

# COMP9444 Neural Networks and Deep Learning

## Session 2, 2018

### Exercises 1: Perceptrons

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#### 1. Perceptron Learning

- a. Construct by hand a Perceptron which correctly classifies the following data; use your knowledge of plane geometry to choose appropriate values for the weights  $w_0$ ,  $w_1$  and  $w_2$ .

| Training Example | $x_1$ | $x_2$ | Class |
|------------------|-------|-------|-------|
| a.               | 0     | 1     | -1    |
| b.               | 2     | 0     | -1    |
| c.               | 1     | 1     | +1    |

- b. Demonstrate the Perceptron Learning Algorithm on the above data, using a learning rate of 1.0 and initial weight values of

$$w_0 = -1.5$$

$$w_1 = 0$$

$$w_2 = 2$$

In your answer, you should clearly indicate the new weight values at the end of each training step.

#### 2. XOR Network

Construct by hand a Neural Network (or Multi-Layer Perceptron) that computes the XOR function of two inputs. Make sure the connections, weights and biases of your network are clearly visible.

Challenge: Can you construct a Neural Network to compute XOR which has only one hidden unit, but also includes shortcut connections from the two inputs directly to the (one) output.

Hint: start with a network that computes the inclusive OR, and then try to think of how it could be modified.

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Make sure you try answering the Exercises yourself, before checking the [Sample Solutions](#)