信号与信息处理

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1 second-layer

$$\frac{\partial E}{\partial w_{kj}^{(2)}} = \frac{\partial E}{\partial y_k} * \frac{\partial y_k}{\partial w_{kj}^{(2)}} \tag{1}$$

$$= -\frac{1}{y_k} * f'(z_k) * h(\sum_{i=0}^{D} w_{ji}^{(1)} * x_i) \tag{2}$$

2 first-layer

$$\frac{\partial E}{\partial w_{ji}^{(1)}} = \frac{\partial E}{\partial y_k} * \frac{\partial y_k}{\partial w_{ji}^{(1)}} \tag{3}$$

$$= -\frac{1}{y_k} * f'(z_k) * w_{kj}^{(2)} * h'(\sum_{i=0}^{D} w_{ji}^{(1)} * x_i) * x_i \tag{4}$$

其中：

$$z_k = \sum_{j=0}^{M} * w_{kj}^{(2)} * h(\sum_{i=0}^{D} w_{ji}^{(1)} * x_i)$$

$$f'(x_i) = \frac{exp(x_i) * \sum_{i=1}^{K} exp(x_i) - exp^2(x_i)}{(\sum_{i=1}^{K} exp(x_i)^2)}$$

$$h(x) = tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$
$$h'(x) = \frac{4}{(e^x + e^{-x})^2}$$