Face Recognition

Objectives

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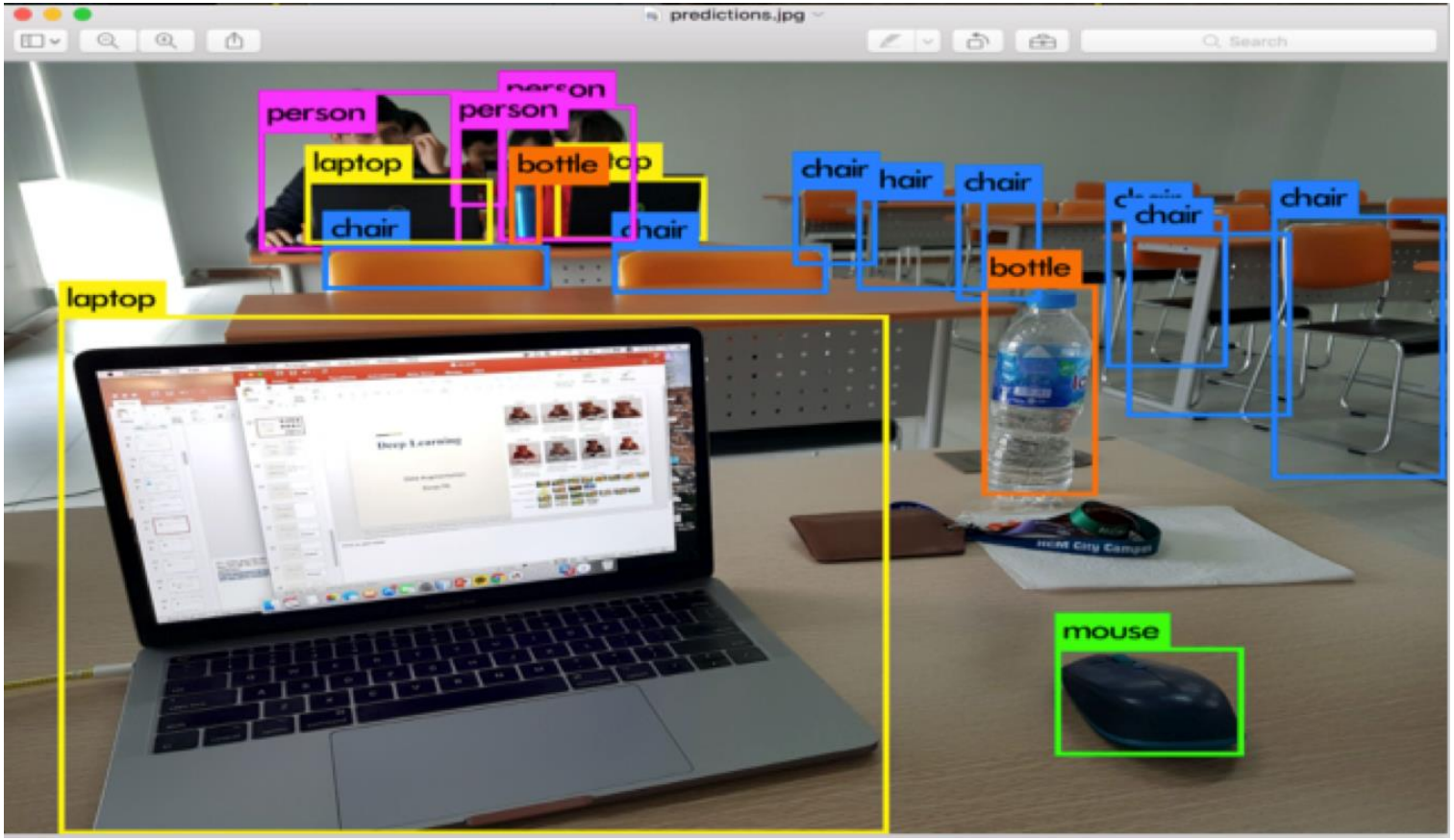
- What is Face Recognition?
- The techniques used in face recognition.
- What are the future of face recognition?
- Applications of face recognition

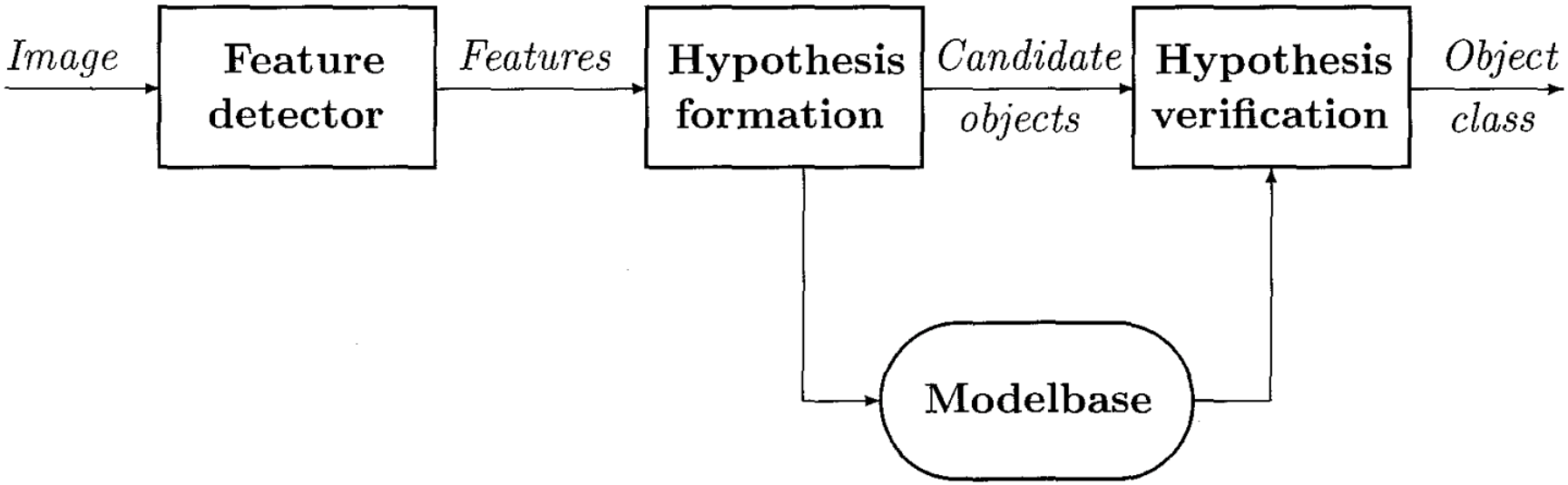
What is Object Recognition?



What is Object Recognition?

- Object recognition is the ability to recognize an object.
- Object recognition consists of recognizing, identifying, and locating objects within a picture with a given degree of confidence.
- This might be after the object has been previously seen or recognizing it from photographs.
- It is the ability to perceive an object's physical properties (such as shape, color, and texture) and apply semantic attributes to the object

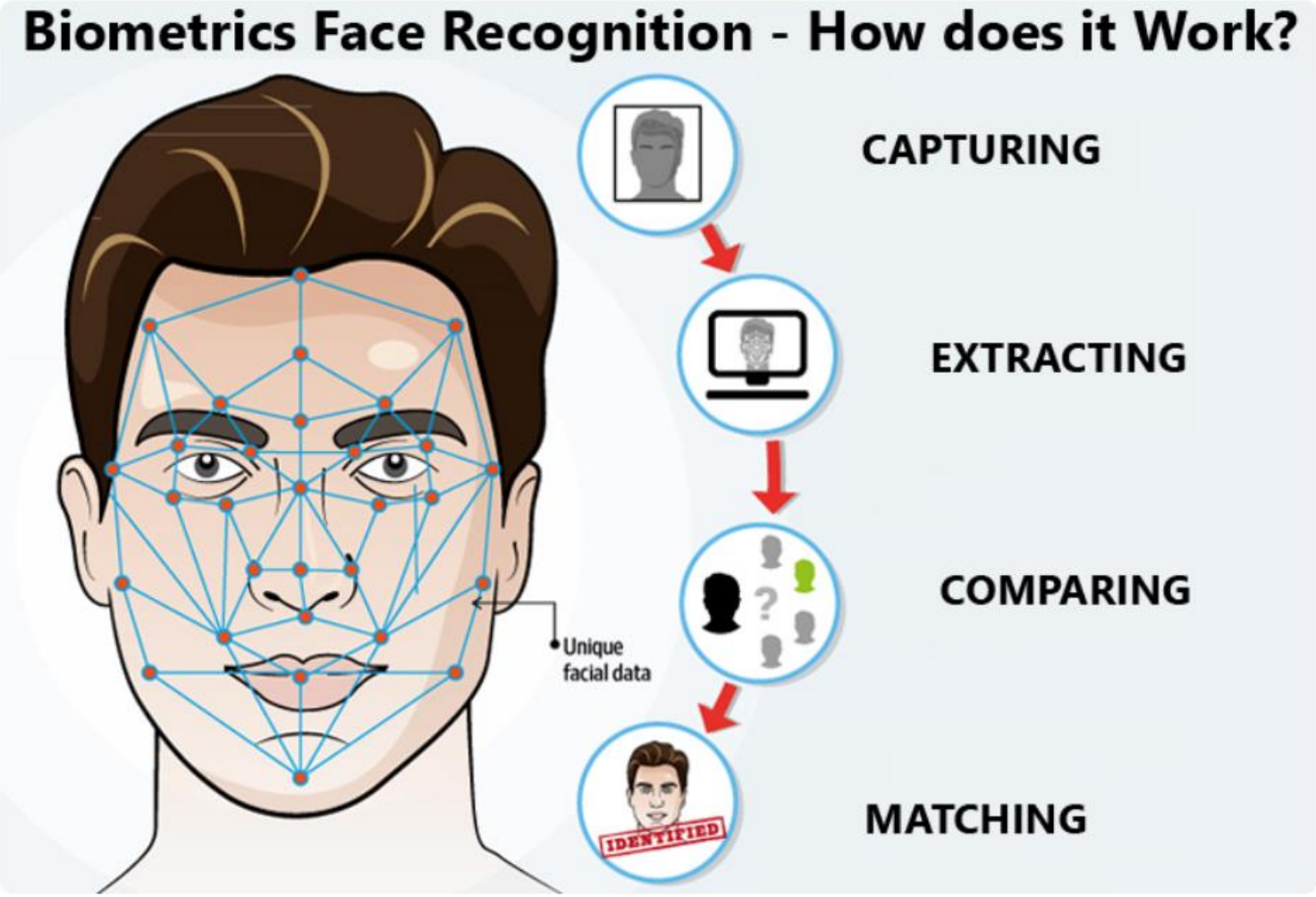
Object Recognition



Object Recognition Steps

- Feature extraction: Which features should be detected, and how can they be detected reliably?
- Feature-model matching: How can features in images be matched to models in the database?
- Hypotheses formation: How can a set of likely objects based on the feature matching be selected, and how can probabilities be assigned to each possible object?
- Object verification: How can object models be used to select the most likely object from the set of probable objects in a given image?

Face Recognition



Face Recognition

- Facial recognition is a way of identifying or confirming an individual's identity using their face.
- Facial recognition systems can be used to identify people in photos, videos, or in real-time.
- Facial recognition is a category of biometric security
  - Voice recognition
  - Fingerprint recognition
  - Iris recognition.

How does it work?

- Step 1: Face detection: detects and locates the image of a face
- Step 2: Face analysis: image of the face is captured and analyzed
- Step 3: Converting the image to data: the face capture process transforms analog information (a face) into a set of digital information (data) based on the person's facial features.
- Step 4: Finding a match: Your faceprint is then compared against a database of other known faces

How does it work?

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- Step 2: Face analysis
  - Reads the geometry of your face.
  - Key factors include:
    - The distance between your eyes.
    - The depth of your eye sockets
    - The distance from forehead to chin
    - The shape of your cheekbones, and the contour of the lips, ears, and chin.
  - The aim is to identify the facial landmarks that are key to distinguishing your face.

The Approach

- Type 1: Holistic Matching Methods: The approach covers face recognition as a two-dimensional recognition problem. Example: Eigenfaces, Principal Component Analysis, Linear Discriminant Analysis, and independent component analysis
- Type 2: Feature-based Methods: In this method, local features such as eyes, nose, and mouth are first of all extracted and their locations and local statistics are fed into a structural classifier.
- Type 3: Hybrid Methods: use a combination of both holistic and feature extraction methods

Eigenfaces method

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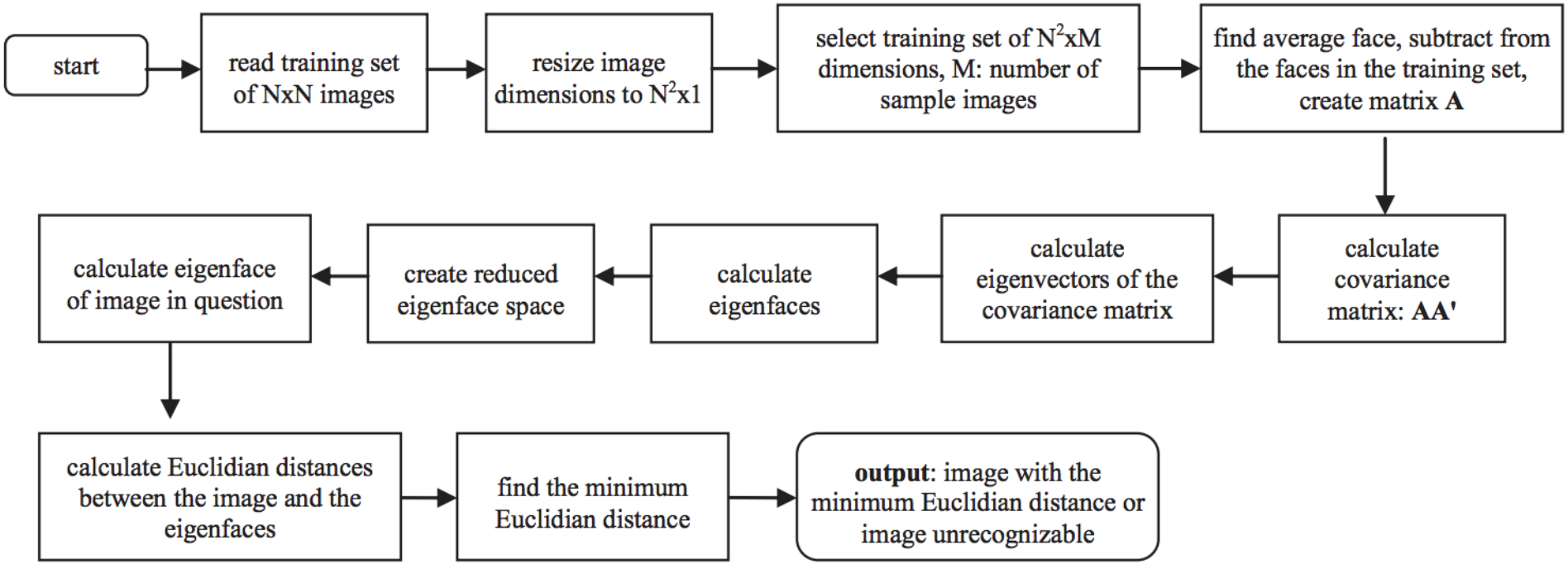
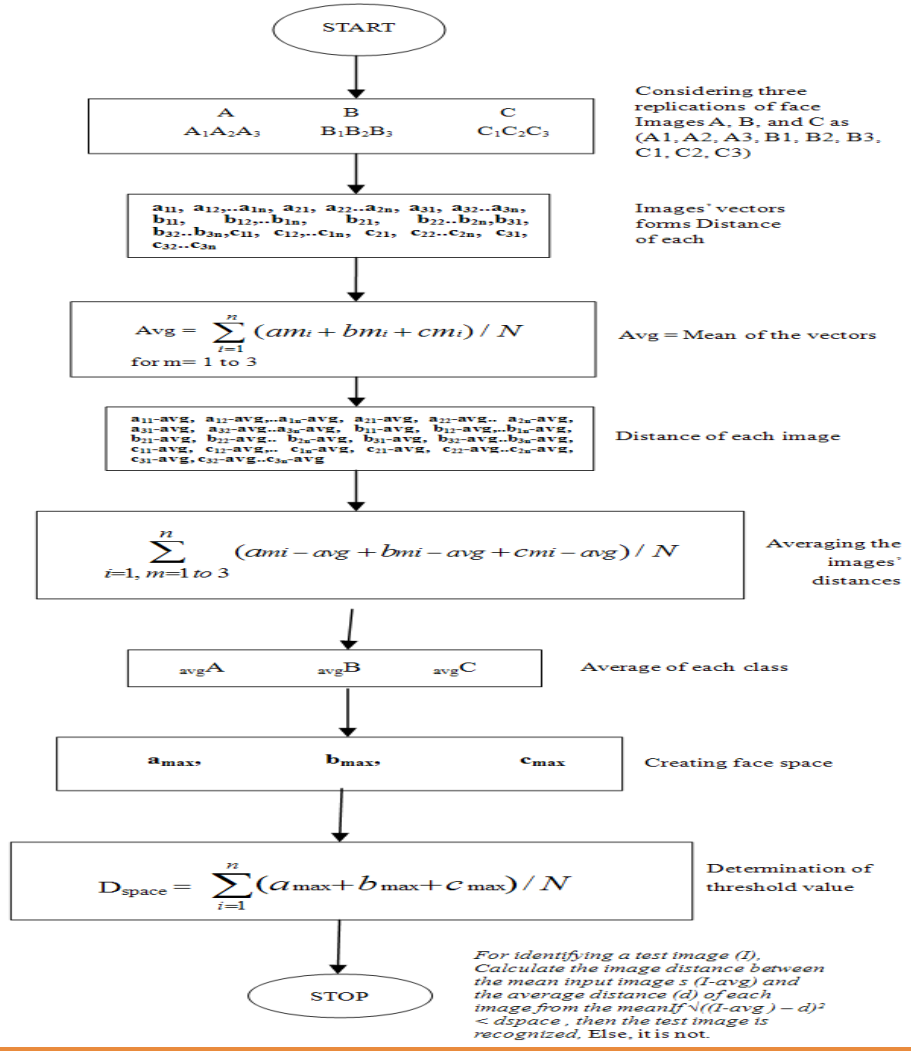
- Facial



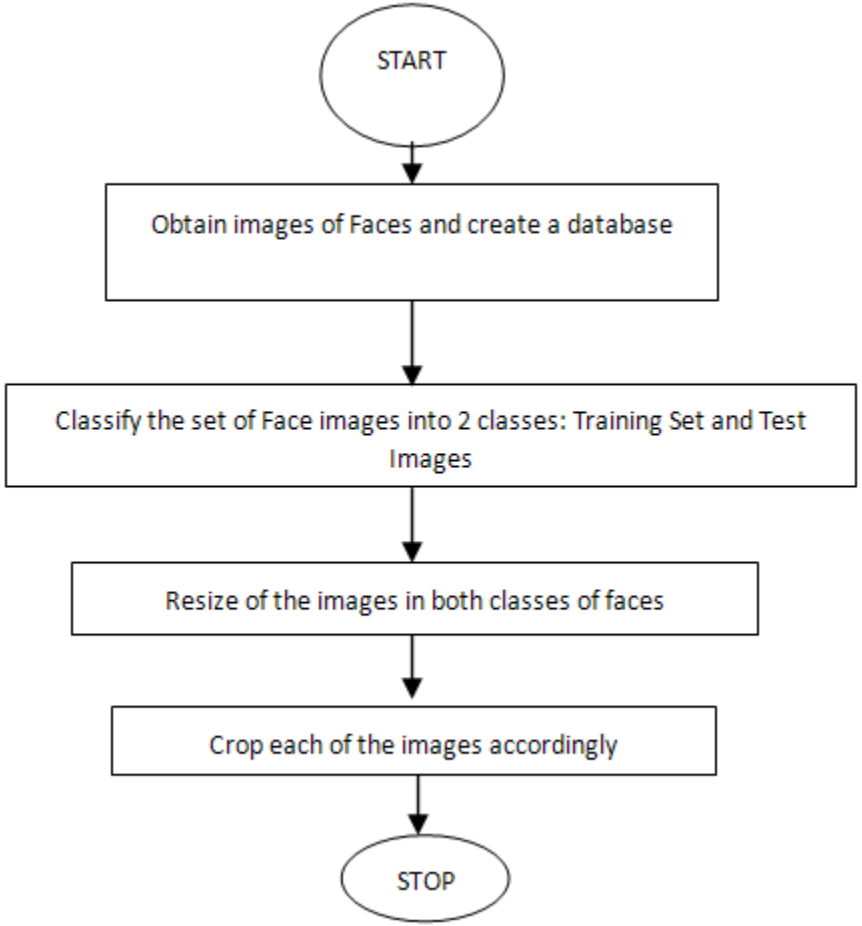
Eigenfaces method

- PCA Steps



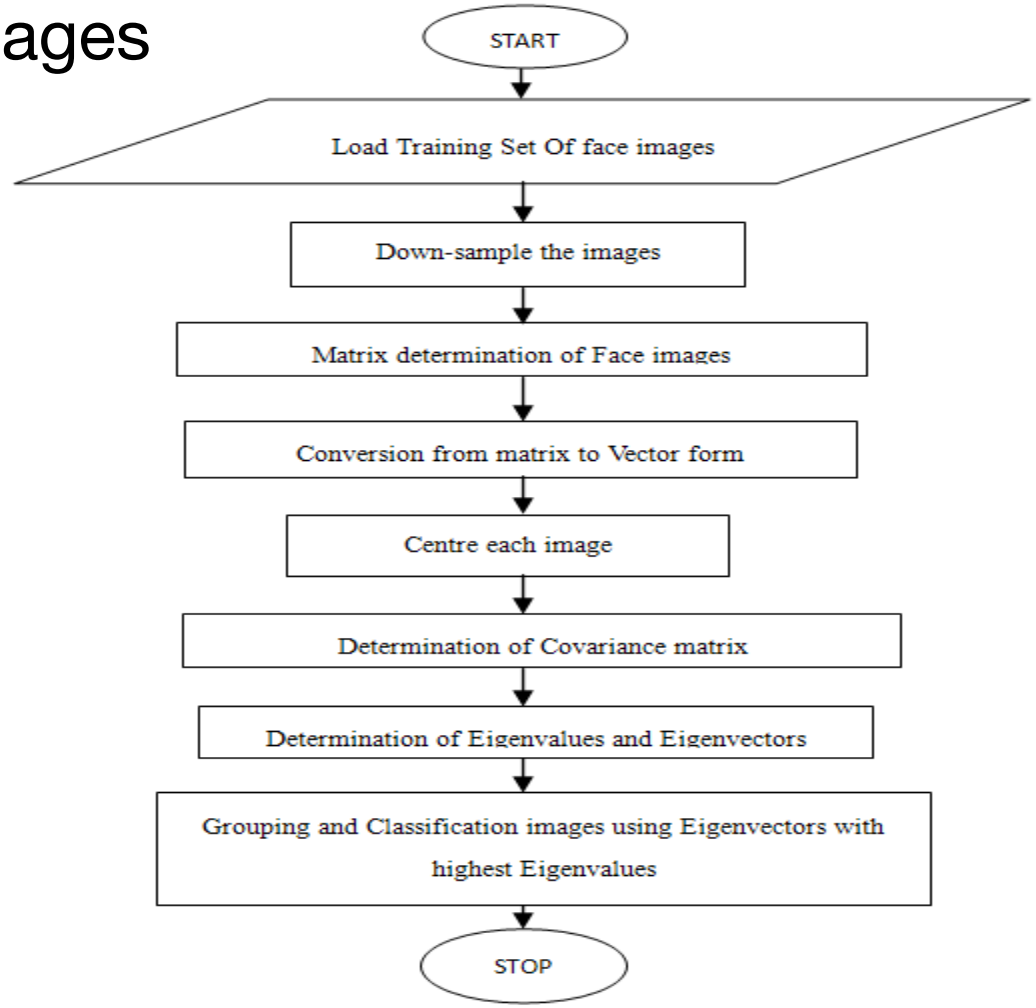
Eigenfaces method

- Pre- Processing Flowchart



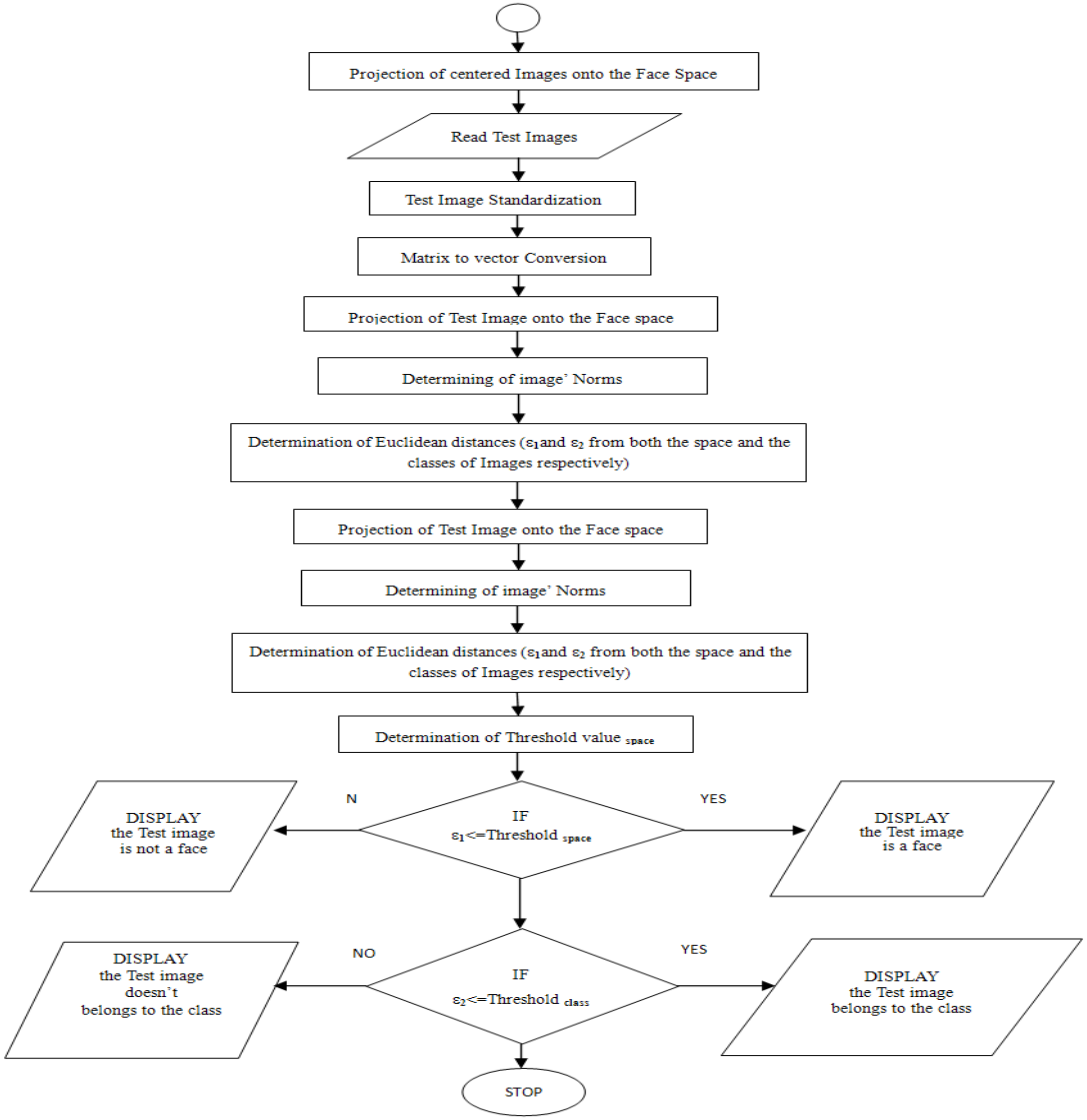
Eigenfaces method

- Trainning of face images



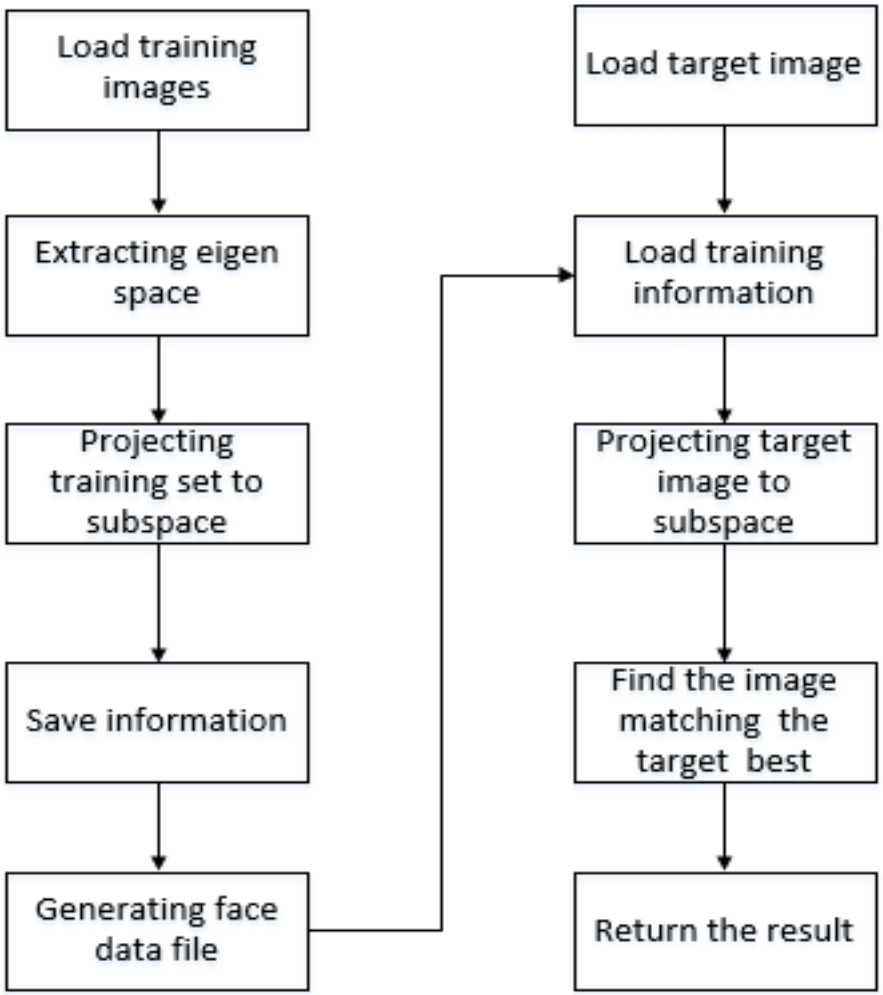
Eigenfaces method

- Recognition



Eigenfaces- Face Recognition

- Summary



Applications

- Prevent Retail Crime.
- Unlock Phones.
- Smarter Advertising.
- Find Missing Persons.
- Help the Blind.
- Protect Law Enforcement.
- Aid Forensic Investigations.
- Identify People on Social Media Platforms.

Summary

- What is Face Recognition?
- The techniques used in face recognition.
- What is a feature of face recognition?
- Applications of face recognition