

Gradient Boosting

Regression

(target) → Continuous value

	(F ₁) Intelligence Level	(F ₂) Score	Package (LPA) (y)	\hat{y}_1	R ₁	\hat{y}_2	$y - \text{pred}^{(m_1 + \eta * m_2)}$	R ₂
→ ①	90	8	3	4.8	-1.8	-1.8	4.62	-1.62
②	100	7	4	4.8	-0.8	-0.8	4.72	-0.72
③	110	6	8	4.8	3.2	3.2	5.12	2.88
④	120	9	6	4.8	1.2	1.2	4.68	1.32
⑤	80	5	3	4.8	-1.8	-1.8	4.62	-1.62
new data	115	7						

m_1

mean → $(3 + 4 + 8 + 6 + 3) / 5$

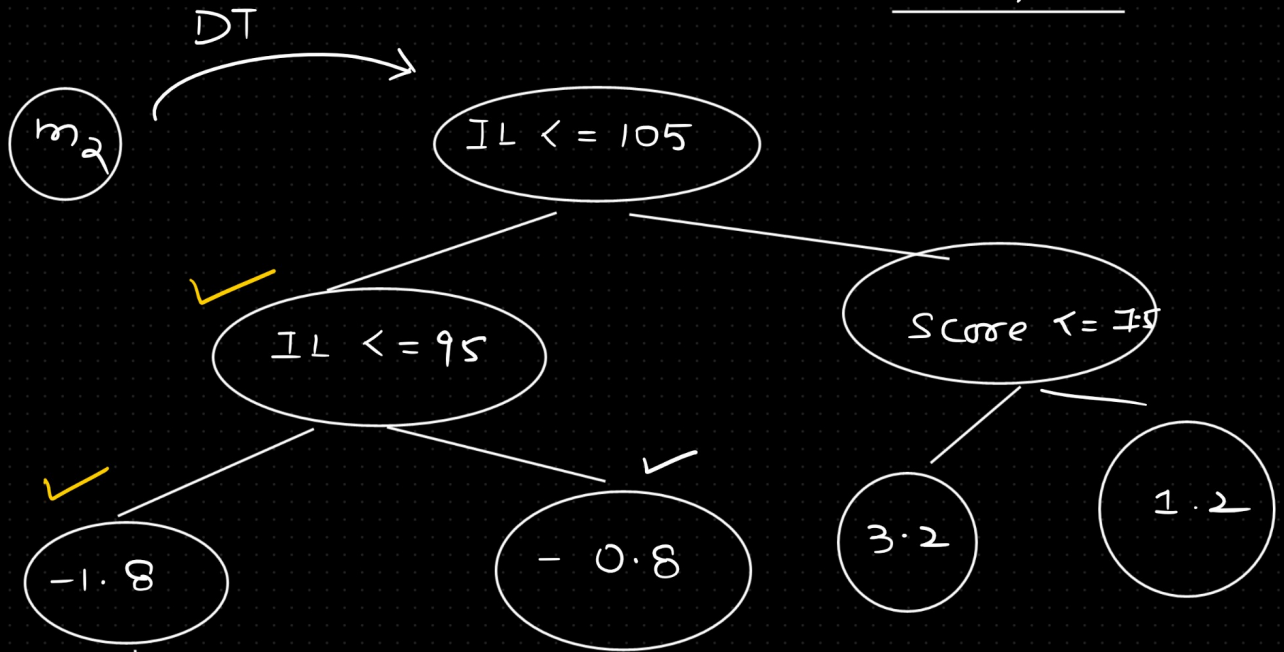
→ 4.8

Linear Regression

→ Residuals = $y - \hat{y}$

Pseudo-Residuals → $y - \hat{y}$

m_2 Input features = $\{f_1, f_2\}$
target = $\{R_1\}$



Predicted
Residuals

Reduce the
Overfitting

only two
estimators

Learning
Rate (0.1)

$$\begin{aligned}
 \left\{ \begin{aligned} & \underline{y_{pred}} = m_1 + \eta * \underline{m_2} \\ & = 4.8 + 0.1 * (-1.8) \\ & = 4.8 - 0.18 \\ & = 4.62 \end{aligned} \right.
 \end{aligned}$$

$$\begin{aligned}
 \Rightarrow & 4.8 + (0.1) * (-0.8) \\
 & = 4.8 - 0.08 \\
 & = 4.72
 \end{aligned}$$

$$\Rightarrow 4.8 + (0.1) * (3.2)$$

$$\Rightarrow 4.8 + 0.32$$

$$\Rightarrow 5.12$$

three
estimators

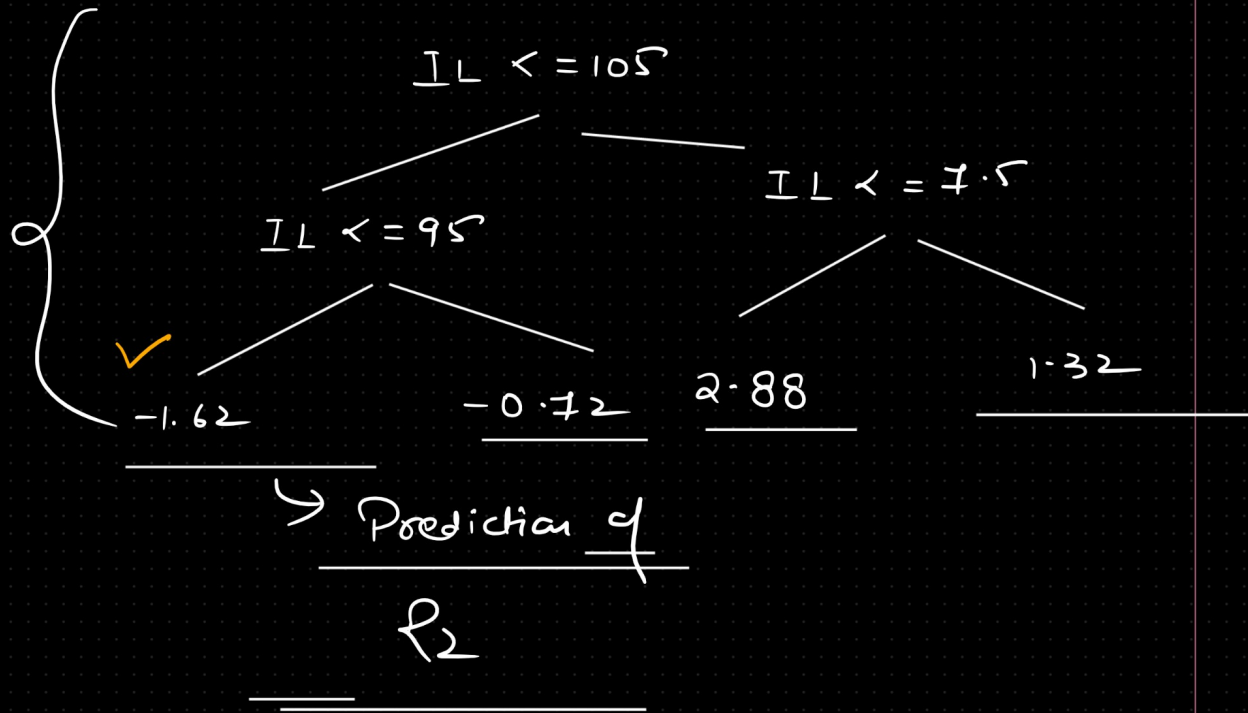
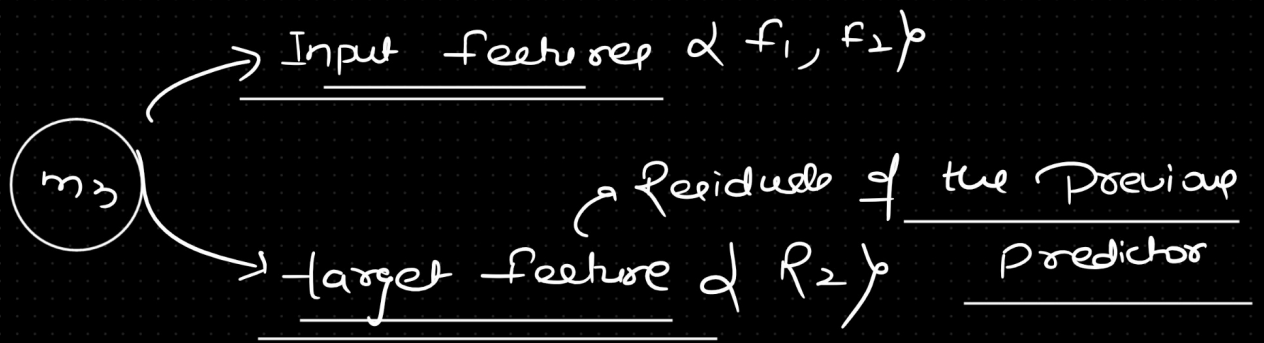
$$\rightarrow y_{\text{pred}} = m_1 + \eta * m_2 + \eta * m_3$$

$$= 4.8 + (0.1) * (-1.8) +$$

$$(0.1) * (-1.62)$$

$$\Rightarrow 4.8 - 0.18 - 0.162$$

$$\Rightarrow \underline{\underline{4.458}}$$



\hat{y}_3

\rightarrow

-1.62
-0.72
2.88
1.32
-1.62

$$y_{pred} = m_1 + \eta \times m_2 + \eta \times m_3 = 4.45$$