

**A Project Report**  
**on**  
**Face Recognition Attendance System Using Face Encoding Algorithm**  
*Submitted in partial fulfillment of the*  
*requirement for the award of the degree of*  
**Bachelor of Technology**



**Under The Supervision of**  
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**SCHOOL OF COMPUTER SCIENCE AND ENGINEERING**  
**DEPARTMENT OF BACHELOR OF TECHNOLOGY**  
**GALGOTIAS UNIVERSITY, GREATER NOIDA**  
**INDIA**

**October, 2023**



**SCHOOL OF COMPUTER SCIENCE AND ENGINEERING**  
**GALGOTIAS UNIVERSITY, GREATER NOIDA**

## **CANDIDATE’S DECLARATION**

We hereby certify that the work which is being presented in the project, entitled “Face Recognition Attendance System Using Face Encoding Algorithm” in partial fulfillment of the requirements for the award of the Bachelor of Technology submitted in the School of Computer Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of September, 2022 to October and 2023, under the supervision of Mr. Ajay Shankar Assistant Professor, Department of Bachelor of Technology and School of Computing Science and Engineering , Galgotias University, Greater Noida

The matter presented in the project has not been submitted by us for the award of any other degree of this or any other places.

Yuvraj Singh, Manish Kumar

20SCSE1010824, 20SCSE1010830

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Mr. Ajay Shankar

Assistant Professor

## **CERTIFICATE**

The Final Project Viva-Voce examination of Yuvraj Singh: 20SCSE1010824, Manish Kumar: 20SCSE1010830 has been held on 30-10-2023 and his work is recommended for the award of Bachelor of Technology

**Signature of Examiner(s)**

**Signature of Supervisor(s)**

**Signature of Program Chair**

**Signature of Dean**

Date: 30 November, 2023

Place: Greater Noida

## **Abstract**

The "Face Recognition for Attendance" project in a Linux environment is a cutting-edge solution designed to revolutionize attendance management systems by harnessing the power of open-source tools and Linux-based technologies. Traditional attendance tracking methods often suffer from inaccuracies, inefficiencies, and a lack of security. This project leverages the robust capabilities of Linux to implement a secure, efficient, and scalable facial recognition attendance system.

**RFID(Radio Frequency Identification)-based Attendance System:** A number of works related to Radio Frequency Identification (RFID) based Attendance Systems exist in the literature. In the authors have proposed RFID based system in which students carry a RFID tag type ID card and they need to place that on the card reader to record their attendance. RS232 is used to connect the system to the computer and save the recorded attendance from the database. This system may give rise to the problem of fraudulent access. Unauthorized person may make use of authorized ID card and enter into the organization.

**Fingerprint based Attendance System:** In A portable fingerprint device has been developed which can be passed among the students to place their finger on the sensor during the lecture time without the instructor's intervention. This system guarantees a fool proof method for marking the attendance. The problem with this approach is that passing of the device during the lecture time may distract the attention of the students.

**Iris-Recognition Based Attendance System:** Iris is another bio-metric that can be used for Attendance Systems. In authors have proposed Daugmans algorithm is based Iris recognition

system. This system uses iris recognition management system that does capturing the image of iris recognition, extraction, storing and matching. But the difficulty occurs to lay the transmission lines in the places where the topography is bad. In authors have proposed a system based on real time face recognition which is reliable, secure and fast which needs improvement in different lighting conditions.

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# **CHAPTER-1**

## **Introduction**

### **1.1 Introduction**

A Face Recognition Attendance System is a technology-driven solution designed to automate the process of tracking and recording attendance in various settings, such as schools, offices, and events, using facial recognition technology. This system relies on a Face Encoding Algorithm as one of its crucial components.

Here's an introduction to the concept and components of a Face Recognition Attendance System, with a focus on the Face Encoding Algorithm:

**1. Face Recognition Technology:-** Face recognition is a biometric technology that identifies and verifies individuals by analyzing and comparing their facial features. It's widely used for security, access control, and attendance tracking.

**2. Attendance Automation:-** Traditional attendance systems often involve manual processes, like taking roll calls, signing in on paper, or using card-based systems. A Face Recognition Attendance System streamlines this process by automating attendance tracking.

**3. Components of the System:-** Face Detection: The system first detects and locates faces in images or video streams. It uses computer vision techniques to identify face regions. - Face Encoding: This is a crucial component of the system. The Face Encoding Algorithm extracts unique features from each detected face, creating a numerical representation of the face that can be compared for recognition. - Database: The system maintains a database of face encodings along

with associated user information (e.g., names, IDs, roles). - Recognition Engine: The recognition engine compares the face encodings of the detected faces with those in the database to determine if a match is found.

**4. Face Encoding Algorithm:-** The Face Encoding Algorithm is a key aspect of the system. It transforms a person's facial features into a unique numerical representation, often referred to as a "face embedding" or "face signature." - This encoding is based on deep learning techniques, usually employing Convolutional Neural Networks (CNNs) to extract features that are distinctive and robust to variations in lighting, pose, and facial expressions.

Once the face is encoded, it can be compared to previously encoded faces stored in the database to determine if the person is recognized and their attendance is marked.

## **1.2 Formulation of Problem**

There is no reason that a critical educational practice like attendance should be viewed in the old, tedious manner in this age of rapidly evolving new technologies. In the conventional method, it is difficult to manage large groups of students in a classroom. Since it takes time and has a high risk of error when entering data into a system, it is not recommended. Real-Time Face Recognition is a practical method for dealing with a large number of students' attendance on a daily basis.

### 1.2.1 Tools and Technology Used

A Face Recognition Attendance System using a Face Encoding Algorithm involves a combination of hardware and software tools and technologies. Here are the essential components and technologies commonly used in such systems:

#### 1. Hardware Components:

**Camera:-** A high-resolution camera or webcam is essential for capturing facial images. The quality of the camera impacts the accuracy of face detection and recognition.

**Server or Computer:-** This is where the software, including the Face Encoding Algorithm, runs. It should have sufficient processing power and memory for real-time image processing and database management.

**Database:-** A database is used to store encoded facial features along with user information. Common databases used include PostgreSQL, MySQL, or NoSQL databases like MongoDB.

**Network Connectivity:-** To connect the camera, server, and database, a network infrastructure is necessary. It could be Ethernet or Wi-Fi, depending on the deployment environment.

#### 2. Software and Technologies:

**Face Detection Algorithm:-** Face detection is the first step in recognizing individuals. Tools like OpenCV (Open Source Computer Vision Library) or Dlib are often used for this purpose.

**Deep Learning Frameworks:-** Deep learning frameworks, such as TensorFlow and PyTorch, are essential for developing and training the Face Encoding Algorithm. Convolutional Neural Networks (CNNs) are commonly used in this context.

**Face Encoding Algorithm:-** The encoding algorithm extracts unique facial features and generates face embeddings or signatures. Some popular algorithms include FaceNet, VGGFace, and ArcFace.

**Machine Learning Models:-** Trained machine learning models are employed to match the captured facial features with the stored encodings in the database.

**Database Management System (DBMS):-** A DBMS is used to store and manage the user data and face encodings efficiently. It's crucial for fast retrieval of face encodings during recognition. Common DBMS options include PostgreSQL, MySQL, SQLite, and MongoDB.

**Programming Languages:-** Programming languages like Python, Java, or C++ are commonly used for developing the software components of the system.

**APIs and Libraries:-** Various APIs and libraries are available to facilitate face recognition. For instance, the dlib library for face recognition and the OpenFace API provide pre-trained models and functions for face encoding.

**User Interface:-** A user-friendly interface can be built using web technologies (HTML, CSS, JavaScript) or desktop application development frameworks to interact with the system for user registration and monitoring.

**Security and Encryption:-** To ensure data security and user privacy, encryption and secure communication protocols are crucial.

**3. Data Privacy and Compliance Tools:-** Depending on the jurisdiction and industry, compliance tools and protocols, such as General Data Protection Regulation (GDPR) compliance tools, can be used to ensure that the system complies with data protection regulations.

**4. Integration and Reporting Tools:-** Integration with existing attendance management or HR systems can be achieved through APIs or custom integration tools. Reporting tools may be used to generate attendance reports for administrators.

## **CHAPTER-2**

### **Literature Survey/Project Design**

#### **Literature Survey**

2.1 Student Attendance Monitoring System Using Face Recognition by E CHARAN SAI, SHAIK ALTHAF HUSSAIN, SYED KHAJA, AMARA SHYAM: SSRN– [1] They used Haar-cascade model to detect faces and passed the cropped images from frame for processing. This method boosts the performance by analyzing only those images which are in ROI (Region of Interest)

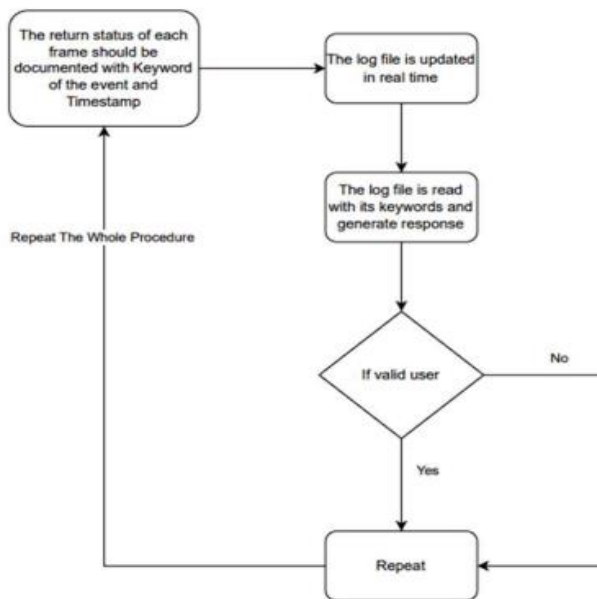
2.2 Automated Attendance System using Machine Learning Approach– [2] In this paper Histogram of Oriented Gradient approach is used which boosted the processing speed and reduce the CPU throughput which is further assisted by changing images to greyscale and oriented gradient for reduced input data. This approach is by far the best method to increase speed but with the expanse of accuracy and augmentation in labeled images.

2.3 Automated attendance system using face recognition A Jadhav, A Jadhav, T Ladhe -[3] RFID (Radio Frequency Identification)-based Attendance System A number of works related to [3] Radio Frequency Identification (RFID) based Attendance Systems exist in the literature. In [6] the authors have proposed RFID based system in which students carry a RFID tag type ID card and they need to place that on the card reader to record their attendance. RS232 is used to connect the system to the computer and save the recorded attendance from the database. This system may give rise to the problem of fraudulent access. Unauthorized person may make use of authorized ID card and enter into the organization

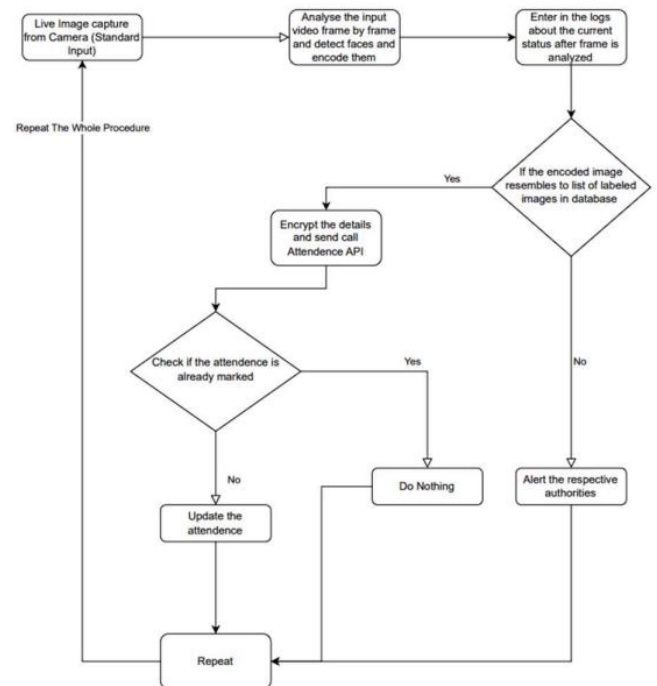
Fingerprint based Attendance System In [1] A portable fingerprint device has been developed which can be passed among the students to place their finger on the sensor during the lecture time without the instructor's intervention. This system guarantees a foolproof method for marking the attendance. The problem with this approach is that passing of the device during the lecture time may distract the attention of the students.

## Project Design

Logging And Security System



Attendance Marking Procedure



## **CHAPTER-3**

### **Functionality/Working of Project**

When a person will enter in an office or any another place like college that type of place where more security needed. This machine will detect a face of person. If it will authorize person then it will grant a permission of person for enter in the office and automatically update the attendance in a system. If it will not authorize person it will indicate sign and send the log file to the authenticator that this is not a person of office .He is entering illegally in an office. In my project security is tight also it will detect half part face of a person and also every corner of face of person . If person will show any part of face like from left, right, top, bottom. It will identify a person very easily. It will indicate that this is authorize person or not. Also In case of any mark of person like growing beard and injury these types of marks also will identify very easily. It will detect a face also in a light dim.



## **CHAPTER-4**

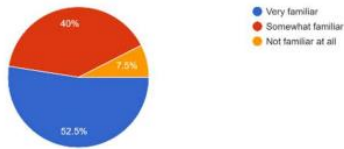
### **Result and Discussion**

We will share the result very soon. We have done 75% work of Project and remaining work we will share very soon.

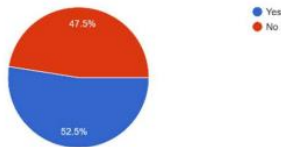
The Survey is done to the public to get proper access to the results and the results are out. We concluded the following insights from Literature Survey

- Accuracy over speed
- Speed faster compared to traditional system
- No issue during data transmission
- Encryption and data backup
- Monitoring and logging

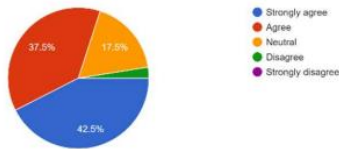
How familiar are you with the concept of an attendance system using machine learning?  
40 responses



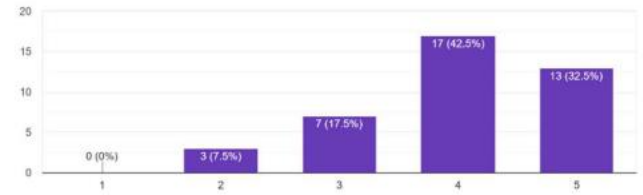
Have you ever used an attendance system that employs machine learning technology?  
40 responses



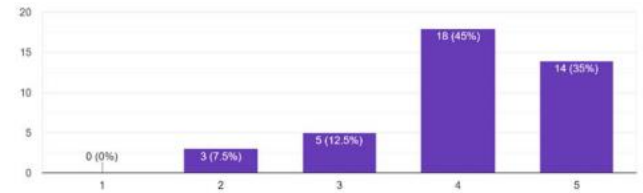
Do you believe that using machine learning for attendance tracking is a more efficient method than traditional methods (e.g., paper-based, manual entry)?  
40 responses



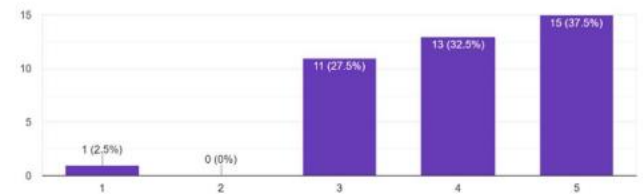
How likely are you to trust attendance data generated by machine learning-based systems?  
40 responses



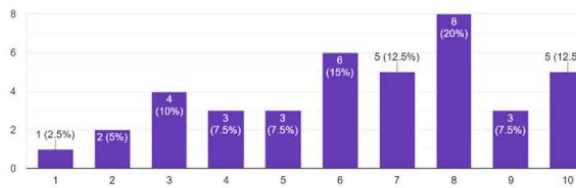
On a scale of 1 to 5, how concerned are you about the privacy and security of your attendance data when using machine learning-based systems?  
40 responses



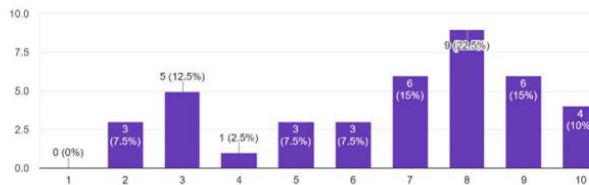
How effective do you think machine learning-based attendance systems are at reducing errors compared to old method in attendance tracking? Rate ...not effective at all and 5 being highly effective.  
40 responses



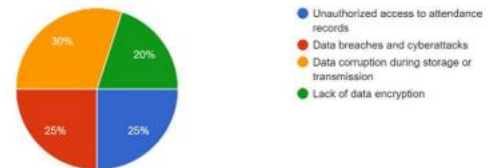
Please rate the efficiency of traditional attendance tracking methods (e.g., paper-based, manual entry) on a scale from 1 to 10, with 1 being highly inefficient and 10 being highly efficient.  
40 responses



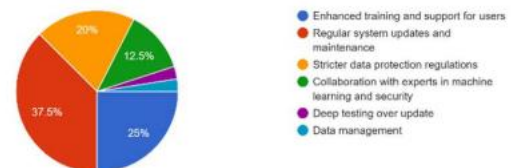
In your opinion, how accurate are traditional attendance tracking methods (e.g., paper-based, manual entry) on a scale from 1 to 10, with 1 being highly inefficient and 10 being highly efficient.  
40 responses



Which of the following is the most significant challenge in ensuring the security of attendance data in a machine learning-based system?  
40 responses



In your opinion, what would be the most effective way to address the challenges associated with machine learning-based attendance systems?  
40 responses



## **CHAPTER-5**

### **Conclusion and Future Scope**

#### **5.1 Conclusion**

Face recognition technology can be used to build practical systems for attendance tracking, security access control, and more. The face recognition system can be built using Python programming language and popular libraries such as OpenCV and face recognition. Once the face recognition model is built, it can be integrated with an attendance system using Python programming and database management tools.

#### **5.2 Future work**

One-one Matching can be replaced by multiple faces detection at once.

#### **Reference:**

1. [1] SAI, E CHARAN and HUSSAIN, SHAIK ALTHAF and KHAJA, SYED and SHYAM, AMARA, Student Attendance Monitoring System Using Face Recognition (May 22, 2021). Available at SSRN: <https://ssrn.com/abstract=3851056> or <http://dx.doi.org/10.2139/ssrn.3851056>
2. [2] H. Rathod, Y. Ware, S. Sane, S. Raulo, V. Pakhare and I. A. Rizvi, "Automated attendance system using machine learning approach," 2017 International Conference on Nascent Technologies in Engineering (ICNTE), Vashi, India, 2017, pp. 1-5, doi: 10.1109/ICNTE.2017.7947889.
3. [3] <https://www.academia.edu/download/53620889/IRJET-V4I1286.pdf>