RANDOM FOREST CLASSIFICATION

Confusion Matrix

		Predict Class	
		Not purchased	Purchased
Actual Class	Not purchased	78 – T(NP)	7 – F(NP)
	Purchased	6 – F(P)	43 – T(P)

1. What is the percentage of correct classification of both Purchased and Not purchased (overall performance) to the total input of the test set?

$$\textbf{Accuracy} = \frac{\mathbf{T(NP) + T(P)}}{\mathbf{T(NP) + T(P) + F(NP) + F(P)}} = \frac{\mathbf{78 + 43}}{\mathbf{78 + 43 + 7 + 6}} = \mathbf{0.9029} \approx \mathbf{0.90}$$

2. What is the percentage of correct classification of Purchased to the total input of Purchased in the test set?

$$\textbf{Recall(P)} = \frac{\mathbf{T(P)}}{\mathbf{T(P) + F(P)}} = \frac{\mathbf{43}}{\mathbf{43 + 6}} = \mathbf{0.8776} \approx \mathbf{0.88}$$

3. What is the percentage of correct classification of Not purchased to the total input of Not purchased in the test set?

$$\textbf{Recall(NP)} = \frac{\mathbf{T(NP)}}{\mathbf{T(NP) + F(NP)}} = \frac{\mathbf{78}}{\mathbf{78 + 7}} = \mathbf{0.9176} \approx \mathbf{0.92}$$

4. What is the percentage of correct classification of Purchased to the sum of correctly classified as Purchased and wrongly classified as Purchased in the test set?

$$\textbf{Precision(P)} = \frac{\mathbf{T(P)}}{\mathbf{T(P) + F(NP)}} = \frac{\mathbf{43}}{\mathbf{43 + 7}} = \mathbf{0.86}$$

5. What is the percentage of correct classification of Not purchased to the sum of correctly classified as Not purchased and wrongly classified as Not purchased in the test set?

$$\textbf{Precision(NP)} = \frac{\mathbf{T(NP)}}{\mathbf{T(NP) + F(P)}} = \frac{\mathbf{78}}{\mathbf{78 + 6}} = \mathbf{0.9286} \approx \mathbf{0.93}$$

6. What is the overall performance of Purchased?

$$\mathbf{F1-score(P)} = \frac{\mathbf{2 * Recall * Precision}}{\mathbf{Recall + Precision}} = \frac{\mathbf{2 * 0.88 * 0.86}}{\mathbf{0.88 + 0.86}} = \mathbf{0.8698} \approx \mathbf{0.87}$$

7. What is the overall performance of Not purchased?

$$\mathbf{F1-score(NP)} = \frac{\mathbf{2 * Recall * Precision}}{\mathbf{Recall + Precision}} = \frac{\mathbf{2 * 0.92 * 0.93}}{\mathbf{0.92 + 0.93}} = \mathbf{0.9249} \approx \mathbf{0.92}$$

8. What is the average performance of Precision (correctly and wrongly classified)?

$$\mathbf{Macro\ avg} = \frac{\mathbf{Precision(P) + Precision(NP)}}{\mathbf{2}} = \frac{\mathbf{0.86 + 0.9285}}{\mathbf{2}} = \mathbf{0.8942} \approx \mathbf{0.89}$$

9. What is the average performance of Recall (correctly classified)?

$$\mathbf{Macro\ avg} = \frac{\mathbf{Recall(P) + Recall(NP)}}{\mathbf{2}} = \frac{\mathbf{0.8776 + 0.9176}}{\mathbf{2}} = \mathbf{0.8976} \approx \mathbf{0.90}$$

10. What is the average performance of F1-Measure (overall performance)?

$$\mathbf{Macro\ avg} = \frac{\mathbf{F1-score(Purchased) + F1-score(Not\ purchased)}}{\mathbf{2}}$$

$$= \frac{\mathbf{0.8698 + 0.9249}}{\mathbf{2}} = \mathbf{0.8974} \approx \mathbf{0.90}$$

11. What is the sum of product of proportion rate (Weight) of each class in precision?

$$\mathbf{Weighted\ avg} = \mathbf{Precision(P)} * \left(\frac{\mathbf{49}}{\mathbf{134}}\right) + \mathbf{Precision(NP)} * \left(\frac{\mathbf{85}}{\mathbf{134}}\right)$$

$$= \mathbf{0.86} * \left(\frac{\mathbf{49}}{\mathbf{134}}\right) + \mathbf{0.9286} * \left(\frac{\mathbf{85}}{\mathbf{134}}\right) = \mathbf{0.9035} \approx \mathbf{0.90}$$

12. What is the sum of product of proportion rate (Weight) of Recall class?

$$\mathbf{Weighted\ avg} = \mathbf{Recall(P)} * \left(\frac{\mathbf{49}}{\mathbf{134}}\right) + \mathbf{Recall(NP)} * \left(\frac{\mathbf{85}}{\mathbf{134}}\right)$$

$$= \mathbf{0.8776} * \left(\frac{\mathbf{49}}{\mathbf{134}}\right) + \mathbf{0.9176} * \left(\frac{\mathbf{85}}{\mathbf{134}}\right) = \mathbf{0.9029} \approx \mathbf{0.90}$$

13. What is the sum of product of proportion rate (Weight) of F1-Measure?

$$\mathbf{Weighted\ avg} = \mathbf{F1-score(P)} * \left(\frac{\mathbf{49}}{\mathbf{134}}\right) + \mathbf{F1-score(NP)} * \left(\frac{\mathbf{85}}{\mathbf{134}}\right)$$

$$= \mathbf{0.8698} * \left(\frac{\mathbf{49}}{\mathbf{134}}\right) + \mathbf{0.9249} * \left(\frac{\mathbf{85}}{\mathbf{134}}\right) = \mathbf{0.9047} \approx \mathbf{0.90}$$