Cost Function

How can we know how well our prediction works? We have to find the error between real values and predicted values $"\| y(x) - a \|"$, then we will add all errors and divide them into the number of errors. As a result, we have found the average error.

$$C(w,b) = \frac{1}{n}\sum_x \| \ y(x) - a \ \|$$

$$a = \sigma(z) = \frac{1}{1+e^{-z}}$$

$$z = \sum_{j=1} w_j * x_j + b$$

- $y(x)$ is an ideal value
- $a = \sigma(z)$ is the predicted value
- n is the total number of errors

Modifiying Cost Function formula

Because our objective is to find an average, we will square the error, so we don't have any negative number.

$$C(w,b) = \frac{1}{n}\sum_x \| \ y(x) - a \ \|^2$$

Multiplying our cost function by $\frac{1}{2}$ will make easier calculus later.

$$C(w,b) = \frac{1}{2*n}\sum_x \| \ y(x) - a \ \|^2$$

Thus, the cost function formula is represented by:

$$C(w,b) = \frac{1}{2*n}\sum_x \| \ y(x) - \frac{1}{1+e^{-z}} \ \|^2$$

$$C(w,b) = \frac{1}{2*n}\sum_x \| \ y(x) - \frac{1}{1+e^{-\left(\sum_{j=1} w_j * x_j + b\right)}} \ \|^2$$

The Cost Function output is calculated using the weights and biases from the last layer, later we will figure out that it affect the whole net. The same set of parameters w y b are used in each prediction. Our objective is to find the smallest error "Cost function output" by using different weights and biases values.