2025.9.18.

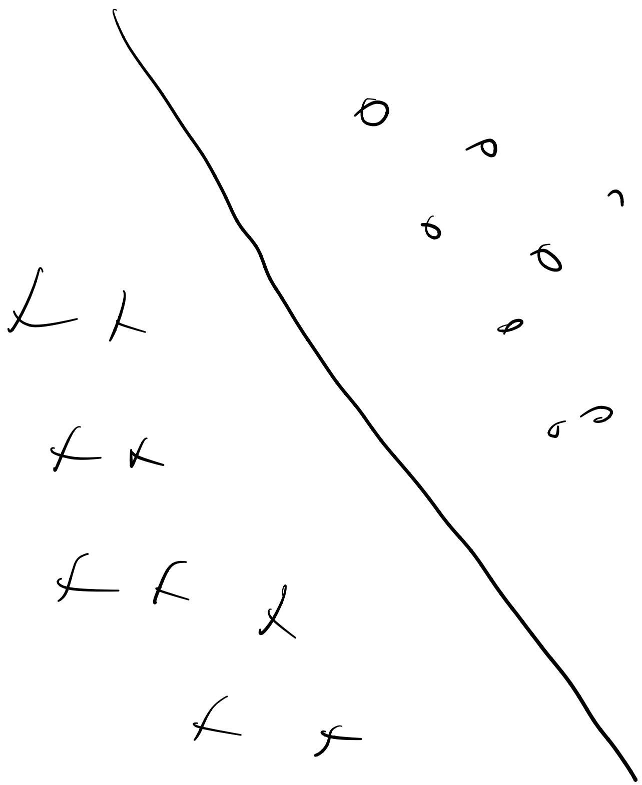
(x_i, y_i)

$\{0,1\}$

$$\boxed{\sum_{i=1}^{N} \frac{1}{2} \| f(x_i; w) - y_i \|^2}$$

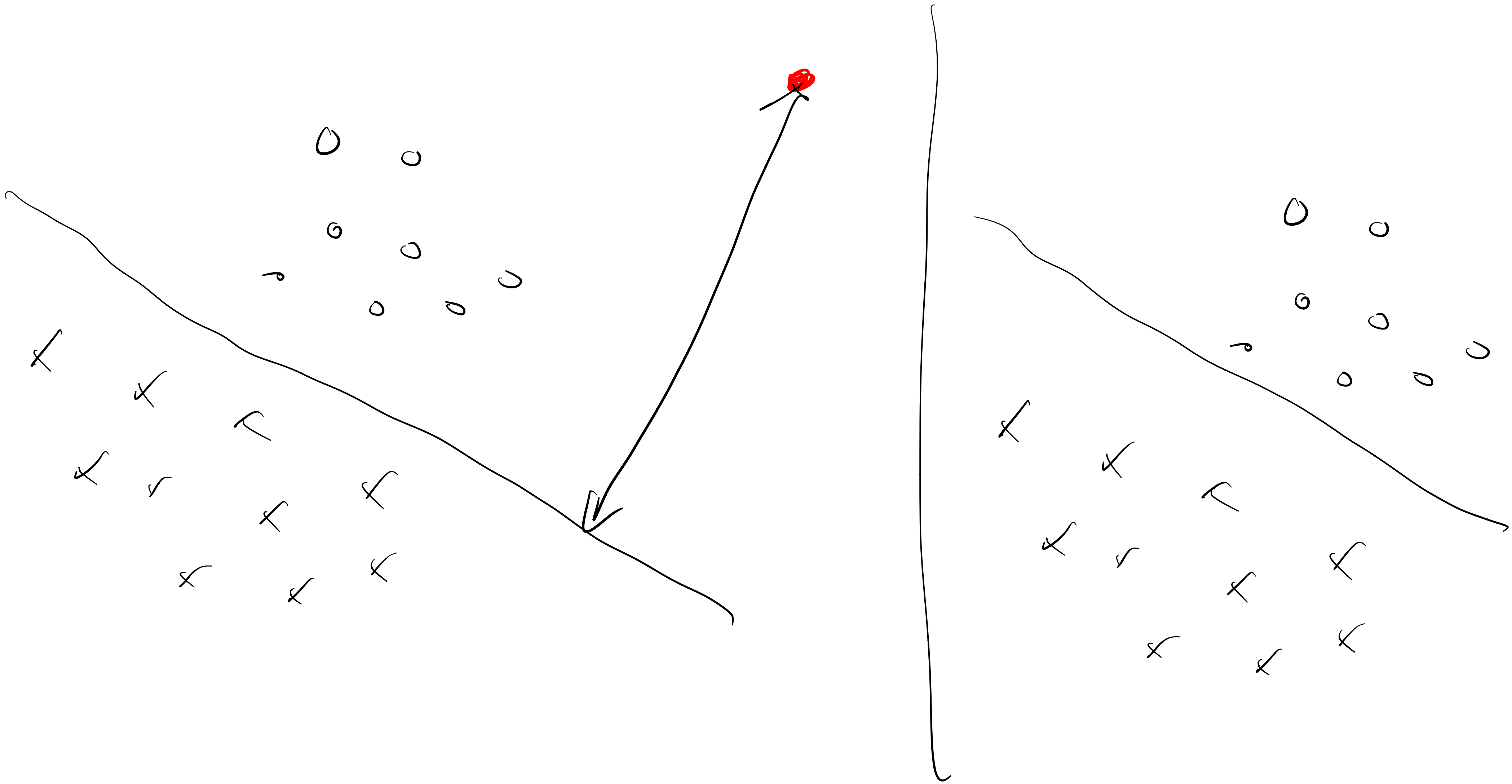
Mean Squared Error

MSE.



$$w^T x_{new} - b \geq 0 \rightarrow 1$$

$$< 0 \rightarrow 0$$



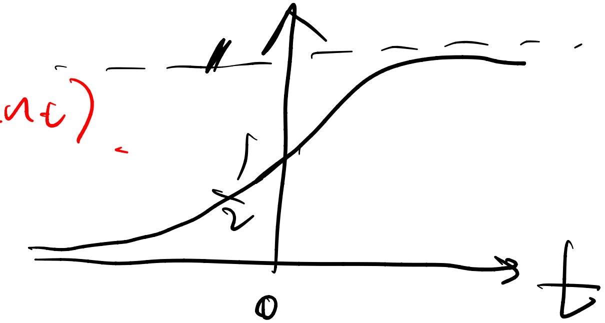
$$f(x; w) = w^T x$$

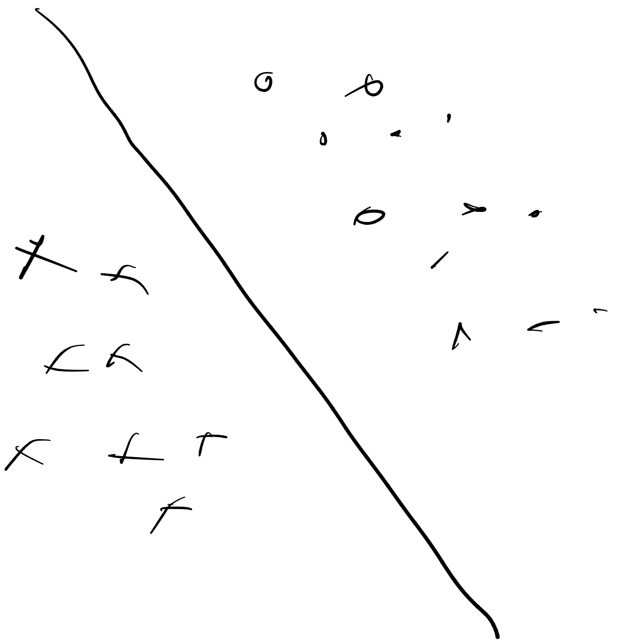
$$f(x; w) = \frac{1}{1 + \exp(-w^T x)}$$

Logistic Function

(Sigmoid Func)

$$\frac{1}{1+\exp(-t)}$$





$$L(w) = \sum_{i=1}^{N} \frac{1}{2} \| f(x_i; w) - y_i \|^2$$

$$w^* = \arg\min_{w} L(w)$$

Logistic Regression (classification)

$$f(x;w) = \frac{1}{1+\exp(-w^T x)}$$

$$L(w) = \frac{1}{2} \sum_{i=1}^{N} \| f(x_i;w) - y_i \|^2$$

$$w^* = \underset{w}{\operatorname{argmin}}\, L(w)$$

$$\frac{dL}{dw} = \sum_{i=1}^{N} (f(x_i) - y_i) \cdot \frac{df}{dw}$$

$$= \sum_{i=1}^{N} (f(x_i) - y_i) \cdot f(1-f)\, x$$

$$\frac{df}{dw} = \frac{-1 \cdot \exp(-w^T x) \cdot (-x)}{(1+\exp(-w^T x))^2}$$

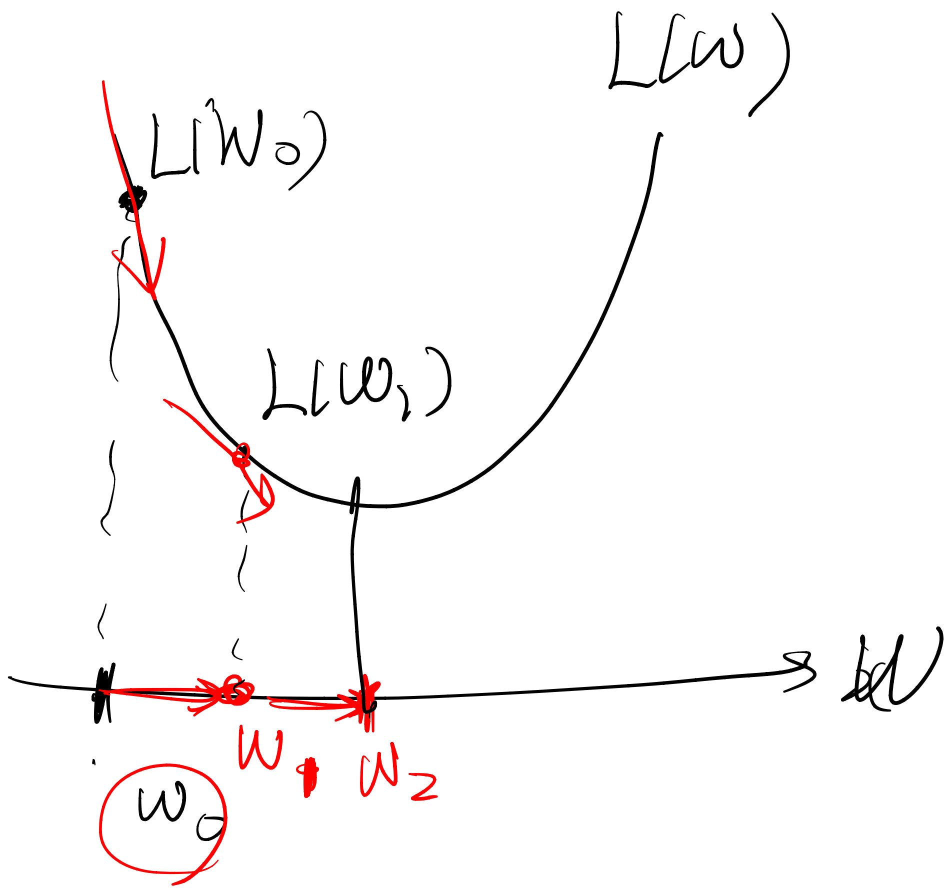
$$= \frac{(1+\exp(-w^T x)) \cdot x - x}{(1+\exp(-w^T x))^2}$$

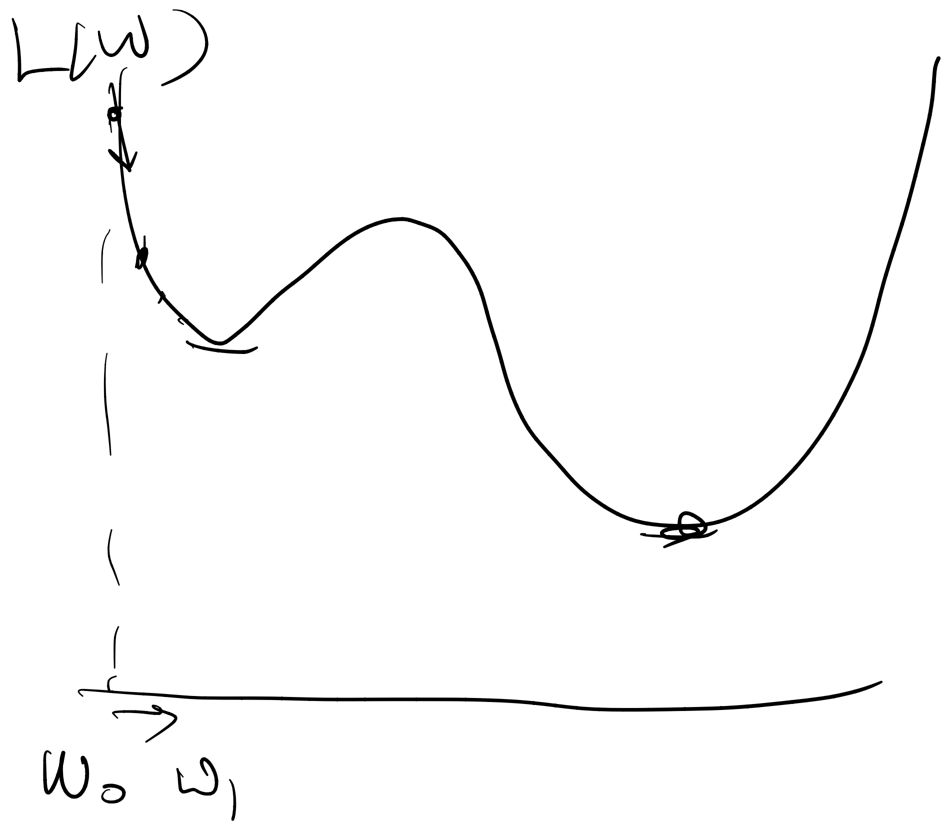
$$= \frac{1}{1+\exp(-w^T x)} \left(1 - \frac{1}{1+\exp(-w^T x)}\right) \cdot x$$

$$\boxed{= f(1-f) \cdot x}$$

$$y = \frac{f}{g}$$

$$y' = \frac{f'g - f \cdot g'}{g^2}$$


L(w)
L(W0)
L(w1)
w
w0
w1
w2


L(w)
w0
w1