

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 ?

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

Precision of Purchased = 0.86

Precision of Not Purchased:

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

Precision of Not Purchased = 0.92

F1 score: Overall performance of Purchased

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

F1 score for purchased = 0.86

F1 score: Overall performance of Not Purchased

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

F1 score for Not purchased = 0.92

Macro Average: Average performance of Precision

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

Macro Average of Precision = 0.89

Macro Average: Average performance of Recall

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

Macro Average of Recall = 0.89

Macro Average: Average performance of F1-Score

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

Macro Average of F1 Score = 0.89

Weighted Average: Precision

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

Weighted Average of Precision = 0.89

Weighted Average: Recall

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

Weighted Average of Recall = 0.90

Weighted Average: F1 measure

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

Weighted Average of Recall = 0.90