1 Single layer perceptron

1.1 Algorithm

- Parameters

  - $m + 1$ input nodes $x_1, x_2, .., x_m$ (+1 for the bias node $x_0 = -1$)

  - n neurons

  - N input vectors

- Initialization.

  - Set each weight w_{ij} to a small random number (positive or negative).

- Training.

  - For T iterations or until all the outputs are correct do:

    * Compute all the activations of the n neurons, with

    $$y_j = g(\sum_{i=0}^{m} w_{ij} x_i) = \begin{cases} 1 & \text{if } \sum_{i=0}^{m} w_{ij} x_i > 0 \\ 0 & \text{if } \sum_{i=0}^{m} w_{ij} x_i \leq 0 \end{cases} \tag{1}$$

    * Update each of the weights w_{ij}, with

    $$w_{ij} \leftarrow w_{ij} - \eta(y_j - t_j) * x_i \tag{2}$$

- Recall.

  - Recalculate the activation of each neuron using:

    $$y_j = g(\sum_{i=0}^{m} w_{ij} x_i) = \begin{cases} 1 & \text{if } \sum_{i=0}^{m} w_{ij} x_i > 0 \\ 0 & \text{if } \sum_{i=0}^{m} w_{ij} x_i \leq 0 \end{cases} \tag{3}$$