

## CIS6930/4930 Intro to Computational Neuroscience Spring 2005

### Home Work Assignment 2:

**Problem 1: Due Thursday 02/10/05 before class,**

**Problem 2 Due Thursday 02/17/05 before class**

1. (50 pts) Code and test a feed forward net of sigmoidal nodes with two input units, ten hidden units and one output unit that learns the concept of a circle in 2D space. The concept is:  $\langle x, y \rangle$  is labeled “+” if  $(x - a)^2 + (y - b)^2 < r^2$  and is labeled “-” otherwise. Set  $a = 2, b = 3, r = 1$ .

Generate 100 random samples uniformly distributed from a cell in  $\mathbb{R}^2$  to train the network using error backpropagation and 100 random samples to test it. Repeat the procedure multiple times and with multiple initial weights. Report the changing accuracy and the hyperplanes corresponding to the hidden nodes.

2. (50 pts) Get 20 images from the internet and reduce them to black and white dithered images of size  $50 \times 50$  pixels. Now train a Hopfield type recurrent net to retrieve these images. Finally, initialize the net with noisy versions of each of these images (randomly inverted pixels or cropped versions of the image) and see whether the net converges to the original images.

Images can be displayed easily in pbm format. For example, copy the next few lines into a file called test.pbm and use your favourite viewer (irfanview, xv, eog) to view it.

P1

# Width, height of image. Pixel values follow: < 70 chars per line

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