Name: _____

Practice Quiz - 2
CS 591Q/791V - Pattern Recognition
Posted on: April 9, 2009

Please read this first:

☐ **This is an in-class, closed-book/notes quiz consisting of 3 questions.** ☺
☐ **You will have to turn in your solutions by 12:15pm.**
☐ **You are not permitted to engage in any kind of discussion during the quiz.**
☐ **If a question seems ambiguous, state your assumption and proceed to solve it.**
☐ **An act of academic dishonesty will fetch you a 0 in the quiz.** ☹

1. Consider a dataset in which every pattern is represented by a set of 15 features. The goal is to identify a subset consisting of 10 features or less that gives the best performance on this dataset. How many subsets would each of the following feature selection algorithms consider before identifying a solution?

   (a) Exhaustive search;

   (b) SFS;

   (c) SBS;

2. Consider the following 2-dimensional labeled training patterns representing two classes C_1 and C_2. The goal is to derive a linear decision boundary using the perceptron learning algorithm.

C_1 $(t = +1)$	C_2 $(t = -1)$
$\boldsymbol{x}_1 = (3,4)$	$\boldsymbol{x}_4 = (1,1)$
$\boldsymbol{x}_2 = (3,5)$	$\boldsymbol{x}_5 = (1,2)$
$\boldsymbol{x}_3 = (4,4)$	$\boldsymbol{x}_6 = (2,1)$

   (a) Write down the transformed 3-dimensional vectors $\boldsymbol{y}_1$, $\boldsymbol{y}_2$, $\boldsymbol{y}_3$, $\boldsymbol{y}_4$, $\boldsymbol{y}_5$ and $\boldsymbol{y}_6$ that are necessary for the perceptron algorithm.

   (b) What is the *final* linear decision boundary obtained using the Batch Perceptron algorithm assuming that the weight vector $\boldsymbol{w}$ is initialized to $(-12, 8, 10)^T$, $\eta = 1$, and $\theta = 0$? Note that $\theta = 0$ implies that the algorithm terminates once all the patterns are correctly classified.

3. What is the rationale behind the expression for the Fisher's criterion?