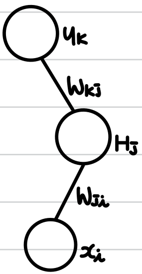
2017150431 조우영



$$E = -\frac{1}{2}\sum_k (T_k - y_k)^2$$

$$\frac{\partial E}{\partial W_{ji}} = \frac{\partial E}{\partial H_j}\frac{\partial H_j}{\partial W_{ji}} \quad \text{where} \quad \frac{\partial E}{\partial H_j} = \sum_k \frac{\partial E}{\partial y_k}\frac{\partial y_k}{\partial H_j}$$

$$\frac{\partial E}{\partial y_k} = -(T_k - y_k)$$

let $net_k = \sum_j (W_{kj}H_j)$, then, $\frac{\partial y_k}{\partial H_j} = \frac{\partial f(net_k)}{\partial H_j} = \frac{\partial f(net_k)}{\partial net_k}\frac{\partial net_k}{\partial H_j} = \frac{\partial f(net_k)}{\partial net_k}\frac{\sum_j (W_{kj}H_j)}{\partial H_j} = f'(net_k)W_{kj}$

$$\therefore \frac{\partial E}{\partial H_j} = \sum_k \frac{\partial E}{\partial y_k}\frac{\partial y_k}{\partial H_j} = -\sum_k (T_k - y_k)f'(net_k)W_{kj}$$

let $net_j = \sum_i (W_{ji}x_i)$, then, $\frac{\partial H_j}{\partial W_{ji}} = \frac{\partial f(net_j)}{\partial W_{ji}} = \frac{\partial f(net_j)}{\partial net_j}\frac{\partial net_j}{\partial W_{ji}} = \frac{\partial f(net_j)}{\partial net_j}\frac{\sum_i (W_{ji}x_i)}{\partial W_{ji}} = f'(net_j)x_i$

$$\therefore \frac{\partial E}{\partial W_{ji}} = \frac{\partial E}{\partial H_j}\frac{\partial H_j}{\partial W_{ji}} = -\sum_k \overbrace{(T_k - y_k)f'(net_k)}^{\sigma_k} W_{kj} \times f'(net_j)x_i$$

$$= -x_i \underbrace{f'(net_j)\sum_k \sigma_k W_{kj}}_{\sigma_j} = -x_i\sigma_j$$