Gradient Boosting Algorithms

① Regression

② classification

Dataset

Exp (x_1)	Degree (x_2)	Salary (y)	$(y-\hat{y})$ R_1	Predicted R_2	$\hat{y}$	R_3
→ 2	B.E	50K	-25K	-23K	47.77	-24.77
→ 3	Masters	70K	-5K	-3K	64.97	-4.97
5	Masters	80K	5K	3	-	-
6	PHD	100K	25K	20K	-	-
		75K				

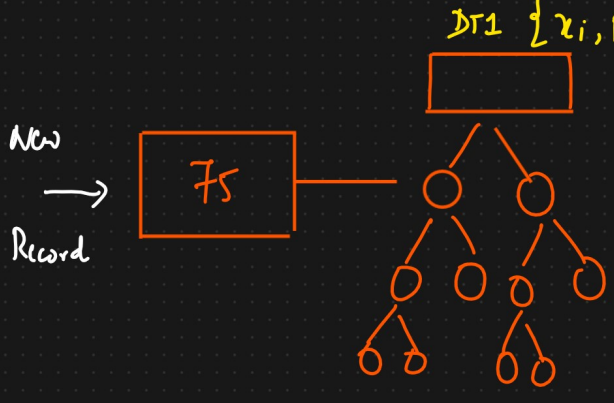
Steps

① Create a Base Model

$$\text{Average} = \frac{[50K + 70K + 80K + 100K]}{4} = 75K$$

② Compute Residuals, Error

③ Construct a Decision Tree consider inputs x_i and o/p R_1



Base Model

Predicted o/p : 75 + (-23) = 75 - 23 = 52 {Overfitting}.

Predicted o/p : $75 + \alpha(-23)$

α = Learning Rate

$\alpha = 0.01 \rightarrow \{0 \text{ to } 1\}$

$= 75 + (0.01)(-23)$

$= 75 - 0.23$

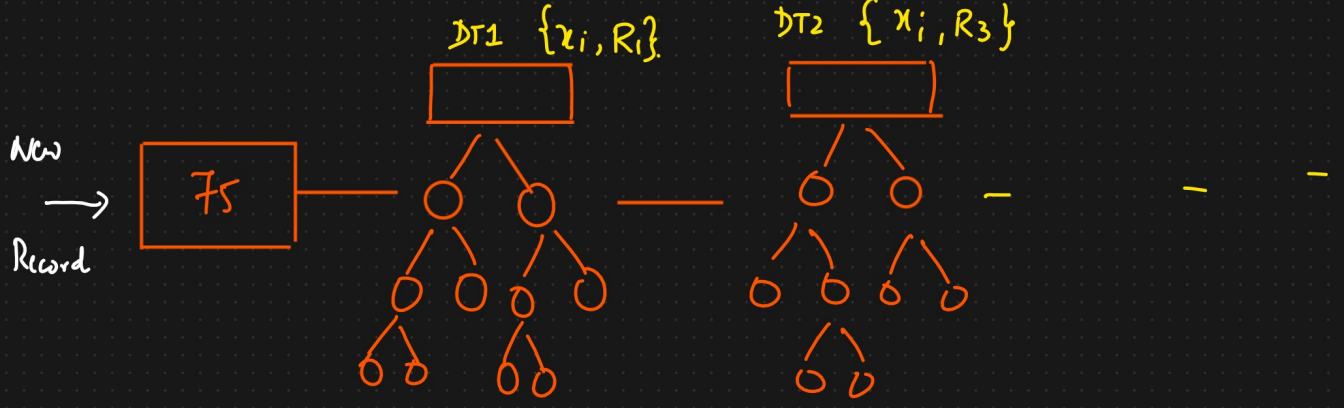
$= 74.77$

② Predicted o/p = $75 + \alpha(-3\alpha)$

$= 75 + (0.01)(-3)$

$= 75 - 0.03$

$= 74.97$ //



Base Model

o/p = $75 + \alpha_1(DT_1) + \alpha_2(DT_2) + \cdots \alpha_n(DT_n)$.

Mathematical

$\alpha_0 = 1$

$F(x) = \alpha_0 h_0(x) + \alpha_1 h_1(x) + \alpha_2 h_2(x) + \cdots + \alpha_n h_n(x)$

$\{\alpha_0, \alpha_1, \alpha_2, \cdots \alpha_n\} \rightarrow$ Learning Rate $\{0 \text{ to } 1\}$

$$F(x) = \sum_{i=0}^{n} \alpha_i h_i(x)$$