ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

DAY – 23

Date: Jul 23, 2025

PROJECT: Face Recognition-Based Attendance System

Results

Encoding of Known Faces

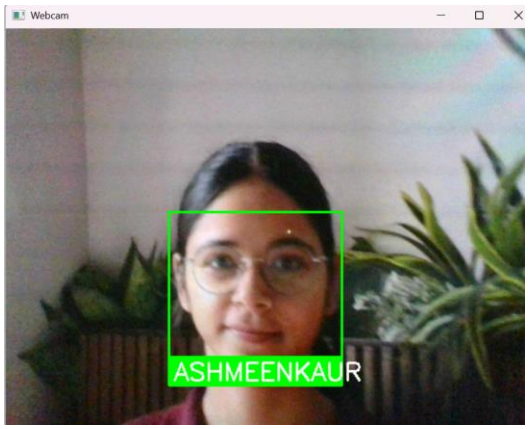
Images of individuals were stored in a designated folder named dataset. Each image was named after the person it represents (e.g., john.jpg, emma.png). When the system is launched, it automatically reads all images from this folder and encodes each face using the face_recognition library. This encoding process generates a unique 128-dimensional facial embedding for each person, which is later used for accurate comparison and identification during real-time recognition.

```
  from pkg_resources import resource_filename
Encoding known faces...
Encoding Complete.
```

Real-Time Face Detection and Recognition

Upon activation of the webcam through the OpenCV library, the system begins scanning live video frames for faces. Detected faces are compared with the previously encoded known faces. If a match is found within a set distance threshold, the individual's name is displayed on the screen with a green bounding box. If no match is found, the face is classified as "Unknown" and displayed with a red bounding box.

- **Recognized Faces:** Displayed with a green rectangle and the person’s name.



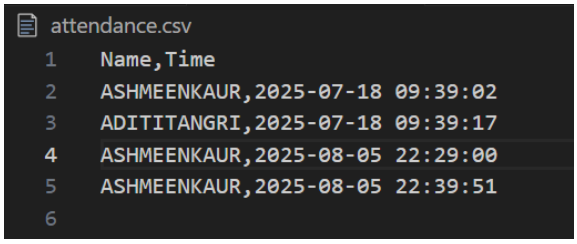
- **Unknown Faces:** Highlighted with a red rectangle and labeled "Unknown".

This visual distinction helps users easily verify whether they were successfully recognized.

Attendance Marking

Once a known face is recognized, the system logs the person's name along with the current timestamp into a CSV file.

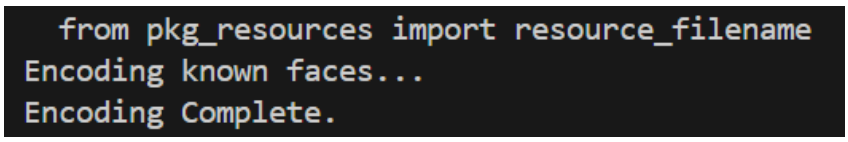
To prevent duplicate entries, the system checks whether the person has already been marked in the ongoing session. If so, it skips re-logging and displays a console message confirming the individual has already been marked.



User Feedback During Execution

The system provides continuous real-time feedback to keep the user informed of the internal processes and decisions. Examples include:

- **Initial Setup:** Displays "Encoding known faces..." and "Encoding complete." to confirm successful dataset processing.



- **Marking Attendance:** Prints the name and timestamp when a new person is marked.

- **Already Marked Individuals:** Outputs messages such as "JOHN is already marked." to prevent duplication.

```
ASHMEENKAUR marked at 2025-08-06 09:27:23
ASHMEENKAUR is already marked in this session.
```

- **Unknown Faces:** Shows "Unknown face detected. Not marking attendance." to inform the user of non-recognition.

```
Unknown face detected. Not marking attendance.
Unknown face detected. Not marking attendance.
```

- **Exit Notification:** On pressing ‘q’, the system exits cleanly and releases the webcam resource, confirming shutdown.

Overall System Experience

- **Performance**: The system was able to recognize and process faces at near real-time speeds with minimal latency.
- **Accuracy**: Accurate identification was achieved for faces that were clearly visible, frontal, and well-lit. Recognition reliability dropped under poor lighting or partially visible faces.
- **Limitations:**
  - Cannot differentiate between identical twins unless uniquely trained images are used.
  - Accuracy depends on the quality of dataset images and live video conditions.
- **Scalability**: Easily extendable. New individuals can be added to the system by placing additional labeled images into the dataset/ folder. No code modification is needed.