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):

$P(x|\omega_1)=N(\mu_1, \Sigma_1)$
where, $\mu_1=[0\ 0]$
and $\Sigma_1= [.25\ .3; .3\ 1]$;
$P(\omega_1) =0.5$

$P(x|\omega_2)= N(\mu_2, \Sigma_2)$
where, $\mu_2=[2\ 2]$
and $\Sigma_2= [.5\ 0; 0\ .5]$;
$P(\omega_2) =0.5$

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:

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

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.