

Random Forest - Confusion Matrix

Test Data Count 134	Predicted (0) Not Purchased	Predicted (1) Purchased
Actual (0) Not Purchased	43 True - Not Purchased	6 False-Not Purchased
Actual (1) Purchased	7 False-Purchased	78 True - Purchased

Accuracy: What is the correct Classification of this model ?

$$\begin{aligned}
 &= \frac{\text{True(Purchased)} + \text{True(Not Purchased)}}{\text{True(Purchased)} + \text{True(Not Purchased)} + \text{False(Purchased)} + \text{False(Not purchased)}} \\
 &= \frac{78+43}{78+43+7+6}
 \end{aligned}$$

Accuracy = 0.90

Recall for Purchased: Out of all actual purchases, how many did we correctly identify ?

$$\begin{aligned}
 &= \frac{\text{True(Purchased)}}{\text{True(Purchased)} + \text{False(Not Purchased)}} \\
 &= \frac{43}{43+6}
 \end{aligned}$$

Recall for Purchased = 0.87

Recall for Not Purchased:

$$\begin{aligned}
 &= \frac{\text{True(Not Purchased)}}{\text{True(Not Purchased)} + \text{False(Purchased)}} \\
 &= \frac{78}{78+7}
 \end{aligned}$$

Recall for not Purchased = 0.92

Precision of Purchased:

Out of all predicted purchases, how many did we correctly identify ?

$$\begin{aligned} &= \frac{\text{True(Purchased)}}{\text{True(Purchased)} + \text{False(Purchased)}} \\ &= \frac{43}{43+7} \end{aligned}$$

Precision of Purchased = 0.86

Precision of Not Purchased:

$$\begin{aligned} &= \frac{\text{True(Not Purchased)}}{\text{True(Not Purchased)} + \text{False(Not Purchased)}} \\ &= \frac{78}{78+6} \end{aligned}$$

Precision of Not Purchased = 0.92

F1 score: Overall performance of Purchased

$$\begin{aligned} &= 2 * \frac{\text{Recall} * \text{Precision}}{\text{Recall} + \text{Precision}} \\ &= 2 * \frac{0.87 * 0.86}{0.87 + 0.86} = 2 * \frac{0.7482}{1.73} = 2 * 0.432 \end{aligned}$$

F1 score for purchased = 0.86

F1 score: Overall performance of Not Purchased

$$\begin{aligned} &= 2 * \frac{\text{Recall} * \text{Precision}}{\text{Recall} + \text{Precision}} \\ &= 2 * \frac{0.92 * 0.92}{0.92 + 0.92} = 2 * \frac{0.8464}{1.84} = 2 * 0.46 \end{aligned}$$

F1 score for Not purchased = 0.92

Macro Average: Average performance of Precision

$$\begin{aligned}\text{Macro Average} &= \frac{\text{Precision(Purchased)} + \text{Precision(Not Purchased)}}{2} \\ &= \frac{0.86 + 0.92}{2} \\ &= \frac{1.78}{2}\end{aligned}$$

Macro Average of Precision = 0.89

Macro Average: Average performance of Recall

$$\begin{aligned}\text{Macro Average} &= \frac{\text{Recall(Purchased)} + \text{Recall(Not Purchased)}}{2} \\ &= \frac{0.87 + 0.92}{2} \\ &= \frac{1.79}{2}\end{aligned}$$

Macro Average of Recall = 0.89

Macro Average: Average performance of F1-Score

$$\begin{aligned}\text{Macro Average} &= \frac{\text{F1(Purchased)} + \text{F1(Not Purchased)}}{2} \\ &= \frac{0.86 + 0.92}{2} \\ &= \frac{1.78}{2}\end{aligned}$$

Macro Average of F1 Score = 0.89

Weighted Average: Precision

$$\text{Weighted Average of Precision} = \text{Precision of Purchased} * \frac{\text{Total count of Purchased in Test Set}}{\text{Total count of Test set}} + \\ \text{Precision Not Purchased} * \frac{\text{Total count of Not Purchased in Test Set}}{\text{Total count of Test set}}$$
$$= 0.86 * \frac{49}{134} + 0.92 * \frac{85}{134}$$

Weighted Average of Precision = 0.89

Weighted Average: Recall

$$= \text{Recall of Purchased} * \frac{\text{Total count of Purchased in Test Set}}{\text{Total count of Test set}} + \\ \text{Recall Not Purchased} * \frac{\text{Total count of Not Purchased in Test Set}}{\text{Total count of Test set}}$$
$$= 0.87 * \frac{49}{134} + 0.92 * \frac{85}{134}$$

Weighted Average of Recall = 0.90

Weighted Average: F1 measure

$$= \text{F1 score of Purchased} * \frac{\text{Total count of Purchased in Test Set}}{\text{Total count of Test set}} + \\ \text{F1 score of Not Purchased} * \frac{\text{Total count of Not Purchased in Test Set}}{\text{Total count of Test set}}$$
$$= 0.86 * \frac{49}{134} + 0.92 * \frac{85}{134}$$

Weighted Average of Recall = 0.90