Assignment 2 - 112652055

(1) $a^{[l]} = \sigma(W^{[l]}a^{[l-1]} + b^{[l]})$

$a^{[l]} = \sigma(z^{[l]})$ $(z^{[l]} = W^{[l]}a^{[l-1]} + b^{[l]})$

when $l = L$

$$n_L = 1, \quad \delta^{[L]} = \frac{\partial a^{[L]}}{\partial a^{[L]}} = 1$$

when $l = 1 \sim L-1$

$$\delta^{[l]} = \frac{\partial a^{[L]}}{\partial a^{[l]}}, \quad \frac{\partial a^{[L]}}{\partial a^{[l]}} = \sum_{j=1}^{n_{l+1}} \frac{\partial a^{[L]}}{\partial a_j^{[l+1]}} \cdot \frac{\partial a_j^{[l+1]}}{\partial a^{[l]}}$$

$$a^{[l+1]} = \sigma(z^{[l+1]}) \Rightarrow \frac{\partial a_j^{[l+1]}}{\partial a^{[l]}} = \sum_{k=1}^{n_l} \frac{\partial a_j^{[l+1]}}{\partial z_j^{[l+1]}} \cdot \frac{\partial z_j^{[l+1]}}{\partial a_k^{[l]}} = \sigma'(z_j^{[l+1]}) \cdot W_{j,k}^{[l+1]}$$

$$\Rightarrow \delta^{[l]} = \left((W^{[l+1]})^T \delta^{[l+1]}\right) \odot \sigma'(z^{[l]})$$

hadamard product

Algorithm

Let $\delta^{[L]} = 1$

Let $temp = (W^{[l+1]})^T \delta^{[l+1]}$

$\delta'[z^{[l]}] = \sigma'(z^{[l]})$

$\delta^{[l]} = temp \odot \delta'[z^{[l]}]$

output $\nabla a^{[L]}(x) = \delta^{[1]}$

(2)

In likehoodly approch, if the function is Not normal distribution, the loss will be big or small for each type of real function.

(polynomial, $\sin x$, $\cos x$)