HW02: Clustering and perceptrons

Hand in at: `http://www.cs.utah.edu/~hal/handin.pl?course=cs726`. Remember that only PDF submissions are accepted. We encourage using LaTeX to produce your writeups. See `hw00.tex` for an example of how to do so. You can make a `.pdf` out of the `.tex` by running "`pdflatex hw00.tex`".

1. Give an example of a low dimensional (approx 20 dimensions), a medium dimensional (approx 1000 dimensions) and a high dimensional (approx 100000 dimensional) problem that you care about.

2. What does the decision boundary for a one nearest neighbor classifier on two data points (one positive, one negative) look like?

3. (Final book question from chapter 2.) Clustering of classes was introduced as a way of making things faster. Will it make things worse, or could it help?

4. A common way to get rid of having to deal with the bias separately on a perceptron is to add a new feature. This feature always has value one, and you learn a weight for it. Thus, if you have a 100 dimensional problem with a bias, we solve it as a 101 dimensional problem without a bias. Draw a picture for *one dimensional* data and a linear separator with a (non-zero) bias and draw the corresponding picture for the same data, "lifted" into two dimensions, with the corresponding lineear separate *without* a bias. (Please make sure that the two separators are actually *equiavalent*!)