Face Attendance System – Documentation

Model and Approach Used
The system uses a face recognition–based biometric approach implemented with the face_recognition library, which internally relies on dlib's deep metric learning model. Each detected face is converted into a 128-dimensional facial encoding. Live camera encodings are compared with stored encodings using Euclidean distance to identify individuals. A basic liveness (spoof) detection mechanism based on motion analysis is applied to block static image attacks.

Training Process
No traditional machine learning training is performed. During the registration phase, multiple face images of a user are captured using a webcam. Facial encodings are extracted from these images and stored locally. These stored encodings act as reference data for future recognition, eliminating the need for retraining.

Accuracy Expectations
Under good lighting and frontal face conditions, the system achieves approximately 90–95% accuracy. Accuracy may vary depending on camera quality, lighting conditions, and the number of face samples captured during registration. Recognition performance improves with multiple samples per user and stable lighting.

Known Failure Cases
The system may face challenges in low-light environments, with heavy face occlusions such as masks, extreme head angles, or when distinguishing between very similar-looking individuals. Advanced spoof attempts using high-quality video playback may also bypass the basic liveness detection mechanism.