Linear regression

$$f_{w,b}(x_i) = w x_i + b$$

$$\text{loss} = (y_i - f_{w,b}(x_i))^2$$

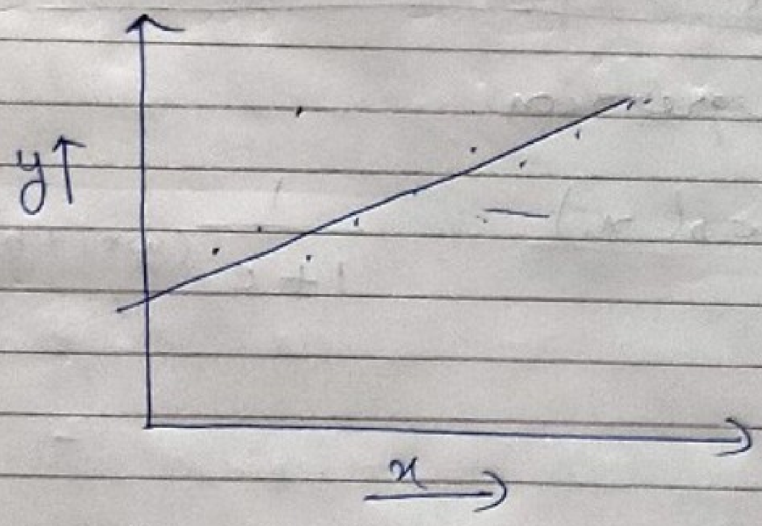
$$\text{RMSE} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (y_i - (w x_i + b))^2}$$

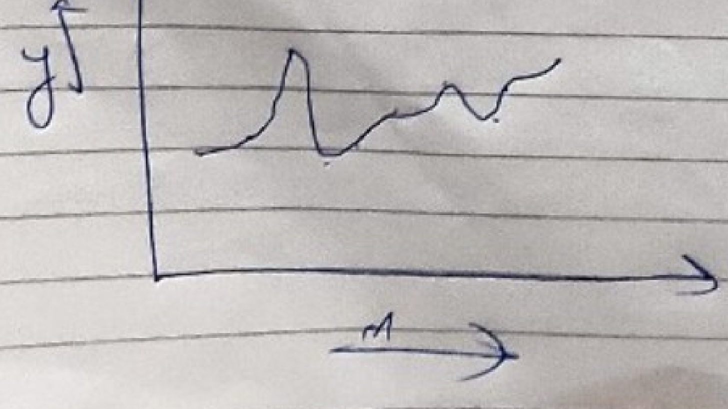
optimization problem

find the minimum of

$$\frac{1}{N} \sum_{i=1}^{N} (y_i - (w x_i + b))^2$$

where w & b are variables.



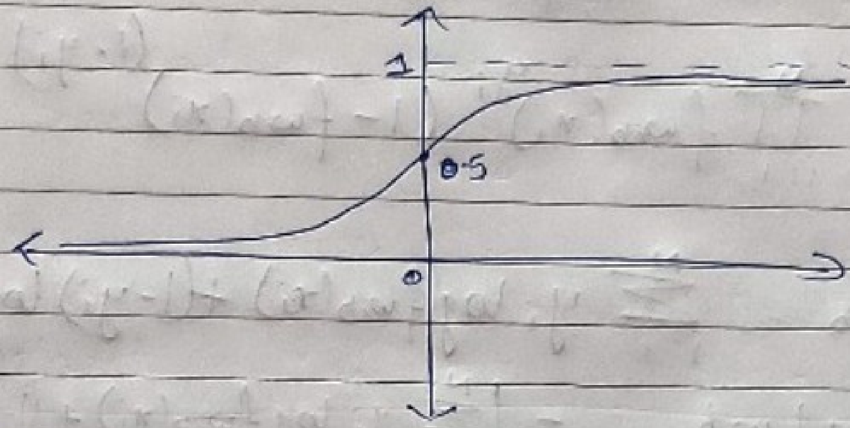


logistic regression

- Classification problem.

if $\sigma(f_{w,b}(x_i)) \geq 0.5$ then belongs to class 1

if $\sigma(f_{w,b}(x_i)) < 0.5$ then belongs to class 0



Instead of minimizing the loss, we maximize the likelihood.

Max likelihood for 1 event:

$$L = f_{w,b}(x)^{y}\,(1 - f_{w,b}(x))^{(1-y)}$$

for all events $= \prod_{i=1}^{N} f_{w,b}(x_i)^{y_i}\,(1 - f_{w,b}(x_i))^{(1-y_i)}$

$$\cancel{\log L = y\log(\sigma(x)) + (1-y)\log(\sigma(x))}$$

$$\log L = y\log(\sigma(x)) + (1-y)\log(1-\sigma(x))$$

$$\cancel{= y\log(\sigma(x)) +}$$

Max $\log L$ = Min$(-ve \log L)$

$-ve$ log loss = ~~to~~ cross entropy loss.

Θ

$$L_{w,b} = \prod_{i=1}^{N} f_{w,b}(x_i)^{y_i} (1 - f(w,$$

$$L_{w,b} = \prod_{i=1}^{N} f_{w,b}(x_i)^{y_i} (1 - f_{w,b}(x_i))^{(1-y_i)}$$

$$\log L_{w,b} = \sum_{i=1}^{N} y_i \log f_{w,b}(x_i) + (1-y_i) \log (1 - f_{w,b}(x_i))$$

$$-\log L_{w,b} = -\left[\sum_{i=1}^{N} y_i \log f_{w,b}(x_i) + (1-y_i) \log (1 - f_{w,b}(x_i)) \right]$$