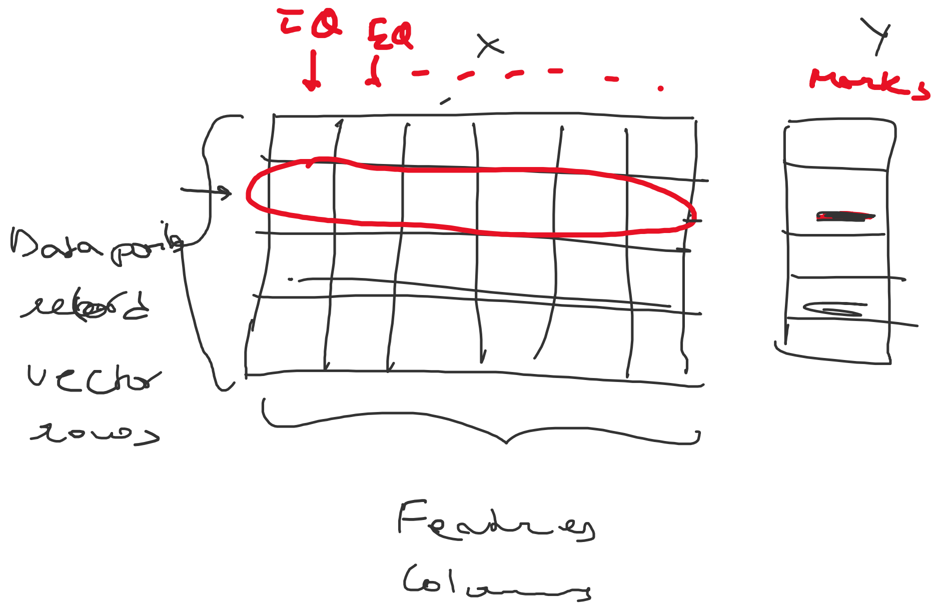
Linear Regression

17 June 2025 12:53



F(X) → Y

Approximate it

Type of ML :

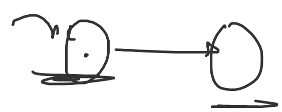
→ Supervised

→ Unsupervised

→ semi supervised

→ Reinforcement

→ self-supervised ~



Y → no supervision

KMeans ① Clustering

PCA ② Dimensionality Reduction

③ Association pattern mining

Recommendation

mobile → cover

Supervised

① Classification

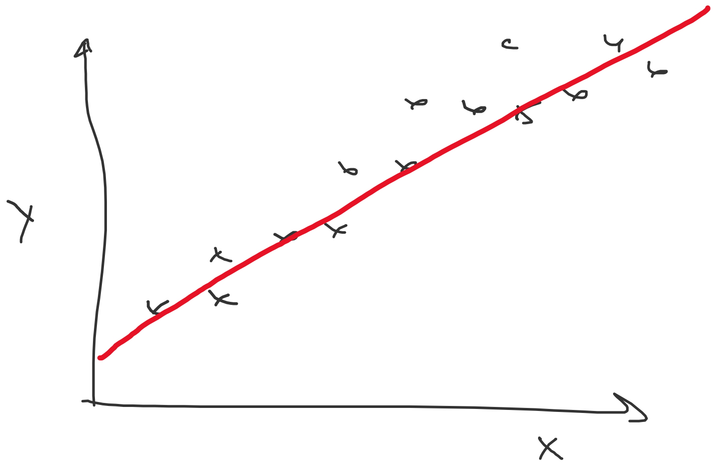
② Regression

Linear Regression

Linear Regression

$Y \rightarrow$ Continuous V...

degree 1



$y = mx + c$

m → slope

c → intercept

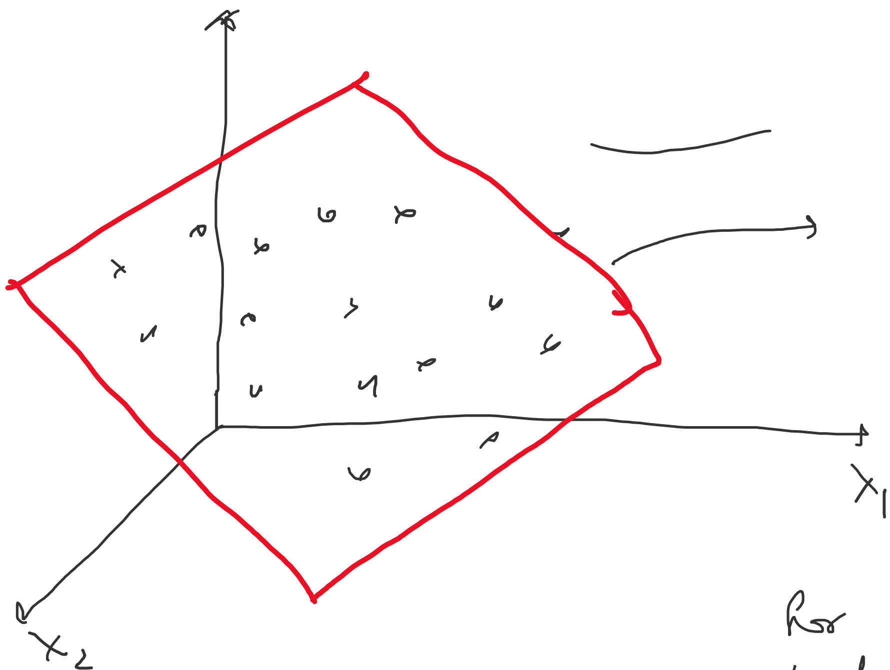
dim of plane = no. o...

$ax + by + cz = c...$

$\Downarrow$

$y = m_1x_1 + m_2x_2$

$\Downarrow$



$\boxed{y = m_1x_1 + m_2x_2 \cdots}$

For n-features

$\Downarrow$

$h_\theta(x) = y = w_1x_1 + w_2x_2 \cdots$

$= \sum_{i=1}^{n} w_i x_i + w_0$

w_i's → lea...

10 feature → no. of wei

w_1 . . .

10

Training

x	y	$\hat{y}$	$\hat{y}$
1	6	6	6
2	12	11	12
3	18	16	18
4	24	21	24
⋮	⋮		

$y = mx + c$

$m = 5$
$c = 1$

$y = 6x +$

Testing 7 → $\boxed{42}$

Ans

Output

Loss : $\boxed{\frac{1}{m}\sum_{i=1}^{m} |\hat{y}_i - y_i|}$ Mean Absolute

Assume Data is Gaussian

Loss : MSE → Mean Squared Error

$$= \boxed{\frac{1}{m}\sum_{i=1}^{m} (\hat{y}_i - y)^2}$$

ω

Optimization Algo

→ Gradient D

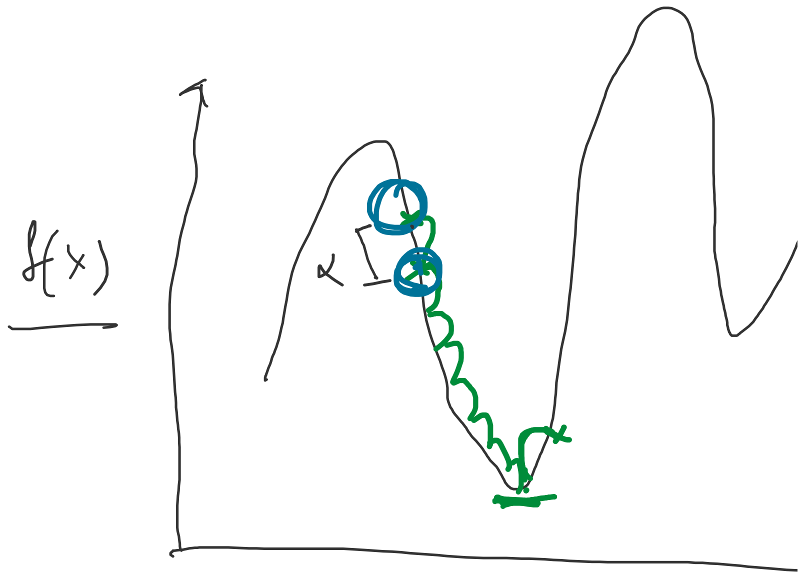
→

Gradient Descent → hill climbing Algo

Global Minima

Local minima

(1) local Minima



Gradient Descent Eqⁿ

$$\boxed{x = x - \alpha \frac{dy}{dx}}$$

Step-size / learn

hyperparame

$$\text{Loss } (J(\omega)) : \frac{1}{m}\sum_{i=1}^{m}(\hat{y}_i - y_i)^2 , \quad \hat{y}_i = \sum_{j=1}^{n} \omega_j x_{ij} +$$

Hyperparameter

Eqn

$$\omega_j = \omega_j - \alpha \frac{dJ}{d\omega_j}$$

$$\frac{dJ}{d\hat{y}} = \frac{2}{m}\sum_{i=1}^{m}$$

$$\frac{d\hat{y}_i}{d\omega_j} = x_{ij}$$

$$\frac{dJ}{d\omega_j} = \frac{dJ}{d\hat{y}} \times \frac{d\hat{y}}{d\omega_j}$$

ω_j

$\omega_0 =$