

Homework_5

Lv Xinpeng

Assume:

The activate function is ReLU, therefore: $\frac{\partial f}{\partial w_i} = \begin{cases} x_i, f > 0 \\ 0, f \leq 0 \end{cases}$

$$K_1 = M_1 U + b_2$$

$$k_i = w \cdot x_{i:i+h-1} + b_1$$

And,

$$\frac{\partial J}{\partial w} = \frac{\partial J}{\partial \hat{y}} \cdot \frac{\partial \hat{y}}{\partial O} \cdot \frac{\partial O}{\partial K_1} \cdot \frac{\partial K_1}{\partial M_1} \cdot \frac{\partial M_1}{\partial c_j} \cdot \frac{\partial c_j}{\partial k_j} \cdot \frac{\partial k_j}{\partial w}$$

$$\frac{\partial J}{\partial w} = (\hat{y} - y) \cdot (\text{ReLU})' \cdot U^T \cdot I_j \cdot (\text{ReLU})' \cdot x_{j:j+h-1}$$

If $c_i < 0$:

$$\frac{\partial J}{\partial w} = 0$$

Else:

$$\frac{\partial J}{\partial w} = (\hat{y} - y) \cdot (M_1 U + b_2) \cdot U^T \cdot (w \cdot x_{j:j+h-1} + b_1) \cdot x_{j:j+h-1}$$

So, the update of w is:

$$w' = w - lr \cdot \frac{\partial J}{\partial w}$$