Pattern Recognition
Programming Assignment 2

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1 Introduction

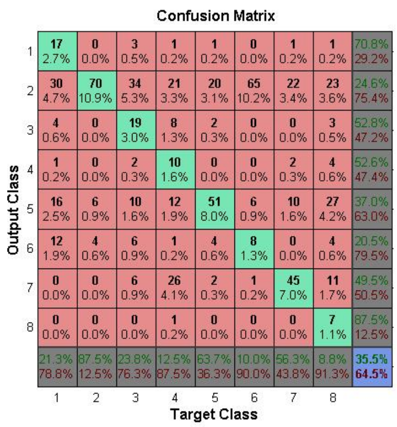
A Gaussian Mixture Model (GMM) is a parametric probability density function represented as a weighted sum of Gaussian component densities. GMMs are commonly used as a parametric model of the probability distribution of continuous measurements or features in a biometric system, such as vocal-tract related spectral features in a speaker recognition system.
GMM parameters are estimated from training data using the iterative Expectation-Maximization (EM) algorithm or Maximum A Posteriori(MAP) estimation from a well-trained prior model.
A Gaussian mixture model is a weighted sum of M component Gaussian densities as given by the equation
p(x| λ) = Σw_ig(x| μ_i, Σ).

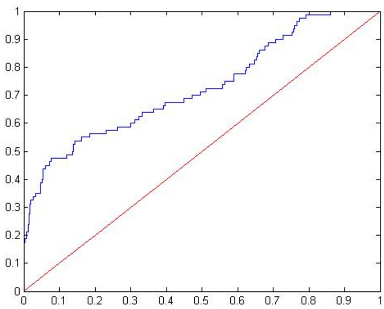
2 Observations and Plots

2.1 Gaussian Mixture Model (GMM)

The following are the Confusion matrix and ROC plots :

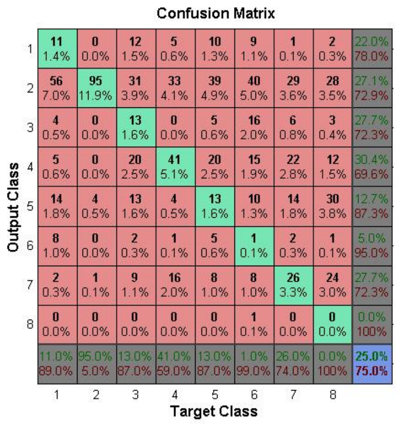
IMAGE DATA SET :

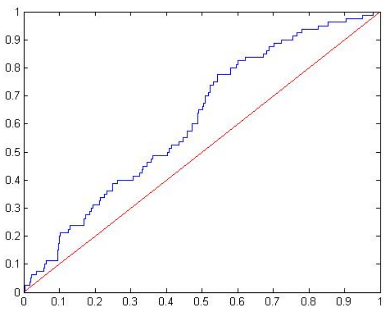




2.2 Parzen Window Method (Gaussian Kernel)

The following are the Confusion matrix and ROC plots :





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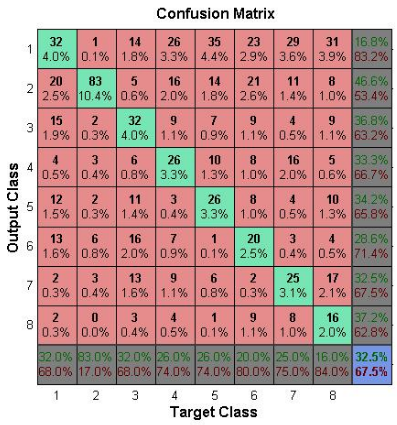
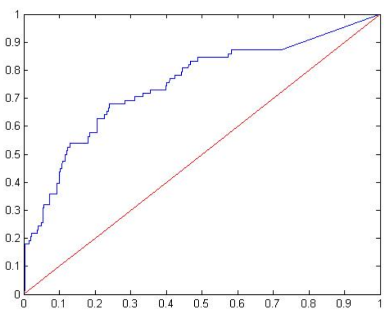
2.3 Parzen Window Method (Spherical Kernel)

The following are the Confusion matrix and ROC plots :





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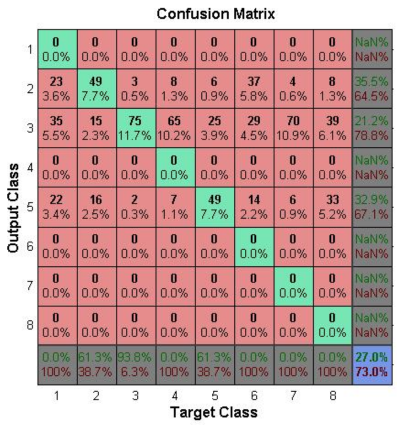
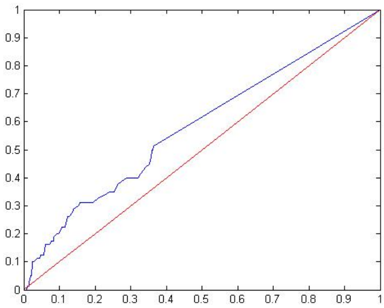
2.4 Perceptron Method

The following are the Confusion matrix and ROC plots :





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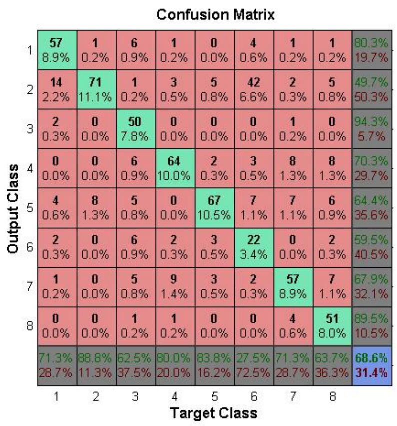
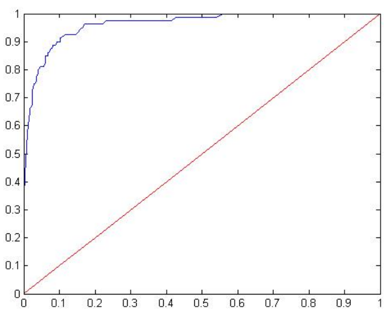
2.5 SVM Method

The following are the Confusion matrix and ROC plots :





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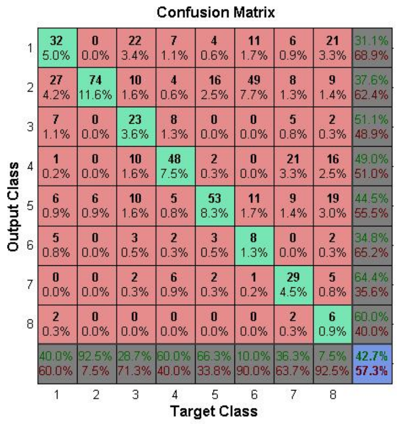
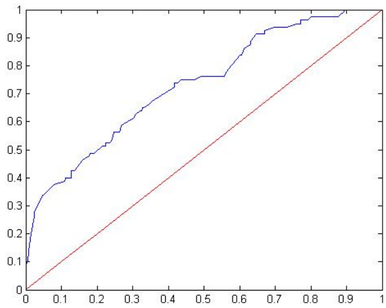
2.6 K-Nearest Neighbors Method

The following are the Confusion matrix and ROC plots :





3 Observations

From the above confusion matrices we can observe the following :
1] The accuracy of the image dataset is 35.5% using GMM.

2] The accuracy of the image dataset is 25% using parzen window method with a gaussian kernel.

3] The accuracy of the image dataset is 32.5% using parzen window method with a spherical kernel.

4] The accuracy of the image dataset is 27% using perceptron method.

5] The accuracy of the image dataset is 27% using k-nearest neighbor 42.7% method.

6]The accuracy of the image dataset is 68.6% using svm method.

4 Conclusions

From the above observations and experiments it can be seen that SVMs perform better in spacial datasets.Even k-nearest neighbors method is also better than perceptron and parzen window methods.