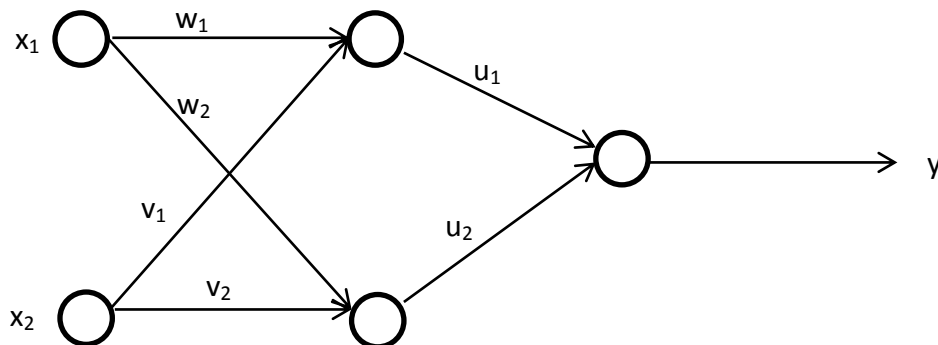
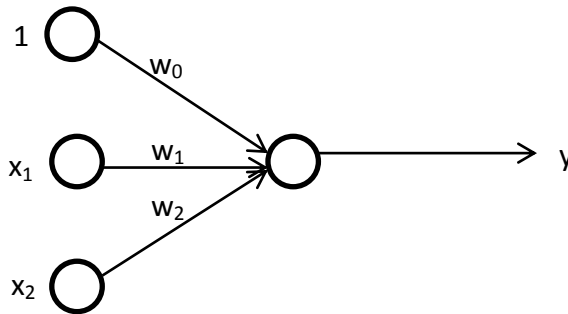


Exercise 2 (13.10.2014)

- 1) Read chapter 2 from Haykin's book until 2.13 (leaving out Statistical learning theory to end of chapter) and summarize or sketch your insights in mind-map or an outline or a summary.
- 2) Design a perceptron that computes the following Boolean function:
 - a) $f(x_1, x_2) = \text{NOT}(x_1 \text{ AND } x_2)$
 - b) $f(x_1, x_2, x_3) = (x_1 \text{ AND } x_2) \text{ OR } x_3$
- 3)
 - a) A basic limitation of the perceptron is that it cannot implement the EXCLUSIVE OR function. Explain the reason for this limitation.
 - b) Show that neural networks with one hidden layer can describe all Boolean functions.
- 4) Let these networks be ADALINE. Derive the Delta rule for the following two networks.



Here x is input and y is output. Assume linear activation function (i.e. $\sum(\text{inputs} * \text{weights}) = \text{output}$) for the neurons.

5) Do the problem 1.13 (Network architecture) from the previous week's assignment.

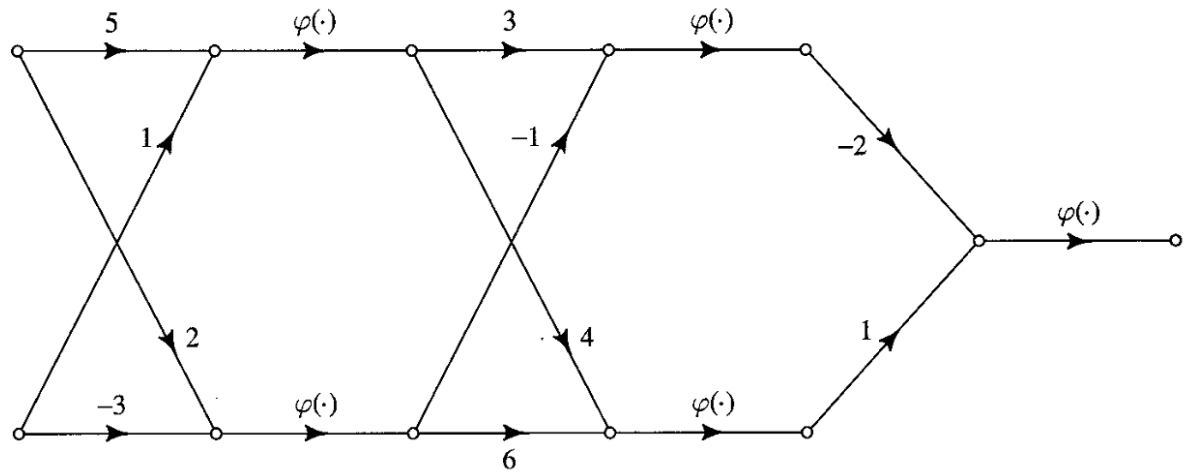


FIGURE P1.13

This time use MATLAB or Python's (sympy) symbolic toolbox. Finally assume the network presented in fig P1.13 is a binary-classifier, please depict how the input space (\mathbb{R}^2) is classified on a 2D graph using different colors.

6) Please upload 3 questions and their brief answers on the reading material in a separate txt file.

- Please follow the book, "Neural Networks: A Comprehensive Foundation (2nd Edition)" by Simon Haykin
- Questions 1) and 6) are supposed to be done individually.
- Answers to questions 1) to 5) should be presented in a single pdf file. On top of this file names of all the team members has to be mentioned.
- Answer to question 6) should be provided in a separate txt file.
- Please specify only your name (not all the team members) in the file name as per naming convention given in the course rules.