$$\frac{\partial E}{\partial w_i}(w) = \frac{\partial \frac{1}{2}\sum_{n=1}^{N}(\sigma(w^\top x_n) - t_n)^2}{\partial w_i}$$

$$\frac{\partial E}{\partial w_i}(w) = \sum_{n=1}^{N} \frac{\partial \frac{1}{2}(\sigma(w^\top x_n) - t_n)^2}{\partial \sigma(w^\top x_n) - t_n} \cdot \frac{\partial \sigma(w^\top x_n) - t_n}{\partial w^\top x_n} \cdot \frac{\partial w^\top x_n}{\partial w_i}$$

$$\frac{\partial E}{\partial w_i}(w) = \sum_{n=1}^{N} (\sigma(w^\top x_n) - t_n) \cdot \sigma(w^\top x_n)(1 - \sigma(w^\top x_n)) \cdot x_{n,i}$$

$$\frac{A}{B} = \frac{A}{D} \times \frac{D}{C} \times \frac{C}{B}$$

$$E(w) = \frac{1}{2} \sum_{n=1}^{N} (\sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n)^2$$

$$\frac{\partial E}{\partial w^{(1)}}(w) = \frac{\partial \frac{1}{2}\sum_{n=1}^{N}(\sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n)^2}{\partial w^{(1)}}$$

$$\frac{\partial E}{\partial w^{(1)}}(w) = \sum_{n=1}^{N} \frac{\partial \frac{1}{2}(\sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n)^2}{\partial \sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n} \cdot \frac{\partial \sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n}{w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)} \cdot \frac{\partial w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)}{\partial w^{(1)}}$$

$$\frac{\partial E}{\partial w^{(1)}}(w) = \sum_{n=1}^{N} (\sigma(w^{(1)}\cdot\sigma(w^{(0)^\top} x_n))-t_n)\cdot\sigma(w^{(1)}\cdot\sigma(w^{(0)^\top} x_n))(1-\sigma(w^{(1)}\cdot\sigma(w^{(0)^\top} x_n)))\cdot\sigma(w^{(0)^\top} x_n)$$

set

$$a_0 = w^{(0)^\top} x_n \text{ and } a_1 = w^{(1)^\top}\sigma(a_0) \text{ and } \delta_1 = (\sigma(a_1) - t_n) \cdot \sigma(a_1)(1 - \sigma(a_1))$$

$$\frac{\partial E}{\partial w^{(1)}}(w) = \sum_{n=1}^{N} \delta_1 \cdot \sigma(a_0)$$

$$\frac{\partial E}{\partial w_i^{(0)}}(w) = \frac{\partial \frac{1}{2}\sum_{n=1}^{N}(\sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n)^2}{\partial w_i^{(0)}}$$

$$\frac{\partial E}{\partial w_i^{(0)}}(w) = \sum_{n=1}^{N} \frac{\partial \frac{1}{2}(\sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n)^2}{\partial \sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n} \cdot \frac{\partial \sigma(w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)) - t_n}{w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)} \cdot \frac{\partial w^{(1)} \cdot \sigma(w^{(0)^\top} x_n)}{\partial w^{(0)^\top} x_n} \cdot \frac{\partial w^{(0)^\top} x_n}{\partial w_i^{(0)}}$$

$$\frac{\partial E}{\partial w_i^{(0)}}(w) = \sum_{n=1}^{N} (\sigma(w^{(1)}\cdot\sigma(w^{(0)^\top} x_n))-t_n)\cdot\sigma(w^{(1)}\cdot\sigma(w^{(0)^\top} x_n))(1-\sigma(w^{(1)}\cdot\sigma(w^{(0)^\top} x_n)))\cdot w^{(1)}\sigma(w^{(0)^\top} x_n)(1-\sigma(w$$

$$\frac{\partial e}{\partial w_i^{(0)}}(w) = \sum_{n=1}^{n} \delta_1 \cdot w^{(1)}\sigma(a_0)(1 - \sigma(a_0)) \cdot x_{n,i}$$

set

$$\delta_0 = \delta_1 \cdot w^{(1)}\sigma(a_0)(1 - \sigma(a_0))$$

$$\frac{\partial E}{\partial w_i^{(0)}}(w) = \delta_0 x_{n,i}$$

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