**ECE 763 PROJECT 1**

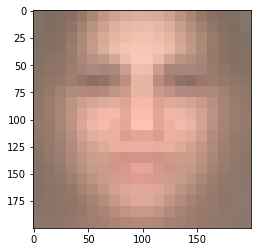
**Shubham Miglani**

**Data Preprocessing:**

1. FDDB dataset was used. (<http://vis-www.cs.umass.edu/fddb/>)
2. There are 10 text files in the dataset for annotation and file name data. 9 text files were combined for training data and the rest one was for test data.
3. The elliptical coordinates in the annotation file provided in the dataset were converted to rectangular ones. Only images with number of faces as 1 were taken.
4. After getting the rectangular coordinates, all the data inside the rectangle was cropped and saved separately.
5. For non-face data, the image area not belonging to the face and an area of (60,60) was cropped and saved separately.
6. Then all the images are resized to 20,20 and saved in npy format for faster loading.
7. PCA is used for Model 1, Model 2, Model 3 as the feature space is huge. Also, the data is standardized with mean 0 and variance 1.
8. All the training and data loading was done on google Colab and using google drive. The paths must be changed correspondingly if running on a local machine

**Model 1: Simple Gaussian**

Mean of face:

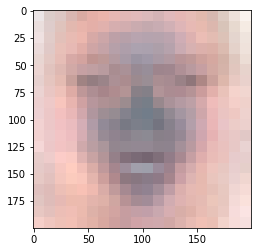


Mean of non face:

A screenshot of a cell phone

Description automatically generated

Covariance of face:



Covariance of nonface:

A screenshot of a cell phone

Description automatically generated

False Positive Rate: 0.44

False Negative Rate: 0.41

Miss Classification Rate: 0.425

ROC Curve:

A close up of a map

Description automatically generated

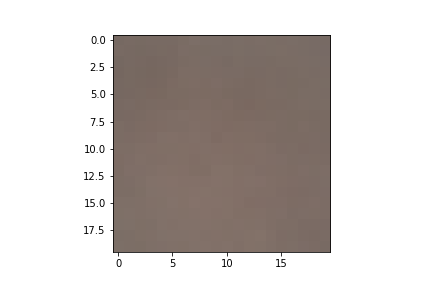
**Model 2: Mixture of Gaussian**

Number of gaussians was chosen as 3. All the plots are for the 1st gaussian. PCA is used with size 30.

Mean of face:



Mean of non face:



The diagonal Covariance matrix is plotted as shown

Covariance face:

A screenshot of a cell phone

Description automatically generated

Covariance non face:

A screenshot of a cell phone

Description automatically generated

False Positive Rate: 0.3

False Negative Rate: 0.36

Miss Classification Rate: 0.33

ROC curve:

A close up of a map

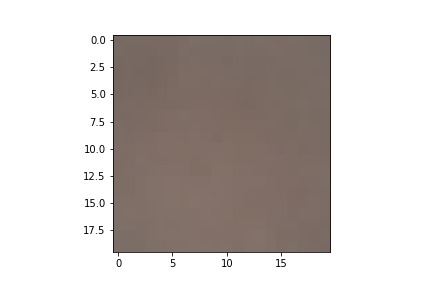
Description automatically generated

**Model 3: t-distribution**

Mean of face:



Mean of face:



Covariance of face:

A screenshot of a cell phone

Description automatically generatedCovariance of nonface:

A screenshot of a cell phone

Description automatically generated

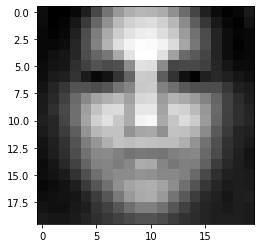
False Positive Rate: 0.36  
False Negative Rate: 0.52  
Miss Classification Rate: 0.44  
ROC:

A close up of a map

Description automatically generated

**Model 4: Factor analyzer**

Mean of face:

****

Mean of nonface:

A bathroom with a black background

Description automatically generated

Covariance of face:

A close up of a mans face

Description automatically generated

Covariance of nonface:

**A bathroom with a white background

Description automatically generated**

False Positive Rate: 0.46

False Negative Rate: 0.24

Miss Classification Rate: 0.35ROC Curve:

A close up of a map

Description automatically generated

References:

1. <http://www.computervisionmodels.com/>
2. <https://github.com/NazneenKotwal/CV_Face_Image_Classification_Python>
3. <https://github.com/ankanbansal/fddb-for-yolo/blob/master/convertEllipseToRect.py>