Chapter 3: Backpropagation, Intuitively

Recap: Gradient Descent.

1. Initialize randomly

   └ random weights & biases.

2. Find "cost"

   └ output the network $\underbrace{\text{gives vs output you need}}_{\text{add up the squares of differences}}$.

   └ Repeat for all of the training data.

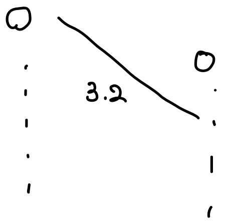
3. Average the cost = total cost of the network.

4. Find the negative gradient to change all of weights & biases. to efficiently decrease the cost.

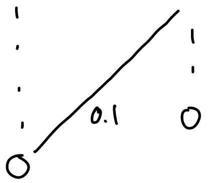
Backpropagation: algorithm for computing complicated gradient

$$-\nabla C(\underbrace{\ldots}_{\text{weights \& biases}}) = \begin{bmatrix} 0.16 \\ 0.72 \\ -0.93 \\ \vdots \\ 0.04 \\ 1.63 \end{bmatrix}$$

↑ How sensitive the cost function is to each weights & biases.

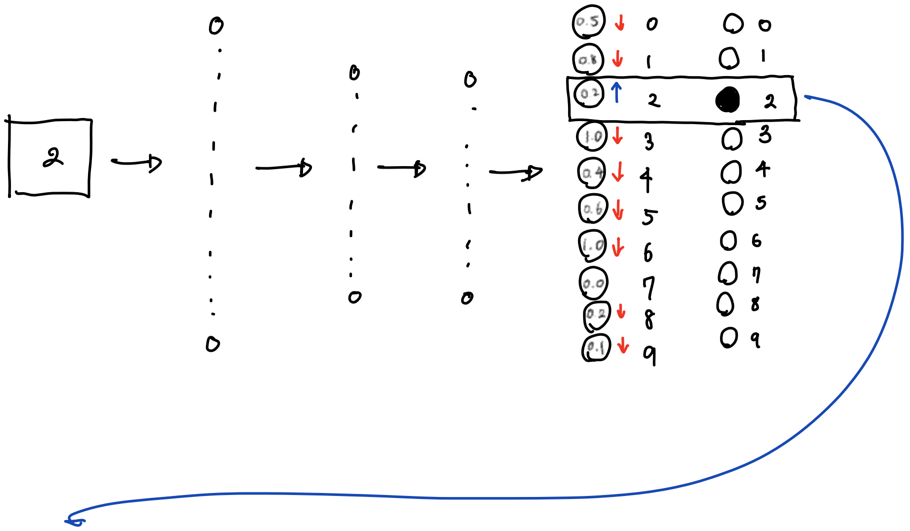


Cost of the function is 32 times more sensitive to change this one than 0.1 weight.



ex) image of 2.

At first, initialized.



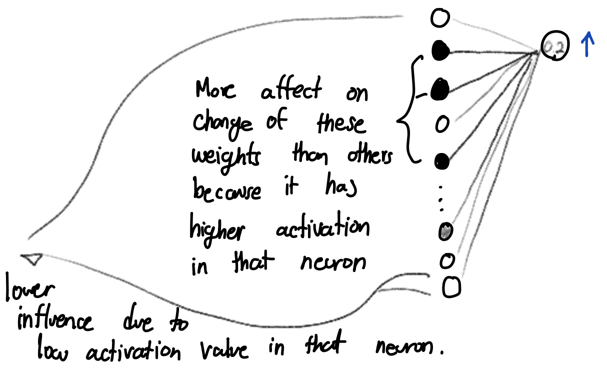
$$0.2 = \sigma(w_0 a_0 + w_1 a_1 + \dots + w_{n-1} a_{n-1} + b)$$

Our choice to change (nudge) 0.2 to be closer to 1?

- Increase b
- Increase w_i (in proportion to a_i)
- Change a_i

Hebbian theory

"Neurons that fire together
wire together"



More affect on change of these weights than others because it has higher activation in that neuron

lower influence due to low activation value in that neuron.