

# Building a Face Recognition Demonstrator

Responsible AI for Biometrics Group

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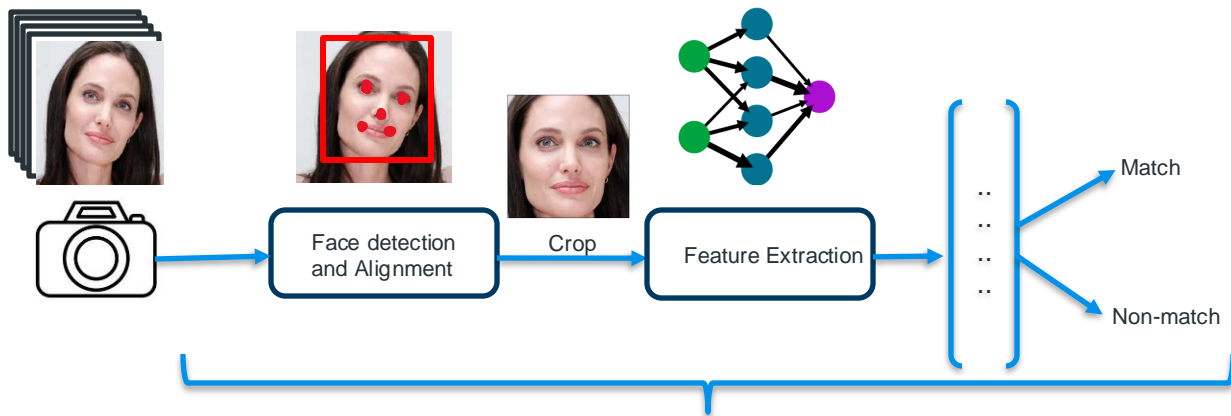
Rouqaiyah Al-Refai



Winter Semester 2024/25



# Continuous Face Recognition



- The process is repeated continuously for each new frame in the video stream.



# Face Image Pre-processing

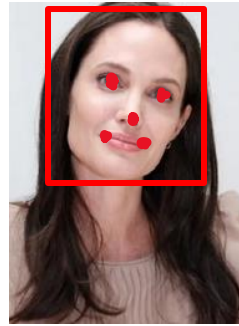
Face detection and Alignment:



Capture image



Detect face



Detect Landmarks



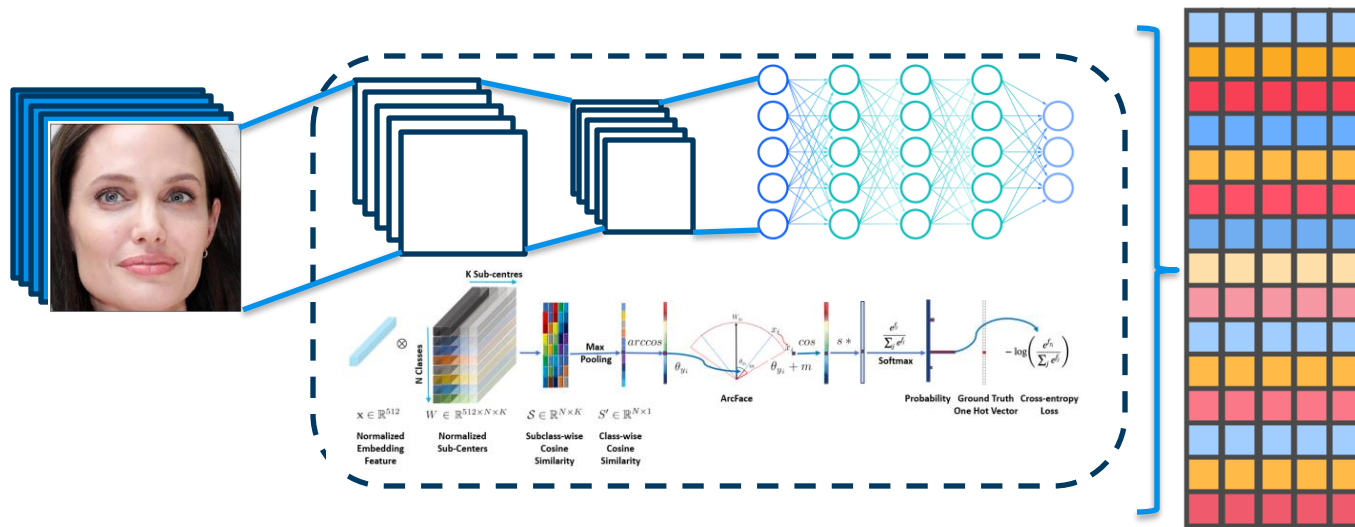
Align face



Crop face image



# Face Feature Extraction

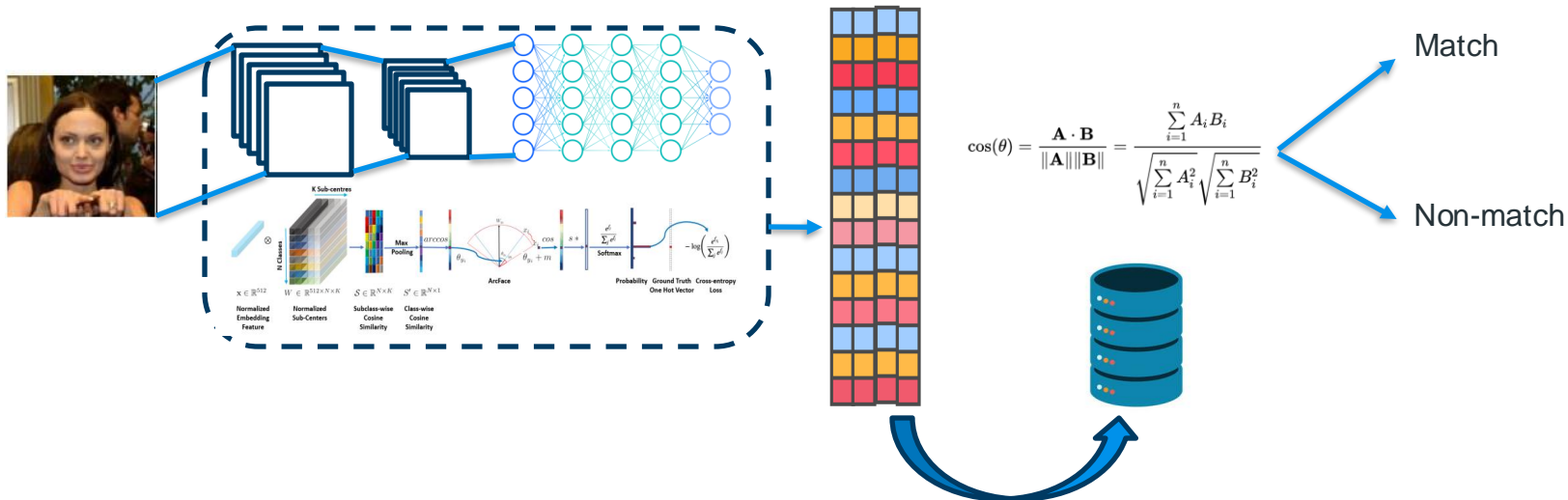


face templates or embeddings

Generated representations are either:

- Stored in the database as part of enrolment.
- Used for comparison.

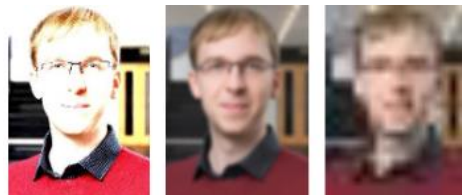
# Face Matching



- Recognize or verify faces by comparing embeddings with template stored in the database.

# Face Image Quality

- Face recognition performance tends to degrade in unconstrained environments.



- **Biometric Image Quality:** It is used to estimate the suitability (utility) of face images for face recognition.



- **Advantages:**
  - More robust enrolment process.
  - The performance of face recognition is driven by the quality of the samples.

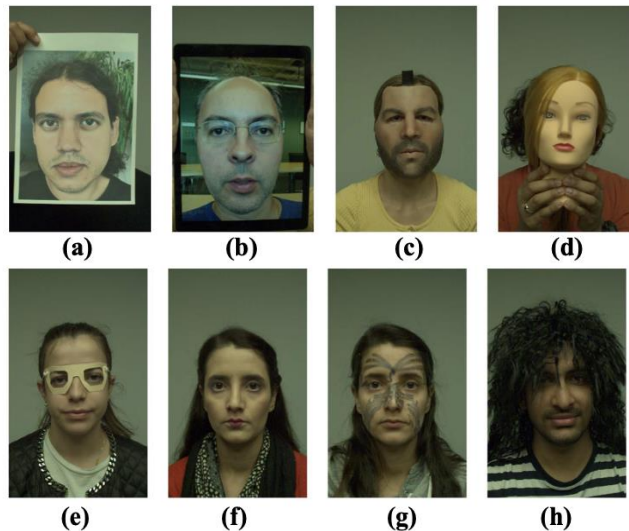
# Face Presentation Attack Detection

**Presentation attacks:** attempts to deceive a biometric authentication system by presenting a fake or manipulated biometric sample to the sensor.

- Attackers attempt to spoof the system at the capture time.

**Presentation attack detection:** techniques used to detect and prevent presentation attacks on biometric systems.

- It is a binary process of deciding whether a sample is bona fide or an imposter.



# Project Group

## Main Goal:

Create a demonstrator that showcases real-time face recognition technology by deploying and integrating the essential modules of an end-to-end face recognition system. This includes face detection, alignment, feature extraction, identity matching, quality assessment, and presentation attack detection.

## Key components:



Real-Time Frame  
Capture



Face Detection and  
Processing



Feature Extraction



Face Enrolment



Identity verification



Quality Assessment



Spoofing Prevention





# Project Details

## Project Tasks:

- Setting up the hardware, software libraries and tools (e.g., OpenCV, Dlib, TensorFlow/PyTorch).
- Designing and Building the FaceDemo user interface.
- Deploying a module to continuously capture frames from the live video feed.
- Implement face detection and alignment algorithms (e.g., using Haar cascades, MTCNN).
- Integrate a model to perform face matching against database of known individuals.
- Implement methods to evaluate the quality of face images.
- Integrate techniques to detect and prevent spoofing attacks.
- Test the different use-cases of the system and evaluate its robustness.



# Project further Information

## What do you need:

- Interest in **biometrics**, motivation to work and enthusiasm.
- Programming skills preferably in **python**.
- Knowledge in **machine learning / deep learning**.
- Knowledge in libraries such as **OpenCV, pytorch, tensorflow** is a plus.



## How can I know more, see the following:

- Kaipeng Zhang, Zhanpeng Zhang, Zhifeng Li, and Yu Qiao. Joint face detection and alignment using multitask cascaded convolutional networks. SPL, 23(10), 2016
- P. Terhörst, J. N. Kolf, N. Damer, F. Kirchbuchner, and A. Kuijper. 2020. SER-FIQ: Unsupervised estimation of face image quality based on stochastic embedding robustness. In Proceedings of the Conference on Computer Vision and Pattern Recognition (CVPR) (Mar. 2020). arXiv:2003.09373.
- Philipp Terhörst, Malte Ihlefeld, Marco Huber, Naser Damer, Florian Kirchbuchner, Kiran Raja, and Arjan Kuijper. Qmag-face: Simple and accurate quality-aware face recognition. In Winter Conference on Applications of Computer Vision (WACV), pages 3484–3494, 2023.

# Team and Contact



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