딥러닝 올인원

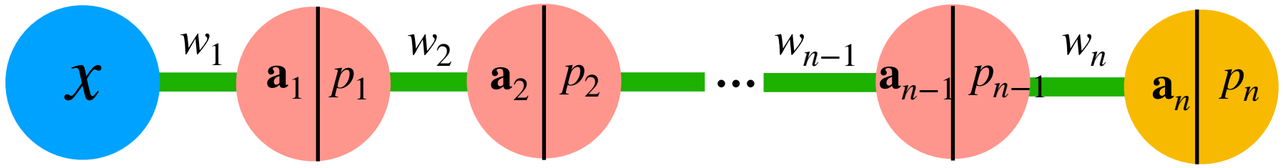
기울기 사라짐
11강

딥러닝호형

기울기 사라짐(Vanishing gradient)

연쇄 법칙과 활성화 함수

$$p_1 = a_1(w_1 x) \quad p_2 = a_2(w_2 p_1) \qquad p_{n-1} = a_{n-1}(w_{n-1} p_{n-2}) \quad p_n = a_n(w_n p_{n-1})$$



$$\frac{\partial p_n}{\partial w_1} = \frac{\partial p_n}{\partial p_{n-1}} \frac{\partial p_{n-1}}{\partial w_1} = \frac{\partial p_n}{\partial p_{n-1}} \frac{\partial p_{n-1}}{\partial p_{n-2}} \frac{\partial p_{n-2}}{\partial p_{n-3}} \cdots \frac{\partial p_2}{\partial p_1} \frac{\partial p_1}{\partial w_1}$$

$$\frac{\partial p_1}{\partial w_1} = \frac{\partial a_1}{\partial w_1} x \qquad \frac{\partial p_n}{\partial p_{n-1}} = \frac{\partial a_n}{\partial p_{n-1}} w_n$$

기울기 사라짐(Vanishing gradient)

연쇄 법칙과 활성화 함수

$$p_n = a_n(w_n p_{n-1})$$

$$\frac{\partial p_1}{\partial w_1} = \frac{\partial a_1}{\partial w_1} x, \frac{\partial p_n}{\partial p_{n-1}} = \frac{\partial a_n}{\partial p_{n-1}} w_n$$

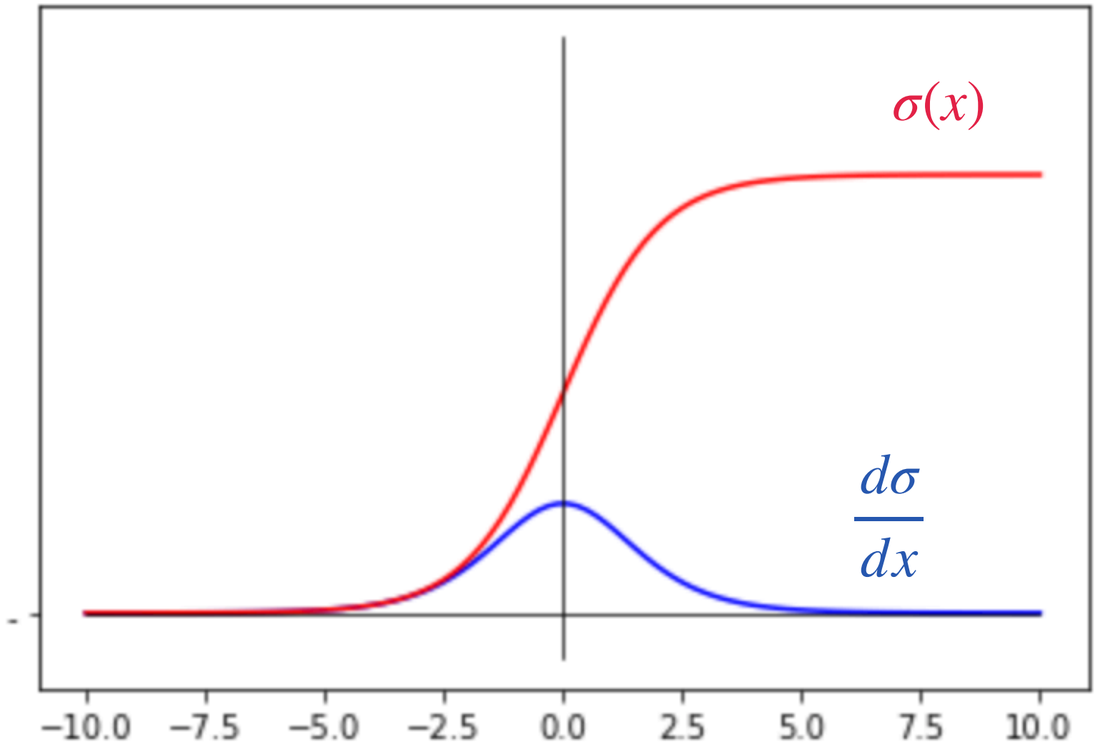
$$\frac{\partial p_n}{\partial w_1} = \frac{\partial p_n}{\partial p_{n-1}} \frac{\partial p_{n-1}}{\partial w_1} = \frac{\partial p_n}{\partial p_{n-1}} \frac{\partial p_{n-1}}{\partial p_{n-2}} \frac{\partial p_{n-2}}{\partial p_{n-3}} \cdots \frac{\partial p_2}{\partial p_1} \frac{\partial p_1}{\partial w_1}$$

$$= \frac{\partial a_n}{\partial p_{n-1}} w_n \frac{\partial a_{n-1}}{\partial p_{n-2}} w_{n-1} \frac{\partial a_{n-2}}{\partial p_{n-3}} w_{n-2} \cdots \frac{\partial a_2}{\partial p_1} w_2 \frac{\partial a_1}{\partial w_1} x$$

$$= \frac{\partial a_n}{\partial p_{n-1}} \frac{\partial a_{n-1}}{\partial p_{n-2}} \frac{\partial a_{n-2}}{\partial p_{n-3}} \cdots \frac{\partial a_2}{\partial p_1} \frac{\partial a_1}{\partial w_1} w_n w_{n-1} w_{n-2} \cdots w_2 x$$

기울기 사라짐(Vanishing gradient)

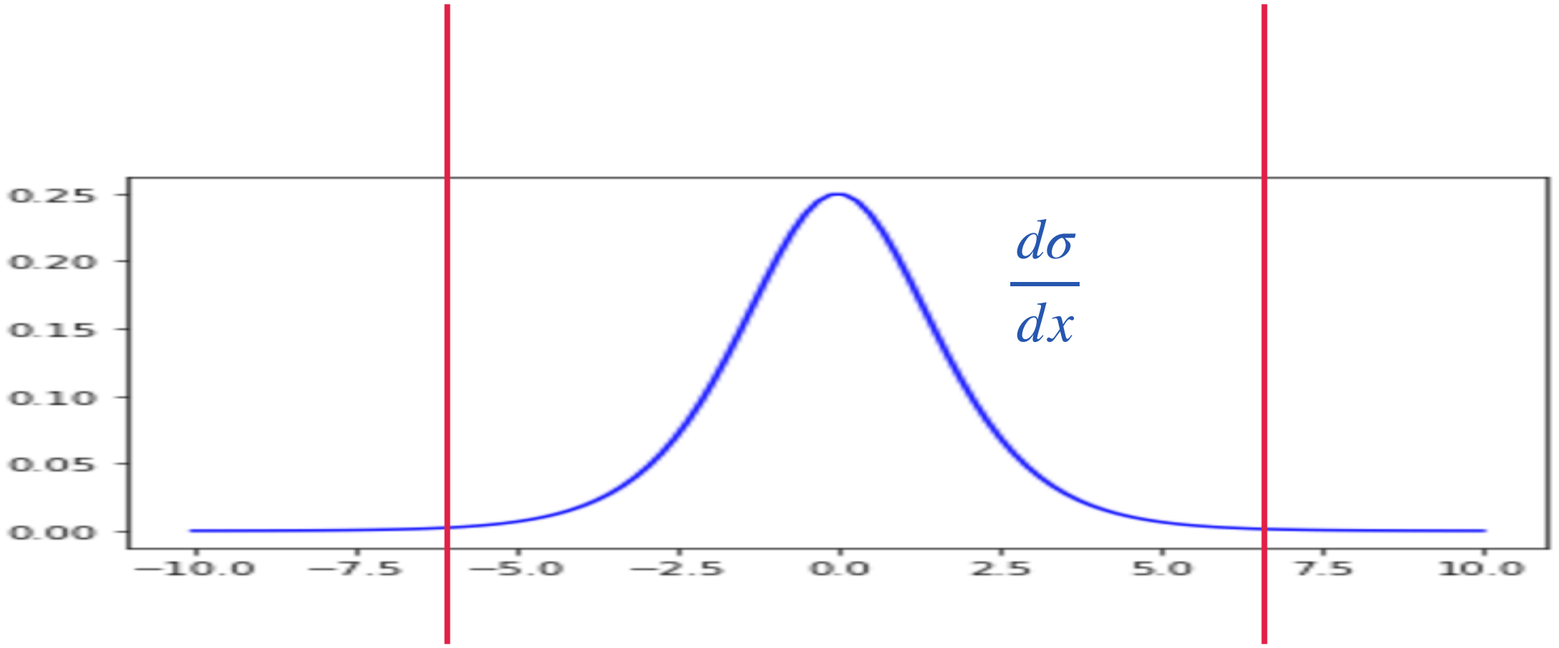
연쇄 법칙과 Sigmoid



기울기 사라짐(Vanishing gradient)

연쇄 법칙과 Sigmoid

$$\frac{\partial p_n}{\partial w_1} = \frac{\partial a_n}{\partial p_{n-1}} \frac{\partial a_{n-1}}{\partial p_{n-2}} \frac{\partial a_{n-2}}{\partial p_{n-3}} \cdots \frac{\partial a_2}{\partial p_1} \frac{\partial a_1}{\partial w_1} w_n w_{n-1} w_{n-2} \cdots w_2 x$$



기울기 사라짐(Vanishing gradient)

연쇄 법칙과 Sigmoid

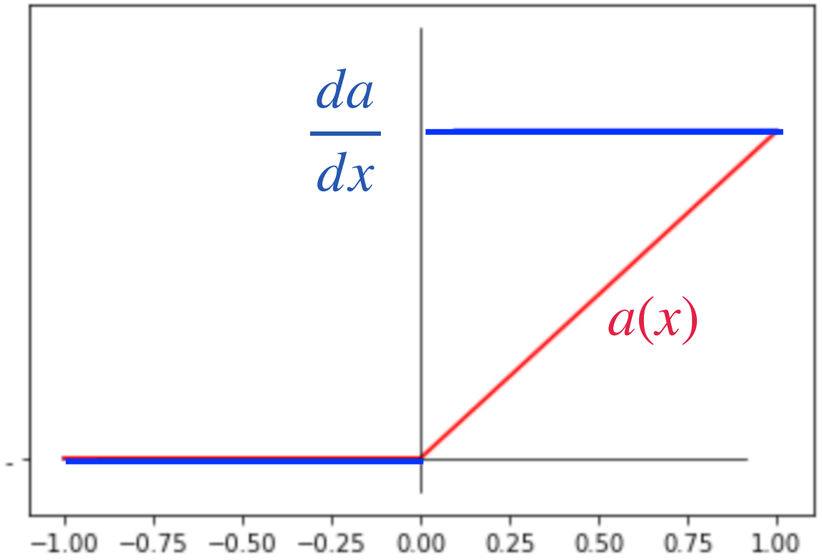
$$\frac{\partial p_n}{\partial w_1} \rightarrow 0$$

$$w_1 \leftarrow w_1 - \alpha \frac{\partial p_n}{\partial w_1} \rightarrow 0$$

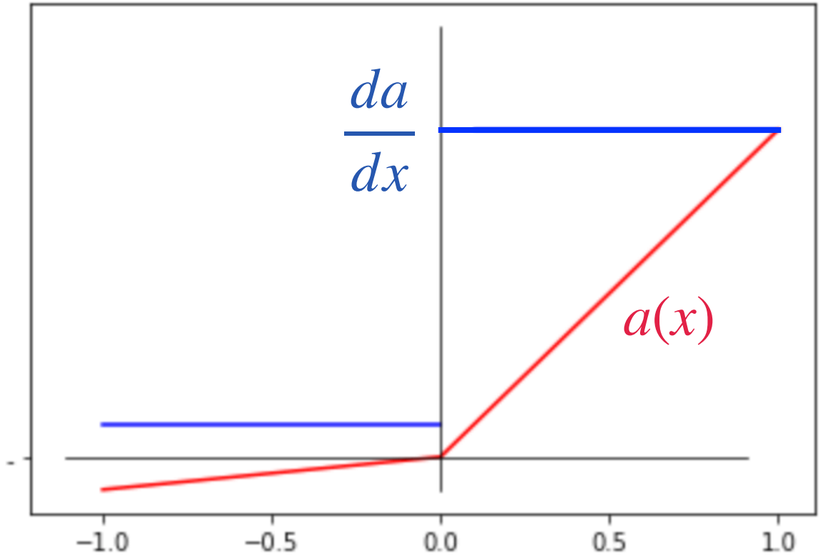
- 가중치 업데이트가 되지 않는다.

기울기 사라짐(Vanishing gradient)

연쇄 법칙과 ReLU



ReLU



Leaky ReLU