Computer Vision: Project 01 Report

Dataset and data preprocessing:

I used the FDDB dataset which can be found here. This dataset had ellipse face annotations. I converted the ellipse annotations to Bounding box annotations. I then cropped these faces from the image which acted as the Face dataset. I then randomly cropped the non-face patches from the same images in order to get negative samples. I considered 1000 images for both face image and non-face image as part of training samples and 100 images for both face image and non-face image as part of testing samples.
All the images were in grayscale.

Different Models implemented:

1. **Single Gaussian Model:**
   I implemented the single Gaussian model and obtained the following results:
   Visualized mean and Covariance of the trained model can be seen below respectively:
   Mean for face image:

   Covariance for face image:

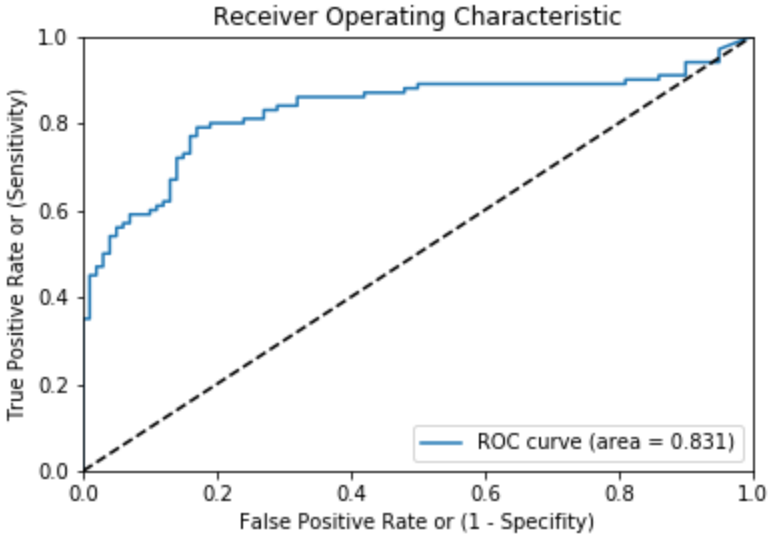
   Mean for non-face Image:

   Covariance for non-face:

   Below is the false positive rate, false negative rate, misclassification rate:

```
False Positive Rate: 0.87
False Negative Rate: 0.35
Mis Classification Rate: 0.61
```

   Below is the ROC Curve of the trained model:



2. **Mixture of Gaussian:**

I implemented the Mixture of Gaussian model with 3 components and obtained the following results:

Visualized mean and Covariance of the trained model can be seen below respectively:

Mean for Face Image: Component 1:

Covariance for Face Image: Component 1:

Mean for Face Image: Component 2:

Covariance for Face Image: Component 2:

Mean for Face Image: Component 3:

Covariance for Face Image: Component 3:

Mean for non-face Image: Component 1:

Covariance for non-face Image: Component 1:

Mean for non-face Image: Component 2:

Covariance for non-face Image: Component 2:

Mean for non-face Image: Component 3:

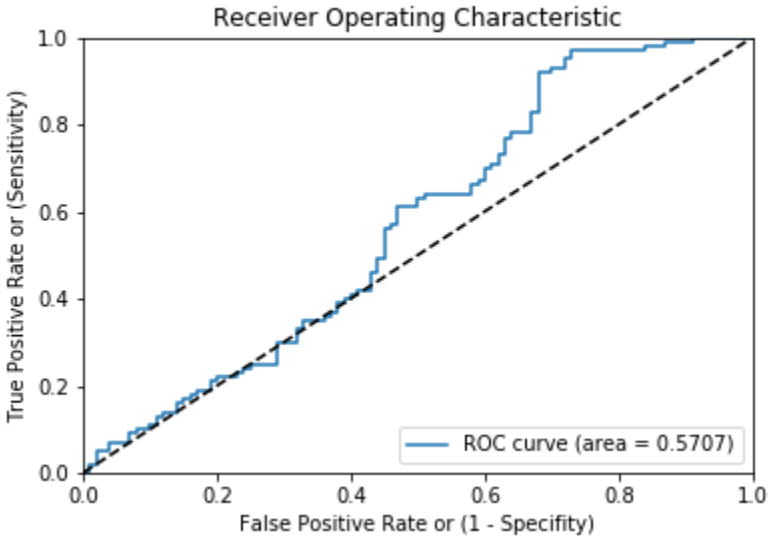
Covariance for non-face Image: Component 3:

Below is the false positive rate, false negative rate, misclassification rate:

```
False Positive Rate: 0.55
False Negative Rate: 0.4
```

```
Mis Classification Rate: 0.475
```

Below is the ROC Curve of the trained model:



3. **T-Distribution:**

I implemented the T-Distribution model and obtained the following results:
Visualized mean and Covariance of the trained model can be seen below respectively:
Mean for Face image:

Covariance for Face image:

Mean for non-face image:

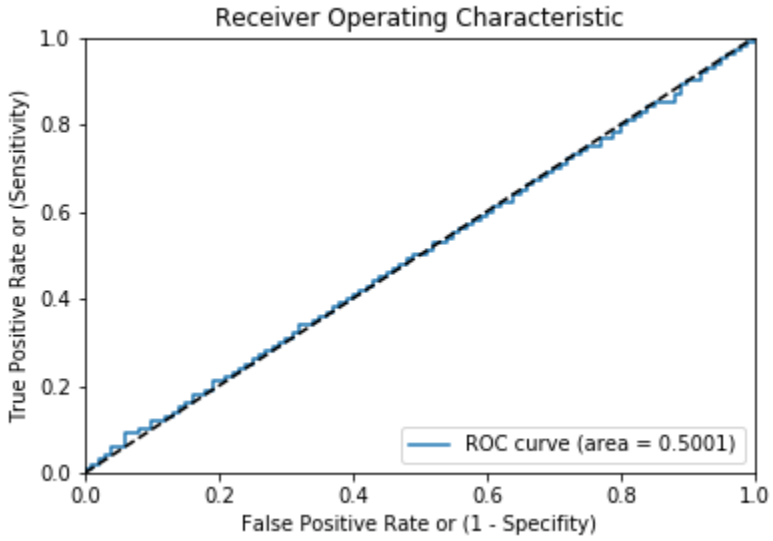
Covariance for non-face image:

Below is the false positive rate, false negative rate, misclassification rate:

```
False Positive Rate: 0.0
False Negative Rate: 0.49
```

```
Mis Classification Rate: 0.245
```

Below is the ROC Curve of the trained model:



4. **Factor Analyzer Model:**

I implemented the Factor Analyzer model and obtained the following results:
Visualized mean and Covariance of the trained model can be seen below respectively:
Mean for Face image:

Covariance for Face image:

Mean for non-face image:

Covariance for non-face image:

Below is the false positive rate, false negative rate, misclassification rate:

```
False Positive Rate: 1.0
False Negative Rate: 0.0
Mis Classification Rate: 0.5
```

Below is the ROC Curve of the trained model: