November 10, 2020

$$f(x) = ax + b \tag{1}$$

$$f(x, p) = p_0 + p_1 x_1 + ... + p_n x_n \tag{2}$$

$$Q(p) = \frac{1}{2N} \sum_{j=1}^{N} (f(x^j, p) - y^j)^2 -> min \tag{3}$$

$$p_i(t+1) = p_i(t) - \alpha \frac{\partial Q}{\partial p_i} \tag{4}$$

$$\frac{\partial Q}{\partial p_0} = \frac{\partial}{\partial p_0} \frac{1}{2N} \sum_{j=1}^{N} (f(x^j, p) - y^j)^2 \tag{5}$$

$$= \frac{1}{2N} \sum_{j=1}^{N} \frac{\partial}{\partial p_0} (f(x^j, p) - y^j)^2$$

$$= \frac{1}{2N} \sum_{j=1}^{N} 2(f(x^j, p) - y^j) \cdot \frac{\partial}{\partial p_0} f(x^j, p)$$

$$= \frac{1}{N} \sum_{j=1}^{N} (f(x^j, p) - y^j) \cdot \frac{\partial}{\partial p_0} f(x^j, p)$$

$$= \frac{1}{N} \sum_{j=1}^{N} (f(x^j, p) - y^j) \cdot \frac{\partial}{\partial p_0} (p_0 + p_1 x_1)$$

$$= \frac{1}{N} \sum_{j=1}^{N} (f(x^j, p) - y^j) \cdot 1$$

$$\frac{\partial Q}{\partial p_1} = \frac{\partial}{\partial p_1} \frac{1}{2N} \sum_{j=1}^{N} (f(x^j, p) - y^j)^2 \tag{6}$$

$$= \frac{1}{N} \sum_{j=1}^{N} (f(x^j, p) - y^j) \cdot \frac{\partial}{\partial p_1} (p_0 + p_1 x_1)$$

$$= \frac{1}{N}\sum_{j=1}^{N}(f(x^j, p) - y^j) \cdot x_1$$

$$f(x) = ax^2 + b\sin(x) + c \tag{7}$$

$$f(x, p) = p_0 + p_1x_1 + p_2x_2 \tag{8}$$

gdzie $x_1 = \sin(x)$, $x_2 = x^2$