

CS 479/679 Pattern Recognition
Spring 2014 – Prof. Bebis
Programming Assignment 1 - Due: 3/10/2014

1. Generate 10,000 samples from each 2D distribution specified by the following parameters:

$$\mu_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \quad \Sigma_1 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \mu_2 = \begin{bmatrix} 1 \\ 4 \end{bmatrix} \quad \Sigma_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

- a. Assuming $P(\omega_1) = P(\omega_2)$
 - i. Design Bayes classifier for minimum error.
 - ii. Plot the Bayes decision boundary together with the generated samples.
 - iii. Classify the samples by the classifier and count the number of misclassified samples.
 - iv. Plot the Chernoff bound as a function of β and find the optimum β for the minimum.
 - v. Calculate the Bhattacharyya bound.
 - b. Repeat part (b) for $P(\omega_1) = 0.3$ and $P(\omega_2) = 0.7$.
2. Repeat problem 1 using the following parameters:

$$\mu_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \quad \Sigma_1 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \mu_2 = \begin{bmatrix} 1 \\ 4 \end{bmatrix} \quad \Sigma_2 = \begin{bmatrix} 3 & 0 \\ 0 & 2 \end{bmatrix}$$

FORMAT FOR SUBMITTING PROJECT REPORTS

Page 1: Cover Page. The cover page should contain Project title, Project number, Course number, Student's name, Date due, and Date handed in.

Page 2: Technical discussion. One to two pages (max). This section should include the techniques used and the principal equations (if any) implemented.

Page 3 (or 4): Discussion of results. One to two pages (max). A discussion of results should include major findings in terms of the project objectives, and make clear reference to any figures generated.

Appendix: Program listings. Includes listings of all programs written by the student. Standard routines and other material obtained from other sources should be acknowledged by name, but their listings should not be included