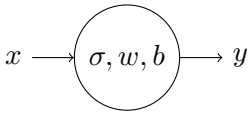
1 Network equations

1.1 Single neuron

Network representation



Forwarding equation

$$y = \sigma(wx + b) \tag{1}$$

Cost function

$$c(w, b) = \sum_{i=1}^{N} (\sigma(wx_i + b) - y_i)^2 \tag{2}$$

where the error of the forwaring is

$$\epsilon(x_i) = \epsilon_i = (\sigma(wx_i + b) - y_i) \tag{3}$$

Cost function derivatives

$$\frac{\partial c}{\partial w} = \sum_{i=1}^{N} 2x_i(\sigma(wx_i + b) - y_i)(1 - \sigma(wx_i + b)) = \sum_{i=1}^{N} 2x_i(y(x_i) - y_i)(1 - y(x_i)) = \sum_{i=1}^{N} 2x_i\epsilon_i(1 - y_i) \tag{4}$$

$$\frac{\partial c}{\partial b} = \sum_{i=1}^{N} 2(\sigma(wx_i + b) - y_i)(1 - \sigma(wx_i + b)) = \sum_{i=1}^{N} 2(y(x_i) - y_i)(1 - y(x_i)) = \sum_{i=1}^{N} 2\epsilon_i(1 - y_i) \tag{5}$$