REGRESSION

Date: D D M M Y Y

- explore relationship b/w variables
- estimation : derive something from existing data by analysing
- prediction : future prediction on unseen data
  - ↳ statistical analysis
  - ↳ ML models
- all features are independent variables
- outcome is dependent variable

⇒ Linear Regression :

↳ linearity in terms of parameters (coefficients)

coefficient ki degree 1 ho. eg. $ax_1 + bx_2^2$

$x_1 + x_2^2$ ↓ non-linear

→ Hypothesis :

$$h_\theta(x) = \theta_0 + \theta_1 x$$

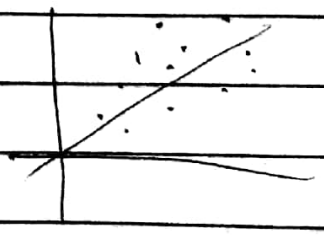
(θ_1: slope, θ_0: intercept)

$$y = mx + c$$

(m: slope, c: y-intercept)

jitne features, utne no. of slopes

- slope fit karaha hota hai. har point ko
- fix intercept at 0
- only challenge is learning slope
- line is your hypothesis
- data points
- best fit is line with lowest error



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- parameters : θ_0, θ_1

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→ Cost Function : MSE

- reduce cost / loss
- choose slope so that prediction is close to actual

$$J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)} \right)^2$$

(2) → +, − sign ka masla na ho

MSE, RMSE

- $\frac{1}{2m}$ ← to make it mathematically simple
- derivate pe square wala 2 udhar ajayega aur no cancel hojayega

$h_\theta(x^{(i)})$ → hypothesis

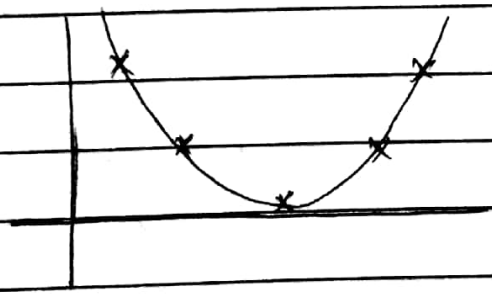
$y^{(i)}$ → actual

$\sum_{i=1}^{m}$ → sum of errors for all samples

Q) Is there any other cost function ?

Yes.

- Hinge Loss :
- MSE : ⌣ → global minima (cost will be min here)



- Har point pe slope calculate karaingay.
- if slope is −ve, we have increase θ
- if slope is +ve, decrease θ

$\theta_{new} = \theta_{new} - \theta$

For −ve :

$\theta_{new} = \theta_{new} - (-\theta)$

For +ve :

$\theta_{new} = \theta_{new} - \theta$

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Q) — θ kitna update hoga?

↳ learning rate (α) — Optimizer

↳ hyperparameter

→ Gradient Descent Algorithm:

↳ exploration to find the best θ.

Agar 100 examples hain toh unn 100 examples pe θ_0, θ_1 calculate hoga — and so on.

- Ways to make it less complex:
  - Stochastic GD
  - Batch GD
  - Mini Batch GD