

Kotitehtävät 6

Teht 1

Aktivaatiot $a_i, i = 1, 2, 3$, lasketaan seuraavasti:

$$z_1 = w_1 x + b_1, \quad a_1 = g(z_1), \quad z_2 = w_2 a_1 + b_2, \quad a_2 = g(z_2)$$

Jokaisessa kerroksessa käytetään aktivaatiofunktiona sigmoid-funktiota.

$$g(x) = \frac{1}{1+e^{-x}}$$

Laske yhdistetyn funktion derivointisäännön eli ketjusäännön avulla derivaatat

$$\frac{\partial a_2}{\partial w_2}$$

$$\frac{\partial a_2}{\partial w_2} = \frac{\partial a_2}{\partial z_2} \frac{\partial z_2}{\partial w_2}$$

$$\frac{\partial a_2}{\partial z_2} = g'(z_2)$$

$$g'(x) = g(x)(1 - g(x))$$

$$\frac{\partial a_2}{\partial z_2} = g(z_2)(1 - g(z_2))$$

$$\frac{\partial z_2}{\partial w_2} = a_1$$

$$\frac{\partial a_2}{\partial w_2} = \frac{\partial a_2}{\partial z_2} \frac{\partial z_2}{\partial w_2} = g(z_2)(1 - g(z_2))a_1$$

$$\frac{\partial a_2}{\partial w_1}$$

$$\frac{\partial a_2}{\partial w_1} = \frac{\partial a_2}{\partial z_2} \frac{\partial z_2}{\partial a_1} \frac{\partial a_1}{\partial z_1} \frac{\partial z_1}{\partial w_1}$$

$$\frac{\partial a_2}{\partial z_2} = g'(z_2)$$

$$\frac{\partial z_2}{\partial a_1} = w_2$$

$$\frac{\partial a_1}{\partial z_1} = g'(z_1)$$

$$\frac{\partial z_1}{\partial w_1} = x$$

$$\frac{\partial a_2}{\partial w_1} = \frac{\partial a_2}{\partial z_2} \frac{\partial z_2}{\partial a_1} \frac{\partial a_1}{\partial z_1} \frac{\partial z_1}{\partial w_1} = g(z_2)(1 - g(z_2))w_2 g(z_1)(1 - g(z_1))x$$