

COMP4302/COMP5322 Artificial Neural Networks
Semester 2, 2003

Assignment 1. Perceptron, ADALINE and Backpropagation

Out: week 3, due: week 6

Create a 2-class problem on 2-dimensional data. Generate 500 examples (approximately equal number for each class) with attributes from [0,1]. In the first experiment pre-classify the data to be linearly separable and in the second – linearly inseparable. Use targets of 1 and -1. Plot the two datasets.

Test the classification ability of the perceptron, ADALINE trained with the Widrow-Hoff algorithm and multilayer perceptron (MLP) trained with the backpropagation. In the case of MLP, use 1 output neuron and 1 hidden layer. Find experimentally a good number of hidden neurons, a heuristic to start with is $\#hiddenNeurons = 1/2(\#inputNeurons + \#outputNeurons)$.

Use 2/3 of the examples as a training set and the remaining as a test set. Compare convergence speed, accuracy and mse:

- speed of convergence – plot a graph showing the number of training epochs vs. the mse error on training set;
- accuracy – give the ratio (%) of the correctly classified examples vs. the total number of examples both on the training and test sets. For ADALINE and MLP, use a threshold to decide what the class of a test example is, e.g. if $a > 0$, then class = 1; else class = -1.
- calculate the mse on test data

Write a brief report:

1. Description of the data

- how the two data sets were generated
- plot of the datasets

2. Experimental setting

- architecture of each neural network (number of input, hidden and output neurons; transfer functions used)
- parameters – learning rate, momentum (if used), stopping criteria

3. Results and discussion

- include the speed plots, accuracy and mse results for each neural network
- briefly discuss the results (1/2-1 page); e.g. compare the performance of the 3 networks on the 2 problems, compare the mse on training and test sets for each network; mse and accuracy, discuss how the experimental results agree with the theory and everything else you consider important.

Enclose your Matlab code.

Submission: 1) hard copy (report+code) must be submitted in the locker labeled COMP4302/COMP5322 located in Madsen Building (the left corridor) and 2) electronically (report+code) by e-mail or netfile to your tutor

Deadline: Tuesday, 2 September 2003, 5pm (week 6)