

Manual calculation-Decision Tree classification-Evaluation

Parameter

`print(cm)`

```
[[78  7]
 [11 38]]
```

`print(clf_report)`

	precision	recall	f1-score	support
0	0.88	0.92	0.90	85
1	0.84	0.78	0.81	49
accuracy			0.87	134
macro avg	0.86	0.85	0.85	134
weighted avg	0.86	0.87	0.86	134

To calculate precision, recall, f1-Score, accuracy, macro average, & Weighted Average

Confusion matrix Result:

```
[[78  7]
 [11 38]]
```

True not purchased, **T (NP)=78**

False not purchased, **F (NP)=7**

False purchased, **F (P)=11**

True Purchased, **T (P)=38**

Total count of not purchased, **TC (NP)=85**

Total count of purchased, **TC (P)=49**

Total count of purchased & not purchased, **TC (P+NP)=134**

1. Accuracy:

$$\text{accuracy} = \frac{T(NP) + T(P)}{T(NP) + T(P) + F(NP) + F(P)}$$

$$= \frac{78 + 38}{78 + 38 + 7 + 11}$$

$$= \frac{116}{134} = 0.865 = 0.87$$

2.Recall:

$$\text{Not purchased} = \frac{T(NP)}{T(NP)+F(NP)} = \frac{78}{78+7} = \frac{78}{85} = 0.92$$

$$\text{Purchased} = \frac{T(P)}{T(P)+F(p)} = \frac{38}{38+11} = \frac{38}{49} = 0.78$$

3.precision:

$$\text{Not purchased} = \frac{T(NP)}{T(NP)+F(P)} = \frac{78}{78+11} = \frac{78}{89} = 0.88$$

$$\text{Purchased} = \frac{T(P)}{T(P)+F(NP)} = \frac{38}{38+11} = \frac{38}{49} = 0.84$$

4.F1-Measure:

Formula:

$$\frac{2 * \text{Recall} * \text{Precision}}{\text{Recall} + \text{Precision}}$$

$$\text{Not purchased} = \frac{2 * 0.92 * 0.88}{0.92 + 0.88} = \frac{1.6192}{1.8} = 0.90$$

$$\text{Purchased} = \frac{2 * 0.78 * 0.84}{0.78 + 0.84} = \frac{1.3104}{1.62} = 0.81$$

5.Macro Average:

$$\text{Precision} = \frac{\text{precision}(NP) + \text{Precision}(P)}{2}$$

$$= \frac{0.88 + 0.84}{2} = \frac{1.72}{2} = 0.86$$

$$\text{Recall} = \frac{\text{recall}(NP) + \text{recall}(P)}{2}$$

$$= \frac{0.92 + 0.78}{2} = \frac{1.7}{2} = 0.85$$

$$\text{F1-Measure} = \frac{f1_measure(NP) + f1_measure(p)}{2}$$

$$= \frac{0.90 + 0.81}{2} = \frac{1.71}{2} = 0.85$$

6. Weighted Average:

Total count in the set---→134

Total count not purchased (NP) in the set--→85

Total count in the set---→49

Precision:

$$\begin{aligned} & \text{Precision}(NP) * (85/134) + \text{precision}(P) * (49/134) \\ &= 0.88 * (85/134) + 0.84 * (49/134) \\ &= 0.88 * 0.634 + 0.84 * 0.365 \\ &= 0.557 + 0.306 \\ &= 0.86 \end{aligned}$$

Recall:

$$\begin{aligned} & \text{Recall}(NP) * (85/134) + \text{Recall}(P) * (49/134) \\ &= 0.92 * 0.634 + 0.78 * 0.365 \\ &= 0.5832 + 0.2847 \\ &= 0.87 \end{aligned}$$

F1_Measure:

$$\begin{aligned} & \text{F1_Measure}(NP) * (85/134) + \text{F1_Measure}(P) * (49/134) \\ &= 0.90 * 0.634 + 0.81 * 0.365 \\ &= 0.5706 + 0.2956 \\ &= 0.86 \end{aligned}$$

