INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
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EE 5024: Machine Learning For Image Processing (Jan-Jun 2020)
Programming Assignment 2

Bayesian Classification

1. Go through the datasets uploaded in the moodle and complete the following table:

Sl.No.	Name of Dataset	1	2	3	4	5
1	Feature vector dimension					
2	No. of classes					
3	Prior prob. for each class					
4	Mean vector dim.					
5	Covariance matrix dim.					

Table 1

2. Select any one dataset. Then for each class select one feature and plot 1D histogram i.e. $p(x_k/\omega_i)$ for at least 3 classes, where x_k is the kth feature of datset and ω_i represents the ith class. Now apply bayesian classification using the above likelihoods, you can experiment with different values of k. Repeat the same by selecting 2 features for at least 3 classes and plot 2D histogram (you can use inbuilt command for this).

3. You need to perform bayesian classification for the dataset (que3.xlxs) uploaded in the moodle. Before starting, divide the data of each class into 70% data as training and 30% for testing. Text file has 1500 data points in which first 500 data points belong to ω_1, next 500 to ω_2 and last 500 to ω_3. Perform Bayesian classification for following cases:

   i Same covariance matrix for all the classes. (Hint: Calculate Σ by considering all data points)

   ii Different covariance matrices. (Hint: Calculate Σ_1, Σ_2 and Σ_3 separately for each class.

   iii Diagonal covariance matrices. (Hint: Make $\sigma_{12} = \sigma_{21} = 0$ in covariance matrices generated in (ii))

NOTE:
You have to plot Eigen vectors for the covariance matrix and the contours of equal probability on the feature space. You may use inbuilt functions like eig , quiver and contour . For building 2D gaussian model you can code yourself or

else you can use inbuilt function in matlab (mvnpdf). Sample plots for (ii) and (iii) are shown below.
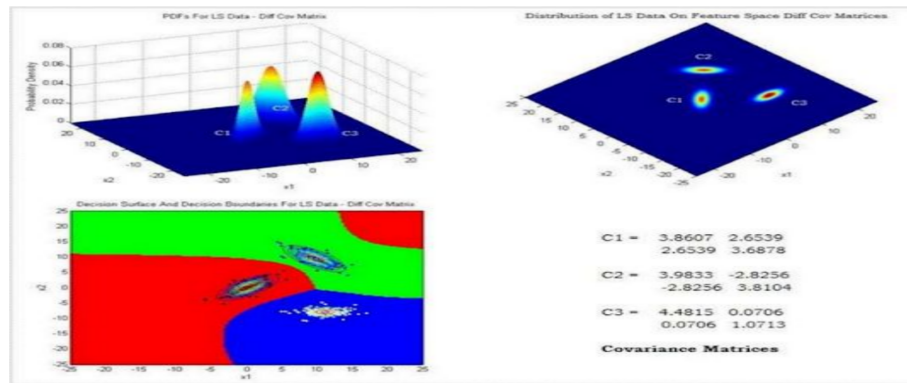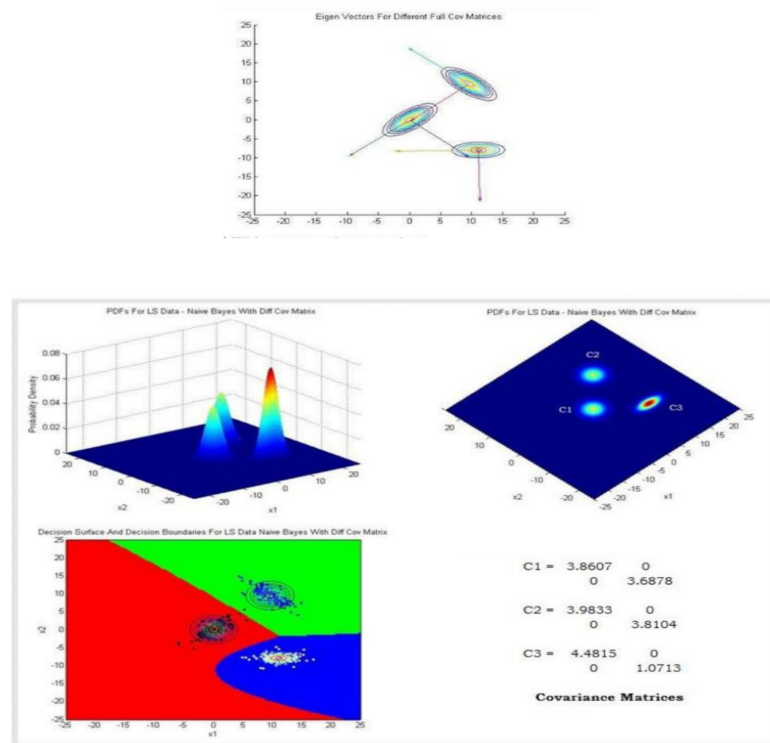

Figure 1

Figure 2