

Machine Learning

Supervised

Unsupervised

Reinforcement

Regression

Classification

↳ Linear

Regression

↳ Logistic

Regression

$$\frac{1}{1+e^{-z}}$$

Sigmoid function

↳ binary classification

softmax

↳ multiclass

classification

function

KNN ✓

Decision Tree

Bagging

Random forest

Boosting

AdaBoost

Gradient Boost ✓

Stacking ✓

Sklearn

Optimization

Evaluation Metrics

Sklearn

Regression

↳ MSE/MAE

↳ RMSE

↳ R² / Adjusted R²

Classification

↳ Confusion matrix

↳ ROC-AUC curve

target LPA MI XgBoost

mean target

(f ₁) CGPA	Package	Pred1	R1	Pred2
6.7	<u>4.5</u>	7.3	-2.8	<u>7.095</u>
9.0	11.0	7.3	3.7	7.67
7.5	6.0	7.3	-1.3	7.095
5.0	8.0	7.3	0.7	7.37
8.0	<u>?</u>			

XgB Tree

-2.8, 3.7, -1.3, 0.7

Similarity score \Rightarrow

$\frac{(\text{sum of Residuals})^2}{\text{# Residuals} + \lambda}$

$\lambda \rightarrow 0$

sum of Residuals

$$\frac{(-2.8 + 3.7 - 1.3 + 0.7)^2}{4} \geq \underline{\underline{0.02}}$$

Regularization Parameter

Sort the CGPA \Rightarrow

5.0	}	\rightarrow <u>5.85</u> ✓
6.7		\rightarrow <u>7.1</u> ✓
7.5		
9.0		\rightarrow <u>8.25</u> ✓

Information Gain

$\hookrightarrow SS = 0.02$

CGPA < 5.85

<p>0.7</p> <p>\downarrow</p> $SS_L = \frac{(0.7)^2}{1}$ <p>\Rightarrow <u>0.49</u></p>	<p>-2.8, 3.7, -1.3</p> <p>\downarrow</p> $SS_R = \frac{(-2.8 + 3.7 - 1.3)^2}{3}$ <p>\Rightarrow <u>0.05</u></p>
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$$\begin{aligned}
 \text{Gain} &= SS_L + SS_R - SS_{\text{Root}} \\
 &= 0.49 + 0.05 - 0.02 \\
 &= \underline{\underline{0.52}}
 \end{aligned}$$

$\hookrightarrow SS = 0.02$

CGPA < 7.1

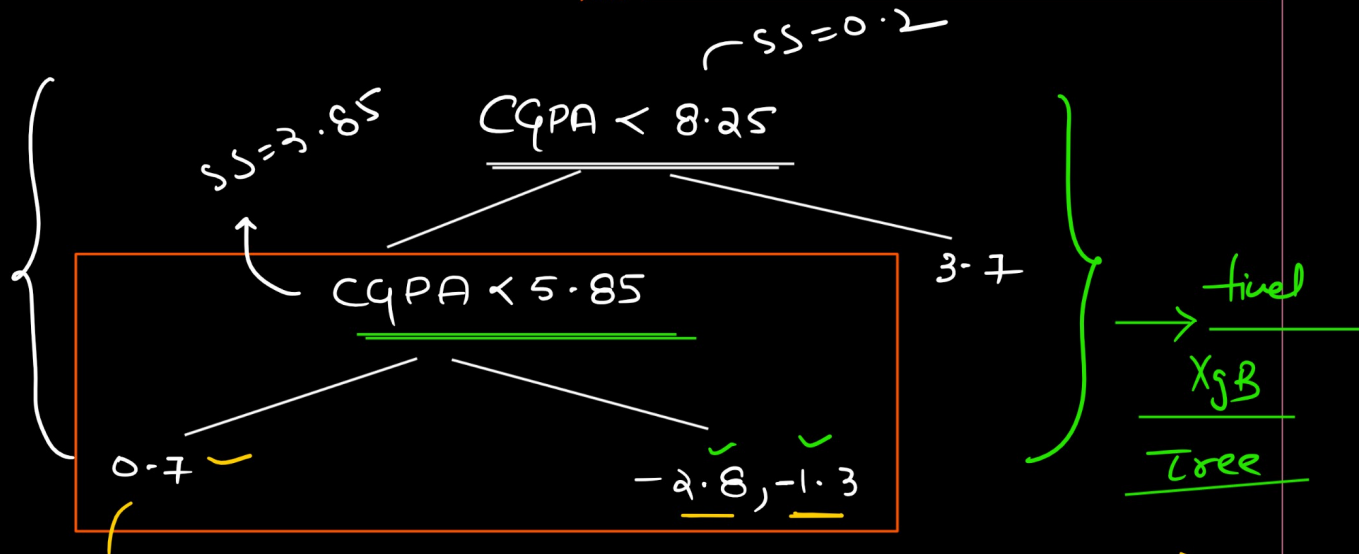
<p>-2.8, 0.7</p> <p>\downarrow</p> $SS_L = \frac{(-2.8 + 0.7)^2}{2}$ <p>$= 2.20$</p>	<p>3.7, -1.3</p> <p>\downarrow</p> $SS_R = \frac{(3.7 - 1.3)^2}{2}$ <p>$= 2.88$</p>
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$$\begin{aligned}
 \text{Gain} &= 2.20 + 2.88 - 0.02 \\
 &= \underline{\underline{5.06}}
 \end{aligned}$$

$$SS_L = \frac{(-2.8 - 1.3 + 0.7)^2}{3}$$
$$= 3.85 \checkmark$$

$$SS_R = \frac{(3.7)^2}{1} = 13.69$$

-x x

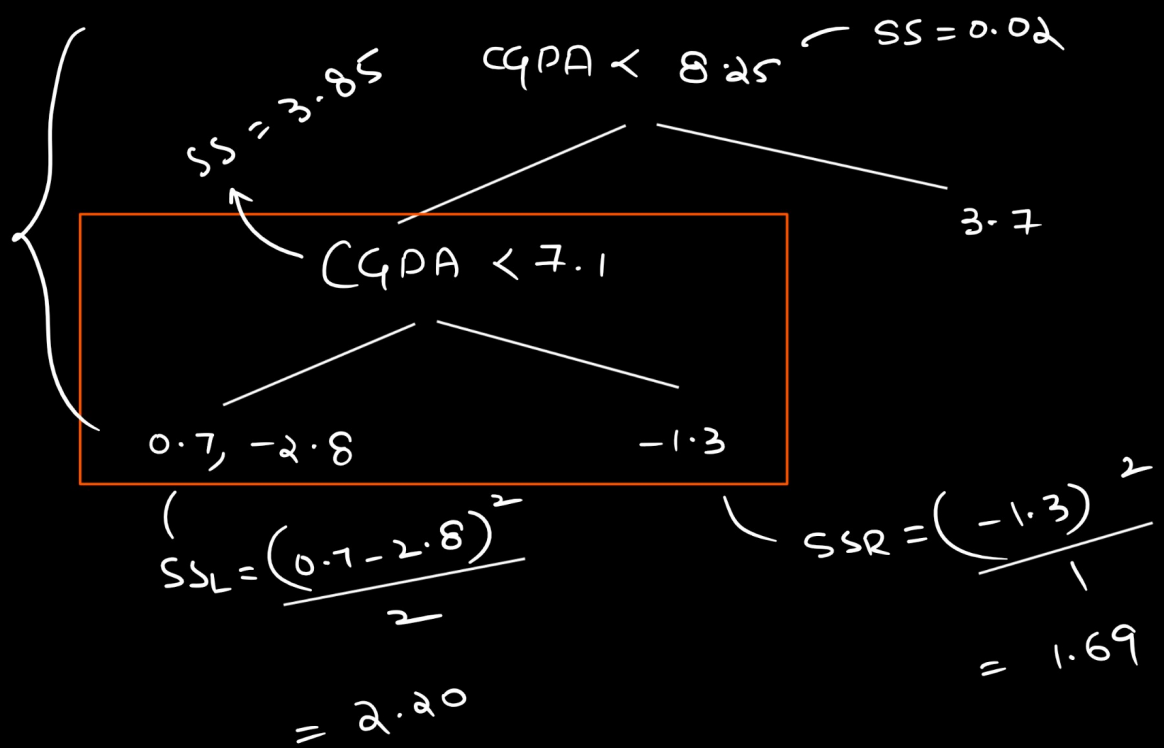


$$SS_L = \frac{(0.7)^2}{1} = 0.49$$

$$SS Q = \frac{(-2.8 - 1.3)^2}{2}$$

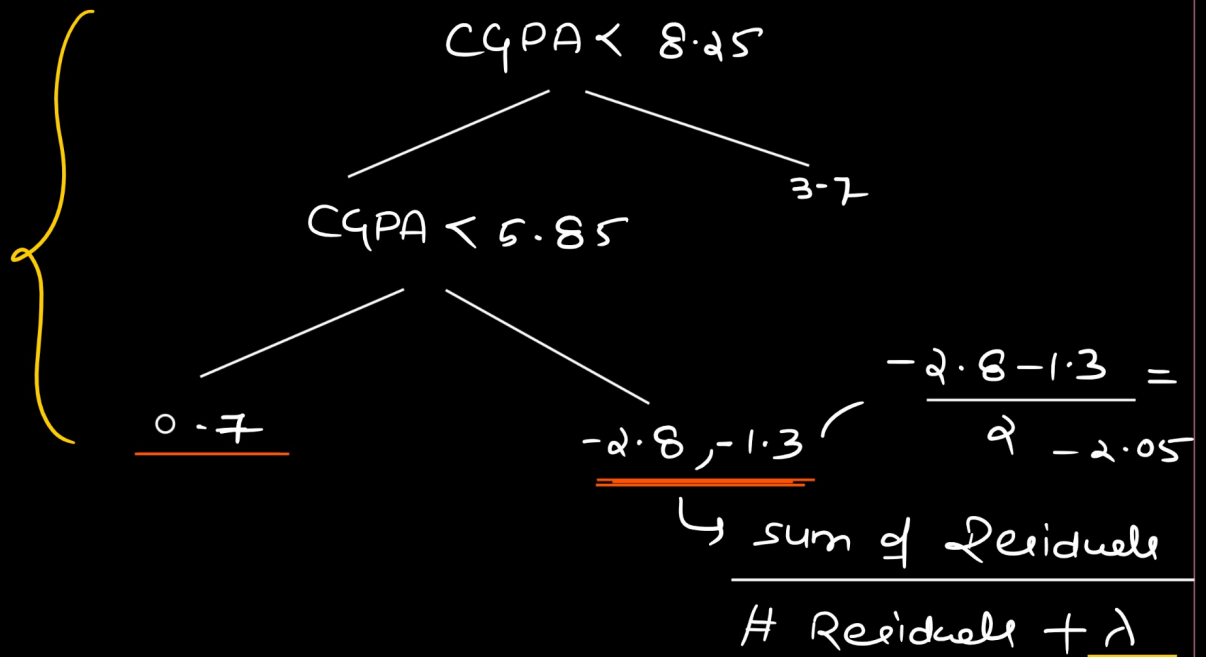
$$\text{Gain} = 0.49 + 8.4 - 3.85 = 5.04 \checkmark$$

$$= 8.4$$

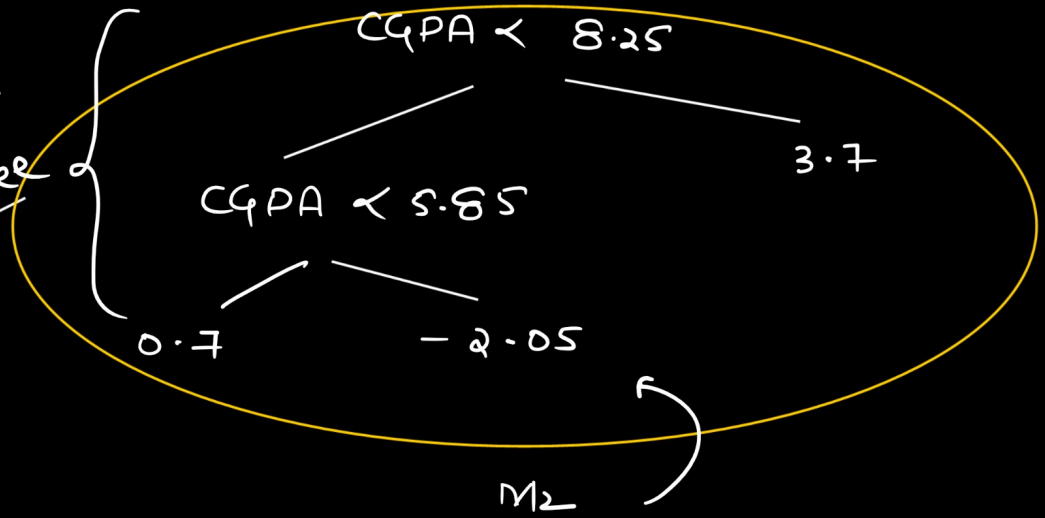


$$\text{Gain} = 2.20 + 1.69 - 3.85 = \underline{0.045} \checkmark$$

final Xgb Tree



Creation of
XgB Tree



$$\text{Pred}_2 = \text{Pred}_1 + \eta * \text{XgB Tree Result}$$

$$= 7.3 + 0.1 * (-2.05)$$

$$= 7.3 - 0.205$$

$$= \underline{\underline{7.095}}$$

2nd Record $\rightarrow 7.3 + 0.1 * 3.7$

$$\Rightarrow 7.3 + 0.37$$

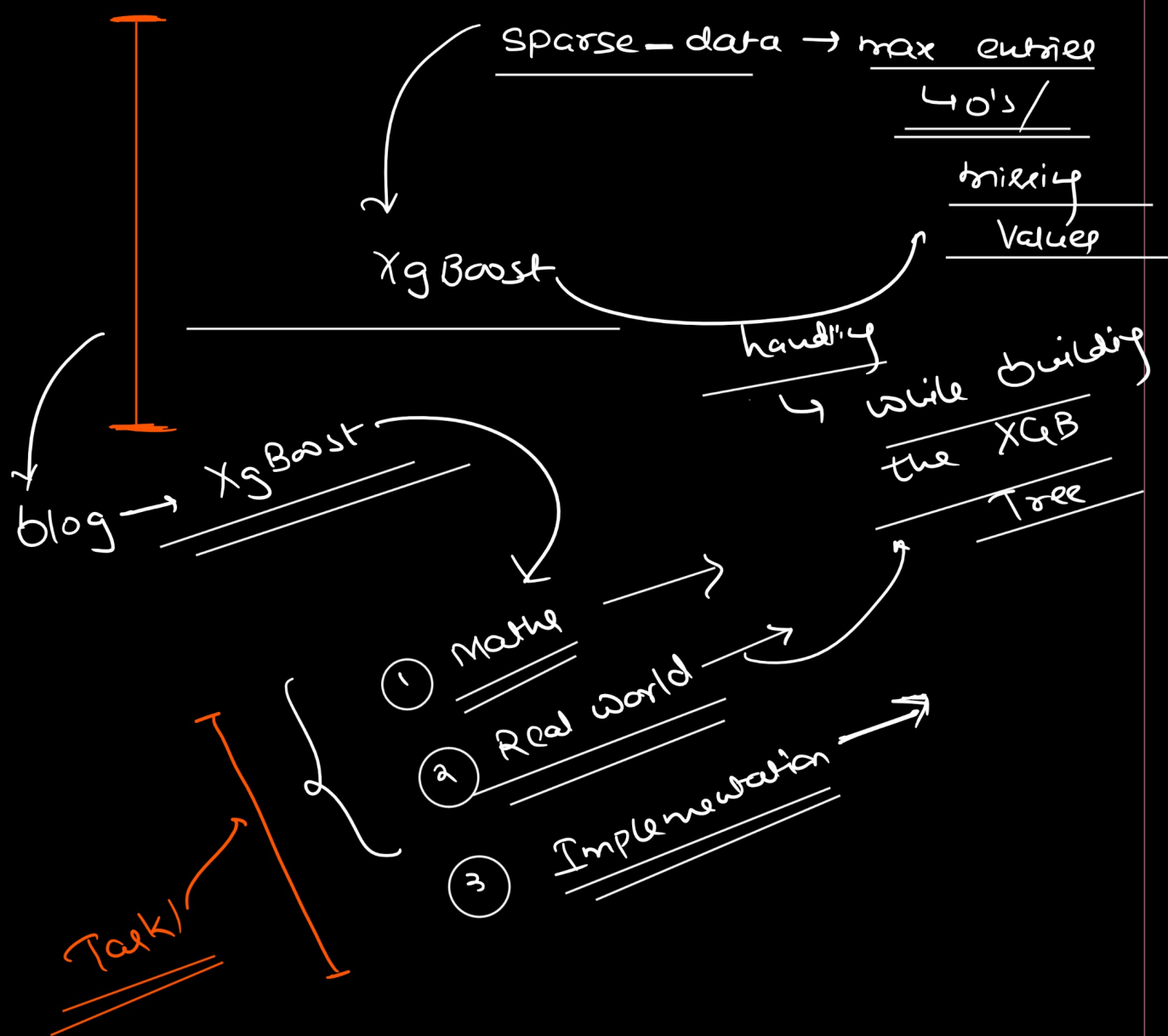
$$\rightarrow \underline{\underline{7.67}}$$

3rd Record $\rightarrow 7.3 + 0.1 * (-2.05)$

$$\Rightarrow 7.095$$

4th Record $\rightarrow 7.3 + 0.1 * (0.7)$

$$\Rightarrow 7.3 + 0.07 = 7.37$$



Task 2 → XgB classifier → Receiver