Smart Attendance System – Complete Setup & Troubleshooting Guide

This document explains, step by step, how the Smart Attendance System using Face Recognition was built, configured, debugged, and deployed. This guide is intended for future reference so the system can be re-built or updated without confusion.

1. Project Environment Setup

- Python virtual environment created using venv.
- Activated environment before installing libraries.
- Used OpenCV, DeepFace, NumPy, gspread, and google-auth.

2. User Enrollment Module

- User provides name, age, phone, and position.
- Camera opens automatically for face verification.
- Multiple face images captured from different angles.
- Images stored locally under face_db directory.

3. Face Embedding Generation

- DeepFace (FaceNet model) used to generate embeddings.
- Face images converted into numerical vectors.
- Embeddings stored as .pkl files.

4. Real-Time Face Recognition

- Webcam captures live video feed.
- Face detected using Haar Cascade.
- Live embedding compared with stored embeddings.
- Distance threshold used to identify the person.

5. Attendance Logic

- Attendance marked only once per day in CSV.
- Duplicate attendance blocked locally.
- Attendance synced to Google Sheet even if already marked.
- Camera auto-closes after recognition.

6. Google Sheets Integration

- Google Sheets API enabled.
- Google Drive API enabled.
- Service Account created in Google Cloud Console.
- credentials.json downloaded and kept private.
- Google Sheet shared with service account as Editor.

7. Common Errors & Solutions

- 403 Insufficient Scopes → Added Drive + Sheets scopes.
- Drive API not enabled → Enabled Google Drive API.
- Duplicate attendance issue → Logic modified for sheet sync.

8. Git & Security Best Practices

- credentials.json excluded using .gitignore.
- Face images and embeddings not pushed to GitHub.
- Clean commits with documentation.

This document ensures that the Smart Attendance System can be rebuilt, debugged, or extended in the future without repeating setup mistakes.