RBF Homework

1. By hand:

   (a) Suppose $x = -2$. Choose the centers $c = \{-1, 1, 2\}$. The transfer function will be the cubic function. Assume the weights and bias terms are:

   $$W = \begin{bmatrix} 1 & 3 & 1 \end{bmatrix} \quad b = 2$$

   Compute the layers that make up the RBF (by hand):

   $$\mathbf{x} \rightarrow \begin{bmatrix} \|\mathbf{x} - \mathbf{c}_1\| \\ \|\mathbf{x} - \mathbf{c}_2\| \\ \vdots \\ \|\mathbf{x} - \mathbf{c}_k\| \end{bmatrix} \rightarrow S = \begin{bmatrix} \phi(\|\mathbf{x} - \mathbf{c}_1\|) \\ \phi(\|\mathbf{x} - \mathbf{c}_2\|) \\ \vdots \\ \phi(\|\mathbf{x} - \mathbf{c}_k\|) \end{bmatrix} \rightarrow WS + b$$

2. Coding Exercise 1:

   Use the sample code given as a template for building a classifier diabetes data. We want to use OLS (you can use the same parameters as the wine example) to place the centers, and a Gaussian as a transfer function (you can set $\sigma = 1$, which is Matlab's default).

   When you load the data, you'll see that X is 768×8, and the targets are T (768×2).

3. Coding Exercise 2:

   Use k-means clustering to place the centers, and build an RBF classifier for the hand-written digit data. In this case, do the clustering before doing the RBF to place 10 centers.

   When you load the data, you'll see that X is 64×1797 and T is 10×1797.