Support Vector Machine - Confusion Matrix

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

Accuracy: What is the correct Classification of this model ?

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

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

Accuracy = 0.78

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

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

$$= \frac{23}{23+26} = \frac{23}{49} = 0.469$$

Recall for Purchased = 0.47

Recall for Not Purchased:

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

$$= \frac{82}{82+3} = \frac{82}{85} = 0.96$$

Recall for Not Purchased = 0.96

Precision for Purchased:

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

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

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

Precision for Purchased = 0.88

Precision for Not Purchased:

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

$$= \frac{82}{82+26} = 0.759$$

Precision for Not Purchased = 0.76

F1 score: Overall performance of Purchased

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

$$= 2 * \frac{0.47*0.88}{0.47+0.88} = 2* \frac{0.413}{1.35} = 2 * 0.305$$

F1 score for Purchased = 0.61

F1 score: Overall performance of Not Purchased

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

$$= 2 * \frac{0.96*0.76}{0.96+0.76} = 2* \frac{0.729}{1.72} = 2 * 0.423=0.847$$

F1 score for Not Purchased = 0.85

Macro Average: Average performance of Precision.

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

= $\frac{0.88+0.76}{2}$

= $\frac{1.64}{2}$ = 0.82

Macro Average of Precision = 0.82

Macro Average: Average performance of Recall

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

= $\frac{0.47+0.95}{2}$

= $\frac{1.43}{2}$ = 0.715

Macro Average of Recall = 0.72

Macro Average: Average performance of F1-Score

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

= $\frac{0.61+0.85}{2}$

= $\frac{1.4}{2}$

Macro Average of F1-Score = 0.73

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

= 0.88 * $\frac{49}{134}$ + 0.76 * $\frac{85}{134}$

= 0.88 * 0.36 + 0.76 * 0.63

= 0.316 + 0.478

= 0.79

Weighted Average of Precision = 0.79

Weighted Average: Recall

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

$$= 0.47 * \frac{48}{134} + 0.96 * \frac{85}{134}$$

= 0.47 * 0.35 + 0.96 * 0.63

= 0.164 + 0.604

= 0.76

Weighted Average of Recall = 0.76

Weighted Average: F1 measure

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

$$= 0.61 * \frac{48}{134} + 0.85 * \frac{85}{134}$$

= 0.61 * 0.35 + 0.85 * 0.62

= 0.213 + 0.527

s= 0.74

Weighted Average of F1 score = 0.74