

Name:

Student ID#:

Statistical Pattern Recognition (CE-725)
Department of Computer Engineering
Quiz #6 Solution (Linear Discriminant Functions) - Spring 2011

Consider Five discriminant functions for a two-dimensional classification problem in the form of $f_i(x) = (x - b_i)^T(x - b_i)$ which b_i 's are:

$$b_1 = [0 \ 0]^T \quad b_2 = [2 \ 0]^T \quad b_3 = [-2 \ 0]^T \quad b_4 = [2 \ 2]^T \quad b_5 = [2 \ -2]^T$$

How do a pairwise linearly separable rule, using these functions, partitions the feature space? (Avoid explicit calculation of discriminant functions and draw a rough sketch of the class boundaries).

Hint: Assume $g_{ij}(x) = g_j(x) - g_i(x)$.

Sol: Pairwise linearly separable rule, using given g_{ij} functions, is equivalent to a linear machine using g_i functions. In addition g_i functions are equivalent to Normal distributions with $\mu_i = b_i$ and $\sum_i = I$. Then the boundaries between adjacent Normal distributions will form the space partitioning boundaries. The result is shown in the following figure:

