ENGG 5202: Assignment #4

Due on Thursday, April 21, 2016

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Problem 1

Figure 1 shows the network structure:

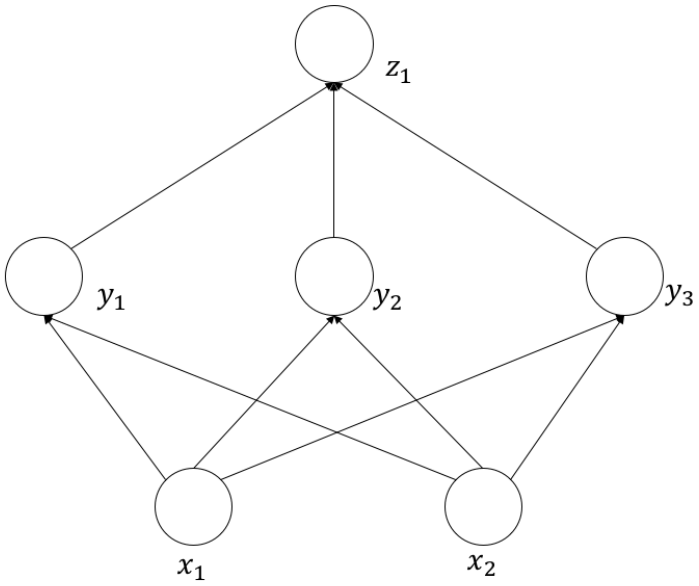

Figure 1: Support vectors of Set1

Nonlinear activation function

$$f(x) = \begin{cases} 1 & x \geq 0 \\ 0 & x < 0 \end{cases}$$

Weights are

$$\begin{aligned} y_1 &= f(x_1 + 1) \\ y_2 &= f(x_2 + 1) \\ y_3 &= f(-x_1 - 2x_2 + 1) \\ z_1 &= f(y_1 + y_2 + y_3 - 2.5) \end{aligned}$$

Problem 2

$$\begin{aligned} \frac{\partial J}{\partial w_{kj}} &= \frac{\partial J}{\partial z_k} \frac{\partial z_k}{\partial (net_k)} \frac{\partial (net_k)}{\partial w_{kj}} \\ &= (t_k - z_k)^3 \cdot f'(net_k) \cdot y_j \end{aligned}$$

So that

$$\Delta w_{kj} = \eta \frac{\partial J}{\partial w_{kj}} = \eta (t_k - z_k)^3 \cdot f'(net_k) \cdot y_j$$

Problem 3

3.1

Storage of network parameters: $O(dn_H + cn_H)$ Storage of training samples: $O(nd + n_H + c)$ Total space comlexity: $O(dn_H + cn_H + nd)$

3.2

Time complexity is $O(dn_H + cn_H)$.

3.3

Time complexity is $O(ndn_H + ncn_H)$.