Linear Regression:

Objective: to find/ predict the continuous value

TO MAKE THE BEST FITT LINE IN SUCH A WAY TO MINIMIZE ERRORS

Equation of line (simple linear regression):

Y^=W.x + b

Y^ : predicted value

X : input

W : Weight/ slope

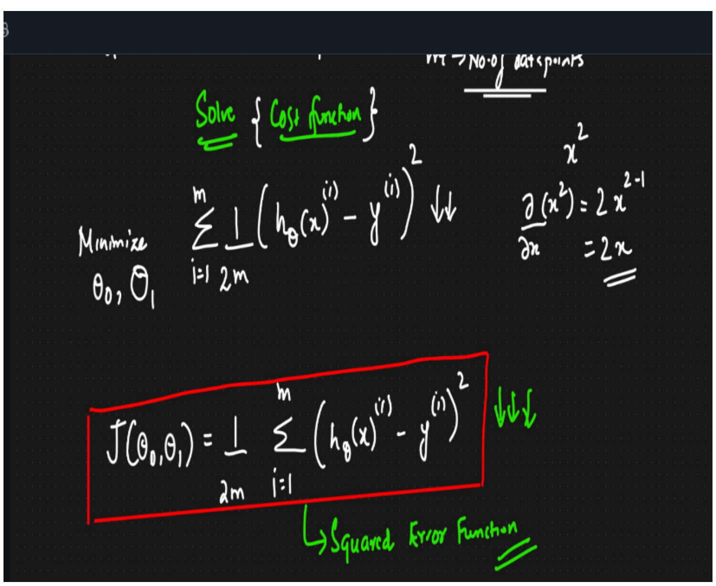
B : Bias/ intercept

- Hypothesis Function : This is our prediction function:

h(x)=w.x+b

- Cost Function (Error Measure) :

Measures how far predictions are from actual values.



Goal: **Minimize this cost** to improve model accuracy.

Gradient Descent (Optimization Algorithm) :

- It updates weights to minimize cost function.

5. Learning Rate (α)

- Controls **how fast** weights are updated.
- Small α\alphaα → slow learning
- Large α\alphaα → may overshoot or diverge

Right learning rate = faster and stable training

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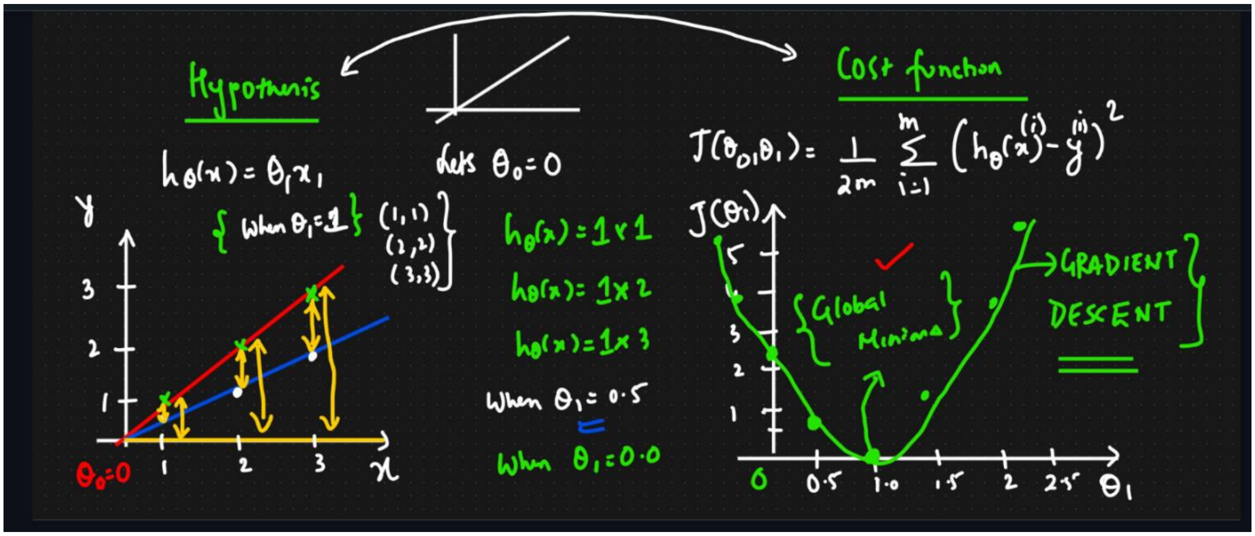
6. Convergence and Global Minima

- Linear regression has **convex cost function**, so only **one global minima** exists.
- Gradient Descent **always reaches the best point** if:
  - Learning rate is proper
  - Sufficient iterations done



Hypothesis
Cost function
$h_\theta(x) = \theta_1 x_1$
lets $\theta_0 = 0$
$J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)}\right)^2$
{ When $\theta_1 = 1$ }
(1,1)
(2,2)
(3,3)
$h_\theta(x) = 1 \times 1$
$h_\theta(x) = 1 \times 2$
$h_\theta(x) = 1 \times 3$
When $\theta_1 = 0.5$
When $\theta_1 = 0.0$
$\theta_0 = 0$
$J(\theta_1)$
Global Minima
GRADIENT DESCENT
θ_1