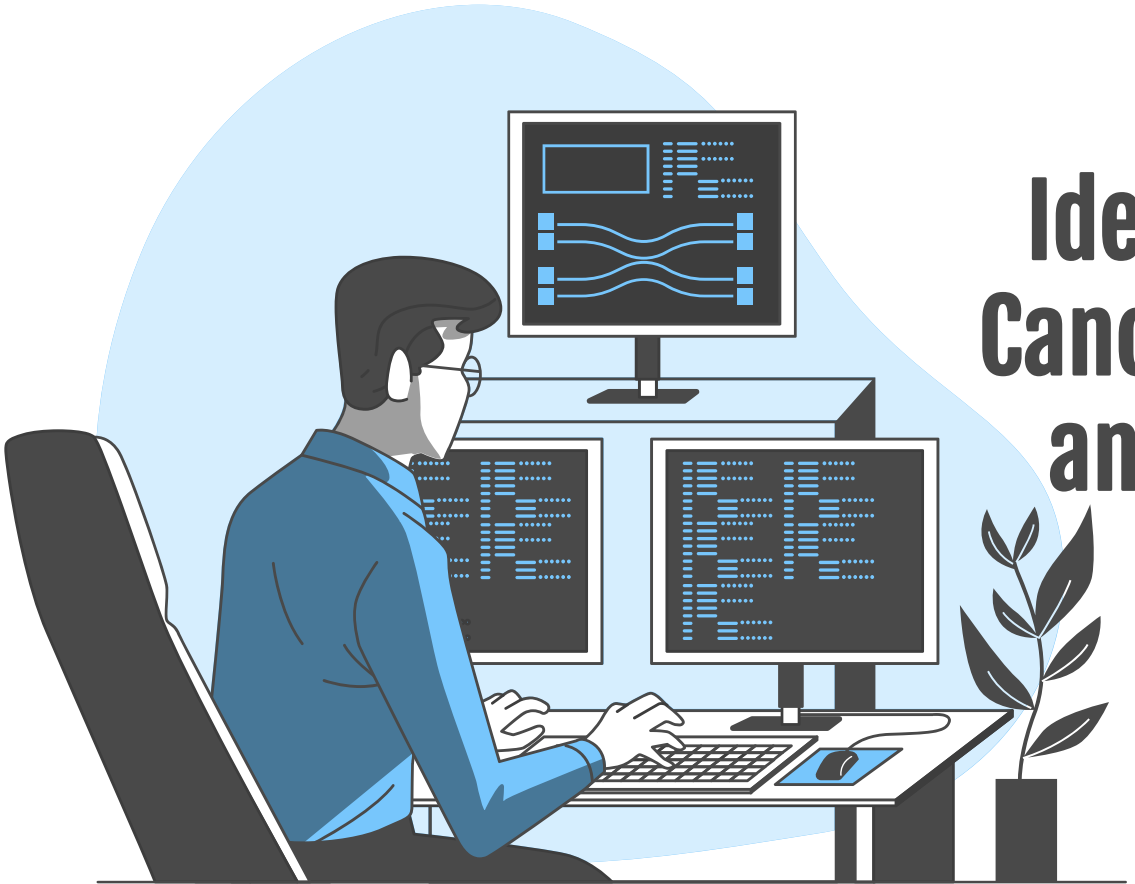

# Identification using Cancelable Biometrics and Deep Learning

## Presented By

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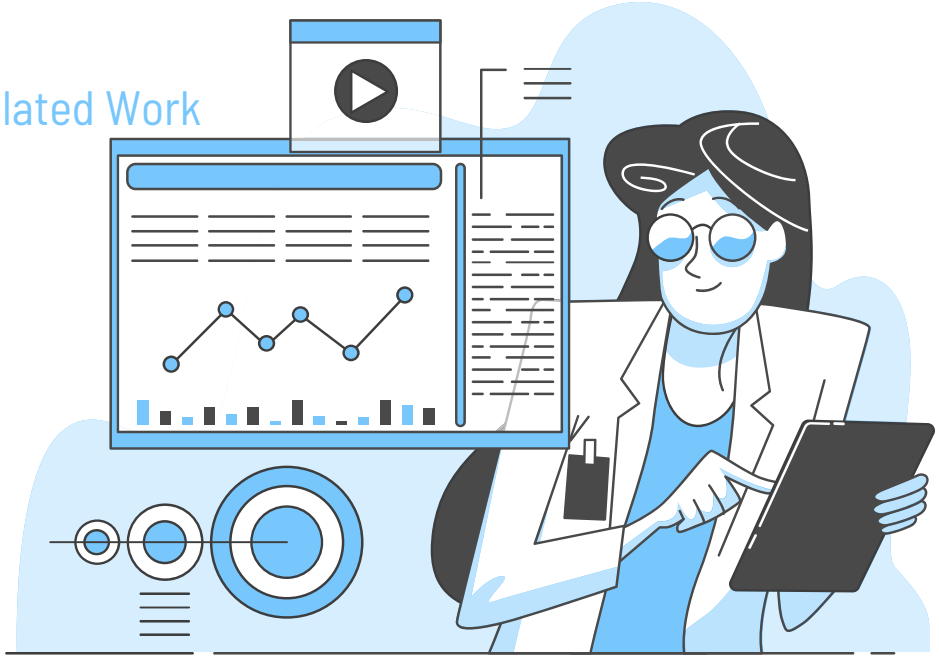
Sara Aldawsari
Deema Almalki
Hatoon Abdullatif
Wed Alotaibi

# Table of Contents





# 01

# Introduction

# Introduction contains a :

- Problem Statement & Significance

...

- Proposed Solution & Objectives

...

- Project Domain & Limitations

# Introduction

Personal identification can be achieved using biometrics recognition which has emerged as a reliable approach for automated human identification and is attracting significant attention from the researchers in multifaceted disciplines.
we propose the development of a reliable personal identification system which is based on cancelable biometrics and distributed deep learning.

# Problem Statement & Significance

The concept of the biometric is the automated recognition of human individuals based on their biological and behavioral traits. Because sometimes People forgetting their passwords all the time even their personal identifications.

If they lost it and it takes space and sometimes you will have to pay for you belongs to get it back or to get new ones.

To Secure personal identification and biomatrices: fingerprint and face ID are safer than password.
It’s not easy to hack and if it hacked, we can cancelable Biometrics and change the encryption of the biometric.

# Problem Statement & Significance

We will use Personal identification using cancelable biometrics and distributed deep learning to solve this problem by using the technic face identification (face id) to make people lives easer so they don’t have to remember every password they have and their personal identification will be more secure and safe because of cancelable biometric it has two category biometrics authentication compares data for the person's characteristics to that person's biometric "template" to determine resemblance .
The data stored is then compared to the person's biometric data to be authenticated.

# Proposed Solution & Objective

A program that contains the personal information such as (id, license, bank account pin password) so they won't forget their password or lost their credit card, id and license anymore and in order to open the program you will have to use your face

- Aims & Goals:
  - We will be learning more about biometrics and new programming langue
  - attach people information in one program that will be secured

# Project Domain & Limitation

This program will apply only on Saudi Arabia, and it will be available for all age ranges.

# 02

# Background Information & Related Work

# Background Information & Related Work contains a :

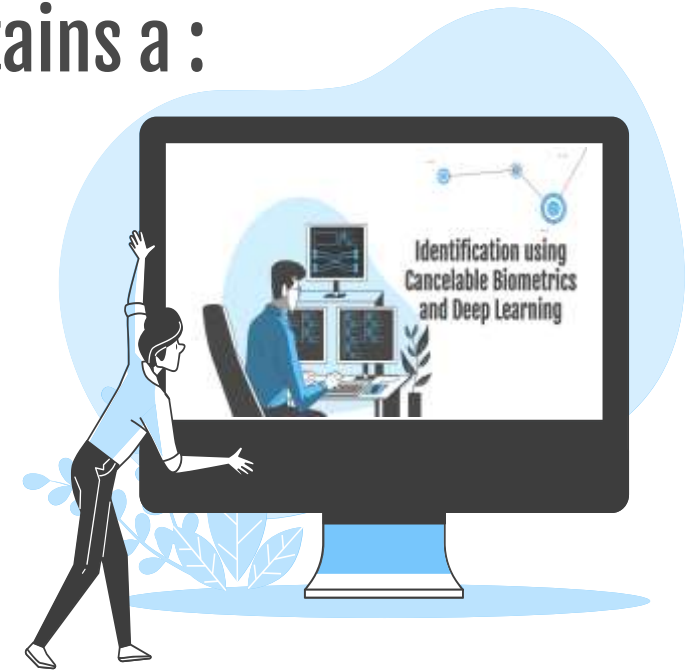
- Background Information

  ...

- Related Work

  ...

- Proposed & Similar System Compairsonsn



# Physical Biometrics

Physical biometrics refers to physiological features on the human body that can serve as identification, analyze data such as facial features, eye structure (retina or iris), finger parameters. Physical biometrics have become widespread, for example, access control to smartphones and laptops.

# Physical measurements

- **face recognition** technique is applications that identify or verify a person automatically from a digital image or a video frame from a video source.

Facial metric technology relies on the manufacture of the specific face recognition feature, such as the position of eyes, nose and mouth, and distances between these features.

...

- **Iris recognition** or iris scanning is the process of using visible and near-infrared light to take a high-contrast photograph of a person's iris

...

- **Fingerprint recognition** allows a person to be verified or identified through the analysis and comparison of his or her finger dermal ridges.

...

# Behavioral Biometrics

Is the field of study related to the measure of uniquely identifying and measurable patterns in human activities in a person so the algorithm can identify the person by their behavioral pattern.

# Behavioral measurements

- **The signature recognition** is based on the dynamics of making the signature, rather than a direct comparison of the signature itself afterwards. The dynamic is measured as a mean of the pressure, direction, acceleration and the length of the strikes, and dynamic number of strokes and their duration

...

- **Typing Recognition** , The use of the unique characteristics of a person's typing for establishing identity.

...

- **Gait recognition** , The use of an individual's walking style or gait to determine identity

# Cancelable Biometrics

# Cancelable Biometrics Definition

is a way in which to incorporate protection and the replacement features into biometrics to create a more secure system.

# Cancelable Biometrics Templates

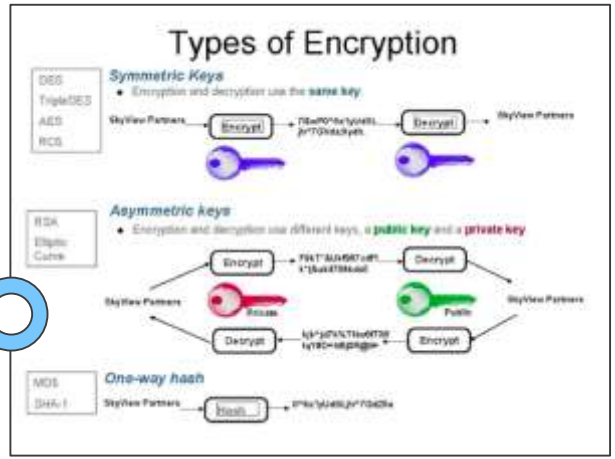
In these methods, a function that is dependent on some parameter is used to generate protected biometric templates. The parameter of the function is used as the key

# Cryptography based methods

is associated with the process of converting ordinary plain text into unintelligible text and vice-versa.

Cryptography not only protects data from theft or alteration but can also be used for user authentication

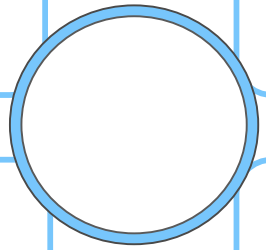
## Cryptographic Techniques



# cryptography concerns

**Confidentiality**
Information cannot be understood by anyone

**Integrity**
Information cannot be altered.



**Non-repudiation**
Sender cannot deny the intentions in the transmission of the information

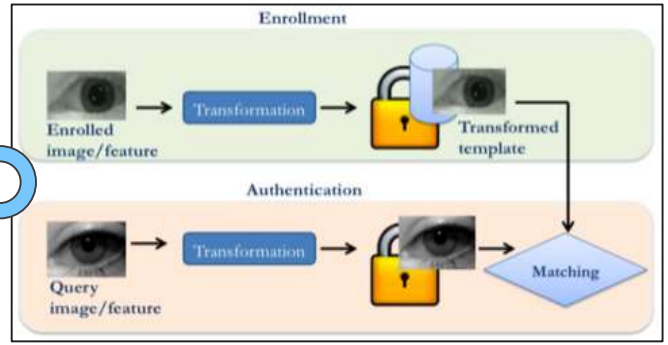
**Authentication**
Sender and receiver can confirm each Cryptography

# Transformation based methods

the original Biometric templates are morphed by applying Different transformations

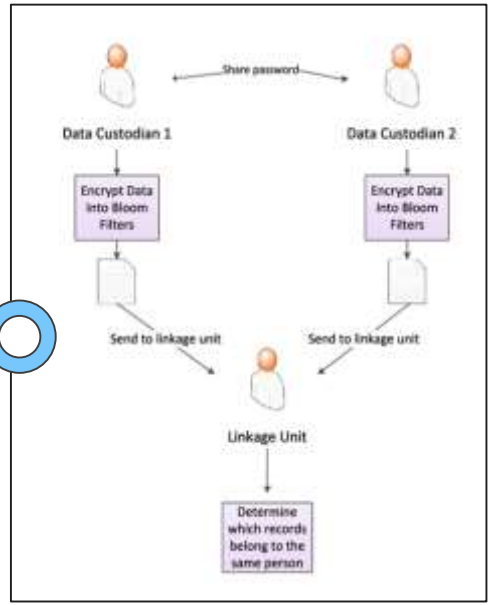
the minutiae positions are measured in rectangular coordinates with reference to the position of the singular point by aligning x-axis with its orientation

The transformation causes changes in the cell positions. In Polar transformation, the minutiae positions are measured in the polar coordinate with reference to the core position

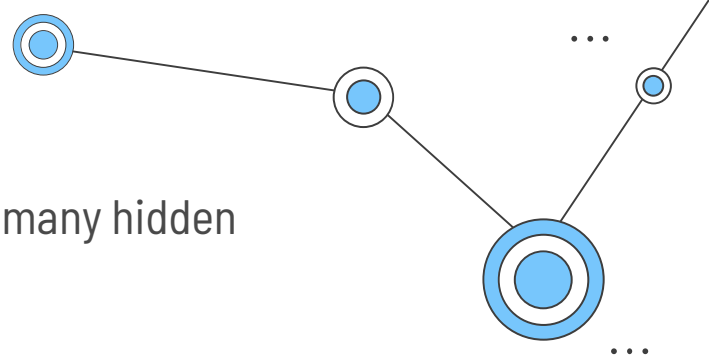


# Filter based methods

Cancelable Biometric Filter is a Convolution based method. Bloom Filters is a space efficient probabilistic data structure representing a set to support membership queries. Bloom filter-based transformation of any binary feature vector generates irreversible Cancelable Biometric templates.



# Machine & Deep Learning

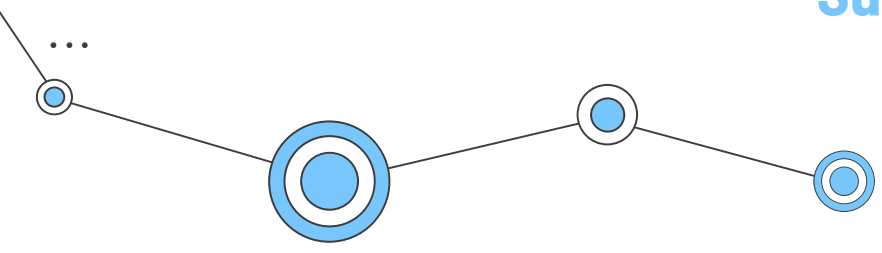


**Deep Learning** is the use of neural networks with many hidden layers and raw data as inputs.

**Machine Learning** is the practice of programming computers to learn from data. we can use machine learning to solve problems that are very complex for non-machine learning software. There are different types of system of machine learning

There are different types of system of machine learning :

**Supervised and Unsupervised**



**Supervised** this type of the data that you feed in the algorithm with the desired solution are referred to as labels

01

### Multilayer Perceptron (MLP):

Multilayer perceptron holds many hidden layers

02

### Recurrent Neural Network (RNN):

RNN is a logical choice if the input data is ordered sequentially, RNNs are capable of handling long-range temporal dependencies

03

### Convolutional Neural Network (CNN):

The CNN has an excellent performance in machine learning problems. Specially the applications that deal with image data

# Unsupervised

In this type you can guess that the data is unlabeled. And the most important unsupervised algorithms are Clustering, Association rule learning and Visualization and dimensionality reduction.

01

### Online Learning:

this type  can learn incrementally by providing the system with all the available data as instances groups or individually.

02

### AutoEncoder:

learns how to efficiently compress and encode data then learns how to reconstruct the data back from the reduced encoded representation

# Deep Learning for :

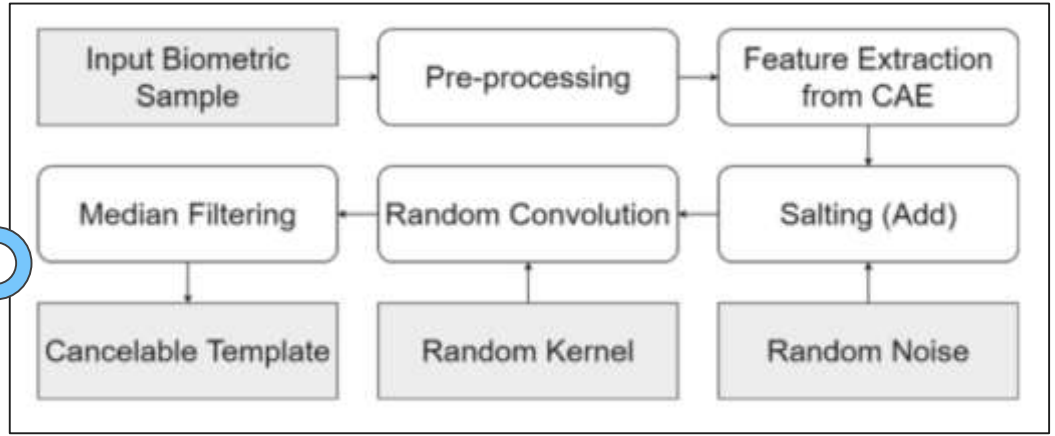
**Facial recognition** is one of the most prominent biometric techniques used for identity authentication and verification, it is the identification of an individual based on the photograph of their face. Deep learning methods, in the recent past, have had great success in the tasks of image recognition and classification.

**Fingerprint recognition** refers to the identification of an individual based on the comparison of two fingerprints. Also it fingerprint recognition has had significant improvement over its former iterations.

# Related Work

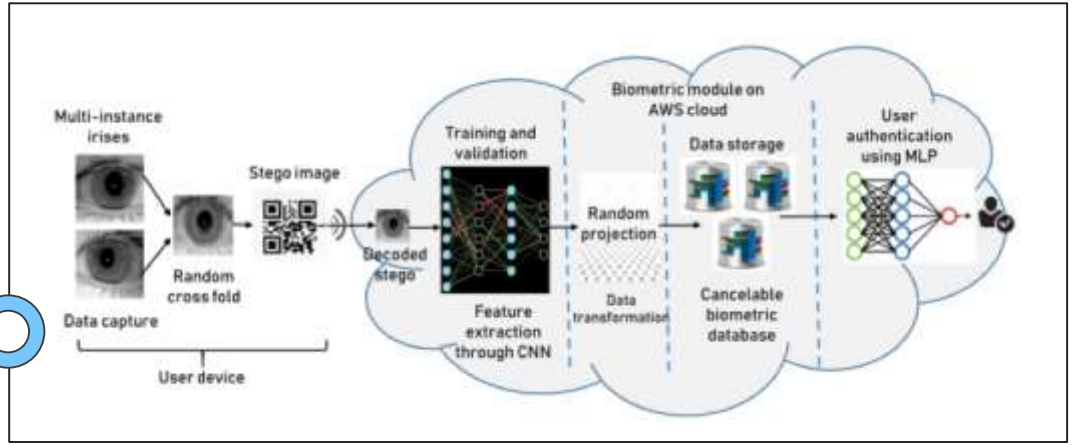
# Convolutional Autoencoder:

It's a tool for extracting features from images and compressing it to a lower dimension called latent space that generated from input images, also it is used for random noise and random convolution. The random noise is extracted features which are random noise followed by median filtering to get non-invertible templates . Also Random convolution is based transformations make use of random kernels to convolve the biometric image or features to generate cancelable templates.



# Cancelable Biometrics Using Deep Learning as a Cloud Service:

Cloud computing is a technique or a tool that allows you to store your sensitive data on a logical could know as a remote database. If an electronic device has access to the web, it has access to the data and the software programs to run it. But here it had been developed by using cancelable Biometrics and Deep Learning to make your sensitive data that stored on the cloud more secure and safe.



# Proposed and Similar Systems comparison

| | Our system | System using fingerprint | System using face recognition |
|---|---|---|---|
| Solved problem | High security | Forgetting password | Forgetting password |
| Advantage | Strong and accurate model | Unique for per person | Can not be stolen easily |
| Limitations | - | Low security | Low accuracy |

# 03

# System Analysis

# System Analysis contains a :

- System Requirements

...

- Use Case Diagram

...

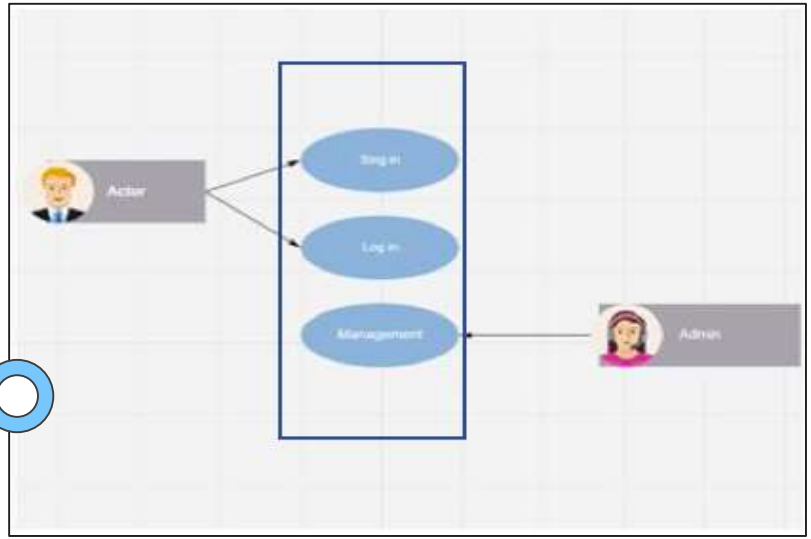
- Functional and nonfunctional Requirements

# Requirements specification

In this project, we will develop a system for personal identification based on cancelable biometrics combined with deep learning. This system will be used to access remotely to a bank by using biometrics which are better than using a password

# Use Case Diagram

The general architecture of our system



# Functional Requirements

The Functional Requirements of the system explain the specific functions to be performed or accomplished by the system. We have three main functions:

- Enrollment (sign up)
- System Management
- Personal Identification (Sign in)

# Non-functional Requirements

- Availability
- Security
- Reliability
- Efficiency (fast response)

# 04

# System Design

# System Design contains a :

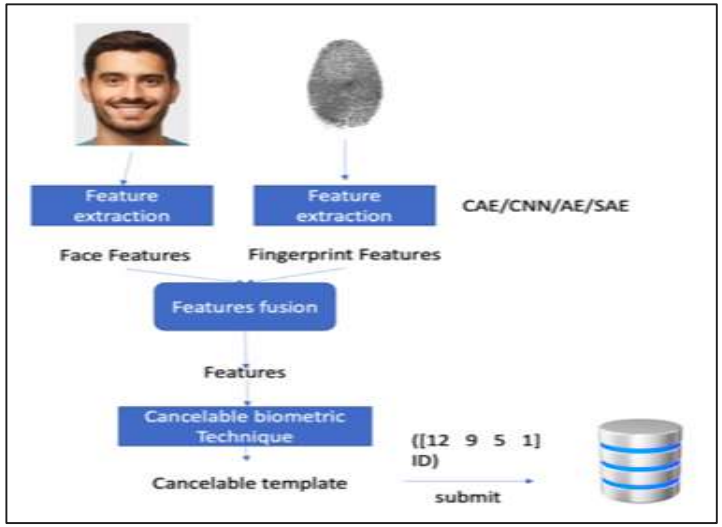
- System Architecture

...

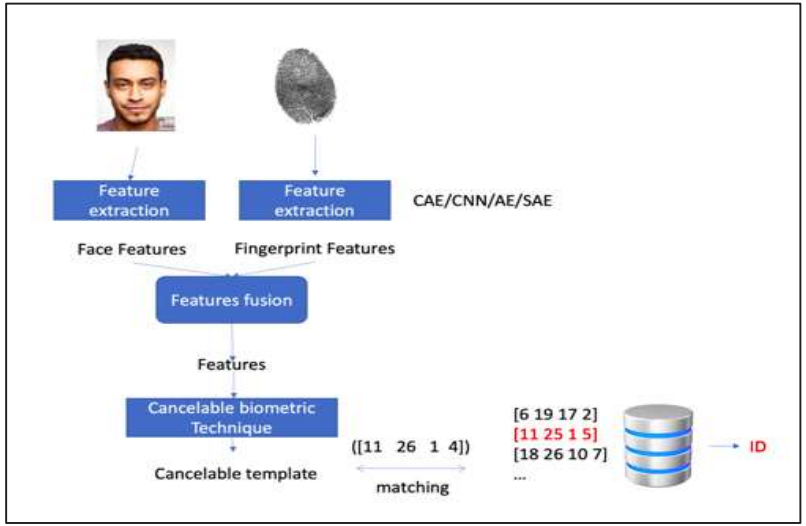
- System Interfaces

# System Architecture

## Enrollment Phase (Sign up):

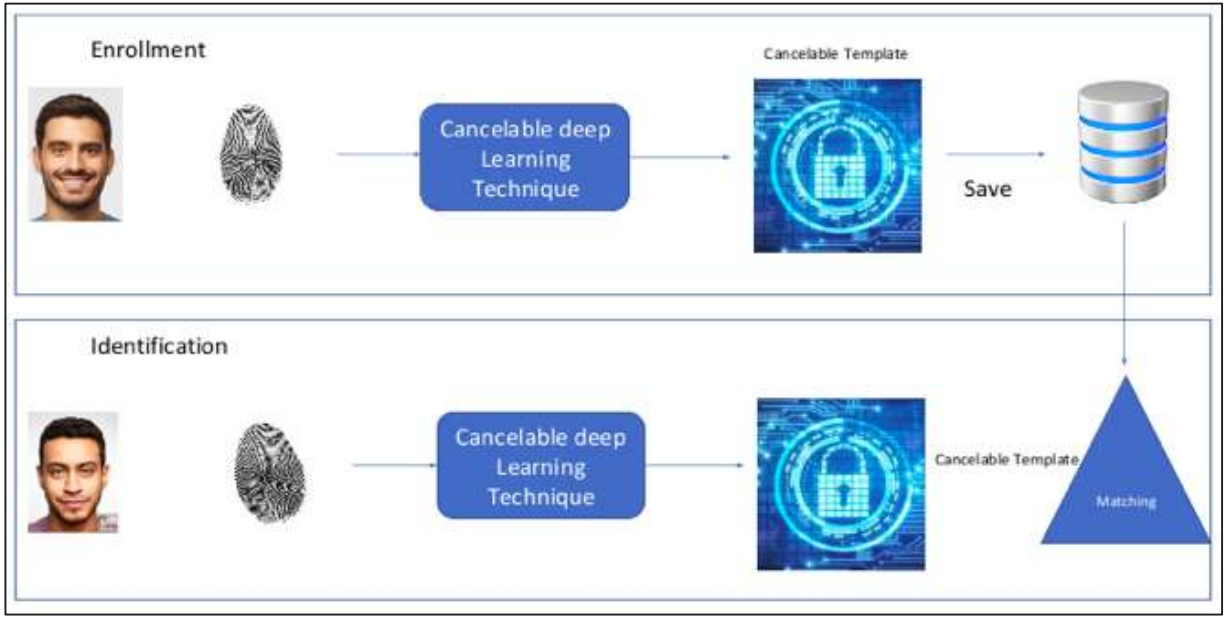



## Identification Phase (Sign in):



# System Architecture

proposed System :



# System Interface :

**Main interface:**

This is the main interface , when the user click or tap the application icon ,this interface will pop-up . The user has two choices sign in if the user has an account or sign up to create an account.

# System Interface :

**Sign up interface:**

When the user tap or click on sign up
to create an account this interface will pop up.
And to sign up the user should enter the Email, Name, Face ID , and Fingerprint .
After that user will click or tap sign up button the System will save the new User information.

# System Interface :

**Signing in interface:**

When user click or tap on sign in  this interface
Will pop up and in order for the user to sign in
The system require Face ID and finger print
 of the user so the system can match them
 in the database and confirm the user.
If the entered Biometrics matches what is saved
in the data base the user shall enter his account
 if not then the system will deny the user

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