Gradient Boosting

↳ Regression
↳ Classification.

$y_{act} - y_{base\ pred}$ = Error

Residual Prediction ⇓ as R_1 is taken as target variable

Exp	Degree	Salary (y_{actual})	$\hat{y}$ $y_{base\ pred}$	R_1	R_2
2	Btech	50k	75	-25	-23
3	M	70k	75	-5	-3
4	M	80k	75	5	3
5	Phd	100k.	75	25	20

Step-1 → Create a base model.

75

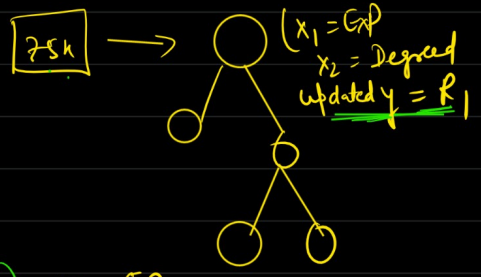
Step-2 Compute the residual/error from y_{actual}.

Step-3 Make a dt considering input as the independent variable (Exp, degree) and target variable as R_1

⇓

Using this decision tree make Prediction for input variables.

$Avg = \frac{50+70+80+100}{4} = 75k.$



for row(2, btech)

Prediction $75 + (-23) = 52$

- 75 → $y_{base\ pred}$
- (-23) → Prediction taking R_1 (error, $y_{act} - y_{base}$) as target.

This way model might overfitting.

⇓

You will use learning rate

Correct way $= 75 + \alpha$ (Residual decision tree pred)

$= 75 + 0.1 \times (-23)$

$= 75 - 2.3 = 72.7$

2nd row $= 75 + 0.1 \times (-3) = 75 - 0.3 = 74.7.$

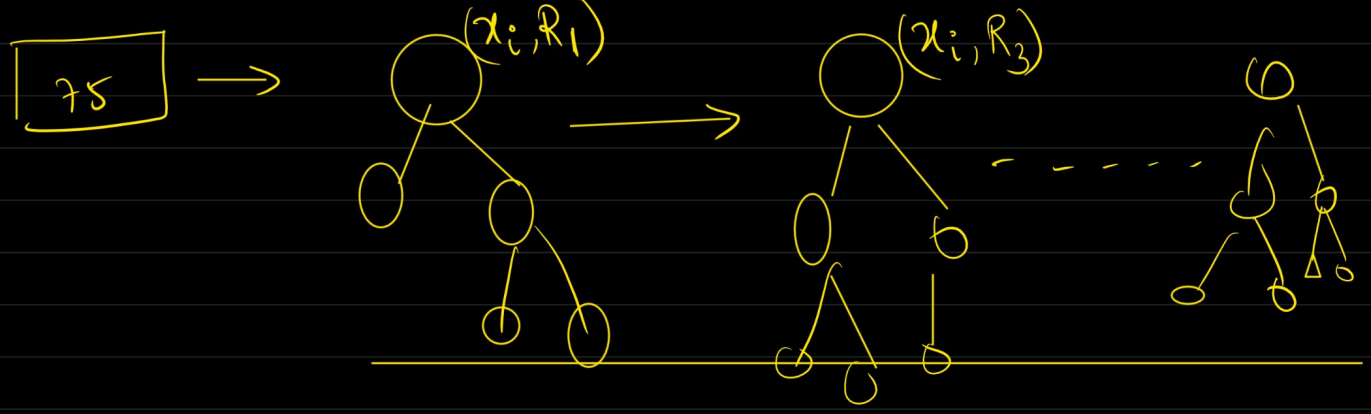
Error with base pred

DT Pred with R_1 as residual.

Exp	Degree	Salary (y_{actual})	$\hat{y}$ $y_{base\ pred}$	R_1	R_2	$\hat{y}$	$R_3 \rightarrow y_{act} - y_{pred}$	R_4
2	Btech	50	75	-25	-23	72.7	50 − 72.7	—
3	M	70k	75	-5	-3	74.7	70 − 74.7	—
4	M	80k	75	5	3	74.5	80 − 74.5	—
5	Phd	100k.	75	25	20		100 − —	—

→ taking Exp, Deg as x_i, R_3 as target

$\hat{y}$	R_5	R_6	$\hat{y}$



$$f(x) = \underbrace{\alpha_1}_{\text{No. of DT}}(RDT_1) + \alpha_2(RDT_2) + \cdots \alpha_n(RDT_n)$$

$\alpha \rightarrow$ same

$$f(x) = \sum_{i=1}^{n} \alpha\,(RDT_i)$$

↳ Gradient fn

Gradient Boosting classifier

* Base predict 0.5
* Instead of var reduction → I.G. in DT.