

**Name:**

In The Name of Almighty  
ECE Dept. Isfahan University of Technology  
Statistical Pattern Recognition  
**Computer Assignment #3**



**STN:**

1. Write a program to implement the Perceptron algorithm.
  - a) Starting with  $\mathbf{w} = \mathbf{0}$ , apply your program to the training data from  $\omega_1$  and  $\omega_2$ . Note the number of iterations required for convergence.
  - b) Apply your program to  $\omega_3$  and  $\omega_2$ . Again, note the number of iterations required for convergence.
  - c) Explain the difference between the iterations required in the two cases.
- 2- Write a program to implement the least squares (LS) criterion algorithm.
  - a) Apply your program to the training data from  $\omega_1$  and  $\omega_2$ .
  - b) Apply your program to the training data from  $\omega_3$  and  $\omega_2$ .
- 3- Write a program to implement a multi-category generalization of Logistic Discrimination.
  - a) Apply it to the data in all four categories in the table based on  $\omega_i$  vs. not  $\omega_i$  for  $i=1, 2, 3, 4$ .
  - b) Apply it to the data in all four categories in the table based on  $\omega_i$  vs.  $\omega_j$  for  $i, j=1, 2, 3, 4$ .
  - c) Find any regions whose categorization by your system is ambiguous.

Table 1: Training Data for Computer Assignment #3

	$\omega_1$		$\omega_2$		$\omega_3$		$\omega_4$	
Sample	$x_1$	$x_2$	$x_1$	$x_2$	$x_1$	$x_2$	$x_1$	$x_2$
1	0.1	1.1,	7.1	4.2	-3.0	-2.9	-2.0	-8.4
2	6.8	7.1	-1.4	-4.3	0.5	8.7	-8.9	0.2
3	-3.5	-4.1	4.5	0.0	2.9	2.1	-4.2	-7.7
4	2.0	2.7	6.3	1.6	-0.1	5.2	-8.5	-3.2
5	4.1	2.8	4.2	1.9	-4.0	2.2	-6.7	-4.0
6	3.1	5.0	1.4	-3.2	-1.3	3.7	-0.5	-9.2
7	-0.8	-1.3	2.4	-4.0	-3.4	6.2	-5.3	-6.7
8	0.9	1.2	2.5	-6.1	-4.1	3.4	-8.7	-6.4
9	5.0	6.4	8.4	3.7	-5.1	1.6	-7.1	-9.7
10	3.9	4.0	4.1	-2.2	1.9	5.1	-8.0	-6.3