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.

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

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

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

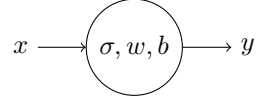$$= \frac{2}{n}\sum_{i=1}^{n}(x_i w - y_i)(x_i)' \tag{5}$$

Cost funtction

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

Derviative of Cost function

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

2.2 One Neuron Model

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

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

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

2.2.1 Cost

i is reffering to a sample and we have only 1 w and 1 b since it is 1 neuron model.

$$a_i = \sigma(x_iw + b) \tag{11}$$

$$\partial_w a_i = \partial_w(\sigma(x_iw + b)) \tag{12}$$

$$= a_i(1 - a_i)\partial_w(x_iw + b) \tag{13}$$

$$= a_i(1 - a_i)x_i \tag{14}$$

$$C = \frac{1}{n}\sum_{i=1}^{n}(a_i - y_i)^2 \tag{15}$$

$$\partial_w C = \frac{1}{n}\sum_{i=1}^{n}\partial_w\left((a_i - y_i)^2\right) \tag{16}$$

$$= \frac{1}{n}\sum_{i=1}^{n}2(a_i - y_i)\partial_w a_i \tag{17}$$

$$= \frac{1}{n}\sum_{i=1}^{n}2(a_i - y_i)a_i(1 - a_i)x_i \tag{18}$$