Exercise 9 – MARTIN TÖRNQVIST

DD2427

2015-05-09

Part 1

$$L(\bar{y}, \bar{z}^{(3)}) = \| \bar{y} - \bar{z}^{(3)} \|^2$$

$$\frac{\partial L(\bar{y}, \bar{z}^{(3)})}{\partial w_{ho}^{(2)}} = \sum_{s=1}^{K} \frac{\partial L(\bar{y}, \bar{z}^{(3)})}{\partial z_s^{(3)}} \cdot \frac{\partial z_s^{(3)}}{\partial a_s^{(3)}} \cdot \frac{\partial a_s^{(3)}}{\partial w_{ho}^{(2)}}$$

$$\frac{\partial L(\bar{y}, z^{(3)})}{\partial z_s^{(3)}} = \frac{\partial \left(\| \bar{y} - \bar{z}^{(3)} \|^2 \right)}{\partial z_s^{(3)}} = -(y_s - z_s^{(3)})$$

$$\frac{\partial z_s^{(3)}}{\partial a_s^{(3)}} = \frac{\partial \left(g(a_s^{(3)}) \right)}{\partial a_s^{(3)}} = g'(a_s^{(3)}) \, , \quad g(x) = \text{activation function}$$

$$\frac{\partial a_s^{(3)}}{\partial w_{ho}^{(2)}} = \frac{\partial \left(\sum_{i=1}^{M} w_{si}^{(2)} \cdot z_i^{(2)} + w_{so}^{(2)} \right)}{\partial w_{ho}} = \begin{cases} 1 & \text{if } s = h \\ 0 & \text{otherwise} \end{cases} = $$

$$= \delta_{sh}$$

$$\frac{\partial L(\bar{y}, \bar{z}^{(3)})}{\partial w_{ho}^{(2)}} = \sum_{s=1}^{K} -(y_s - z_s^{(3)}) g'(a_s^{(3)}) \delta_{sh} =$$

$$= -(y_k - z_h^{(3)}) g'(a_h^{(2)}) = \delta_h^{(2)}$$

Note: U = no of output nodes

M = no of hidden nodes