



$$a: (0.1 + 0.3 \times 2) \tanh = 0.60437$$

$$b: \tanh(0.4 \times 2 + 0.2) = 0.7616$$

$$d: \tanh(2 \times (-0.9015) + 1) = -0.666$$

$$C = (d - y)^2 \quad \frac{dC}{dd} = 2(d - y) \quad d = \tanh(z_5)$$

$$\frac{dd}{dw_5} = d \cdot (1 - d^2)$$

$$w_5' = w_5 - 0.1 \left(\frac{dC}{dw} \right)$$

$$\frac{d(C)}{dz_5} = \frac{dC}{dd} \cdot \frac{d(\sigma(z_5))}{dz_5}$$

$$= w_5 - 0.1 \left(\frac{2d - 2y}{d - d^2} \right)$$

$$= 1.848$$

$$= 2(\sigma(z_5) - y) \cdot (1 - \sigma^2(z_5))$$

$$z_5 = W_5 \cdot c + b_5 \quad \frac{dz_5}{dW_5} = c \rightarrow \text{or } z_4$$

$$\frac{d(c)}{dW_5} = \frac{d(c)}{d(\sigma(z_5))} \cdot \frac{d(\sigma(z_5))}{d(z_5)} \cdot \frac{d(z_5)}{d(W_5)}$$

$$= 2(\sigma(z_5) - y) \cdot (1 - \sigma^2(z_5)) \cdot c$$

$$= 2(d - y)(1 - d^2) \cdot c$$

$$= \cancel{2.49} \cdot 1.671$$

$$W_5' = W_5 - 0.1 \left(\frac{d(c)}{dW_5} \right) = \cancel{2.49} + 2.49$$

$$= \cancel{2.49} \cdot 1.671$$

$$\frac{d(c)}{d(W_4)} = \frac{d(c)}{d(z_5)} \cdot \frac{d(z_5)}{d(\sigma(z_4))} \cdot \frac{d(\sigma(z_4))}{d(z_4)} \cdot \frac{d(z_4)}{d(W_4)}$$

$$z_5 = W_5 \cdot \sigma(z_4) + b_5 \quad \frac{d(z_5)}{d(\sigma(z_4))} = W_5$$

$$z_4 = W_4 a + W_3 b$$

$$\frac{d(c)}{d(z_5)} = 2(d - y)(1 - d^2) = \cancel{1.854} - 1.854$$

$$\frac{d(\sigma(z_4))}{d(z_4)} = 1 - \sigma^2(z_4)$$

$$\frac{d(z_4)}{d(W_4)} = a = 0.604$$

$$= 1 - c^2 \cdot 0.9015^2$$

$$= 1 - \cancel{0.81} = \cancel{0.19}$$

$$= 0.1873$$

$$\frac{d(c)}{d(w_4)} = \cancel{16.822 \times 0.604 \times -1.1904 \times 0.8} \\ = \cancel{-9.676} \times -1.854 \times 0.604 \times 0.1873 \\ = -0.419$$

$$w_4' = w_4 - 0.1 \left(\frac{d(c)}{d(w)} \right) = 1.042$$

$$\frac{d(c)}{d(w_3)} = \frac{d(c)}{d(z_5)} \cdot \frac{d(z_5)}{d(\sigma(z_4))} \cdot \frac{d(\sigma(z_4))}{d(z_4)} \cdot \frac{d(z_4)}{d(w_3)}$$

$$\frac{d(z_4)}{d(w_3)} : z_4 = w_4 a + w_3 b \rightarrow \frac{d(z_4)}{d(w_3)} = b = 0.7616$$

$$w_3' = w_3 - 0.1 \times (2 \times -1.854 \times 0.7616 \times 0.1873) \\ = -2.947$$

$$\frac{d(c)}{d(w_1)} = \frac{d(c)}{d(z_5)} \cdot \frac{d(z_5)}{d(\sigma(z_4))} \cdot \frac{d(\sigma(z_4))}{d(z_4)} \cdot \frac{d(z_4)}{d(\sigma(z_1))} \cdot \frac{d(\sigma(z_1))}{d(z_1)} \cdot \frac{d(z_1)}{d(w_1)}$$

$$z_4 = a \cdot w_4 + 0.2$$

$$\frac{d(z_4)}{d(\sigma(z_1))} = w_4$$

$$\frac{d(z_1)}{d(w_1)} = 2$$

$$a = \sigma(z_1)$$

$$z_1 = 2 \cdot w_1 + 0.1$$

$$\frac{d(\sigma(z_1))}{d(z_1)} = 1 - \sigma^2(z_1)$$

$$\frac{d(c)}{d(w_1)} = -1.854 \times w_5 \times 0.1873 \times 1 \times (1 - 0.604^2) \times 2 \\ = -0.882$$

$$w_1' = w_1 - 0.1 \frac{d(c)}{d(w_1)} = 0.3 + 0.0882$$

$$= 0.388$$

$$\frac{d(c)}{d(w_2)} = \frac{d(c)}{d(z_5)} \cdot \frac{d(z_5)}{d(\sigma(z_4))} \cdot \frac{d(\sigma(z_4))}{d(z_4)} \cdot \frac{d(z_4)}{d(\sigma(z_2))} \cdot \frac{d(\sigma(z_2))}{d(z_2)} \cdot \frac{d(z_2)}{d(w_2)}$$

$$z_4 = w_4 a + w_3 b \quad \frac{d(\sigma(z_2))}{d(z_2)} = 1 - \sigma^2(z_2) \quad \frac{d(z_2)}{d(w_2)} = 2$$

$$\frac{d(z_4)}{d(\sigma(z_2))} = w_3$$

$$\frac{d(c)}{d(w_2)} = -1.854 \times 2 \times 0.1873 \times -3 \times 2$$

$$= 4.167$$

$$w_2' = 0.4 - 0.4167 = 0.8167$$

$$w_1' = 0.388 \quad w_2' = 0.8167 \quad w_3' = -2.947$$

$$w_4' = 1.042 \quad w_5' = 1.833$$