📚 Attendance System — Face Recognition Based

An AI-powered smart attendance system that uses face recognition to automate student attendance, verify teachers, record classes, and stream the live session via a Flask web app.

✅ How It Works

- 🔷 Load **teacher faces** (for all known teachers).
- 🔷 Load **student faces** based on selected class.
- 🔷 Load **timetable** for the selected class.
- 🔷 Load **teacher's subject mapping** for the class.
- 🔷 Automatically **start or stop camera** based on current timetable slot.
- 🧠 Real-Time Face Detection Logic
  - 🟥 **Unknown person** → Red box
  - 🟦 **Any other teacher** → Blue box
  - ⚪ **Current teacher** → White box
  - 🟩 **Student** → Green box (Marked present if seen for defined threshold)
- 🔷 Detect **current subject's assigned teacher**:
  - If verified teacher is present for a short threshold time, **attendance starts**.
- 🔷 If student seen for given threshold, it make that student present
- 📄 Saves `attendance.txt` for each subject per class, date, and time
- 🔘 Records video of the full session (browser-compatible `.mp4`)

🌐 Web Dashboard Features

Accessible after **Admin or Teacher 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**
    - 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

✅ Features

👦🏫 Teacher Verification

- Detects and verifies the **correct assigned teacher** using face recognition.
- Starts attendance automatically **after a defined time threshold** once the correct teacher is present.

🎓 Student Attendance Tracking

- Detects student faces using `face_recognition`.
- Marks students **"Present"** only if they stay continuously visible for a set duration.
- Ignores unknown or unauthorized individuals.

📅 Timetable-Based Automation

- Automatically matches **current time and day** with the class timetable.
- Fetches the ongoing class's subject, start time, and end time.
- **Automatically starts and stops attendance** and recording *based on schedule*.

📼 Video Recording

- Starts webcam and records the entire session using **OpenCV + FFmpeg**.
- Saves recordings as `.mp4` files in a folder structure:

```
VIDEO_DIR/class_name/DD-MM-YYYY/subject_timestamp.mp4
```

- Uses H.264 encoding and browser-compatible settings (`yuv420p` , `+faststart`).

📝 Attendance Saving

- Creates subject-wise attendance `.txt` files under:

```
ATTENDANCE_DIR/class_name/DD-MM-YYYY/subject.txt
```

- Saves:
  - Class subject
  - Start and end time
  - List of present students

🌐 Live Video Streaming (Web App)

- Streams live annotated webcam feed via browser using Flask.

🧠 Face Recognition System

- Loads **student and teacher face encodings** from pre-trained data.
- Handles multiple known individuals.
- Displays bounding boxes and names with color coding:
  - ⚪ Verified teacher of current subject
  - 🟩 Present student
  - 🟥 Unknown
  - 🟦 Other teacher

🗂️ Directory Management

- Auto-creates folders for attendance, videos, and others files.
- Keeps the project organized by **class name, date, and subject**.

🔒 Login Page (HTML/CSS/JS)

- ✅ Login system for Teachers/Admins
- use **Flask-Login for authentication**.

♻️ Reusable Modular Code

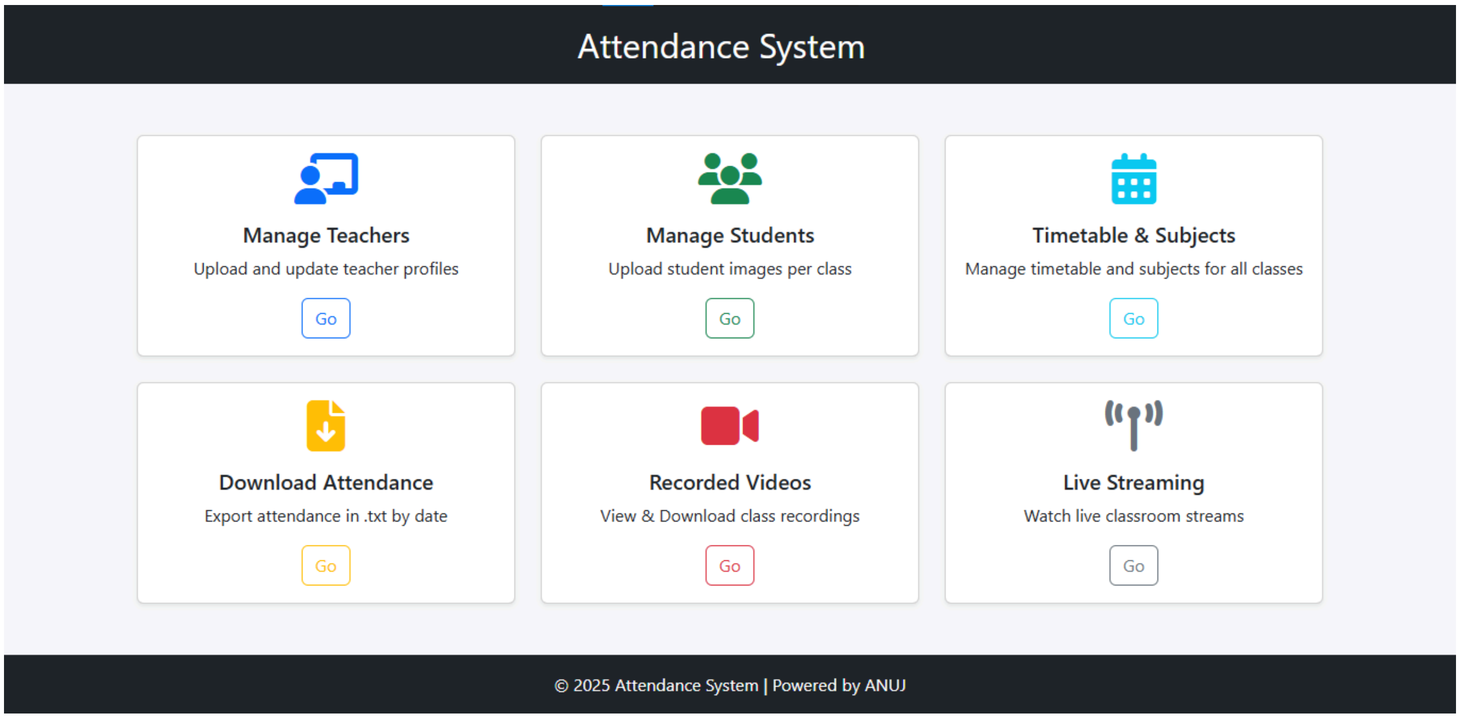
- All major logic (attendance, face detection, timetable, video) is split into **modular `core/` scripts**.

- Code is clean, maintainable, and ready for scaling.

💻 WebApp Dashboard

- ✅ Flask-based Attendance System web app

Section	Description
Manage Teachers	Upload/update teacher profiles with face encodings.
Manage Students	Upload student images class-wise for face recognition.
Upload Timetable	Upload timetable for each class (in JSON format).
Download Attendance	Download `.txt` reports for class attendance.
Recorded Videos	View/download previously recorded class videos.
Live Streaming	Watch real-time classroom streams from browser.


Attendance System

Manage Teachers
Upload and update teacher profiles
Go

Manage Students
Upload student images per class
Go

Timetable & Subjects
Manage timetable and subjects for all classes
Go

Download Attendance
Export attendance in .txt by date
Go

Recorded Videos
View & Download class recordings
Go

Live Streaming
Watch live classroom streams
Go

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⚙️ Technologies Used

- Python
- Flask
- OpenCV
- face_recognition (dlib)
- FFmpeg
- HTML/CSS/JS & bootstrap (Login & UI)

📁 Folder Structure

```
ATTENDANCE_SYSTEM/
│
├── core/                      # Core functional scripts
│   ├── attendance_saver.py
│   ├── face_detector.py
│   ├── face_encoder.py
│   ├── main.py
│   ├── teacher_subject_loader.py
│   ├── timetable_loader.py
│   └── video_recorder.py
│
├── encodings_faces/          # Pre-computed face encodings
│   ├── student_bca_encodings.pkl
│   ├── student_mca_encodings.pkl
│   └── teacher_encodings.pkl
│
├── static/                   # Static assets and outputs
│   ├── attendance/           # Saved attendance TXT files
│   ├── recorded_videos/      # Saved session videos
│   ├── student_images/       # Uploaded student photos
│   ├── teacher_images/       # Uploaded teacher photos
│   ├── teacher_subjects/     # Mapping of teachers to subjects
│   └── timetables/           # Class-wise timetables
│
├── templates/                # HTML (if Flask or Jinja used)
│
├── app.py                    # Main application (raw)
├── config.py                 # Configuration variables
├── mp4_for_browser.py        # Video processing
├── encoding_faces.py         # Utility to encode face datasets
├── mongodb.py                # MongoDB integration script
├── requirements.txt          # Required Python libraries
├── run_bca.py                # Run for BCA attendance and live streaming
├── run_btech.py              # Run for B.Tech attendance and live streaming
├── run_mca.py                # Run for MCA attendance and live streaming
├── server.py                 # Server or backend logic
├── run_server.py             # run the server
├── next_step.txt             # Notes/plans for future
```

🚀 How to Run

✅ Requirements

- Python 3.8+
- Required packages:

  ```
  pip install -r requirements.txt
  ```

🧪 Initial Setup

1. Create necessary folders:

   ```
   static/attendance/
   static/recorded_videos/
   static/student_images/
   static/teacher_images/
   static/timetables/
   static/teacher_subjects/
   encodings_faces/
   ```

2. upload timetable json file for each classes:

   ```
   - static\timetables\bca_timetable.json
   - static\timetables\mca_timetable.json
   ```

3. upload teacher's subject json file for each classes:

   ```
   - static\teacher_subjects\bca_subjects.json
   ```

4. Upload images:

   ```
   - Place student and teacher images in respective folders.
   - Ensure student images are meaningful (e.g., `24BCA101_Rahul.jpg`)
   - Ensure teacher's image with theirs names
   ```

5. Generate Encodings:

   ```
   python encoding_faces.py
   ```

6. Run the server:

```
python run_server.py
```

7. run the class:

```
python run_bca.py
python run_mca.py
python run_btech.py
```

8. Optional: modify config.py:

```
- change folder locations
- update threshold time in seconds for teacher or student detection
- change login user & password
- change camera for each class
- change live streaming IP address or URL
```

📥 Output Examples

- **Attendance txt:**

```
/static/attendance\bca\15-06-2025\Computer Architecture & Organization.txt
Class: Computer Architecture & Organization
Time: 18:18-18:19
Present:
Anuj
```

- **Saved Video File:**

```
/static\recorded_videos\bca\15-06-2025/
  Computer Architecture & Organization_20250615_180842.mp4
```

- **live streaming of classes**

📈 Future Improvements

- ✅ Add support for dual camera setup
- 🔄 Merge multiple run scripts into one with dynamic class selection
- 📧 Send email/SMS alerts to absentees
- 🧠 Use MongoDB for central attendance storage and querying

👨‍💻 Author

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