The University of Yonsei
Faculty of Industrial Engineering

Tsoding MachineLearning In C

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1 Introduction

안녕하세요 한국말이 처음 입니다.

2 Gradient Descent

$$C'(w) = \lim_{\epsilon \to 0} \frac{C(w+\epsilon) - C(w)}{\epsilon} \tag{1}$$

2.1 Twice

sequence of derivating C(w) with respect to w.

$$C(w) = \frac{1}{n}\sum_{i=1}^{n}(x_i w - y_i)^2 \tag{2}$$

$$C'(w) = \left(\frac{1}{n}\sum_{i=1}^{n}(x_i w - y_i)^2\right)' \tag{3}$$

$$= \frac{1}{n}\left(\sum_{i=1}^{n}(x_i w - y_i)^2\right)' \tag{4}$$

$$= \frac{2}{n}\sum_{i=1}^{n}(x_i w - y_i)(x_i)' \tag{5}$$

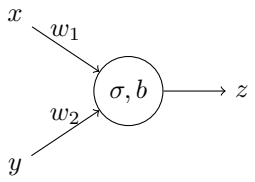
Cost funtction

$$C(w) = \frac{1}{n}\sum_{i=1}^{n}(x_i w - y_i)^2 \tag{6}$$

Derviative of Cost function

$$C'(w) = \frac{2}{n}\sum_{i=1}^{n}(x_i w - y_i)(x_i)' \tag{7}$$

2.2 One Neuron Model with 2 inputs



$$y = \sigma(xw_1 + yw_2 + b) \tag{8}$$

$$\sigma(x) = \frac{1}{1 + e^{-x}} \tag{9}$$

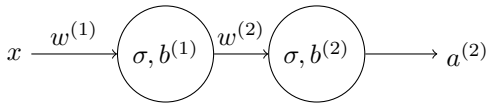
$$\sigma'(x) = \sigma(x)(1 - \sigma(x)) \tag{10}$$

2.2.1 Cost

i is reffering to a sample number

$$a_i = \sigma(x_i w_1 + y w_2 + b) \tag{11}$$
$$\partial_{w_1} a_i = \partial_{w_1}(\sigma(x_i w_1 + y w_2 + b)) \tag{12}$$
$$= a_i(1 - a_i)\partial_{w_1}(x_i w_1 + y w_2 + b) \tag{13}$$
$$= a_i(1 - a_i)x_i \tag{14}$$
$$\partial_{w_2} a_i = a_i(1 - a_i)y_i \tag{15}$$
$$\partial_b a_i = a_i(1 - a_i) \tag{16}$$
$$C = \frac{1}{n}\sum_{i=1}^{n}(a_i - y_i)^2 \tag{17}$$
$$\partial_{w_1} C = \frac{1}{n}\sum_{i=1}^{n}\partial_{w_1}\left((a_i - z_i)^2\right) \tag{18}$$
$$= \frac{1}{n}\sum_{i=1}^{n} 2(a_i - z_i)\partial_{w_1} a_i \tag{19}$$
$$= \frac{1}{n}\sum_{i=1}^{n} 2(a_i - z_i)a_i(1 - a_i)x_i \tag{20}$$
$$\partial_{w_2} C = \frac{1}{n}\sum_{i=1}^{n} 2(a_i - z_i)a_i(1 - a_i)y_i \tag{21}$$
$$\partial_b C = \frac{1}{n}\sum_{i=1}^{n} 2(a_i - z_i)a_i(1 - a_i) \tag{22}$$

2.3 Two Neuron Model with 1 inputs



$$a^{(1)} = \sigma(xw^{(1)} + b^{(1)}) \tag{23}$$

$$a^{(2)} = \sigma(a^{(1)}w^{(2)} + b^{(2)}) \tag{24}$$