Pattern Recognition

Assignment: 2

Note: Implementation can be done in any programming/ simulation software.
Steps to design Baye's Classifier is given in page 2.

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1. Implement Baye's Classifier for Iris Dataset.

   Dataset Specifications:

   Total number of samples = 150
   Number of classes = 3
   (Iris setosa, Iris virginica, and Iris versicolor)
   Number of samples in each class = 50

   Assumption:

   Number of training feature vectors (in each class) = 40
   Number of test feature vectors (in each class) = 10

   Number of dimensions = 4
   Feature vector = $< x_1 , x_2, x_3, x_4 >$
   <sepal length, sepal width, petal length, petal width>

   If the samples follow a multivariate normal density, find the accuracy of classification for the test feature vectors.

Due Date : 28/ Feb/2019

12/2/2019 Assignment-2

Design of Bayes classifier

Given: Iris dataset

$X = \langle x_1, x_2, x_3, x_4 \rangle$; $d = 4$

no. of classes = $\omega_1, \omega_2, \omega_3$; $C = 3$.

$N = 150$; $n(\omega_1) = 50$; $n(\omega_2) = n(\omega_3) = 50$

Bayes rule:

Find $$P(\omega_i/X) = \frac{P(X/\omega_i) \cdot P(\omega_i)}{P(X)}$$

← It is constant for all classes; so ignored.

STEPS:

1. Find a Priori probability $P(\omega_i) = \frac{n(\omega_i)}{N} = \frac{50}{150}$

2. Find $P(X/\omega_i)$; It's multivariate class | by following normal density

$$P(X/\omega_i) = \frac{1}{(2\pi)^{d/2} |\Sigma_i|^{1/2}} \exp\left[\frac{-1}{2}\left\{(X-M_i)^t \Sigma_i^{-1} (X-M_i)\right\}\right]$$

2.a) Find the mean vector

2.b) Find the covariance matrix Σ_i

2.c) Find the $|\Sigma_i|$ and Σ_i^{-1}

3. Find $P(\omega_1/X)$; $P(\omega_2/X)$ and $P(\omega_3/X)$; Find the maximum and assign X to that class. Also plot the Accuracy for i) separate classes and ii) overall performance.