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.

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

   Confusion Matrix:

   $$\begin{pmatrix} \mathbf{74} & \mathbf{14} \\ \mathbf{11} & \mathbf{35} \end{pmatrix}$$

   Total Count in test set= 134
   Total Not purchased in test set= 88
   Total purchased in test set= 46

   Using KNN((K- Nearest Neighbor) algorithm,

   Accuracy = $\frac{35+74}{35+74+11+14} = 0.813$

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

   Not purchased,

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

   Recall = $\frac{74}{74+14}$= 0.84

   Purchased,

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

   Recall = $\frac{35}{35+11}$= 0.76

3. **Precision:**
   Here, it shows the % of correct classification of class to the correct classification and incorrect classification of a class.

   Not purchased,

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

Precision = $\frac{74}{74+11}$= 0.87

Purchased,

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

Precision = $\frac{35}{35+14}$= 0.71

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

   Not purchased,

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

   F1- measure = $\frac{2*0.84*0.87}{0.84+0.87}$= 0.86

   Purchased,

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

   F1- measure = $\frac{2*0.76*0.71}{0.76+0.71}$= 0.74

5. **Macro Average:**

   For Precision,

   $\frac{[Precision\ (not\ purchased)+\ Precision\ (\ purchased)]}{2}$ = $\frac{[0.87+\ 0.71]}{2}$ = 0.79

   For Recall,

   $\frac{[Recall\ (not\ purchased)+\ Recall\ (\ purchased)]}{2}$ = $\frac{[0.84+\ 0.76]}{2}$ = 0.80

   For F1 Measure,

   $\frac{[F1\ measure\ (not\ purchased)+\ F1\ measure(\ purchased)]}{2}$= $\frac{[0.86+\ 0.74]}{2}$ = 0.80

6. **Weighted Average:**

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

For Precision,

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

= 0.87*(88/134) + 0.71*(46/134)= 0.82

For Recall,

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

= 0.84*(88/134) + 0.76*(46/134)= 0.81

For F1-measure,

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

=0.86*(88/134) + 0.74*(46/134)= 0.81