DATASET:
For this project, I've used the UMD Faces Dataset (http://www.umdfaces.io/)

For preparation of dataset as per requirements, a module data_io.DataPreparation has been created which extracts given number of images from the umd faces dataset.
Similarly data_io.DataLoader is used to read in all the extracted images and load the dataset.

Following images show the mean and covariance of the face training images.
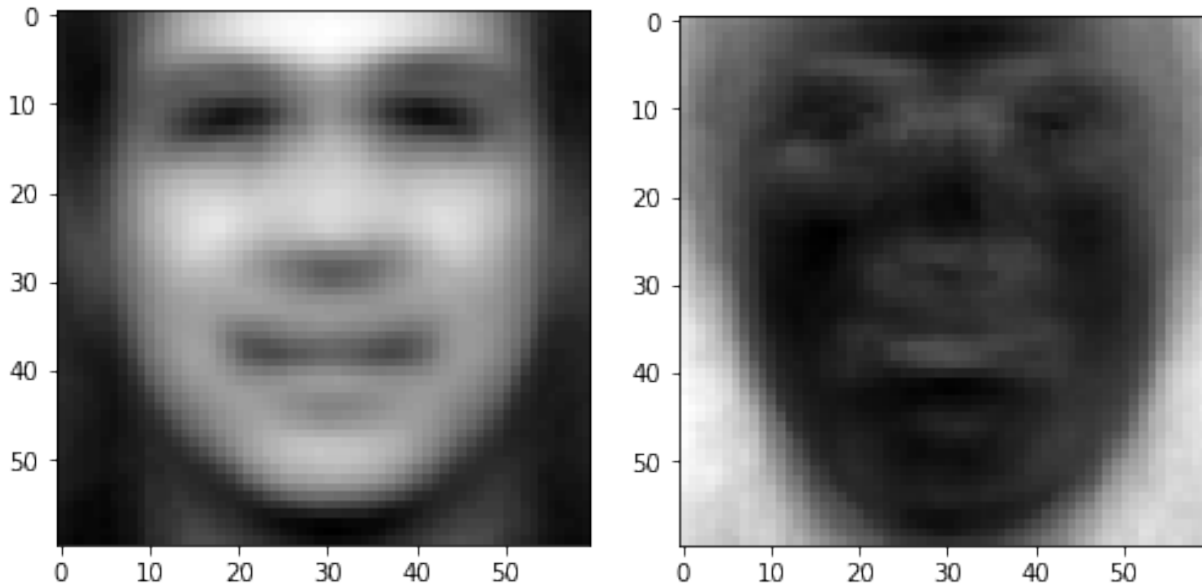
Following images show the mean and covariance of the non_face training images.
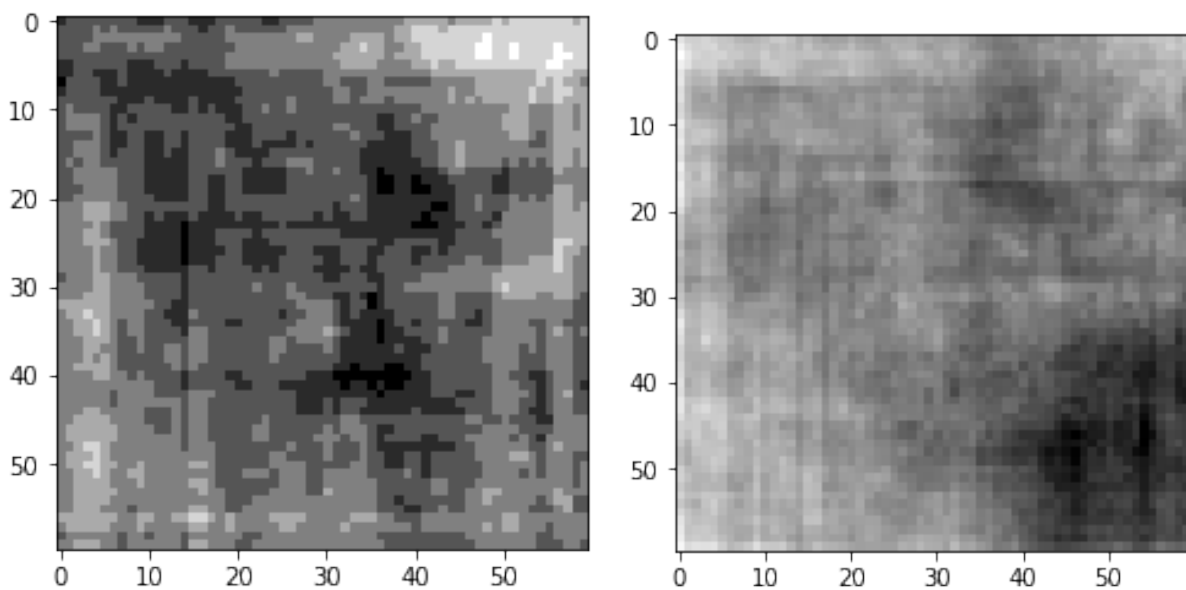
From these set of images, we observe that non_face images do not show any specific patterns in the mean/covariance images. For face class, we observe that mean image closely resembles a face and covariance image shows that most of the non-zero variance is on edges and in the background, which is expected.
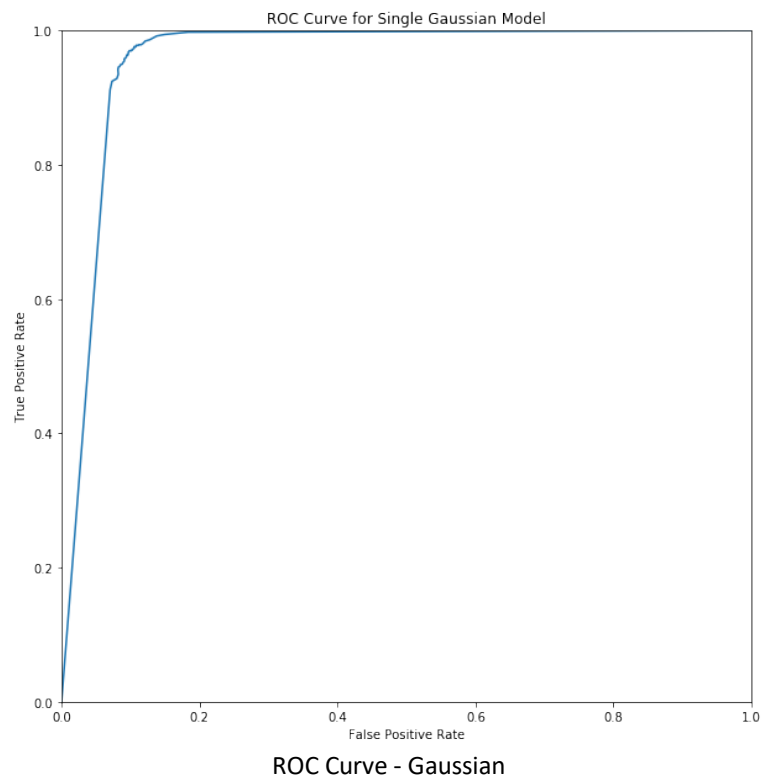

MODELS:
The models implemented are present in models/ directory. Model.py is the main file from which all models are run. A Python notebook named TestingModels.ipynb has also been created for the same purpose.

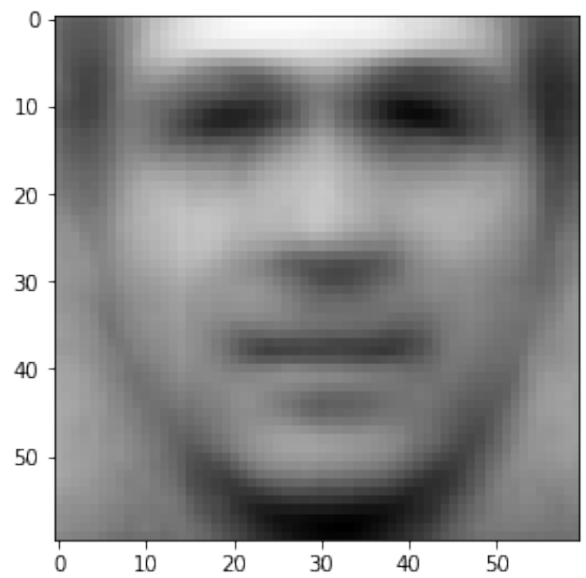## Model 1: Gaussian:

Mean – Gaussian
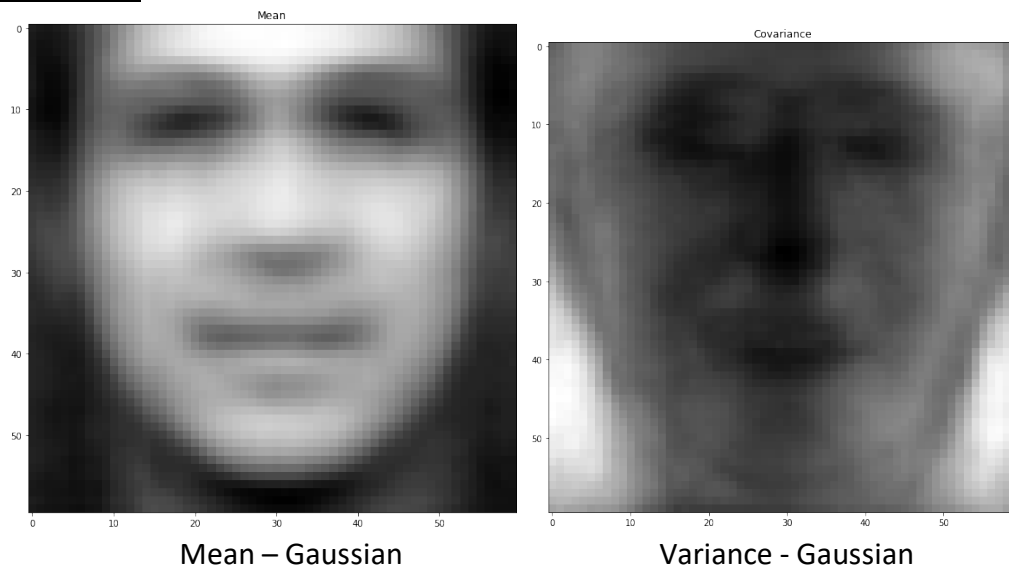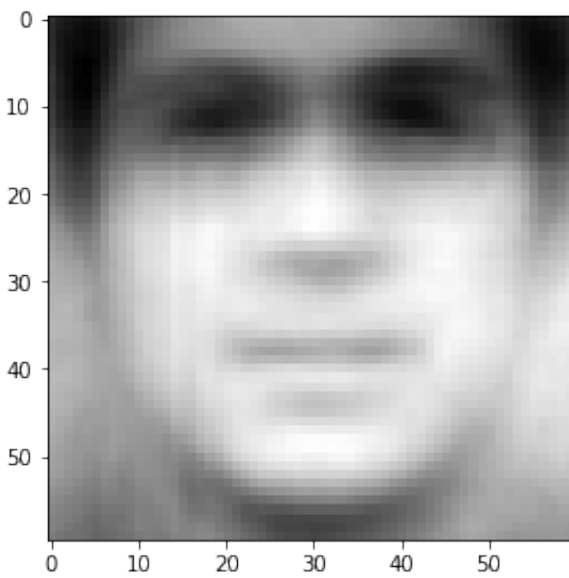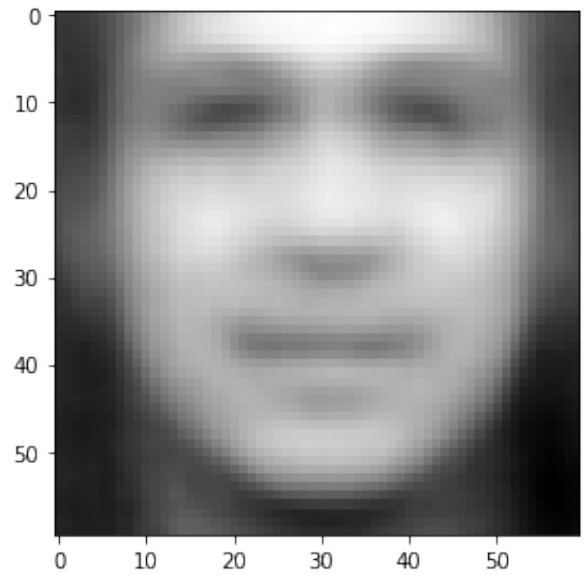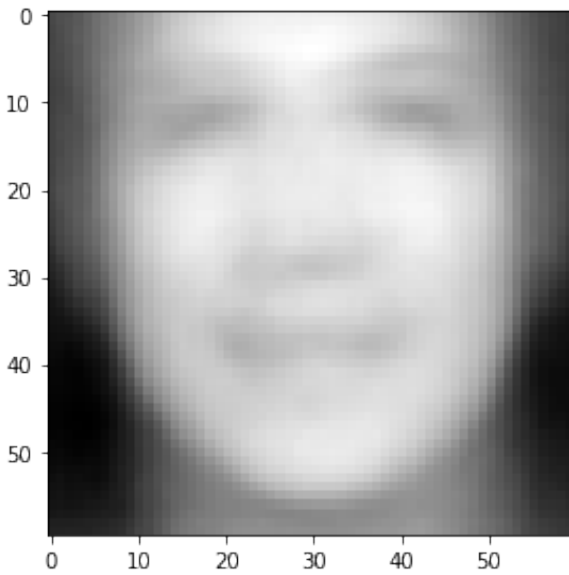
Variance - Gaussian

```
false_positive_rate =   0.0983302411874
false_negative_rate =   0.0303687635575
misclassification_rate =   0.067
```
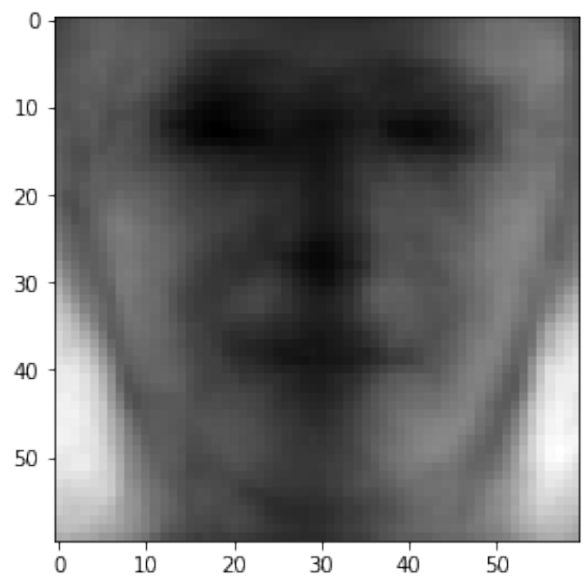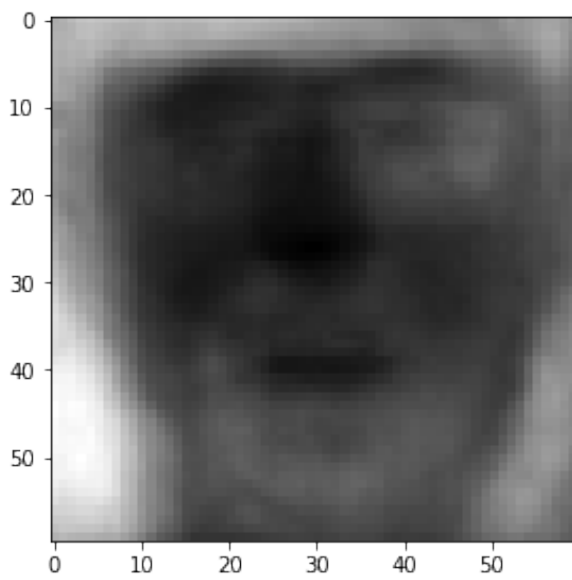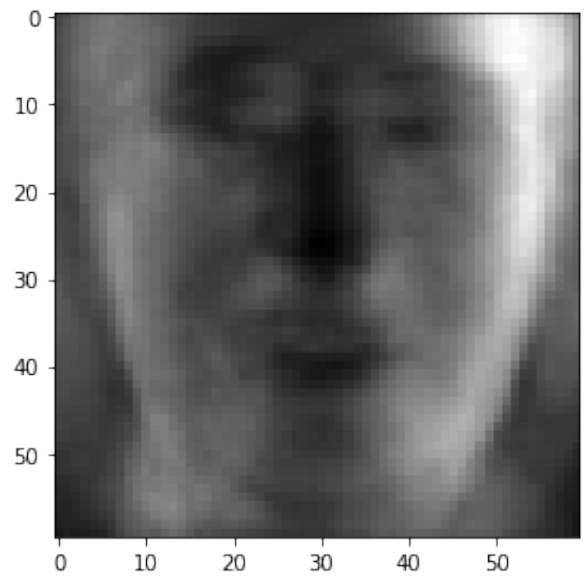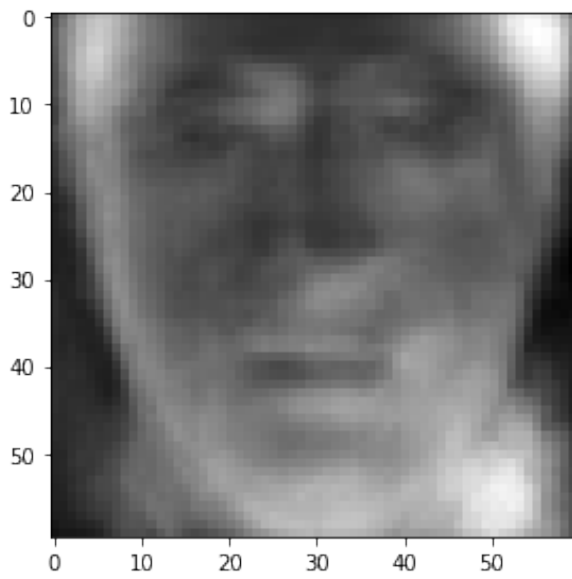

ROC Curve - Gaussian

Model 2: Mixture of Gaussians:
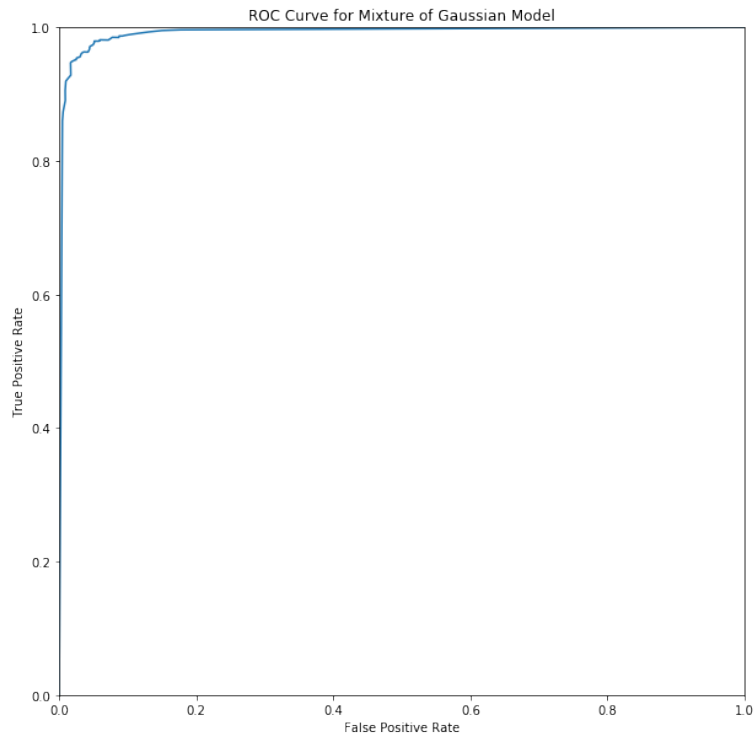For number of components = 4

Means of Mixture of Gaussian

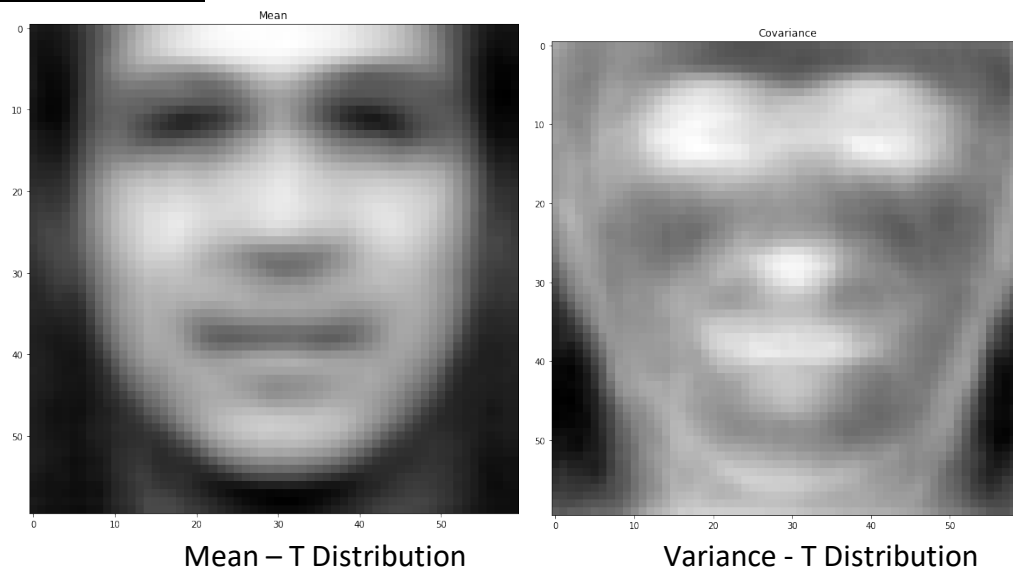Diagonal Covariance for Mixture of Gaussian

```
false_positive_rate =   0.0377358490566
false_negative_rate =   0.031218529708
misclassification_rate =   0.0345
```
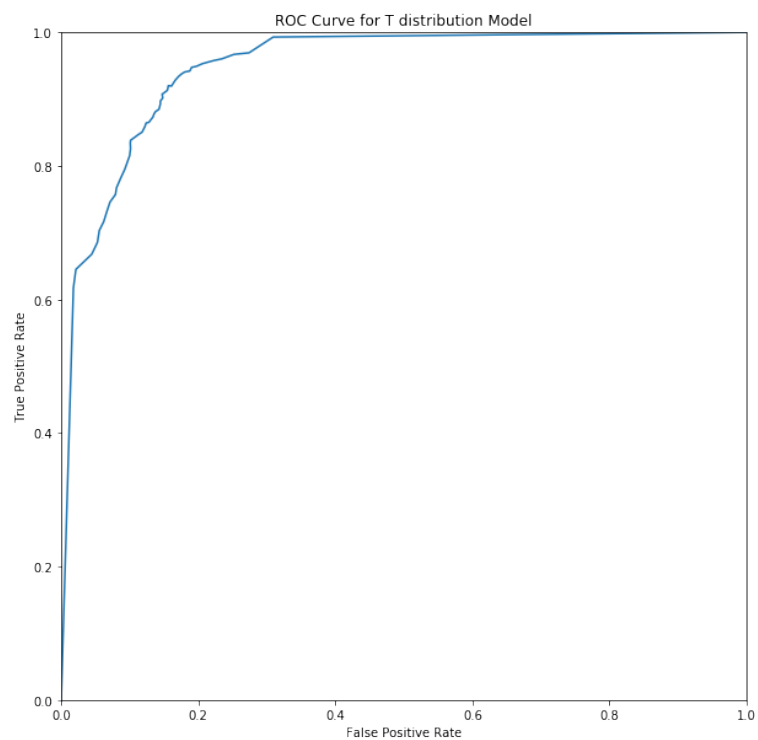
ROC Curve for Mixture of Gaussian

Model 3: T Distribution:

Mean – T Distribution
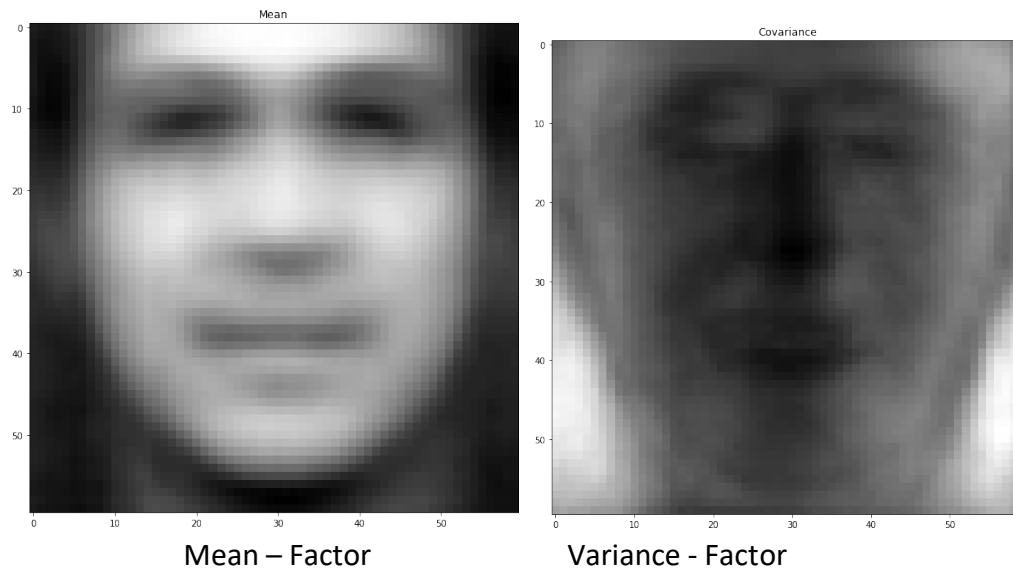

Variance - T Distribution

```
false_positive_rate =   0.131605184447
false_negative_rate =   0.129388164493
misclassification_rate =   0.1305
```

Model 5: Factor Analyzer:

For Factor = 5

Mean – Factor

Variance - Factor

```
false_positive_rate =  0.098788443616
false_negative_rate =  0.0355987055016
misclassification_rate =  0.0695
```


ROC Curve for Factor Analyzer