CSE4214 Pattern Recognition Lab

Experiment No 3

Implementing Minimum Error Rate Classifier

Problem Description:

Design a minimum error rate classifier for a two class problem with given data (assuming they follow normal distribution):

$$\begin{array}{ll} P(x|\omega_1) \! = \! N(\mu_1, \Sigma_1) & P(x|\omega_2) \! = \! N(\mu_2, \Sigma_2) \\ \text{where, } \mu_1 \! = \! [0 \ 0] & \text{where, } \mu_2 \! = \! [2 \ 2] \\ \text{and } \Sigma_1 \! = \! [.25 \ .3; \ .3 \ 1]; & \text{and } \Sigma_2 \! = \! [.5 \ 0; \ 0 \ .5]; \\ P(\omega_1) = \! 0.5 & P(\omega_2) = \! 0.5 \end{array}$$

- 1. Classify the sample points from "test.txt".
- 2. Classified samples should have different colored markers according to the assigned class label.
- 3. Draw a figure which should include these points, the corresponding probability distribution function along with its contour.
- 4. Draw decision boundary.

You can not use library function for calculating values from normal distribution.

Normal Distribution Formula:

$$N_k(\mathbf{x}_i|\mathbf{\mu}_k,\mathbf{\Sigma}_k) = \frac{1}{\sqrt{(2\pi)^D|\mathbf{\Sigma}_k|}} e^{\left(-\frac{1}{2}(\mathbf{x}_i - \mathbf{\mu}_k)^T \mathbf{\Sigma}_k^{-1}(\mathbf{x}_i - \mathbf{\mu}_k)\right)}$$

Helpful python library: numpy, matplotlib, pandas, sympy

Marks Distribution:

Task	Mark
1 and 2	5
3	3
4	2

Sample figures:

Your figure can be any of these types, or something similar.

