

# FACE RECOGNITION IN ARTIFICIAL INTELLIGENCE

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# INTRODUCTION

- Today in this information era, data is secured by passwords, encryption keys, fingerprints and many other modes.
- The human face plays an important role in our social interaction and in conveying people's identity.
- Biometric face recognition technology has received significant attention in the past several years due to its potential for applications in both law enforcement and non-law enforcement agencies.
- As compared with other biometrics systems using fingerprint, palm print and iris, face recognition has distinct advantages because of its non-contact process.
- Images can be captured from a distance without touching the person and face can be extracted from that image. The identification does not require interacting with the person.
- In addition, recognized face images can be recorded and archival can later help to identify the person(s).

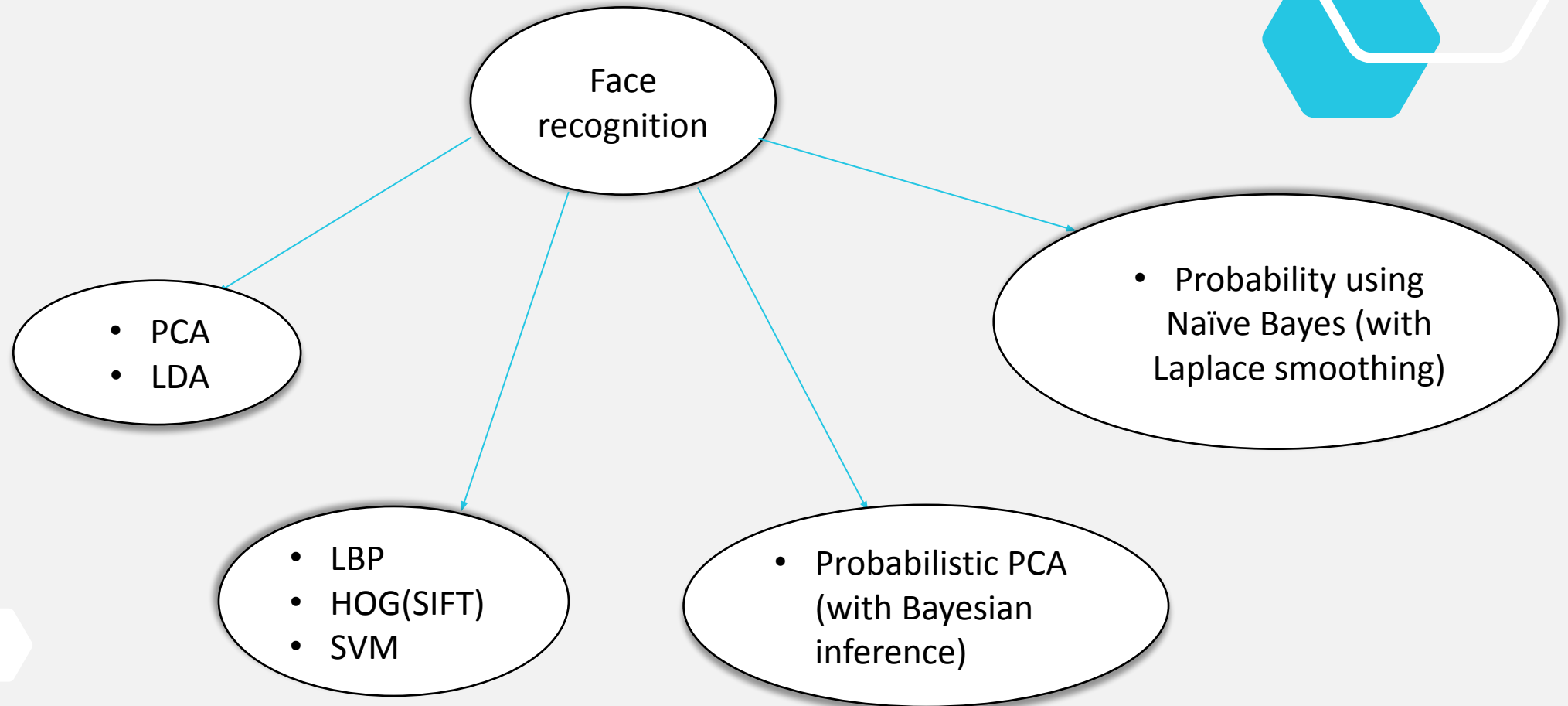


# PROBLEM STATEMENT

- Given a dataset consisting of facial images and their sketches, retrieve all images (real and sketches) which are similar to given test image.
- **Figure of merit:** Maximal accuracy in retrieval of all 14 images of the subject from the dataset



# EXISTING BODY OF WORK



# APPROACH

- Dataset collection
- Data preprocessing
  1. Color normalization
    - i. **Four approaches were compared**
    - ii. HDTV(Luminosity as a measure)  
 $0.21 * R + 0.72 * G + 0.07 * B$
  2. Feature extraction
    - PCA
    - KLT
  4. Face detection
    - Viola-Jones
    - **HAAR**
  5. Dimensionality reduction
    - PCA
  6. Labelling



# APPROACH

## • FACE RECOGNITION

- Step: 1 - PCA
  - Eigen Face
  - Correlation = (Covariance) / (Standard Deviation)
- Step: 2 - LDA
  - Used when there is overlapping of samples.
  - Projecting all the points on the  $y=w^T x$  and checking whether their means are getting separated or not.
  - Sample-class Variance, Projected Variance
  - Overall within-class Scatter Matrix
  - Overall Between-class Scatter matrix
- Step: 3
  - Class Prior Probability using Naïve Bayes Approach

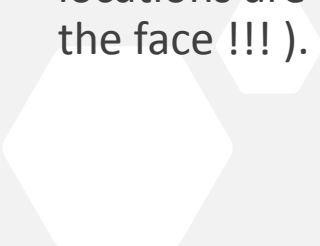


# PRE-PROCESSING

- Starting with preprocessing HDTV method is used to convert images from RGB to GRAY-SCALE

```
1 from PIL import Image
2
3 im = Image.open('16BCP064_NEUTRAL_RGB.png')
4 pix = im.load()
5 print pix[x,y] # Get the RGBA Value of the a pixel of an image
```

- HDTV method.
- Find the faces in the image, if the faces are found, it returns the positions of detected faces as Rect(x,y,w,h). Once these locations are extracted, a ROI is created for the face and eye detection is applied on this ROI (since eyes are always on the face !!!).



```
1 import numpy as np
2 import cv2 as cv
3 face_cascade = cv.CascadeClassifier('haarcascade_frontalface_default.xml')
4 eye_cascade = cv.CascadeClassifier('haarcascade_eye.xml')
5 img = cv.imread("16BCP064_NEUTRAL_RGB.png")
6 gray = cv.cvtColor(img, cv.COLOR_BGR2GRAY)
7 faces = face_cascade.detectMultiScale(gray, 1.3, 5)
8 for (x,y,w,h) in faces:
9     cv.rectangle(img, (x,y), (x+w,y+h), (255,0,0), 2)
10    roi_gray = gray[y:y+h, x:x+w]
11    roi_color = img[y:y+h, x:x+w]
12    eyes = eye_cascade.detectMultiScale(roi_gray)
13    for (ex,ey,ew,eh) in eyes:
14        cv.rectangle(roi_color, (ex,ey), (ex+ew,ey+eh), (0,255,0), 2)
15 cv.imshow('img', img)
16 cv.waitKey(0)
17 cv.destroyAllWindows()
```



# ROLE OF EACH GROUP MEMBER

- **Varun Chauhan (16BCP006):** Data Preprocessing & Literature Survey
- **Jeanie Jessica (16BCP016):** Data Preprocessing & Literature Survey
- **Nihit Parikh (16BCP027):** Face Recognition & Documentation
- **Parth Shah (16BCP028):** Code Implementation & Testing
- **Urja Thakkar (16BCP055):** Data Preprocessing & Literature Survey
- **Yaagni Raolji (16BCP064):** Face Recognition & Documentation



# FUTURE WORK

- Implementing the PCA algorithm for classifying the face, so as to detect the face as well the expression of the person
- Improving the model's accuracy with variety of different poses and angle of photos



# REFERENCE

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