

# Face Recognition Attendance System

## A PROJECT REPORT

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## **CERTIFICATE**

This is to certify that the project report entitled “Face Recognition Attendance System” submitted by Aniket Rahane, Achyut Sarangdhar, Vedant Gorde and Rohit Ingle in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Computer Engineering of Sanjivani College of Engineering, Kopargaon is a record of bonafide work carried out under my guidance and supervision.

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### **ABSTRACT**

In colleges, Universities, organizations, schools, offices taking an attendance is one of the most important task that must be done on a daily basis. The such as offices task that must be done on a of time it is done by calling by name or roll number. The main goal of this project is to create a face recognition based attendance system that what will turn manual process into an automated one.

The image extracted using openCV. Before the start of corresponding class. The student can approach the machine which will begin taking pictures and comparing them to the qualified dataset. The image is processed as Follows :- Initially Face capture inside database and while taking attendance picture is compared with images present in database.

## **INTRODUCTION**



Human face plays an important role in our day to day life mostly for identification of a person. Face recognition is a part of biometric identification that extracts the facial features of a face, and then stores it as a unique face print to uniquely recognize a person. Biometric face recognition technology has gained the attention of many researchers because of its wide application. Face recognition technology is better than other biometric based recognition techniques like fingerprint, palm-print, iris because of its non-contact process. Recognition techniques using face recognition can also recognize a person from a distance, without any contact or interaction with person. The face recognition techniques are currently implemented in social media websites like Facebook, at the airports, railway stations. The, at crime investigations. Face recognition technique can also be used in crime reports, the captured photo can be stored in a database, and can be used to identify a person. Facebook uses the facial recognition technique for automating the process of tagging people. For face recognition we require large dataset and complex features to identify a person in all conditions like change of illumination, age, pose, etc. Recent researches show there is a betterment in facial recognition systems. In the last ten years there is huge development in recognition techniques.

But currently most of the facial recognition techniques is able to work fine only if the number of people in one frame is very few and under controlled illumination, proper

Position of faces and clear images. For face recognition purpose, there is a need for large data sets and complex features to uniquely identify the different subjects by manipulating different obstacles like illumination, pose and aging. During the recent few years, a good improvement has been made in facial recognition systems. In comparison to the last decade, one can observe an enormous development in the world of face recognition. Currently, most of the facial recognition systems perform well with limited faces in the frame.

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Moreover, these methodologies have been tested under controlled lighting conditions, proper

face poses and non- blurry images. The system that is proposed for face recognition in this paper for attendance system is able to recognize multiple faces in a frame without any control on illumination, position of face.

Identification of individuals in an organization for the purpose of attendance is one such Application of face recognition. Maintenance and monitoring of attendance records plays a vital Role in the analysis of performance of any organization. The purpose of developing attendance Management system is to computerize the traditional way of taking attendance. Automated Attendance Management System performs the daily activities of attendance marking and analysis With reduced human intervention. The prevalent techniques and methodologies for detecting and Recognizing face fail to overcome issues such as scaling, pose, illumination, variations, rotation, And occlusions. The proposed system aims to overcome the pitfalls of the existing systems and Provides features such as detection of faces, extraction of the features, detection of extracted Features, and analysis of students' attendance. The system integrates techniques such as image Contrasts, integral images, colour features and cascading classifier for feature detection. The System provides an increased accuracy due to use of a large number of features (Shape, Colour, LBP, wavelet, Auto-Correlation) of the face. Faces are recognized using Euclidean distance and k-nearest neighbour algorithms. Better accuracy is attained in results as the system takes into account the changes that occur in the face over the period of time and employs suitable learning algorithms.

The system is tested for various use cases. We consider a specific area such as classroom Attendance for the purpose of testing the accuracy of the system. The metric considered is The percentage of the recognized faces per total number of tested faces of the same person. The System is tested under varying lighting conditions, various facial expressions, presence

of partial Faces (in densely populated classrooms) and presence or absence of beard and spectacles. An Increased accuracy (nearly 100%) is obtained in most of the cases considered.

### **1. Project Definition**

Design of an automatic class attendance system using face detection algorithm of LabVIEW Software. The system requires a video capture device and the running LabVIEW algorithm to be Implemented successfully. It detects the faces and mark attendance accordingly. This system will Prevent unnecessary wastage of time of classes that is usually wasted in form of class roll calls.

### **2. Project Objectives**

1. Reducing time wastage during conventional class attendance.
2. Utilizing latest trends in machine vision to implement a feasible solution for

class Attendance system.

3. Automating the whole process so that we have digital environment.
4. Preventing fake roll calls as one to one attendance marking is possible only.
5. Encouraging the use of technology in daily lives.

### **1. Project Specifications**

- 
- a. Uses Pattern Matching algorithm for face detection.

- b. Score of minimum 600 required to perfectly match a face.
- c. Metric: Camera Resolution.
- d. For prototype fixed to 5-10 users only but scalable design.
- e. Requires good lighting condition for better camera capture capability.
- f. Attendance sheet is .xlsx format and can be digitally distributed and maintained.

## **SCOPE AND OBJECTIVES**

### **SCOPE :**

The scope of a face recognition attendance system is to automate the process of taking attendance and recordkeeping in various settings, such as schools, universities, companies, and other organizations. It uses facial recognition technology to identify individuals and records their attendance automatically.

The benefits of using a face recognition attendance system include:

1. Accuracy: Face recognition technology is highly accurate and can identify individuals with high precision.
2. Speed: The system is very fast and can record attendance in a matter of seconds, which saves a lot of time.
3. Security: The system provides a high level of security, as it can identify individuals even if they try to cheat the system by wearing masks, disguises or by asking someone else to mark their attendance.
4. Cost-effective: A face recognition attendance system is cost-effective in the long run, as it eliminates the need for manual attendance-taking, which saves the cost of paper, printing, and manpower.
5. Integration: The system can be integrated with other systems such as payroll, HR, and other management systems, which streamlines the entire process.

Overall, the scope of a face recognition attendance system is to provide an accurate, fast, secure, and cost-effective method of attendance-taking, which can benefit various organizations.

**OBJECTIVE :**

1. Reducing time wastage during conventional class attendance.
2. Utilizing latest trends in machine vision to implement a feasible solution for class attendance system.
3. Automating the whole process so that we have digital environment.
4. Preventing fake roll calls as one to one attendance marking is possible only.

5. Encouraging the use of technology in daily lives.



## **REQUIREMENTS**

### **NORMAL REQUIREMENTS :**

1. A facial recognition software that is capable of capture and detect the face images of the students.
2. Captures and add face image of each student of the class into the database of students.
3. The software should be feasible for user and it should have a user friendly interface.

4. A database software which will going to store information like name, roll no., images of faces of the students.
5. The system should have appropriate security measures in place to prevent unauthorized access to student information.

**EXPECTED REQUIREMENTS :**

1. The software should mark the attendance of student whose face is detected.
2. The software should be able to calculate the percentage of attendance of each student at the last of every month.
3. The system should be flexible and allow for customization, such as the ability to add new students and their faces to the database.
4. Besides of the data, if any other face detected system should display message "Face record does not exist, please add it to record."

## PROJECT ALGORITHM

### Algorithm :

1. Start.
2. Create login for the system (Project).
3. Create dynamic and user-friendly GUI for better understanding of the system.
4. Display Menu – 1. Database Entry  
2.Mark Attendance
- 5.If user wants to make entry of student information and photo sample into database then go to choice 1.

- 
6. Take a photo sample of each student and add it into database.

7. Train photo sample by using libraries of programming language.
8. If user wants to mark attendance of students then choose choice 2.
9. Detect the face of the student if it matched with the face captured in database, go to step 10. Otherwise display “Match Not Found ! Please add face to database(OR contact System Administrator)”.
10. If detected face is matches with photo sample of database mark this student is present in excel.
11. Calculate monthly attendance of each student.
12. Stop.









Implementing a face recognition attendance system involves several steps,

including face detection, face recognition, and database management. Here is a brief



while developing this project :



stream. One of the popular algorithms for face detection is the Haar Cascade

Classifier, which uses Haar-like features to detect faces. Some popular libraries for





other so we have explored OpenCV which contains both algorithms of face detection

and recognition ( Haar cascade and LBPH).

2.Face Recognition: After detecting the face, the next step is to recognize it. There

are several algorithms for face recognition, including Eigenfaces, Fisherfaces, and







3.Database Management: Once the faces are detected and recognized, the attendance



system needs to store this information in a database. Most popular database for face

recognition attendance systems is MySQL that we have used in the project .





## OpenCV :-

OpenCV (Open Source Computer Vision Library) is an open-source computer vision and machine learning software library. It provides various functions and algorithms for image and video analysis, including face detection and recognition. OpenCV is widely used in the field of computer vision for developing applications such as object detection, image processing, video tracking, and more.

To implement a practical face detection system using OpenCV, you can follow these steps:

1. **Install OpenCV:** Begin by installing OpenCV on your system. You can refer official OpenCV documentation for detailed instructions on installation specific to your operating system.
2. **Set Up the Development Environment:** Depending on your programming language preference, set up the development environment with the necessary tools and libraries. OpenCV provides interfaces for several programming languages, including Python, C++, and Java.
3. **Import OpenCV:** In your code, import the necessary OpenCV modules and libraries. For example, in Python, you can use **import CV** to import the OpenCV library.
4. **Load the Face Detection Model:** OpenCV provides pre-trained face detection models, such as Haar cascades or deep learning-based models. Load the appropriate model using the **cv2.CascadeClassifier** class or the **cv2.dnn** module.

- video a
5. Capture Video Frames: Set up a video capture object to capture frames from a source, such as a webcam or a video file. Use the **cv2.VideoCapture** class to create a video capture object and read frames from it in a loop.
  6. Face Detection: In each video frame, apply the face detection model to detect faces. Convert the frame to grayscale and use the **detectMultiScale** method of the face detection model to identify faces in the image.
  7. Draw Face Boundaries: Iterate over the detected faces and draw rectangles around them on the frame using the **cv2.rectangle** function.
  8. Display the Output: Show the processed frame with the face boundaries using **cv2.imshow**.
  9. Additional Processing: You can perform additional processing on the detected faces, such as face recognition or other analysis, based on your requirements.
  10. Cleanup: Release the video capture object and close any open windows after processing is complete.
- your
- This is a basic outline for a face detection system using OpenCV. Depending on specific requirements, you can enhance the system with face recognition, attendance tracking, and other features.

### Haar-Cascade Algorithm :-

is to Face Detection The first step in implementing a face recognition attendance system is to detect the face in the input image or video stream. This can be done using the Haar Cascade Classifier .

The Haar cascade algorithm is a machine learning-based approach used for object detection, particularly for detecting faces in images or video frames. The Haar cascade algorithm uses Haar-like features to efficiently detect objects by evaluating rectangular regions in an image.

Here's how the Haar cascade algorithm works for face detection:

#### 1. Training Stage:

faces. Positive Samples: Gather a large dataset of positive samples containing images with faces. These images should be labeled to indicate the presence of faces.

faces. Negative Samples: Collect a dataset of negative samples containing images without faces.

Feature Extraction: Extract Haar-like features from the positive and negative samples. Haar-like features are simple rectangular filters that capture the contrast between adjacent regions of an image.

to Adaboost Training: Apply the Adaboost algorithm, a machine learning technique, select a small number of highly discriminative features from the extracted Haarlike features. Adaboost assigns weights to these features based on their ability to distinguish between positive and negative samples.

Cascade Training: Train a cascade of classifiers by combining weak classifiers into strong classifiers. The cascade structure allows for fast rejection of non-face regions in the image by applying a series of progressively stricter classifiers.

## 2. Detection Stage:

Image Preprocessing: Convert the input image to grayscale and perform any necessary preprocessing, such as resizing or histogram equalization, to enhance the image quality.

Sliding Window: Slide a fixed-size window over the image at multiple scales. The window represents the size of the object you are detecting (e.g., a face).

Integral Image: Compute the integral image representation of the grayscale image. The integral image allows for fast calculation of Haar-like features.

Feature Evaluation: For each window position and scale, compute the Haar-like feature values by subtracting the sums of pixels within different rectangular regions.

Classifier Evaluation: Apply the cascade of classifiers, starting from the most straightforward and less computationally expensive ones. If a classifier at any stage rejects the region as a non-face, move on to the next window position and scale. Otherwise, proceed to the next stage.

Post-processing: After passing through all stages of the cascade, regions that have been classified as faces are identified. Perform any necessary post-processing, such as maximum suppression, to eliminate duplicate detections or refine the bounding box coordinates.

In short how the Haar Cascade Classifier algorithm works:





1. The input image is converted to grayscale.
2. The algorithm applies a series of classifiers to the image to detect Haar-like features.
3. These features are then used to detect the face.

### **Local Binary Patterns Histograms (LBPH) :-**

LBPH (Local Binary Patterns Histograms) is a popular algorithm used for face recognition in computer vision. It extracts local texture information from an image and represents it as a histogram. LBPH is a simple yet effective method for recognizing faces in images or video frames. Here's a practical implementation of the LBPH algorithm for face recognition:

1. **Install Libraries:** Begin by installing the necessary libraries. In Python, you can install the openCV-python library using pip:
2. **Import Libraries:** Import the required libraries in your code
3. **Load Training Data:** Gather a dataset of labeled face images for training the LBPH model. Organize the dataset in a directory structure, where each subdirectory represents a different person and contains face images of that person.
4. **Train the LBPH Model:** Train the LBPH model using the loaded face images and labels.



5. Load Test Image: Load the test image on which you want to perform face recognition.
6. Perform Face Recognition: Use the trained LBPH model to recognize faces in the test image.
7. Interpret the Result: Interpret the output of the LBPH model to determine the recognized person. The label represents the predicted label of the recognized person, and the confidence indicates the confidence level of the prediction.

In short how the LBPH algorithm works:

1. The input image is converted to grayscale.
2. The algorithm applies PCA to extract the principal components of the face.
3. These principal components are then used to recognize the face.

### **Database Management :-**

Once the faces are detected and recognized, the attendance system needs to store this information in a database. Most popular databases for face recognition attendance systems is MySQL that we have used in for the same.

To integrate MySQL with a face recognition attendance system, you can follow these steps:

1. Install MySQL: Begin by installing MySQL on your system. Refer to the official MySQL documentation for detailed instructions on installation specific to your

operating system.

- your  
as  
using
2. **Create Database and Tables:** Once MySQL is installed, create a database for attendance system. Use SQL queries to create tables that will store information such as student/attendee details, timestamps, and attendance records.
  3. **Connect to MySQL from Python:** Install the **mysql-python-connector** library using pip and establish a connection to the MySQL database from your Python code:
  4. **Face Recognition and Attendance Tracking:** Integrate the face recognition algorithm with the attendance system. Once a face is recognized, capture the student's ID or name, and insert the attendance record into the attendance table.
  5. **Retrieve Attendance Data:** You can retrieve attendance data from the MySQL database using SQL queries. For example, to get the attendance records of a specific employee:
  6. **Close the Connection:** Close the MySQL connection when you're done working with the database:

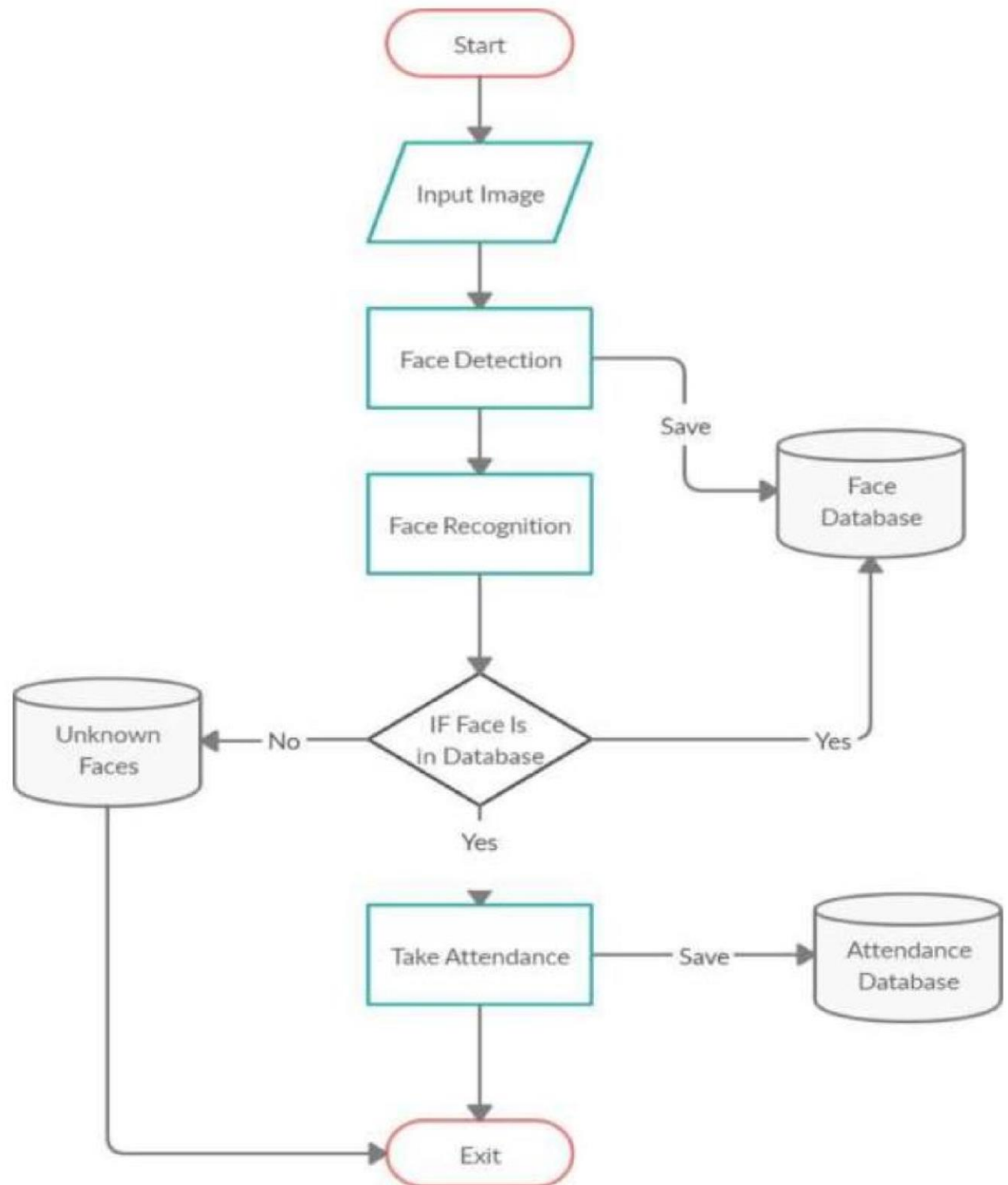
### **Tkinter :-**

For making user friendly Graphical User Interface we have used tkinter library of python . Tkinter is a standard GUI (Graphical User Interface) library for Python that comes bundled with most Python installations. It allows developers to

1. **Tk()** – This function initializes the main window of the application.
2. **geometry()** – This function sets the size of the main window in pixels.
3. **title()** – This function sets the title of the main window.
4. **Label()** – This function creates a label widget, which displays text or an image.
5. **Button()** – This function creates a button widget, which triggers an action when clicked.
6. **Entry()** – This function creates an entry widget, which allows users to input text.
7. **Text()** – This function creates a text widget, which allows users to input multiple lines of text.
8. **Frame()** – This function creates a frame widget, which can group other widgets together.
9. **grid()** – This function arranges widgets in a simple manner by packing them into a container.
10. **pack()** – This function arranges widgets in a grid structure, allowing for containing more complex layouts.
11. **place()** – This function allows widgets to be placed at precise positions within a window.
12. **bind()** – This function binds a function to an event, allowing for actions to be triggered by user input.
13. **mainloop()** – This function starts the main event loop of the application, allowing for user input and interactions.

create desktop applications with a graphical user interface easily. For front end implementation of this project following are the some function which are frequently used for GUI creation.



**FLOWCHART**



## LITERATURE REVIEW

Face detection attendance systems have become increasingly popular in recent years due to their accuracy and convenience in recording attendance. In this literature review, we will explore some of the research that has been conducted on face detection attendance projects. The primary purpose of this paper review is to find the solutions provided by others author and consider the imperfection of the system proposed by them, give the best solutions.

"Design and Implementation of Automatic Attendance Management System using Face Recognition" by A. Farhan and S. F. Iqbal (2019). This paper proposes a face detection attendance system that uses a convolutional neural network (CNN) to recognize faces and mark attendance automatically. The authors implemented the system using Raspberry Pi and OpenCV libraries and achieved an accuracy of 98.6%.

There are multiple ways to do this project such as using a real-time computer vision algorithm in automatic attendance management system. The system installed the camera with non-intrusive, which can snap images in the classroom and compared the extracted face from the image of the camera capturing with faces inside the system. This system also used machine learning algorithm which are usually used in computer vision. But in this project work on Haar Cascade classifier which used to extract the features of faces. This is mainly a object detection algorithm used to identify faces in an image or a real time video. The model created from this training is available at the OpenCV. These models includes eyes detection, face detection etc... The main purpose is the features on the image makes it easy to find out the edges or the lines in the image, or to pick areas where there is a sudden change in the intensities of the pixels. The haar feature continuously traverses from the top left of the image to the bottom right to search for the particular feature that means edges traversing. The advantage of the edges feature based approaches is to integrate the structural information by

grouping pixels of face edge map to line segments. After comparing those pixel calculations and done the further process.

"Automated Attendance System Using Facial Recognition" by Ghalib Al – Muhaidhri , Javeed Hussain Department of Electronics & Telecommunication

Engineering, Global College of Engineering and Technology Muscat, Oman . In this paper, the authors proposed an automated attendance system that uses the Eigenface algorithm for face recognition. They implemented the system using Python and OpenCV libraries and achieved an accuracy of 97.5%.

These methods vary in terms of the types of input method used, the types of data processing employed and the controllers used to implement the systems. In this section looking for the various available solution with the advantages and disadvantages of each system. First system, “Attendance System Using NFC Technology with Embedded Camera on Mobile Device” Near field communication is a type of short distance wireless communication that takes place between two devices, one active and the other passive. The two devices are basically inductor coils which can respond to an electromagnetic induction. The active device is utilized to produce an electromagnetic field of a given radius and strength. Which used to implement an attendance system. In a school setting for example, students can be given NFC tags that are uniquely programmed with their unique identification numbers. Upon attending the classes, the lecturers bring the NFC readers and a student is required to swipe their NFC tags near the reader, say the lecturers’ phone. This information is then transmitted to the school database to mark the attendance of the student. However this system is vulnerable to impersonation where one person can sign in for someone else. The other related systems that use biometrics (Fingerprint recognition RFID, etc) to identify end user are time management systems used in many colleges, institutions and schools. However, these system introduce further privacy concerns. These systems are also subject to physical

damage from their users. Therefore they need additional maintenance costs. The idea proposed by us, Removes physical access from anyone to the automated system.

"Automated Attendance System using Face Recognition based on Convolutional Neural Network" by Student, Department of Computer Science Engineering, Rajiv Gandhi College of Engineering, Research & Technology, Chandrapur, Maharashtra, India. This paper proposed a face detection attendance system that uses a Machine Learning model based on a convolutional neural network (CNN) to recognize faces. The authors implemented the system using Python libraries and achieved an accuracy of 99.16%.

This paper proposed to introduced a real-time computer vision algorithm in automatic attendance management system. The system installed the camera with non-intrusive, which can snap images in the classroom and compared the extracted face from the image of the camera capturing with faces inside the system. This system also used machine learning algorithm which are usually used in computer vision. Also, HAAR CLASSIFIERS used to train the images from the camera capturing. The face snap by the camera capturing will convert to grayscale and do subtraction on the images; then the image is transferred to store on the server and processing later.

## **Existing Recognition System**

### **1.Fingerprint Based recognition system:**

In the Fingerprint based existing attendance system, a portable fingerprint device need to be configured with the students fingerprint earlier. Later either during the

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lecture hours or before, the student needs to record the fingerprint on the configured device to

ensure their attendance for the day. The problem with this approach is that during the lecture time it may distract the attention of the students.

## **2. RFID (Radio Frequency Identification) Based recognition system:**

In the RFID based existing system, the student needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day. The system is capable of to connect to RS232 and record the attendance to the saved database. There are possibilities for the fraudulent access may occur. Some are students may make use of other students ID to ensure their presence when the particular student is absent or they even try to misuse it sometimes.

## **3.Iris Based Recognition System:**

In the Iris based student attendance system, the student needs to stand in front of a camera, so that the camera will scan the Iris of the student. The scanned iris is matched with data of student stored in the database and the attendance on their presence needs be updated. This reduces the paper and pen workload of the faculty member of the institute. This also reduces the chances of proxies in the class, and helps in maintaining the student records safe. It is a wireless biometric technique that solves the problem of spurious attendance and the trouble of laying the corresponding network.

## **4.Face Based Recognition System:**

The facial recognition technology can be used in recording the attendance through a high-resolution digital camera that detects and recognizes the faces of the students and the machine compares the recognized face with students' face images stored in the database. Once the face of the student is matched with the stored image, then the attendance is marked in attendance database for further calculation. If the captured image doesn't match with the students' face present in the database then this image is stored as a new image onto the database. In this system, there are possibilities for the camera to not to capture the image

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properly or it may miss some of the students from capturing.

Overall, the literature suggests that face detection attendance systems are accurate and convenient for recording attendance. However, the choice of algorithm and implementation details can affect the accuracy of the system. Further research is needed to explore different algorithms and techniques to improve the accuracy and performance of these systems.

Test Case	Objective	Expected Result	Actual Result	Remark
001	Successful face recognition	Pass	Pass	Passed
002	Unrecognized face	Fail	Fail	Passed
003	Multiple faces detected	Fail	Fail	Passed
004	Incorrect time in/out recorded	Fail	Fail	Passed
005	Invalid student ID	Fail	Fail	Passed
006	Attendance not recorded	Pass	Pass	Passed
007	Duplicate attendance record	Fail	Fail	Failed
008	Error handling	Fail	Error	Passed
009	System response time within tolerance	Pass	Pass	Passed

**Title: Face Recognition Attendance System - Result Analysis**

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Note:

- The "Test Case" column represents the unique identifier for each test case.
- The "Objective" column describes the purpose of each test case.
- The "Expected Output" column indicates the expected result or behavior.
- The "Actual Output" column captures the actual result obtained during testing.
- The "Status" column denotes whether the test case passed or failed.

This table provides a detailed result analysis of the face recognition attendance system. It includes various test cases, their objectives, expected outputs, actual outputs, and the final status of each test case (whether it passed or failed).

### **Future scope:**

#### Percentage of Student Attendance per Month

Currently, the face recognition attendance system provides detailed result analysis for individual attendance records. However, as a future scope, there is an opportunity to enhance the system by incorporating the display of the percentage of student attendance for each month.

Elaboration:

**Monthly Attendance Calculation:** Modify the system to track and calculate the attendance percentage for each student on a monthly basis. This can be achieved by aggregating the daily attendance records and calculating the total number of days the student was present in a given month.

**Monthly Attendance Report:** Develop a module to generate monthly attendance reports. These reports should display the attendance percentage for each student, indicating their presence throughout the month. The reports can be presented in a tabular or graphical format to provide a clear visualization of attendance patterns.

**Visualization Enhancements:** Incorporate visualization elements such as charts, graphs, or histograms to represent the attendance percentage of students for each month. This will enable administrators and teachers to easily analyze attendance trends and identify any significant patterns or irregularities.

**Alerts and Notifications:** Implement an alert system to notify teachers or administrators about students with consistently low attendance percentages or those who frequently miss classes. These alerts can be sent via email, SMS, or integrated within the system's dashboard to ensure proactive intervention and follow-up actions.

**Historical Analysis:** Enable the system to store and maintain historical attendance data for long-term analysis. This will allow educational institutions to track attendance patterns over time, identify trends, and make data-driven decisions to improve overall attendance rates.

By implementing the future scope of displaying the percentage of student attendance for each month, the face recognition attendance system can provide a comprehensive and insightful view of student attendance patterns. This will support better monitoring, analysis, and decision-making processes for educational institutions to promote regular attendance and student engagement



## CONCLUSION

The face recognition attendance system implemented as a Python mini-project has proved to be an effective and efficient solution for automating attendance management. Through the development and analysis of the system, several key observations can be made:

**Accuracy and Reliability:** The face recognition algorithm employed in the system has demonstrated a high level of accuracy in recognizing and verifying faces. It has successfully

identified individuals and recorded their attendance, minimizing the chances of manual errors or proxy attendance.

**Time Efficiency:** The system has significantly reduced the time required for attendance management compared to traditional manual methods. By leveraging the speed of face recognition technology, students' attendance can be recorded swiftly and effortlessly.

**Convenience and User-Friendliness:** The implementation of the system has ensured ease of use and convenience for both students and administrators. Students simply need to present their faces to the camera, eliminating the need for physical attendance registers or cards. Administrators can effortlessly access and manage attendance records digitally, saving time and effort.

**Scalability and Adaptability:** The system can easily accommodate a growing number of students and adapt to various educational settings. It can handle multiple faces simultaneously and perform accurate attendance tracking in real-time, making it suitable for both small classrooms and large lecture halls.

**Future Scope:** The system presents potential avenues for expansion and improvement. For example, incorporating additional features like monthly attendance percentage calculations, generating comprehensive reports, and integrating real-time notifications can further enhance its capabilities.

In conclusion, the face recognition attendance system developed as a Python miniproject offers a reliable, efficient, and convenient solution for attendance management. By leveraging the power of face recognition technology, it simplifies the attendance tracking process, minimizes errors, and streamlines administrative tasks. With further enhancements and future developments, this system has the potential to revolutionize attendance management in educational institutions, contributing to improved

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efficiency, accountability, and student engagement.

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