Date :

2x2 Confusion Matrix

		Actual: Positive	Actual: Negative
Predicted	Positive	TP = 10	FP = 3
	Negative	FN = 1	TN = 6

$$\text{Accuracy} = \frac{\text{No of Correct Predictions}}{\text{Total No of Predictions}}$$

$$= \frac{TP + TN}{TP + TN + FP + FN}$$

$$\text{Accuracy} = \frac{10 + 6}{10 + 6 + 3 + 1} = \frac{16}{20} = 0.8$$

$$= 0.8 \times 100$$

Accuracy = 80%.

Date :

Class - 1 (Positive) :-

$$\text{Recall} = \frac{TP}{TP + FN}$$

$$= \frac{10}{10+1} = \frac{10}{11} = 0.91$$

$$\text{Precision} = \frac{TP}{TP + FP}$$

$$= \frac{10}{10+3} = \frac{10}{13} = 0.77$$

$$\text{F1 Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

$$= 2 \times \frac{0.77 \times 0.91}{0.77 + 0.91}$$

$$= 2 \times 0.417$$

F1 Score = 0.83

Date :

Class - 2 (Negative) :-

$$\text{Recall} = \frac{TN}{FP + TN}$$

$$= \frac{6}{3+6} = \frac{6}{9} \quad \boxed{= 0.67}$$

$$\text{Precision} = \frac{TN}{FN + TN}$$

$$= \frac{6}{1+6} = \frac{6}{7} \quad \boxed{= 0.86}$$

$$\text{F1 Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

$$= 2 \times \frac{0.86 \times 0.67}{0.86 + 0.67}$$

$$\text{F1 Score} = 2 \times 0.376 \quad \boxed{= 0.75}$$

Date :

Weighted Average Precision :-

= Actual class-1 (Positive) instances * precision of class-1 (positive) + Actual class-2 (Negative) instances * precision of class-2 (Negative)

$$= \frac{TP+FN}{100} * 0.77 + \frac{FP+TN}{100} * 0.86$$

$$= \frac{10+1}{100} * 0.77 + \frac{3+6}{100} * 0.86$$

$$= 0.0847 + 0.0774$$

$$\boxed{= 0.1621}$$

Date :

Weighted Average Recall :-

= Actual Class-1 (Positive) instances * Recall of class-1 (Positive) +

Actual Class-2 (Negative) instances * Recall of class-2 (Negative)

$$= \frac{TP+FN}{100} * 0.91 + \frac{FP+TN}{100} * 0.67$$

$$= \frac{10+1}{100} * 0.91 + \frac{3+6}{100} * 0.67$$

$$= 0.1001 + 0.0603$$

$$= 0.1604$$

Date :

3x3 Confusion Matrix

Predicted \ Actual	Positive	Negative	Neutral
Positive	TP = 10	FP = 1	FP = 2
Negative	FN = 0	TN = 6	FN = 4
Neutral	FNeutral = 1	FNeutral = 2	TNeutral = 4

$$\text{Accuracy} = \frac{\text{No of Correct Predictions}}{\text{Total no of Predictions}}$$

$$= \frac{TP + TN + TNeutral}{TP + TN + FP + FN + TNeutral + FNeutral}$$

$$= \frac{10 + 6 + 4}{10 + 6 + 3 + 4 + 4 + 3}$$

$$= \frac{20}{30} = 0.667 = 0.6667$$

Date :

$= 0.6667 \times 100$

Accuracy = 66.67 %.

Class - 1 (Positive) :-

$$\text{Recall} = \frac{TP}{TP + FN + FNeutral}$$

$$= \frac{10}{10 + 0 + 1} = \frac{10}{11} = 0.91$$

$$\text{Precision} = \frac{TP}{TP + FP + FP}$$

$$= \frac{10}{10 + 1 + 2} = \frac{10}{13} = 0.77$$

Date :

$$F1\ Score = 2 \times \frac{Precision \times Recall}{Precision + Recall}$$

$$= 2 \times \frac{0.77 \times 0.91}{0.77 + 0.91}$$

$$= 2 \times 0.417$$

$$F1\ Score = 0.83$$

Date :

Class-2 (Negative) :-

$$\text{Recall} = \frac{TN}{TN + FP + FNeutral}$$

$$= \frac{6}{6 + 1 + 2}$$

$$\text{Recall} = \frac{6}{9} \quad \boxed{= 0.67}$$

$$\text{Precision} = \frac{TN}{TN + FN + FN}$$

$$= \frac{6}{6 + 0 + 4} \quad = \frac{6}{10}$$

$$\text{Precision} \quad \boxed{= 0.60}$$

Date :

$$F1\ Score = 2 \times \frac{Precision \times Recall}{Precision + Recall}$$

$$= 2 \times \frac{0.60 \times 0.67}{0.60 + 0.67}$$

$$= 2 \times 0.316$$

F1 Score = 0.63

Date :

Class - 3 (Neutral)

$$\text{Recall} = \frac{TNeutral}{TNeutral + FP + FN}$$

$$= \frac{4}{4 + 2 + 4}$$

$$\text{Recall} = \frac{4}{10} \quad \boxed{= 0.40}$$

$$\text{Precision} = \frac{TNeutral}{TNeutral + FNeutral + fNeutral}$$

$$= \frac{4}{4 + 1 + 2}$$

$$= \frac{4}{7}$$

$$\text{Precision} \quad \boxed{= 0.57}$$

Date :

$$F1\ Score = 2 \times \frac{Precision \times Recall}{Precision + Recall}$$

$$= 2 \times \frac{0.57 \times 0.40}{0.57 + 0.40}$$

$$= 2 \times 0.235$$

F1 Score $= 0.47$

Date :

Weighted Average Precision :-

= Actual Class-1 (Positive) instances * precision of class-1 (Positive) +

Actual Class-2 (Negative) instances * precision of class-2 (Negative) +

Actual Class-3 (Neutral) instances * precision of class-3 (Neutral)

$$= \frac{TP+FN+FNeutral}{100} * 0.77 + \frac{FP+TN+FNeutral}{100} * 0.60 +$$

$$+ \frac{FP+FN+TNeutral}{100} * 0.57$$

$$= \frac{10+0+1}{100} * 0.77 + \frac{1+6+2}{100} * 0.60 + \frac{2+4+4}{100} * 0.57$$

$$= \frac{11}{100} * 0.77 + \frac{9}{100} * 0.60 + \frac{10}{100} * 0.57$$

Date

$= 0.0847 + 0.054 + 0.057$

$= 0.1957$

Date :

Weighted Average Recall

= Actual class-1 (Positive) instances * Recall of class-1 (Positive) +

Actual class-2 (Negative) instances * Recall of class-2 (Negative) +

Actual class-3 (Neutral) instances * Recall of class-3 (Neutral)

$$= \frac{TP+FN+FNeutral}{100} * 0.91 + \frac{FP+TN+FNeutral}{100} * 0.67$$

$$+ \frac{FP+FN+TNeutral}{100} * 0.40$$

$$= \frac{10+0+1}{100} * 0.91 + \frac{1+6+2}{100} * 0.67 + \frac{2+4+4}{100} * 0.40$$

$$= \frac{11}{100} * 0.91 + \frac{9}{100} * 0.67 + \frac{10}{100} * 0.40$$

Date :

$= 0.1001 + 0.0603 + 0.04$

$= 0.2004$