Statistics 315c
Homework 4, due Friday June 2, 2000.

1. For the phoneme classification problem with two classes ("aa" and "ao", as done in class), you wish to use a penalization approach to constrain the coefficients to be smooth. Construct a suitable penalized log-likelihood, and derive the form of the iteratively-reweighted-least-squares algorithm for maximizing it. N.B. No need to implement this! Just show the algebra.

2. *Kernels and linear discriminant analysis.* Suppose you wish to carry out a linear discriminant analysis (two classes) using a vector of transformations of the input variables $h(x)$. Since $h(x)$ is high-dimensional, you will use a regularized within-class covariance matrix $W_h + \gamma I$. Show that the model can be estimated using only the inner products $K(x_i, x'_j) = \langle h(x_i), h(x'_j) \rangle$. Hence the kernel property of support vector machines is also shared by regularized linear discriminant analysis. [Hint: use optimal scoring].

3. Chapter 6, exercise 5.