

Multi-Class Face Recognition Attendance System

Developer: Anuj Kumar Singh

Tech Stack: Python · Flask · OpenCV · face_recognition · MongoDB · Pandas · NumPy

- currently working on 3 classes
 - 1. BCA
 - 2. MCA
 - 3. BTECH

1 Project Overview

The **Multi-Class Face Recognition Attendance System** is an **AI-powered attendance automation platform** that eliminates manual attendance marking by using **real-time facial recognition, liveness detection, and timetable-based automation**.

It provides a **complete attendance ecosystem** for educational institutions — integrating students, teachers, and administrators through a unified digital system.

Goal: Make attendance fully automatic, accurate, and tamper-proof for schools, colleges, universities and coaching institutions.

2 Problem Statement

Traditional attendance systems in Indian institutions are **manual, slow, and prone to manipulation**. Teachers waste valuable teaching time calling out names, and students often mark proxies for others.

Key Challenges:

- Manual attendance consumes 10–15 minutes per class
- Proxy/fake attendance remains common
- Data inconsistencies when using paper or Excel
- Lack of central monitoring

Our Solution:

A **smart AI attendance platform** that recognizes faces, verifies liveness, records attendance automatically, and stores everything securely — all in real time.

3 Core Objectives

1. Automate attendance marking using **AI-based facial recognition**
2. Verify identity and presence through **eye-blink liveness detection**
3. Ensure accurate teacher verification before starting attendance
4. Manage multiple classes using a **timetable-based automation system**
5. Provide personalized dashboards for Admin, Teacher, and Student
6. Store all attendance data securely in **MongoDB**

7. Send daily attendance summaries to students automatically
 8. Fully screen responsive and mobile screen responsive
-

5 Authentication System

Users can log in either with:

1. Username + Password

User Type	Credentials	Redirects To
Admin	admin / admin123	Admin Dashboard
Teacher	teacher name / teacher123	Teacher Dashboard
Student	student firstname / roll no.	Student Dashboard

2. Facial Recognition with Liveness Detection (blink eye)

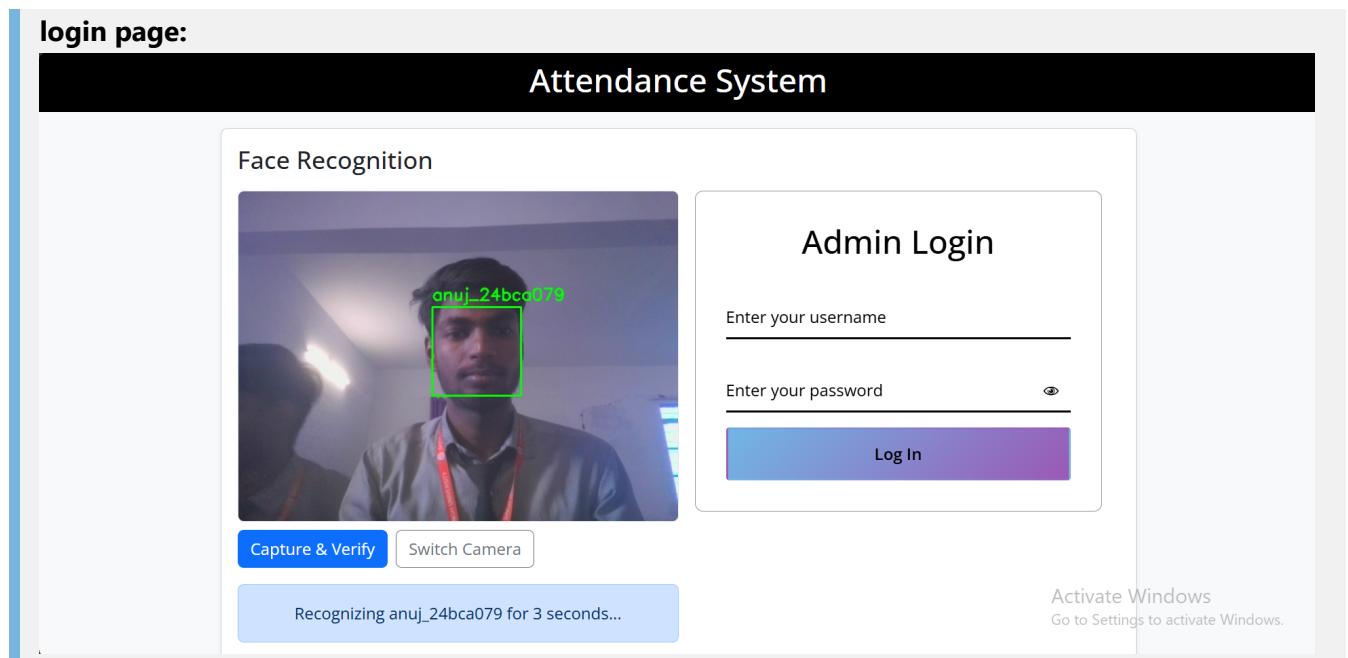
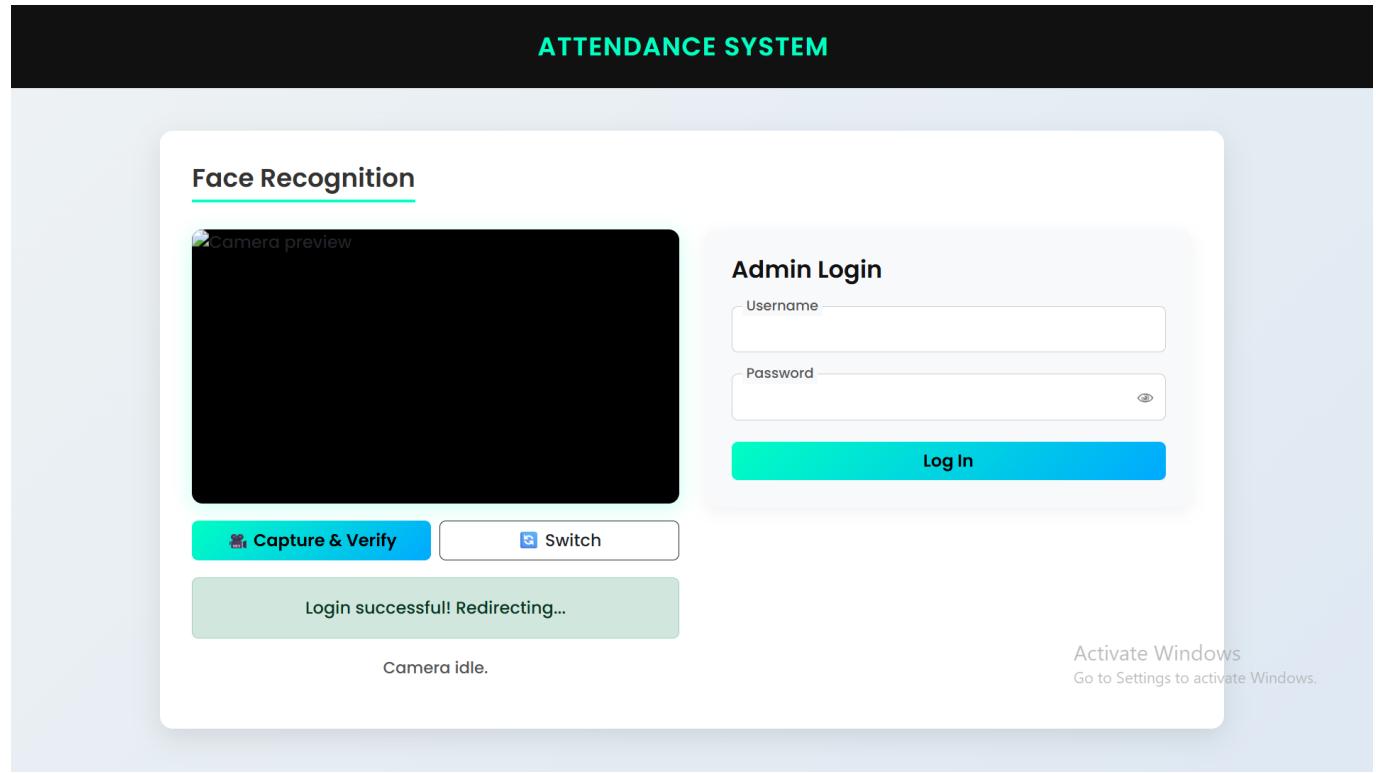
- The system intelligently identifies whether the face belongs to a **teacher**, **student**, or **unknown user**, ensuring secure access.

Key Notes:

- Blink ensures liveness, preventing photos or videos from spoofing login.
 - “Liveness = verifying real human by blink”
- 3–5 second continuous recognition ensures stability (face is consistently identified).

What to do for login through camera

- Stand in front of the camera.
- Wait 3–5 seconds for continuous recognition.
- blink once to verify liveness.
- Redirect:
 - **Teacher** → Teacher Dashboard
 - **Student** → Student Dashboard

login page:**login page --updated version:**

6 Camera Modes

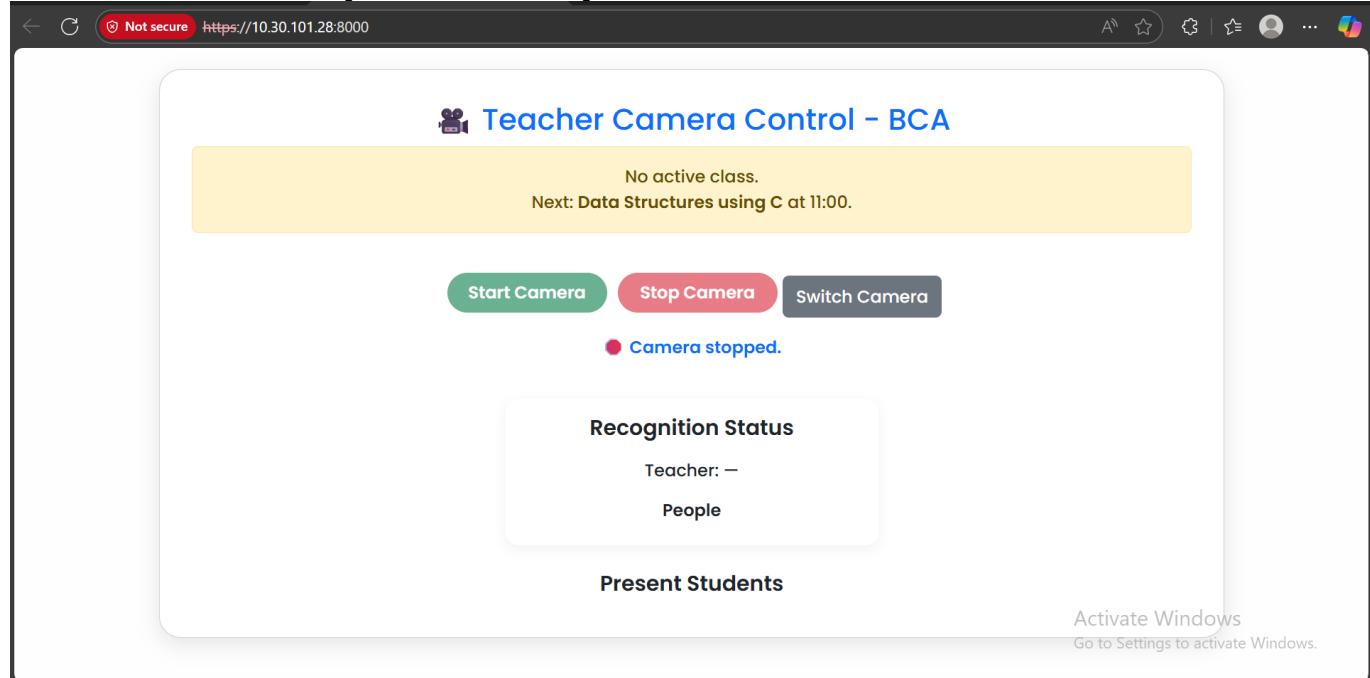
Web Camera Mode (working on class's IP camera)

- Camera starts automatically based on timetable
- Teacher verification: must remain visible for **30 seconds**
- Students must remain visible for **10 minutes** to be marked *Present*
 - time can be changed based on requirement...

Mobile Camera Mode (working on teacher's mobile phone)

- Teacher can **manually start/stop** the camera
- Both teacher and students are recognized within **2 seconds**
- **Eye blink detection** ensures real human verification

Camera Access by mobile --updated version:



Attendance Logic

7 Teacher Verification

Objective: Prevent unauthorized or incorrect attendance initiation.

Algorithm Flow:

1. Detect teacher's face.
 2. Match with the correct teacher assigned in the timetable.
 3. If verified for threshold duration → start attendance session.
- This ensures that only the **right teacher** can initiate attendance for their class.

8 Student Attendance Logic

Goal: Mark students present only after consistent and verified visibility.

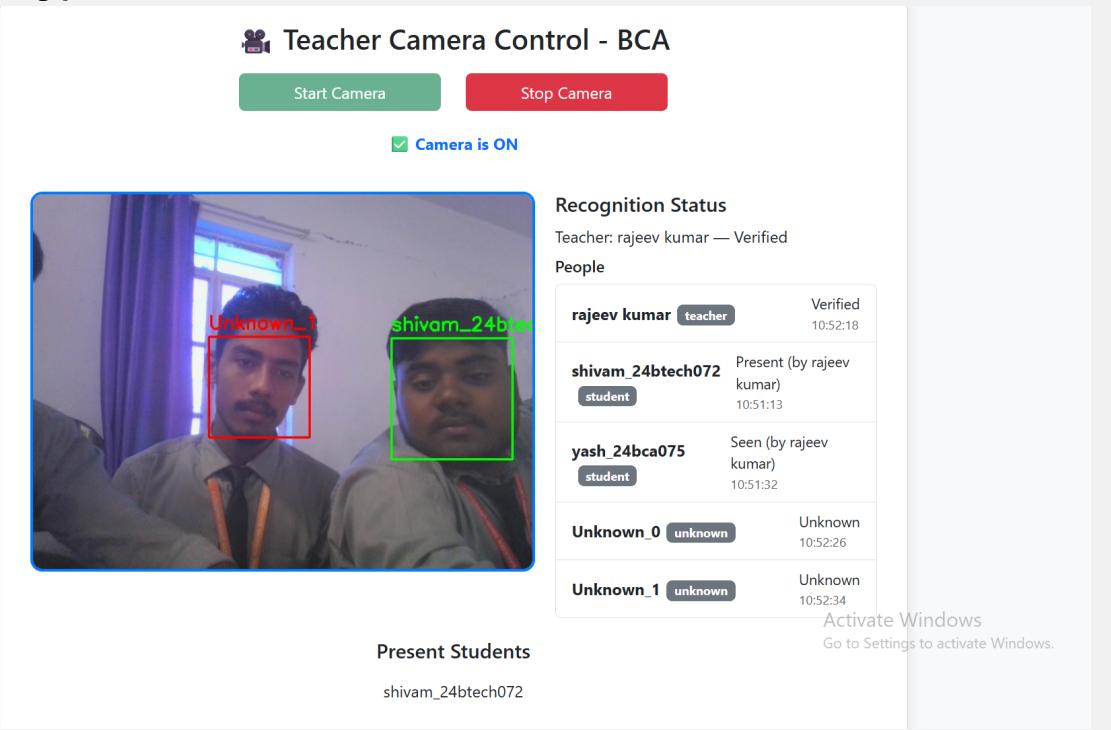
Steps:

1. Recognize student faces from live camera feed.
2. Track visibility duration for each recognized student.
3. If visible for threshold time → mark *Present* in MongoDB.
4. Unknown faces are logged but ignored.

```
_update_recognition_status(name, "student", "Present", verified_by=teacher)
```

- If attendance is taking through mobile camera then eye blink is necessary... otherwise if IP camera is used, then only face recognition.

attendance taking process:



9 Role-Based Dashboards

STUDENT DASHBOARD

Accessible after STUDENT login

- After login, it shows the student's name, roll no. and class
 - Bar graph of attendance**
 - Overall attendance percentage**
 - Date-wise and subject-wise records**
 - records**: daily attendance per subject
 - month_summary**: present/total per month
 - subject_summary**: present/total per subject
- Optional: Filter by a specific month.
- Logout button to return to the login page..

The screenshot shows a web-based student dashboard. At the top, it displays a welcome message "Welcome, Anuj" and the student's details "Roll: 24BCA079 | Class: BCA". A "Logout" button is in the top right corner. Below the header, there are two main sections: "Overall Summary" and "Attendance by Subject".

Overall Summary:

- Total Classes: 7
- Total Present: 4
- Total Absent: 3
- Overall: 57.14%

Subject Summary:

Subject	Status	Count
Computer Architecture & Organization	Good (>70%)	1/1
Front End Development	Satisfactory (50–70%)	2/3
Programming with Java	Good (>70%)	1/1
Programming with Java Laboratory	Bad (<50%)	0/1

Attendance by Subject:

A bar chart titled "Attendance by Subject" showing attendance percentages for various subjects. The Y-axis ranges from 0 to 100. The X-axis lists subjects: Computer Architecture & Organization, Front End Development, Programming with Java, Programming with Java Laboratory, math, and Z-Overall.

Subject	Attendance (%)
Computer Architecture & Organization	~98
Front End Development	~65
Programming with Java	~98
Programming with Java Laboratory	~98
math	N/A
Z-Overall	~58

At the bottom right of the dashboard, there is a message: "Activate Windows Go to Settings to activate Windows."

TEACHER DASHBOARD

Accessible after **TEACHER login**

- After login, it shows the teacher's name
- **Start Attendance**
 - Start or stop the camera depending on the class to take attendance
- **Attendance Reports**
 - View or Download **attendance.txt** files based on class, date, and subject
- **Recorded Sessions**
 - View or download class recordings by class and date
- **Live Streaming**
 - Watch real-time video stream of any classroom in session
- Logout button to return to the login page..

Welcome, Rajeev Kumar!

Manage attendance efficiently and seamlessly

Attendance

Start taking attendance of classes

Start Attendance

Download Attendance

Export attendance in .txt by date

Go

Recorded Videos

View & download class recordings

Go

Live Streaming

Watch live classroom streams

Go

Activate Windows
Go to Settings to activate Windows.

© 2025 Attendance System | Powered by ANUJ

ADMIN DASHBOARD

Accessible after **Admin login:**

- **Manage Teachers**
 - Upload, view, and delete teacher profiles
- **Manage Students**
 - Upload, edit, and delete student images by class
- **Timetable & Subject Setup**
 - Add or edit class-wise timetable
 - Map subjects to teachers for each class
- **Attendance Reports**
 - View or Download `attendance.txt` files based on class, date, and subject
- **Recorded Sessions**
 - View or download class recordings by class and date
- **Live Streaming**
 - Watch real-time video stream of any classroom in session
- Logout button to return to the login page..

The screenshot shows the 'Attendance System' admin dashboard with the following features:

- Manage Teachers:** Upload and update teacher profiles. (Icon: Person at a desk)
- Manage Students:** Upload student images per class. (Icon: Three people)
- Timetable & Subjects:** Manage timetable and subjects for all classes. (Icon: Calendar)
- Download Attendance:** Export attendance in .txt by date. (Icon: Document with a download arrow)
- Recorded Videos:** View & Download class recordings. (Icon: Camera)
- Live Streaming:** Watch live classroom streams. (Icon: Webcam)

At the bottom, there is a copyright notice: © 2025 Attendance System | Powered by ANUJ. On the right, there is a link to 'Activate Windows'.

⌚ Correct Teacher – Attendance Activation Logic

This section explains how the system determines **whether a teacher is authorized** to start attendance for a particular class based on the **current timetable and login credentials**.

1. When the Logged-in Teacher is the Correct Teacher and Class is Active

If the teacher who logs in is the **assigned teacher** for the ongoing class (as per the timetable), and the class is currently **active**,

then the system automatically validates this match.

Once verified, the system opens the **Attendance Page**, allowing the teacher to take attendance using their **mobile camera**.

This ensures that:

- Only the correct teacher can start attendance.
- The class timing matches the schedule.
- Unauthorized teachers cannot access the attendance panel.

The screenshot shows a web browser window with the URL https://10.127.212.28:5000/teacher_dashboard/run_classes. The page title is "CLASS SELECTION". There are three tabs at the top: BCA (blue), BTECH (green, selected), and MCA (pink). A green box contains the following information:

- Status:** You can take attendance.
- Class:** BCA
- Teacher:** You
- Action:** Opening attendance page...

At the bottom right of the page, there is a message: "Activate Windows Go to Settings to activate Windows."

⚠ 2. When the Logged-in Teacher is Not the Assigned Teacher

If the teacher who logs in **is not assigned** to the currently active class (according to the timetable), but there **is** an active class session in progress, the system will **restrict access** to the attendance page.

In this case, a warning message appears informing the teacher that:

"You are not the assigned teacher for the current active class."

This prevents the wrong teacher from mistakenly or intentionally marking attendance for another class.

The screenshot shows a web browser window with the URL https://10.127.212.28:5000/teacher_dashboard/run_classes. The page title is "CLASS SELECTION". There are three tabs at the top: BCA (blue), BTECH (green), and MCA (pink). A red box contains the following information:

- Status:** you are not correct teacher
- Teacher:** Ananya Singh
- Subject:** Front End Development Laboratory
- Time:** 12:40 – 13:41

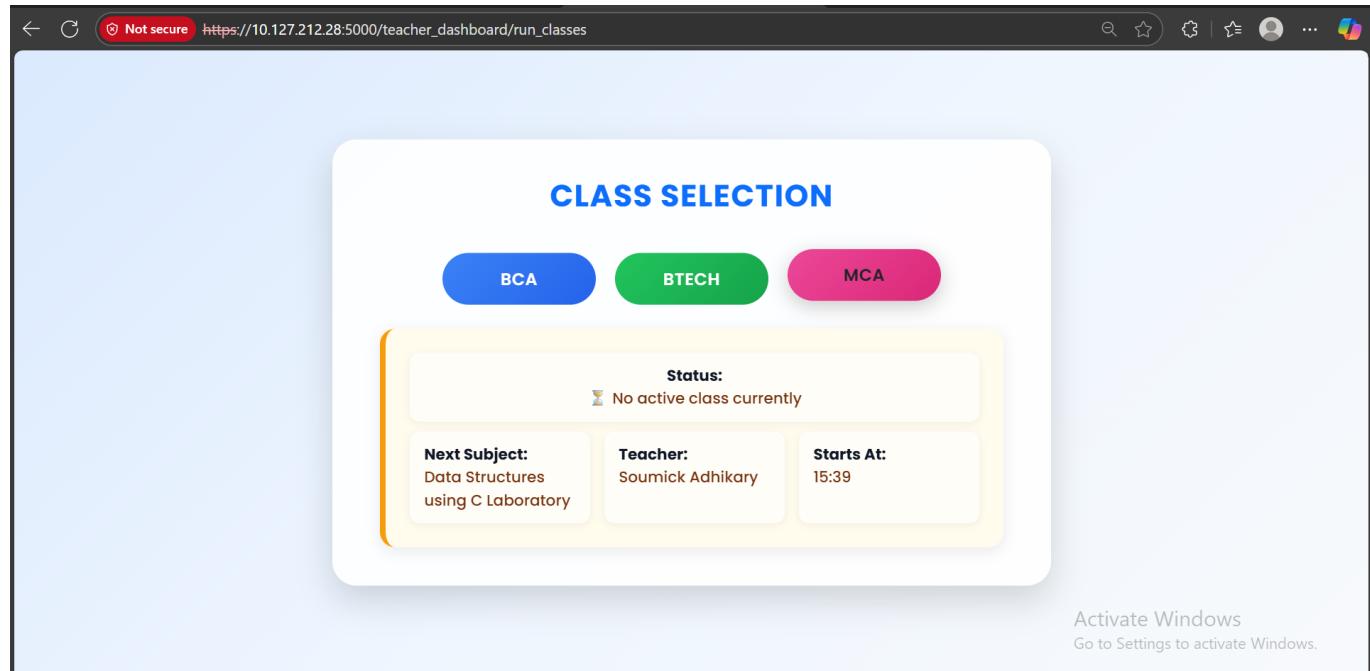
At the bottom right of the page, there is a message: "Activate Windows Go to Settings to activate Windows."

⏸ 3. When No Class is Currently Active

If there is **no active subject or class** scheduled at the current time for the logged-in teacher, the system will not start the attendance process.

Instead, it displays a message indicating that there is **no ongoing class** at the moment.

This avoids unnecessary system activity outside scheduled hours and ensures that attendance can only be taken during the correct class period.



In Summary

Scenario	System Behavior
<input checked="" type="checkbox"/> Correct teacher + Active class	Opens attendance page
<input type="triangle-down"/> Wrong teacher + Active class	Shows warning message
<input type="double-bar"/> No active class	Displays "No active class" message

This logic ensures that attendance can **only** be initiated by the **right teacher**, at the **right time**, for the **right class**, maintaining system accuracy and preventing misuse.

1 | 0 Attendance Decision Engine

The system follows a **state-driven process** that controls attendance flow intelligently.

A. Teacher Detection

1. Detect teacher → check match with timetable.
2. If verified for **TEACHER_DETECTION_THRESHOLD**: start attendance.

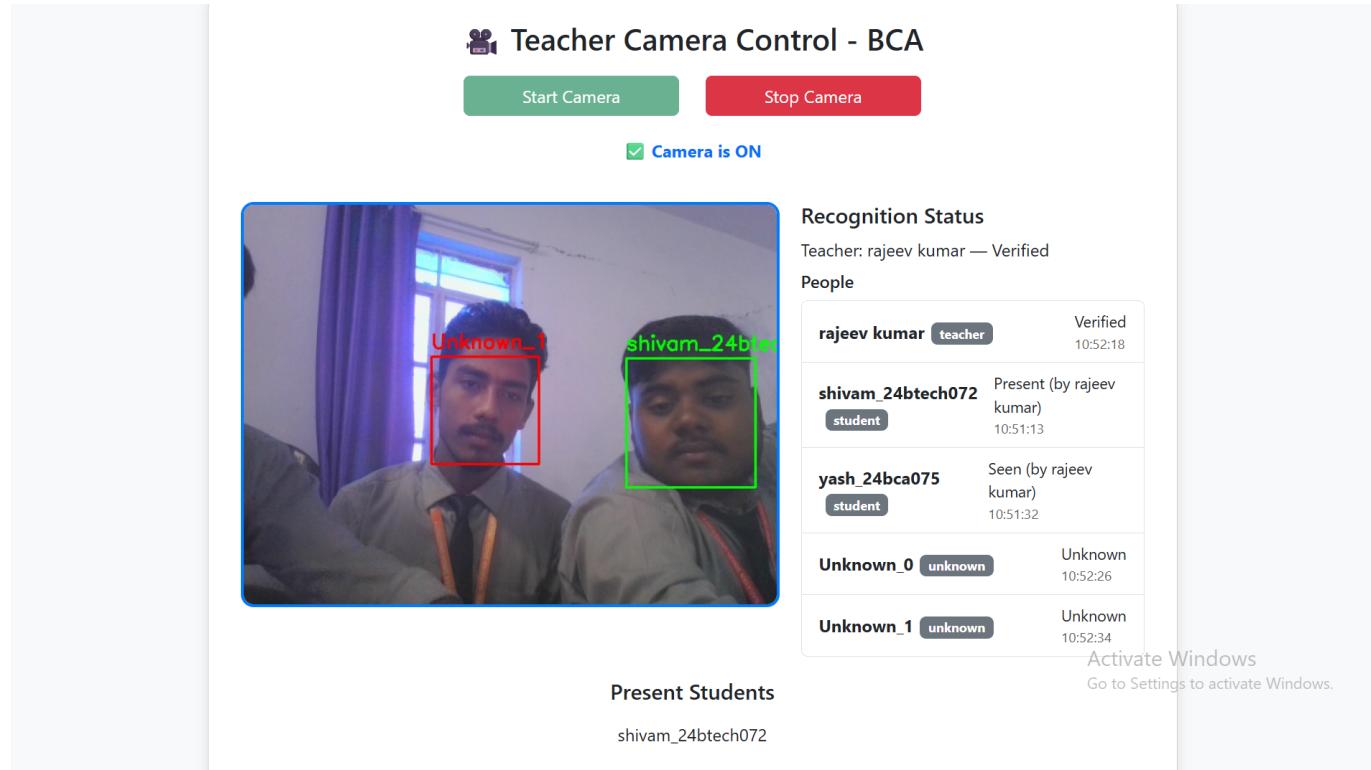
B. Student Recognition

1. Detect face → check encoding match.

2. Track visibility duration (`STUDENT_PRESENCE_THRESHOLD`).
 3. Mark *Present* if conditions met.
- System ensures students are continuously visible for a set time to confirm real attendance.

C. Unknown Face Handling

- Label as "`Unknown_<id>`"
- Log in system, but ignore for attendance.



1 | 1 Student Attendance Notifications

Add a notification feature to inform students about their daily attendance summary.

- it automatically sent attendance notification of each student on fix time that is 5PM daily.

Gmail Search mail

48 of 1,461

Daily Attendance Summary - 20-10-2025

Summarise this email

jasjadsk@gmail.com to me Mon 20 Oct, 17:12 (7 days ago) ☆

Hello Anuj,

Attendance Summary for 20-10-2025:

- Computer Architecture & Organization: Present
- Front End Development: Present
- Programming with Java: Present

Regards,
Your Attendance System

Activate Go to Settings

Reply Forward

Gmail Search mail

Mon, Oct 20, 5:13 PM (7 days ago)

Daily Attendance Summary - 20-10-2025

jasjadsk@gmail.com to me

Hello Neelesh,

Attendance Summary for 20-10-2025:

- Computer Architecture & Organization: Absent
- Front End Development: Present
- Programming with Java: Present

Regards,
Your Attendance System

Activate

Reply Forward

Technical Workflow Summary

```

Start Flask + Main Thread
    |
    --> Load encodings, timetable, subjects
    |
    --> Infinite Loop:
        |
        --> Check current class from timetable
        --> Find assigned teacher
        --> Wait until teacher is recognized for ≥ threshold
            |
            --> attendance_started = True
        --> Start recording video
        --> While within schedule:
            |
            --> Capture frame
    
```

```

    └── Detect + recognize faces
    └── Update recognition_status
    └── Mark students "Present" after threshold time
        └── Write frame to video + stream to Flask
    └── Stop recording when class ends
    └── Save attendance text file
    └── Reset all states

→ Repeat for next class

```

currently working on

Database Connectivity

Integrate a database (MongoDB) to store and manage attendance, user details, and class records efficiently.

Future Enhancements

1. Server for Global Use

Implement a centralized server to enable access and usage of the attendance system globally.

2. Dual Camera Support

Enable the system to use dual cameras simultaneously for better accuracy and coverage during attendance by web camera.

3. AI Analytics Dashboard

Add features like attendance trends, student focus analysis, and engagement scoring.

4. Mobile App Integration

Provide real-time access to attendance and notifications on Android/iOS.

Impact & Scalability

Category	Benefit
Efficiency	Saves 15–20 minutes per class session
Security	Prevents proxy attendance through liveness detection
Scalability	Supports multiple classes, teachers, and institutions
Transparency	Real-time reports accessible to all stakeholders
Data Management	Centralized, cloud-ready MongoDB storage

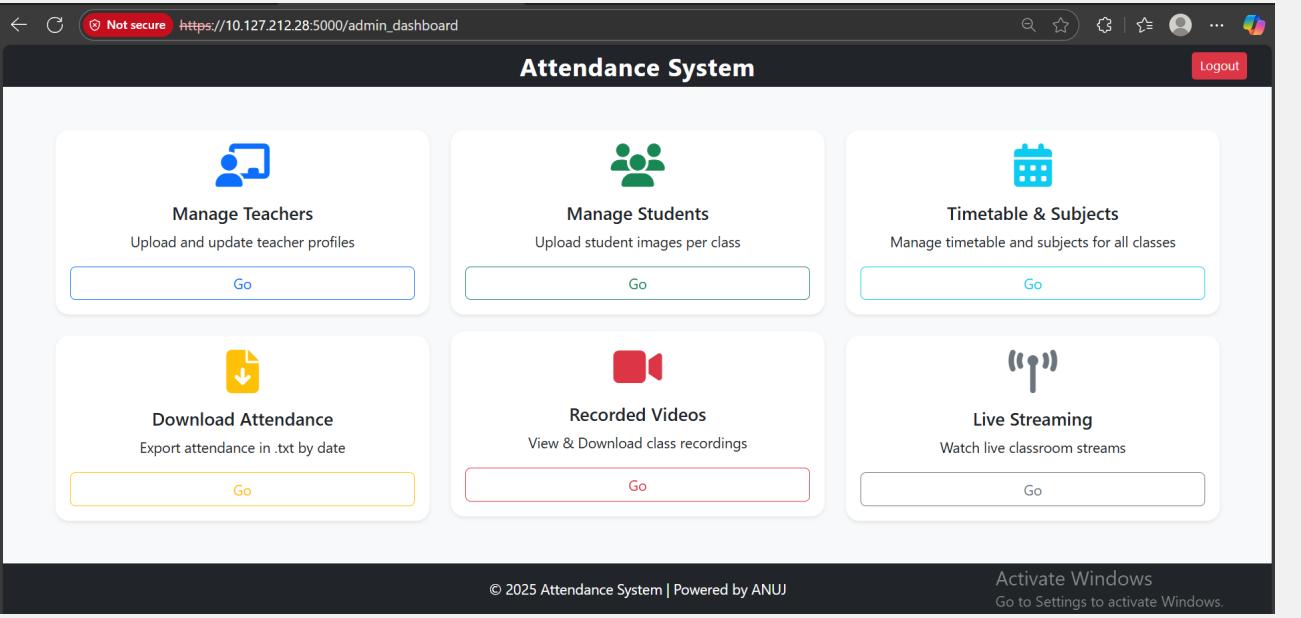
Deployment

Live Demo of only admin part with older version:

🔗 <https://attendance-system-1-5jxp.onrender.com/>

Username: admin
Password: admin123

 **Add image:**



The screenshot shows the 'Attendance System' dashboard with the URL https://10.127.212.28:5000/admin_dashboard. The page features a dark header with the title 'Attendance System' and a 'Logout' button. Below the header are six cards arranged in a 2x3 grid:

- Manage Teachers**: Upload and update teacher profiles. Includes a blue user icon and a 'Go' button.
- Manage Students**: Upload student images per class. Includes a green people icon and a 'Go' button.
- Timetable & Subjects**: Manage timetable and subjects for all classes. Includes a blue calendar icon and a 'Go' button.
- Download Attendance**: Export attendance in .txt by date. Includes a yellow download icon and a 'Go' button.
- Recorded Videos**: View & Download class recordings. Includes a red video camera icon and a 'Go' button.
- Live Streaming**: Watch live classroom streams. Includes a black microphone icon and a 'Go' button.

At the bottom of the dashboard, there is a copyright notice: © 2025 Attendance System | Powered by ANUJ. To the right, there is an 'Activate Windows' section with a link to go to Settings to activate Windows.

17 Conclusion

The **Multi-Class Face Recognition Attendance System** demonstrates how **AI, computer vision, and automation** can revolutionize academic operations.

By combining **real-time facial recognition, intelligent class scheduling, and automated reporting**, this platform provides a **secure, efficient, and scalable** solution for institutions of all sizes.

Contact

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