

## CLASSIFICATION ASSIGNMENT

### 1. Accuracy (or) Overall Performance:

Here, it is a collection of both purchased and not purchased class to the total input of test set.

$$\text{Accuracy} = \frac{\text{true}(\text{purchased}) + \text{true}(\text{not purchased})}{[\text{true}(\text{purchased}) + \text{true}(\text{not purchased}) + \text{false}(\text{purchased}) + \text{false}(\text{not purchased})]}$$

**Confusion Matrix:**

$$\begin{pmatrix} 78 & 7 \\ 4 & 45 \end{pmatrix}$$

**Total Count in test set= 134**

**Total Not purchased in test set= 85**

**Total purchased in test set= 49**

**Using KNN(( K- Nearest Neighbor) algorithm,**

$$\text{Accuracy} = \frac{45+78}{78+7+45+4} = 0.917$$

### 2. Recall:

Here, it shows the % of correct classification of a class to the total input of the class in test set.

**Not purchased,**

$$\text{Recall} = \frac{\text{true}(\text{not purchased})}{[\text{true}(\text{not purchased}) + \text{false}(\text{not purchased})]}$$

$$\text{Recall} = \frac{78}{78+7} = 0.917$$

**Purchased,**

$$\text{Recall} = \frac{\text{true}(\text{purchased})}{[\text{true}(\text{purchased}) + \text{false}(\text{purchased})]}$$

$$\text{Recall} = \frac{45}{45+4} = 0.918$$

### 3. Precision:

Here, it shows the % of correct classification of class to the correct classification and incorrect classification of a class.

**Not purchased,**

$$\text{Precision} = \frac{\text{true(not purchased)}}{[\text{true(not purchased)} + \text{false (purchased)}]}$$

$$\text{Precision} = \frac{78}{78+4} = 0.95$$

**Purchased,**

$$\text{Precision} = \frac{\text{true(purchased)}}{[\text{true(purchased)} + \text{false (not purchased)}]}$$

$$\text{Precision} = \frac{45}{45+7} = 0.865$$

#### 4. F1- measure:

When Recall value is high and precision is low or vice versa, we can evaluate model using F1 score.

**Not purchased,**

$$\text{F1- measure} = \frac{2(\text{Recall} * \text{Precision})}{[\text{Recall} + \text{Precision}]}$$

$$\text{F1- measure} = \frac{2 * 0.917 * 0.95}{0.917 + 0.95} = 0.93$$

**Purchased,**

$$\text{F1- measure} = \frac{2(\text{Recall} * \text{Precision})}{[\text{Recall} + \text{Precision}]}$$

$$\text{F1- measure} = \frac{2 * 0.918 * 0.865}{0.918 + 0.865} = 0.89$$

#### 5. Macro Average:

For Precision,

$$\frac{[\text{Precision (not purchased)} + \text{Precision (purchased)}]}{2} = \frac{[0.95 + 0.865]}{2} = 0.91$$

For Recall,

$$\frac{[\text{Recall (not purchased)} + \text{Recall (purchased)}]}{2} = \frac{[0.917 + 0.918]}{2} = 0.92$$

For F1 Measure,

$$\frac{[\text{F1 measure (not purchased)} + \text{F1 measure (purchased)}]}{2} = \frac{[0.93 + 0.89]}{2} = 0.91$$

## 6. Weighted Average:

It is the sum of product of proportion of each class.

For Precision,

$$= [Precision(not\ purchased) * proportion(not\ purchased) + Precision(purchased) * proportion(purchased)]$$

$$= 0.95 * (85/134) + 0.865 * (49/134) = 0.92$$

For Recall,

$$= [Recall(not\ purchased) * proportion(not\ purchased) + Recall(purchased) * proportion(purchased)]$$

$$= 0.917 * (85/134) + 0.918 * (49/134) = 0.92$$

For F1-measure,

$$= [F1-measure(not\ purchased) * proportion(not\ purchased) + F1-measure(purchased) * proportion(purchased)]$$

$$= 0.93 * (85/134) + 0.89 * (49/134) = 0.92$$

