Support Vector Machine - Confusion Matrix

Test Data Count 134	**Predicted (0)** **Not Purchased**	**Predicted (1)** **Purchased**
Actual (0) **Not Purchased**	82 True - Not Purchased	3 False - Not Purchased
Actual (1) **Purchased**	26 False - Purchased	23 True - Purchased

Accuracy: What is the correct Classification of this model ?

$$= \frac{True(Purchased)+True(Not\ Purchased)}{True(Purchased)+True(Not\ Purchased)+False(Purchased)+False(Not\ purchased)}$$

$$= \frac{23+82}{23+82+26+3}$$

Accuracy = 0.78

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

$$= \frac{True(Purchased)}{True(Purchased)+False(Not\ Purchased)}$$

$$= \frac{23}{23+3} = \frac{23}{26} = 0.88$$

Recall for Purchased = 0.88

Recall for Not Purchased:

$$= \frac{True(Not\ Purchased)}{True(Not\ Purchased)+False(Purchased)}$$

$$= \frac{82}{82+26} = \frac{82}{108} = 0.75$$

Recall for Not Purchased = 0.75

Precision for Purchased:

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

$$= \frac{True(Purchased)}{True(Purchased)+False(Purchased)}$$

$$= \frac{23}{23+26}$$

Precision for Purchased = 0.46

Precision for Not Purchased:

$$= \frac{True(Not\ Purchased)}{True(Not\ Purchased)+False(Not\ Purchased)}$$

$$= \frac{82}{82+3}$$

Precision for Not Purchased = 0.96

F1 score: Overall performance of Purchased

$$= 2 * \frac{Recall*Precission}{Recall+Precision}$$

$$= 2 * \frac{0.88*0.46}{0.88+0.46} = 2* \frac{0.404}{1.34} = 2 * 0.301$$

F1 score for Purchased = 0.60

F1 score: Overall performance of Not Purchased

$$= 2 * \frac{Recall*Precission}{Recall+Precision}$$

$$= 2 * \frac{0.88*0.75}{0.88+0.75} = 2* \frac{0.66}{1.63} = 2 * 0.40$$

F1 score for Not Purchased = 0.80

Macro Average: Average performance of Precision.

Macro Average = $\frac{Precision(Purchased)+Precision(Not\ Purchased)}{2}$

= $\frac{0.46+0.96}{2}$

= $\frac{1.42}{2}$ = 0.71

Macro Average of Precision = 0.71

Macro Average: Average performance of Recall

Macro Average = $\frac{Recall(Purchased)+Recall(Not\ Purchased)}{2}$

= $\frac{0.88+0.75}{2}$

= $\frac{1.63}{2}$

Macro Average of Recall = 0.81

Macro Average: Average performance of F1-Score

Macro Average = $\frac{F1(Purchased)+F1(Not\ Purchased)}{2}$

= $\frac{0.60+0.80}{2}$

= $\frac{1.4}{2}$

Macro Average of F1-Score = 0.70

Weighted Average: What is the sum of the product of each class ?

Weighted Average of Precision = Precision of Purchased* $\frac{Total\ count\ of\ Purchased\ in\ Test\ Set}{Total\ count\ of\ Test\ set}$ +

Precision Not Purchased* $\frac{Total\ count\ of\ Not\ Purchased\ in\ Test\ Set}{Total\ count\ of\ Test\ set}$

= 0.46 * $\frac{108}{134}$ + 0.96 * $\frac{26}{134}$

= 0.46 * 0.80 + 0.96 * 0.19

= 0.368 + 0.182

Weighted Average of Precision = 0.55

Weighted Average: Recall

$$= \text{Recall of Purchased} * \frac{Total\ count\ of\ Purchased\ in\ Test\ Set}{Total\ count\ of\ Test\ set} + \text{Recall Not Purchased} * \frac{Total\ count\ of\ Not\ Purchased\ in\ Test\ Set}{Total\ count\ of\ Test\ set}$$

$$= 0.88 * \frac{108}{134} + 0.75 * \frac{26}{134}$$

= 0.88 * 0.80 + 0.75 * 0.19

= 0.70 + 0.14

Weighted Average of Recall = 0.84

Weighted Average: F1 measure

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

$$= 0.60 * \frac{108}{134} + 0.80 * \frac{26}{134}$$

= 0.60 * 0.80 + 0.80 * 0.62

= 0.48 + 0.49

Weighted Average of F1 score = 0.97