



Facial Recognition System



EURON

✂ Facial Recognition System

The system consists of **five key layers**:

- 1. Data Acquisition & Preprocessing Layer**
 - Captures images/videos from cameras or uploads.
 - Normalizes & preprocesses (resize, grayscale, denoise).
 - Converts frames for feature extraction.
- 2. Feature Extraction & Embedding Layer**
 - Detects faces in images using MTCNN/Haar Cascade.
 - Extracts embeddings using Deep Learning models (FaceNet, ArcFace, DeepFace).
 - Generates 128D-512D vector representations for unique identity.
- 3. Database & Indexing Layer**
 - Stores embeddings in a database for matching (PostgreSQL, MongoDB, or Vector DB like FAISS, Pinecone).
 - Optimizes query performance with indexing (LSH, KD-Trees).
- 4. Recognition & Matching Layer**
 - Compares real-time embeddings with stored ones using similarity metrics (Cosine Similarity, Euclidean Distance).
 - Identifies match based on a **threshold score**.
- 5. Application & Decision Layer**
 - Integrates with APIs, security systems, access control, etc.
 - Logs recognition events & triggers alerts if necessary.
 - Provides real-time dashboard (Streamlit, Flask, FastAPI).