Indian Institute of Technology Tirupati

Course: EE5106: Pattern Recognition & Machine Learning

Programming Assignment_2

Q.1 Go through the Datasets Uploaded and complete the following table:

S.No		1	2	3	4	5	6	7	8
	NAME OF THE DATASET								
1	Feature Vector Dimension								
2	No. of Classes								
3	Prior Prob. For Each class								
4	Mean Vector Dimension								
5	Covariance Matrix Dim.								

Q.2. Select any one dataset. Then for each class select one feature and plot the 1D histogram i.e. p (x_k/w_i) for at least 3 classes where x_k is k^{th} feature of dataset. Repeat the same by selecting 2 features for at least 3 classes and plot the 2D histogram.

Q.3. You need to perform Bayesian classification for the following Datasets. Before starting divide the data of each class into 70% data as training and 30% for testing.

(a) Linearly Separable Data (3 Class Problem)

Text File has 1500 data points. First 500 data points belong to class_1, next 500 to class_2 and last 500 to class_3.Perform Bayesian Classification for the following cases:

- **Case_1:** Same Covariance Matrix for all the classes. Hint: Calculate $\sum$ by considering all data points.
- **Case_2:** Different Covariance Matrices. Hint: Calculate $\sum_1$, $\sum_2$ and $\sum_3$ separately for each class.
- **Case_3:** Different Diagonal Covariance Matrices. Hint: Make $\sigma_{12}= \sigma_{21}=0$ in covariance matrices generated in case_2.

NOTE: Plot Eigen vectors of Covariance Matrix and Contours in feature space for each case.

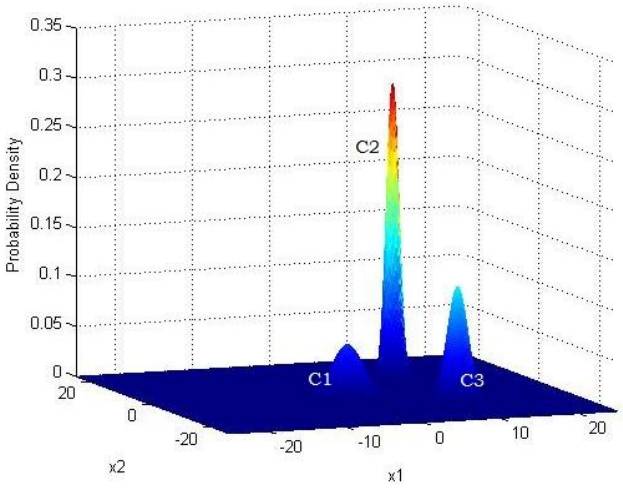
(b) Non Linearly Separable Data (2 class problem)

Two Text files for each class have been uploaded. Perform Bayesian Classification for Different Covariance Matrices case.

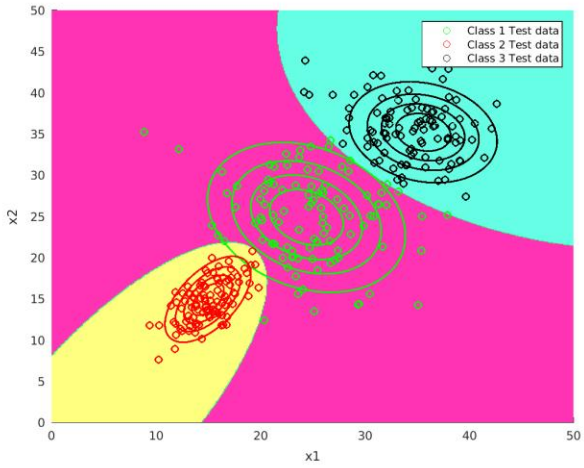
NOTE: Plot Eigen vectors of Covariance Matrix and Contours in feature space.

NOTE: You need to code yourself for building 2D Gaussian model. No inbuilt functions are allowed.

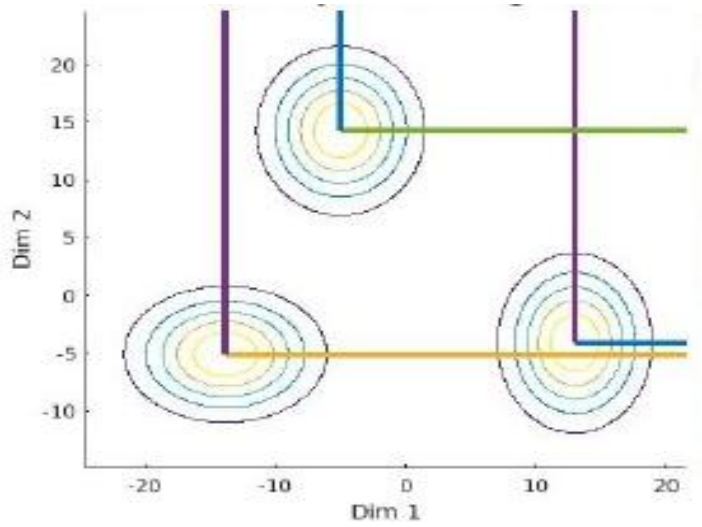
Sample Plots for Q.3.



2D Gaussian Model



Decision Boundary & Decision Surface



Eigen Vectors For Covariance Matrix