Computer Vision

ECE- 763

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1. INTRODUCTION

We are trying to classify the face versus non-face using four models, namely,

(i) Single Gaussian Model
(ii) Mixture of Gaussian Model
(iii) T- Distribution Model
(iv) Factor Analysis Model

The dataset which we used is Face Detection Dataset and Benchmark. [Link]

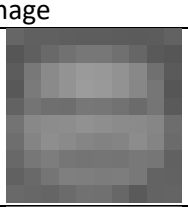
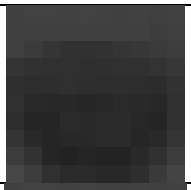
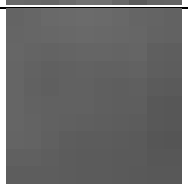
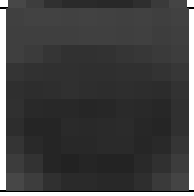
Data Preprocessing

The faces available in this dataset are annotated. Annotations: center x and y coordinates, major and minor axis of the faces. We cropped the 1100 face and 1100 non-faces images from the dataset. In training we are using 1000 face and non-face images, and in testing we are using 100 face and 100 non-face images.

Finally, we reshaped each image to 10x10 grayscale and used it for our training and testing. This was done to avoid the limitation of computation which let to overflow and underflow while training our model.

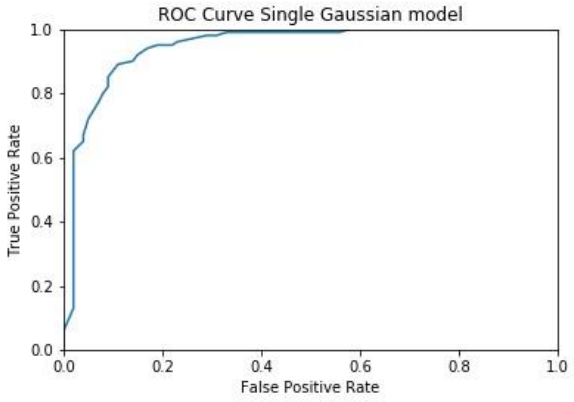
2. Model 1- Single Gaussian Model

Training Results

	Mean Image	Covariance Face
Face Image		
Non- Face Image		

Testing Results

False Positive Rate	0.14
False Negative Rate	0.10
Misclassification Rate	0.12



3. Model 2: Mixture of Gaussian Model

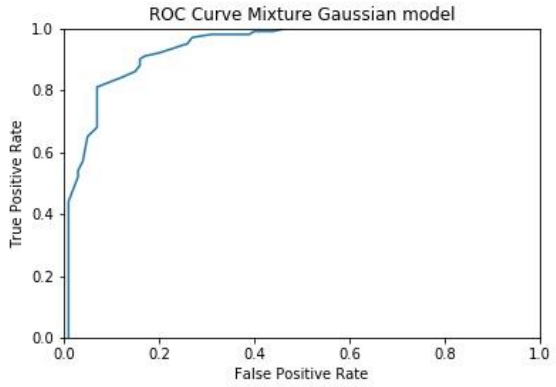
Training Results

For this model, we chose k = 5 and we got the following results.

	Mean Image					Covariance Image				
	λ = 0.1522 k = 1	λ = 0.2052 k = 2	λ = 0.2330 k = 3	λ = 0.2139 k = 4	λ = 0.1995 k = 5	λ = 0.1522 k = 1	λ = 0.2052 k = 2	λ = 0.2330 k = 3	λ = 0.2139 k = 4	λ = 0.1995 k = 5
Face Image										
	λ = 0.2622 k = 1	λ = 0.1505 k = 2	λ = 0.1133 k = 3	λ = 0.2698 k = 4	λ = 0.2039 k = 5	λ = 0.2622 k = 1	λ = 0.1505 k = 2	λ = 0.1133 k = 3	λ = 0.2698 k = 4	λ = 0.2039 k = 5
Non- Face Image										

Testing Results

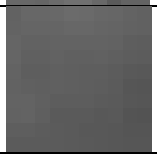
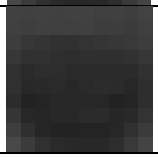
False Positive Rate	0.150
False Negative Rate	0.140
Misclassification Rate	0.145



4. Model 3: t- Distributions Model

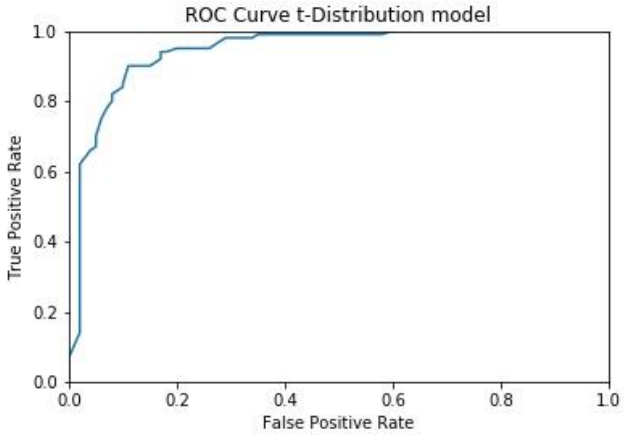
Training Results

For this model, we chose v = 1000 and got the following results.

	Mean Image	Covariance Face
Face Image		
Non- Face Image		

Testing Results

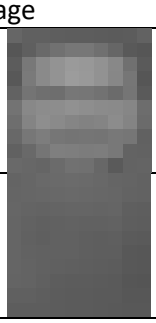
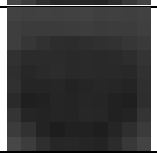
False Positive Rate	0.130
False Negative Rate	0.100
Misclassification Rate	0.115



5. Model 4: Factor Analysis Model

Training Results

For this model, we chose k = 20 and got the following results.

	Mean Image	Covariance Face
Face Image		
Non- Face Image		

Testing Results

False Positive Rate	0.130
False Negative Rate	0.120
Misclassification Rate	0.125