

EEL 6814

HMW # 3

Due February 16, 2016

1- Code the backpropagation algorithm and test it in the following 2 class problem called the Star problem. You have to specify the size of the hidden layer and tell why you select that number of hidden PEs.

x1	x2	d
1	0	1
0	1	1
-1	0	1
0	-1	1
0.5	0.5	0
-0.5	0.5	0
0.5	-0.5	0
-0.5	-0.5	0

I expect that the system learns this pattern exactly. You can think that points close to the x/y axes belong to one class and all the others belong to another class (hence the star). See how well your solution performs in points that do not belong to the training set, by selecting other points that follow the pattern (keep the points within the square of size 2). How could you improve the generalization accuracy of the solution?

2- The sleep datasets are larger, more involved classification problems where the goal is to design a MLP to classify the sleep data.

Sleep is not an uniform physiologic state. When one sleeps our brain waves (EEG) go into a set of stages (awake to stage 5), but remember, no two brains are the same. The goal is to be able to classify each minute of sleep, by utilizing the information on a set of EEG descriptors (Alpha, Beta, Delta, Sigma, Theta, Artifact, REM 1 and REM2 counts per minute) that are automatically detected from the EEG. Therefore, sleep stages are your desired targets, and these descriptors are your inputs.

You will find in the course website two data sets from two different patients. You train in patient one, and test on patient 2. There are four files, two with the inputs (EEG descriptors) and the other two with the manual sleep scoring.

Summarize the results of the training and testing in a confusion table, and show the effect on performance of different stepsizes, and different initial conditions. How could you improve the generalization results?