The Delta Rule (Linear Neuron)

Changing weights

$$\Delta w_k = -\epsilon \frac{\partial E}{\partial w_k}$$

ϵ: Learning rate

Substitute $E = \frac{1}{2}\sum_i \left(t^{(i)} - y^{(i)}\right)^2$

$$= -\epsilon \frac{\partial}{\partial w_k}\left(\frac{1}{2}\sum_i \left(t^{(i)} - y^{(i)}\right)^2\right)$$

$$= \sum_i -\frac{1}{2}\epsilon\left(-2\left(t^{(i)} - y^{(i)}\right)\frac{\partial y^{(i)}}{\partial w_k}\right)$$

$$= \sum_i \epsilon\left(t^{(i)} - y^{(i)}\right)\frac{\partial y^{(i)}}{\partial w_k}$$

Recall that $y^{(i)} = w_1 x_1^{(i)} + \ldots + w_n x_n^{(i)}$

$$= \sum_i \epsilon\, x_k^{(i)}\left(t^{(i)} - y^{(i)}\right)$$