficult to detect the face. So to address this issue facial landmarks are used. In this step the eyes and lips are always kept in the same place. There are various facial landmark models are available, but we are using 68 points facial landmark model which detects 68 facial points on the face.

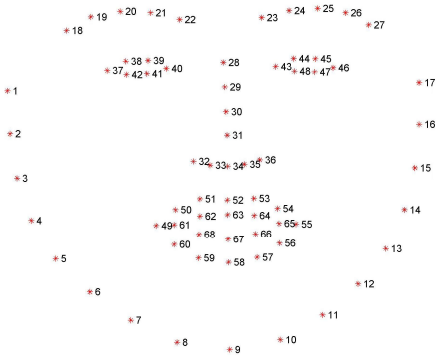


Fig 2: Facial Landmarks

4) *Encoding Faces*: The simple way to recognize the face is the direct comparison of unknown faces with the faces in the database. In this step we extract the face encodings from the face. Face encoding is a method of representing face with 128 measures. Two images of the same person will have same encodings and two images of different person will have different encodings. Based on this we have used neural network i.e. ResNet to create 128 encodings.
5) *Finding Person's Name from the Encodings*: As we get the encodings from the neural network the next step is to compare these encodings with the images stored in the database. In this step the encodings are compared to see if the match is found. For comparing the encodings, we have used Euclidean distance. If the match is found the student is marked as Present else the student is marked as Absent and an excel sheet is generated at last.
6) *Sending Attendance Record to Parents*: Based on the excel sheet generated an email is sent to the parent if the student is absent.

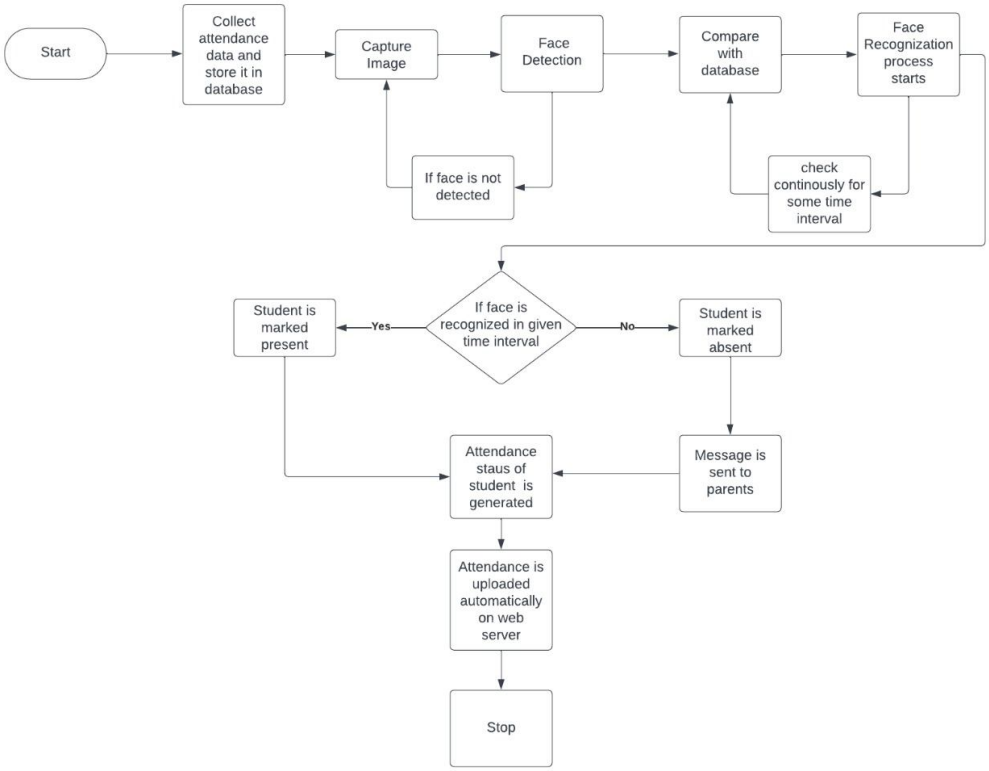


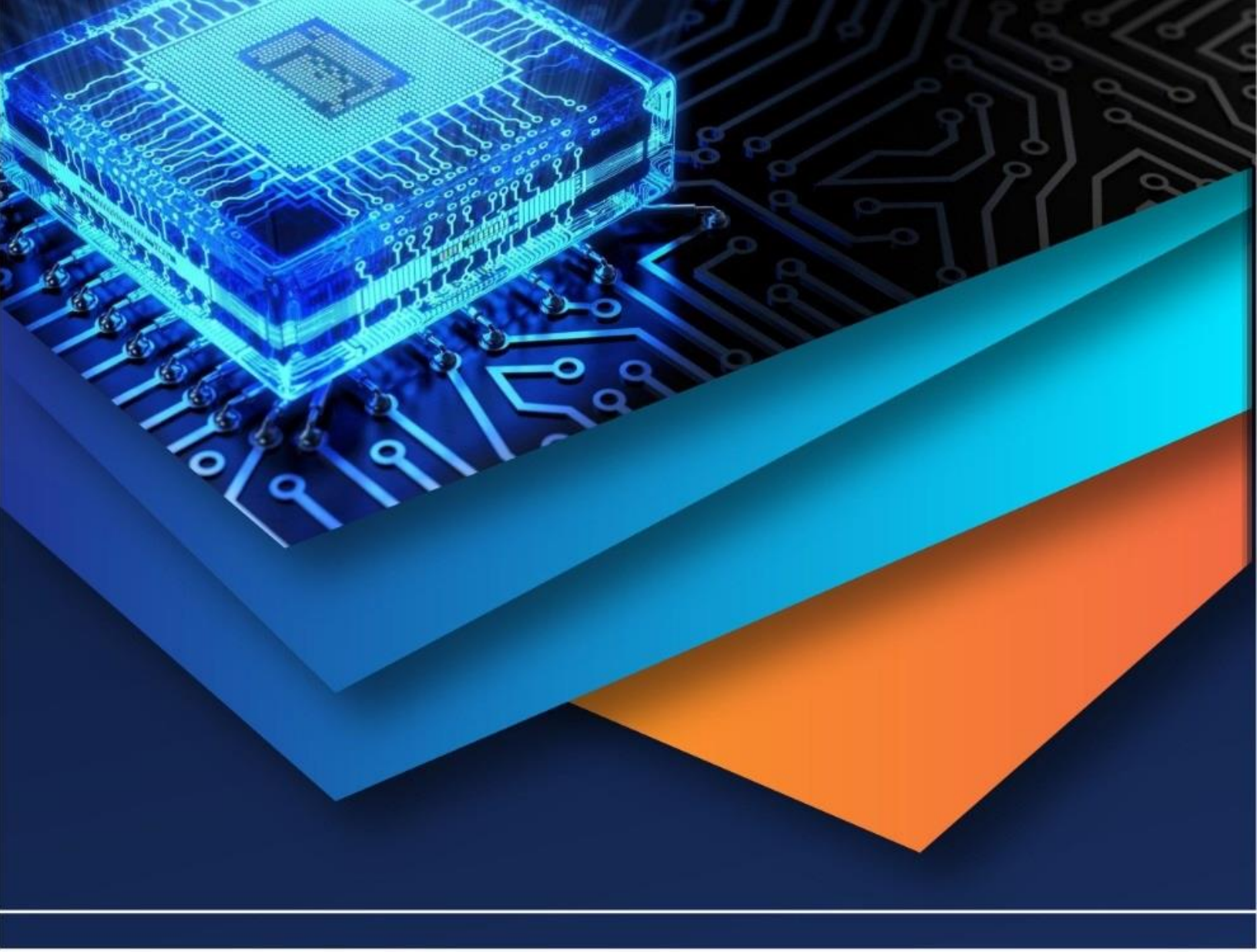

Fig 3: Work Flow Diagram

## IV. CONCLUSION

The proposed system helps to develop automated attendance system using facial recognition. In this mainly 3 steps are used for the work Histogram of Oriented Gradients(HOG), Facial Landmark and Deep Convolutional Neural Network. HOG approach is used for detecting the faces and a deep neural network is trained to extract 128 face encodings. Then these encodings are compared using Euclidean distance. If the face is matched the student is marked as present and at last the student faces that are not matched are marked as absent. An email is sent to the parents of absent students. This system will reduce the time that is required to take attendance in the college, schools, etc. The deep learning model we have used is the ResNet34 model which has an accuracy of 99.38% on LFW dataset. Thus we provide a system which is time efficient, simple and easy to use.

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