CSC3022H: Machine Learning

Lab 6: Artificial Neural Networks

Department of Computer Science
University of Cape Town

2019

Due: Monday, 7 October, 2019, 10.00 AM

Problem Description

Implement (in C++) an algorithm that uses *only* perceptrons with *threshold* activation functions and the *perceptron learning rule* (chapter 4 [Mitchell, 1997]) to solve the binary A XOR B problem. Table 1 shows the correct inputs and outputs for the binary XOR problem.

Question 1: What is the minimum number of perceptrons required to solve the XOR problem, and how should they be connected?

Question 2: Devise a list of training examples to teach the perceptrons to solve the binary XOR problem. How many training examples did it take for your algorithm to correctly learn to solve the binary XOR problem?

NOTE: Your perceptrons **must not** use *linear* or *continuous* activation functions, *gradient descent* or the *back-propagation* algorithm.

In a ZIP file, place the source code, executable, and a text file containing your list of training examples, as well as answers to question 1 and 2. Upload the ZIP file to *Vula* before 10.00 AM, 7 October, 2019.

Table 1: Inputs and outputs for the binary XOR problem.

Input 1	Input 2	Output
1	1	0
1	0	1
0	1	1
0	0	0

References

[Mitchell, 1997] Mitchell, T. (1997). *Machine Learning.* McGraw Hill, New York, USA.