

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

DAY – 21

21 July 2025

PROJECT : Face Recognition-Based Attendance System

Tools and Technologies Used

Programming Language

- **Python:**
Python was selected as the main programming language because of its simplicity, readability, and strong support for artificial intelligence and computer vision applications. Its vast ecosystem of libraries allows quick development and testing of face recognition systems.

Libraries and Frameworks

- **OpenCV (Open Source Computer Vision Library):**
Used for capturing real-time video from the webcam and performing image processing tasks such as frame resizing, color conversion (BGR to RGB), and drawing rectangles and labels on detected faces.
- **face_recognition:**
A powerful library built on top of dlib, used for detecting faces, extracting 128-dimensional facial feature encodings, and comparing them to identify known individuals accurately.
- **NumPy:**
Utilized for efficient handling of arrays and numerical data, especially for managing facial encodings and calculating distances between them to match identities.
- **Pandas:**
Used to manage attendance data in CSV format. It simplifies reading, writing, and appending attendance records efficiently with timestamps.
- **OS Module:**
Python's built-in os module was used to interact with the file system—reading images from the folder, verifying paths, and listing files for processing.
- **Datetime Module:**
Used to generate timestamps (date and time) when marking attendance for each recognized face.

Hardware Used

- Webcam:
A standard USB webcam was used to capture a live video stream. It continuously feeds video frames to the system for face detection and recognition in real time.

Development Environment

- Visual Studio Code (VS Code):
The project was developed using VS Code, a powerful and lightweight Python IDE that offers debugging tools, syntax highlighting, and project organization features, making development faster and more manageable.

Data Storage Format

- CSV (Comma-Separated Values):
Attendance records are stored in CSV files, a simple and readable text-based format for tabular data. This format allows easy viewing, editing, and integration with other tools like Excel or Google Sheets.