Evaluation Metrics using Confusion Matrix

1. **SVM Classification:**

Array = [82, 3]
[26, 23]

True Purchased **82**	False Not Purchased **3**
False Purchased **26**	True Not Purchased **23**

True Purchased = TP = 82
True Not Purchased = TN = 23
False Purchased = FP = 26
False Not Purchased = FN = 3
Total Purchased = TP + FN = 85
Total Not Purchased = TN + FP = 49
Sum of Purchased and Not Purchased = TP+ TN +FP +FN = 134

- **Accuracy:**

Formula: $\frac{TP + TN}{TP + FP + TN + FN}$

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

$= \frac{105}{134}$ **= 0.78**

- **Recall:**

Formula: Purchased = TP/ Total Purchased

$= \frac{TP}{TP + FN}$

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

$= \frac{82}{85}$ **= 0.96**

Formula: Not Purchased = TN/ Total Not Purchased

$= \frac{TN}{TN + FP}$

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

$$= \frac{23}{49} = \mathbf{0.47}$$

- **Precision:**

  Formula: Purchased

$$= \frac{TP}{TP + FP}$$

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

$$= \frac{82}{108} = \mathbf{0.76}$$

  Formula: Not Purchased

$$= \frac{TN}{TN + FN}$$

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

$$= \frac{23}{26} = \mathbf{0.88}$$

- **F1 measure:**

  Formula: Purchased

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

$$= 2* \frac{0.96*0.76}{0.96+0.76}$$

$$= 2* \frac{0.7296}{1.72} = \mathbf{0.85}$$

  Formula: Not Purchased

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

$$= 2* \frac{0.88*0.47}{0.88+0.47}$$

$$= 2* \frac{0.4136}{1.35} = \mathbf{0.61}$$

- **Macro Average:**

  Formula: Precision

$$= \frac{\text{Precision Purchased + Precision Not Purchased}}{2}$$

$$= \frac{0.76+0.88}{2} = \mathbf{0.82}$$

Formula: Recall

$$= \frac{\text{Recall Purchased} + \text{Recall Not Purchased}}{2}$$

$$= \frac{0.96+0.47}{2} = \mathbf{0.72}$$

Formula: F1 measure

$$= \frac{\text{F1 measure Purchased} + \text{F1 measure Not Purchased}}{2}$$

$$= \frac{0.85+0.61}{2} = \mathbf{0.73}$$

- **Weighted Average:**

Formula: Precision

$$= \text{Precision Purchased} * \frac{\text{Total Purchased}}{\text{Sum of Purchased \& Not Purchased}} + \text{Precision Not Purchased} * \frac{\text{Total Not Purchased}}{\text{Sum of Purchased \& Not Purchased}}$$

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

$$= 0.76 * 0.63 + 0.88 * 0.37 = \mathbf{0.81}$$

Formula: Recall

$$= \text{Recall Purchased} * \frac{\text{Total Purchased}}{\text{Sum of Purchased \& Not Purchased}} + \text{Recall Not Purchased} * \frac{\text{Total Not Purchased}}{\text{Sum of Purchased \& Not Purchased}}$$

$$= 0.96 * \frac{85}{134} + 0.47 * \frac{49}{134}$$

$$= 0.96 * 0.63 + 0.47 * 0.37 = \mathbf{0.78}$$

Formula: F1 measure

$$= \text{F1 measure Purchased} * \frac{\text{Total Purchased}}{\text{Sum of Purchased \& Not Purchased}}$$

$$+ \text{F1 measure Not Purchased} * \frac{\text{Total Not Purchased}}{\text{Sum of Purchased \& Not Purchased}}$$

$$= 0.85 * \frac{85}{134} + 0.61 * \frac{49}{134}$$

$$= 0.85 * 0.63 + 0.61 * 0.37 \quad \mathbf{= 0.76}$$