

FACELOG: MODERNIZING STUDENT ATTENDANCE MANAGEMENT WITH FACIAL RECOGNITION

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ABSTRACT — At present, there are two types of systems handy: manual and automatic. The generally handy second method for capturing attendance is completely electrical-based. Attendance tracking is a fault-finding facet of various areas, including instructional institution management and safety. Traditional systems, to a degree, manual tracking, or label-located plans, are susceptible to errors apart from lacking adeptness. Little do we know that lately, deciphering the face has resulted in a wide spectrum of bestowing employment across different walks of life. This paper, in detail, has the appropriate manifestation of executing algorithms. The project influences deep education algorithms for facial acknowledgment, providing a smooth and correct means for attendance management. Additionally, solitude concerns, moral concerns, and scalability issues are discussed, along with pieces of advice for optimizing arrangement efficiency and ensuring consumer agreement. Through this project, we aim to influence the growing methodical study of the material world's part on attendance listening wholes and foster change engaged in face acknowledgment science.

Keywords — *Facial Recognition, Facial Detection Method, Histogram of Oriented Gradients Method, Local Binary Pattern Algorithm, K-Nearest Neighbors(KNN).*

I. INTRODUCTION — Attendance is very important for many institutions and organizations to enhance the presence of individuals, manage resources effectively, and ensure compliance with regulations. Traditionally the marking is performed through laborious mechanism using a pen and paper shielding it against any authentic security. Face recognition technology offers a promising alternative to conventional attendance monitoring systems by leveraging biometric identifiers for authentication. In our country the student attendance can be taken by two steps. First

step is manual attendance system and second step is attendance system using finger print scanner but both of the methods has some limitation or demerits. In our country attendance using face recognition has been implemented but there are less number are following them. Attendance system using finger print scanner is not safe and secure too because if the thumb impression of student has been leaked or leaked to

some other persons then it may leads to misuse and the previous methods will also leads to increase time consumption. In this project we propose a system of attendance using face recognition in our approach we have various levels to mark the attendance the first level is the student must register them self in admin phase with their name and roll no and in the second level the faculty will register by giving some details after registration the faculty will get access take the attendance for students by login in faculty access by providing id and password by taking security as consideration. An authentic examination to cross check the login credentials executed accounting which upon successful spotting shall the login be proceeded enabling the authority to mark attendance third step includes the detection through snap and the already logged and verified database.

➤ **Advantages -**

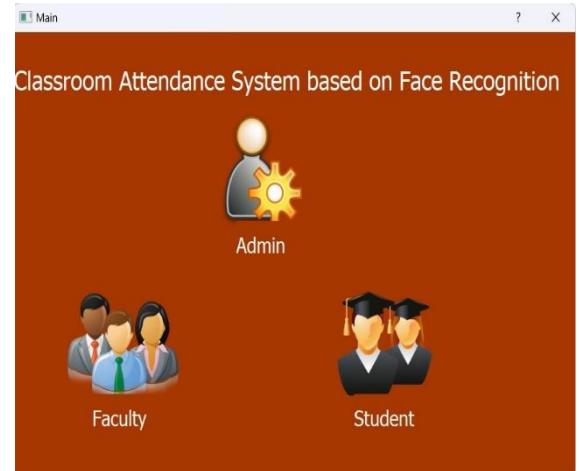
This idea offers many benefits over conventional techniques like manual attendance method, here some of the major advantages are:

- a. **Time efficiency :** Face acknowledgment methods can mechanize the attendance process significantly lowering moment of truth necessary for manual dossier entry or program swiping students clearly need to show their faces to a camcorder and bureaucracy can quickly recognize and record their attendance outside some manual interference

- b. **Accuracy** : Face recognition science can realize extreme levels of veracity in identifying things lowering the chances of wrongs or false attendance with advanced algorithms and machine intelligence methods these schemes can handle differences in lighting pose and first verbalizations guaranteeing trustworthy attendance recording.
- c. **Real-Time Recording** : Attendance is written immediately removing the delay guide manual data access fraud prevention face acknowledgment orders can discover impersonation attempts or agent attendance by proving the liveness of the individual in the way that detecting first movements or needing a haphazard operation.
- d. **Reduced Errors** : Manual attendance arrangements may contract an illness mistakes on account of human omission or intentional guidance when in fact face acknowledgment schemes provide trustworthy and agreeing results.

➤ **Software Used :**

- a. **MySQL** : Manipulating information is what we need so to edit the collected information as per the significant requirement we maintain sql being one of the most utilized media to manipulate data on the grounds of data arranged in terms of rows and columns in this project for instance we generated parameters of the database and snapped images ;the simpler syntax will be of greater aid to us in times of desperate manipulation.
- b. **Open CV** : a tool to process multimedia aiding in algorithm implementation to enable transformations and attribute conclusion across a wide spectrum to decode visual information this project involves the action of utilizing a camera to automatically capture images of students this capability could potentially be realized through opencv which facilitates adjustments to camera functionality and comparisons aligned with desired functionalities



Fig(1):User_Interface

- c. **Python** : any programming language could account for structuring in accordance with code but python could be well-utilized with ease when implementing opencv .The pil library of python expanded as python imaging library is adept for image saving edits and also the construction of guis compatibility across several platforms makes sure of easy deployment under collaboration.
- d. **PyCharm**: PyCharm maybe secondhand for law study, debugging, and experiment, containing. It is specifically beneficial for netting invention utilizing netting application foundations like Django and Flask. Python plugins maybe erected by programmers utilizing miscellaneous API.

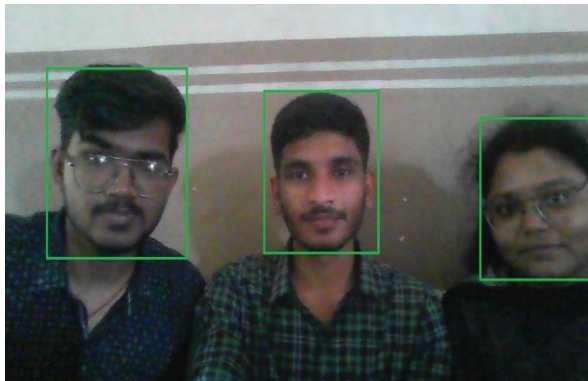
II. METHODOLOGIES:

Little do we know there exists wide spectrum possibly can be obeyed so as to execute the idea where each methodology serves ones own significance and irrelevance we are ought to make a choice of it upon precision laborious computation and environmental sophistication.

1. **Local Binary Pattern Histogram(LBPH)**: LBP is a makeup-located approach that interprets local patterns in first representations. It extracts physiognomy established the contrasting of pel principles accompanying adjacent pixels. LBP is computationally efficient and healthy to differences in ignition, but it can not capture fine first analyses.
2. **Histogram of Oriented Gradients (HOG)**: It is being chosen in the cv where the only reason being accounts for the extreme computation that is relatively at ease and its accuracy in understanding and detailing out the varying concentration to

ranges in the minor area of the same image that falls in the bracket of utilization for face detection.

3. **Face Detection** : Face discovery at present is acted utilizing Histogram of Oriented Gradients (HOG) accompanying OpenCV. Histogram of Oriented Gradients (HOG) invention needs to be expected, prepared to discover and figure out facial features of humans prior to face discovery for it being essential to generate a square about detection as a concept. It has took three limits in deeming: scale factor, min neighbors, min size. The first parameter is used to display by means of what much a figure must mislay in each concept scale. Min neighbors designates by virtue of what several neighbors each applicant square should possess; greater principles occasionally detect low in facial features but detect excellence in representation. Minsize designates the minimum object breadth by default it is 3030 [1].The limits secondhand in this place whole is scalefactor and minneighbors accompanying the values 13 and 5 individually.



Fig(2): Face_Detection with multiple Entities

4. **Face Recognition** : Feature recognition process might be divided in 3 sects: prepare, prepare dossier, train face recognizer, and forecast. Preparation dossier constitute concepts embedded in the dataset. They're designated to accompany a number label of the graduate to which it belongs. These representations are prior to face recognition. The list of local twofold patterns of complete face is obtained. These LBPs are converted into having ten of something number, and before histograms of all those units of the mathematical system principles are created. At the end, an individual graph

with bars for values will be made for each



Fig(3):Face_Recognition

representation in the preparation dossier. Later, all along the acknowledgment process, a graph with bars for values of the face expected acknowledged is deliberate and therefore distinguished accompanying the previously computed histograms and returns highest in rank doubled label guide the graduate it belongs to.

5. k-Nearest Neighbors (KNN):

- a. **Feature Representation:** Before asking KNN, facial looks need expected presented in a appropriate feature room. This maybe approved utilizing methods like Principal Component Analysis (PCA), Local Binary Patterns (LBP), or even deep education-located embedding.
- b. **Feature Extraction:** Use a feature extraction technique like Histogram of Oriented Gradients or Local Binary Patterns to draw traits from each facial image. Ensure the extracted features represent key characteristics of the face while being robust to variations in lighting, pose, and expression.
- c. **Training:** Unlike CNNs, k-NN is a sluggish learner and does not demand unambiguous preparation. Instead, it stores all preparation instances and class labels.
- d. **Distance Metric:** During deduction, k-NN calculates the distance betwixt the query face as well preparation faces in the feature room. Common distance versification contain Euclidean distance, cosine likeness.
- e. **Classification:** k-NN classifies the query face by selecting the adulthood class between allure k most familiar neighbors in the feature room. In the

framework of attendance administration, this complements to recognizing the graduate whose face is most complementary to the query face.

- f. **Parameter Tuning:** The choice of the limit k- (number of nearest neighbors) can impact the acting of the classifier and grant permission need expected brought into harmony utilizing.

III. PROPOSED SYSTEM —

We are trying to develop a new development for appearance of the students during classes by face detection technique in python employing open cv2 for face detection feature encoding and distance metrics for precise identification through open cv2 the system identifies and recognizes faces in real-time video from a webcam, key components include face tracking to locate and extract faces and face identification to peer them with in the database for identification upon recognizing a student in the system records their attendance in a CSV file including timestamps and displays names and the attendance status on a user-friendly interface students register by providing details and their images are stored in the data set periodically. The system detects students via the webcam compares them with the data in the database including record attendance in an excel sheet [2].

The system architecture of the proposed system is :

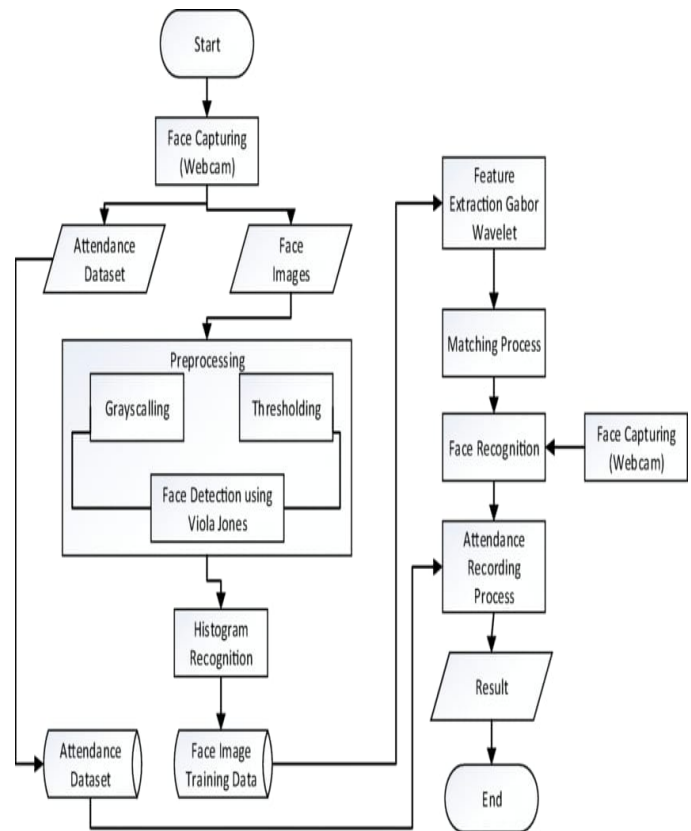


Fig.(4).System Architecture

Basically, This process is categorized into four stages :

1. **Dataset Creation :** This stage involves accumulating a dataset of facial images for each student. Each student's dataset should ideally include multiple pictures captured under various lighting cases, angles and facial details. Ensure that the dataset exists diverse and representative of the real-world scenarios the system will encounter. The dataset could be stored in a structured manner, such as individual folders for each student, containing their respective facial images[3].

2. **Training with Classifier :** Once the dataset is collected, the next step is to train a classifier using the collected facial images. In this example, we will use HOG (Histogram of Oriented Gradients) for feature extraction and KNN (K-Nearest Neighbors) for classification. HOG extracts features from images based on the distribution of intensity gradients. This classifier is a simple ML algorithm that classifies a data point relying on the most common class among its closest neighbors.

Practical Example :

- ✓ Load the facial images dataset.
- ✓ Pull Out HOG features from each image.

- ✓ Train a KNN algorithm using the HOG features and corresponding labels(student identities).

3. **Detecting the Face :** Before recognizing a students face, the system needs to detect faces within input images or frames. There are various face detection algorithms available such as Haar Cascades,HOG+Linear SVM or more advanced methods like MTCNN(Multi-task Cascaded Convolutional Networks).

Practical Example:

- ✓ Utilize opencv's pre-trained face detector, such as the HOG for face detection.
- ✓ Apply the face detection algorithm to each frame or image.
- ✓ If faces are detected,proceed to the next step; otherwise, prompt the user to adjust the camera or position.

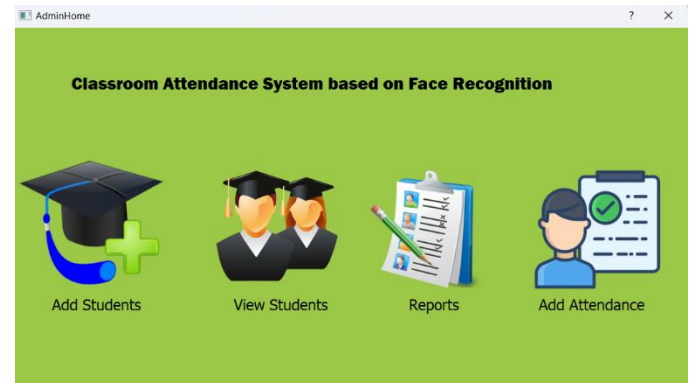
4. **Marking the Attendance :** The system detect the student using the trained classifier and updates their attendance. Algorithm is local binary patterns histograms (LBPH) and can be used to recognize faces.

Practical Case : For each detected face, extract facial features using the chosen face recognition algorithm.Fee d the extracted features into the trained classifier to predict the students identity.Once each students image has been identified,the face which matches with the databases stored data will be tagged as appearance if not the student will be tagged as absent.

IV. RESULT AND DISCUSSIONS —

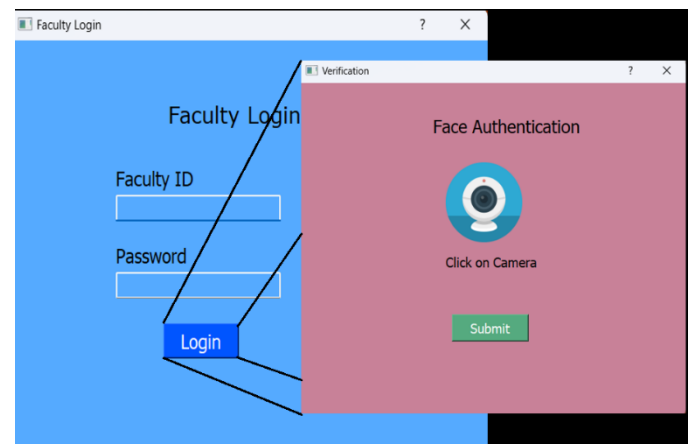
In our study, we implemented a comprehensive login system comprising three distinct roles: admin, faculty, and student. The admin login, endowed with numerous privileges, serves as the gateway to various administrative tasks within the system. Authentication into the admin portal requires a username and password, ensuring secure access[4] .Upon successful login, administrators are empowered to undertake essential functions such as adding students, accessing student reports, and managing student data inclusive of view students and add attendance. Notably, the process of adding students involves capturing vital details like name, roll number and password, complemented by a snapshot captured via the camera.This snapshot is then stored in the SQL server database, meticulously organized under the respective student's profile. This meticulous organization ensures streamlined management of student information, facilitating efficient administration within educational institutions. Likewise, the view option serves with details being displayed onto an Excel. Details are in accordance with the student added at add student privilege bestowed to admin. Reports include choice of month and download option which, upon selection, is saved to reports Excel. Add attendance

involves selection of hours, subject name, date, roll no, and attendance.



Fig(5):Admin Interface

Following the admin login, we introduce the faculty login, which is pivotal for faculty members to access the system and perform tasks related to attendance management. Access to the faculty portal mandates authentication through a unique faculty ID and password.

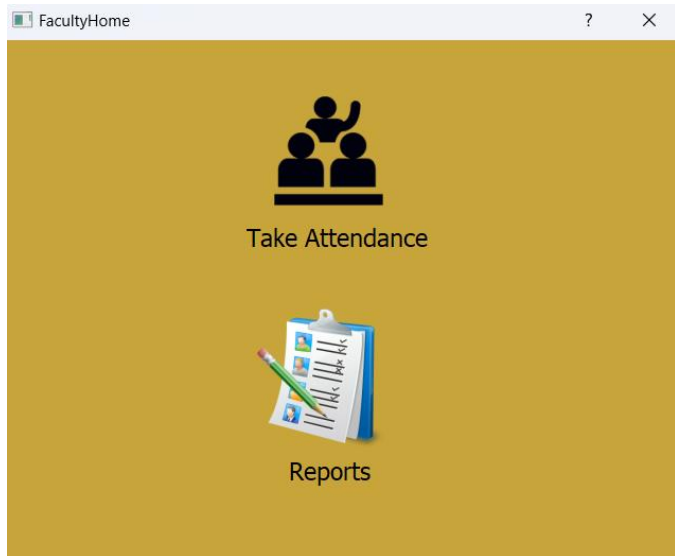


Fig(6):Faculty login with Face recognition

Here they are provided the ease of access to attendance and reports where upon choosing to take attendance, the hour along with subject name and the snap to perform the operation are bestowed. Reports are as well same as that of admin's privilege.

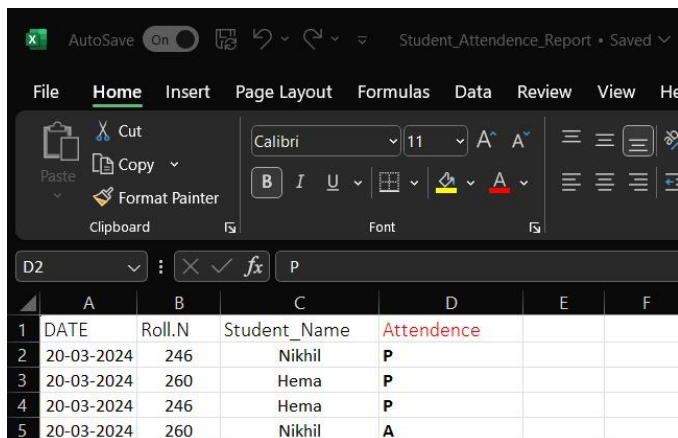
Moreover, provisions are made for new faculty registrations through the "register now" option, facilitating seamless on boarding of new faculty members into the system. The faculty registration process involves furnishing personal details such as name, email ID, password, and mobile number, ensuring accurate identification and authentication of faculty members. Once registered, faculty members gain access to the system, enabling them to mark attendance for their respective classes

[5]. This attendance marking process is facilitated by capturing students' faces using the system's webcam functionality as follows:



Fig(7):Faculty Interface

Subsequently, an advanced algorithm deciphers these facial images and cross-references them with stored images in the SQL server database via the admin portal. This meticulous comparison ensures accurate attendance tracking, with students being marked present or absent based on successful matches.



	A	B	C	D	E	F
1	DATE	Roll.N	Student_Name	Attendance		
2	20-03-2024	246	Nikhil	P		
3	20-03-2024	260	Hema	P		
4	20-03-2024	246	Hema	P		
5	20-03-2024	260	Nikhil	A		

Fig(8):Excel_report

Overall, this integrated login system and attendance management mechanism showcase the efficacy of modern technological solutions in enhancing administrative efficiency and student engagement within educational settings.

V. FUTURE SCOPE —

Manual methods last until the laborious supply gets available, accounting for the redundancy that this traditional method

possesses, while the automated approach inherently increases the extreme accuracy and precision. Under diverse conditions, could this be implemented even upon poor technical issues? Future scope of this system is revolutionary, accounting for its application in a wide range of organizational units. Little could this be totally automated; it would be implemented so as to ensure appropriate authentication and security as well.

VI. CONCLUSION —

The facial recognition attendance method we employ, utilizing the mentioned technologies and algorithms, epitomizes effortless tracking for lecture sections or labs, enabling automated attendance recording with a mere glance using a webcam. Students' faces are swiftly identified by comparing them to an existing database, eliminating the need for manual sign-in. This enhances efficiency, particularly in larger classes, while showcasing the institution's embrace of modern technology.

However, ensuring robust security, scalability, and addressing lighting variations are crucial for a smooth user experience. Ultimately, this system demonstrates the transformative impact of image processing in education, offering benefits beyond mere attendance tracking.

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