

# CONFUSION MATRIX

## I Dataset

Observation.

Actual Value

Predicted Score.

Predicted Label.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10

1  
0  
1  
1  
0  
1  
0  
0  
1  
0

0.85  
0.60  
0.70  
0.40  
0.55  
0.50  
0.65  
0.35  
0.60  
0.20

0.5

Th

0.7

0.2

0.4

1

1

1

0

1

1

1

0

1

0

1

0

1

0

0

0

0

0

0

0

1

1

1

1

1

1

1

0

1

0

	Predicted Positive	Predicted Negative
Actual +ve.	TP	FN
Actual Negative	FP	TN

For Threshold 0.5

Step-1

cf

	A +ve	A -ve
P +ve	4 TP	3 (0.1) FP
P -ve	(1.0) 1 FN	2 TN

$$\textcircled{1} \text{ Acc} = \frac{4 + 2}{10} = \frac{6}{10} = 0.6$$

$$\textcircled{2} \text{ prec} = \frac{TP}{TP + FP} = \frac{4}{4 + 1} = \frac{4}{5} = 0.8$$

$$\textcircled{3} \text{ Sen} = \frac{TP}{TP + FN} = \frac{4}{4 + 2} = \frac{4}{6} = 0.66$$

$$\textcircled{4} \text{ Specificity} = \frac{TN}{TN + FP} = \frac{2}{2 + 1} = \frac{2}{3} = 0.6$$

$$\textcircled{5} 1 - \text{Specif} = 1 - 0.6 = 0.4 \text{ False +ve.}$$

$$\textcircled{6} F_1\text{-score} = \frac{1}{\frac{1}{0.8} + \frac{1}{0.6}} = \frac{1}{1.25 + 1.67} = \frac{1}{2.92} = 0.34$$

$$\textcircled{7} \text{ AUC/ROC} = \frac{0.4}{2} = 0.2$$



$$\text{Accuracy} = \frac{TP + TN}{\text{Total}} = \frac{2 + 5}{10} = \frac{7}{10} = 0.7$$

$$\text{Precision} = \frac{TP}{TP + FP} = \frac{2}{2 + 3} = \frac{2}{5} = 0.4$$

$$\text{Sensitivity} = \frac{TP}{TP + FN} = \frac{2}{2 + 0} = 1$$

$$\text{Specificity} = \frac{TN}{TN + FP} = \frac{5}{5 + 3} = \frac{5}{8} = 0.625$$

$$\text{False +ve. specificity} = 1 - \text{specificity} = 1 - 0.625 = 0.375$$

$$\text{F1-score} = \frac{1}{\frac{1}{\text{recall}} + \frac{1}{\text{precision}}} = \frac{1}{\frac{1}{0.4} + \frac{1}{0.4}} = \frac{1}{2.5 + 2.5} = \frac{1}{5} = 0.2$$

~~F1-score~~

for threshold 0.7.

Table  $\rightarrow$  step ①

	A +ve	A -ve.
P +ve	2 TP	0 FN
P -ve.	3 FP	5 TN

for threshold  $d = 0.4$   
Table -

	A + v	A - v
P +ve	5 TP	3 FN
P -ve	0	2 TN

for Threshold 0.2

	A +	A - v
P +	5 TP	5
P -	0	0

$$\textcircled{1} \text{Ac} = \frac{TP + TN}{T} = \frac{2 + 5}{10}$$

$$\textcircled{2} \text{P/R} = \frac{5}{5 + 5} = \frac{5}{10}$$

$$\textcircled{3} \text{Sen} = \frac{5}{5 + 0} = \frac{5}{5} = 1$$

$$\textcircled{4} \text{Spe} = \frac{0}{0 + 5} = 0$$



Threshold 0.2		
	0.1	0.2
P.P	5	2
P.N	1	2

$$\text{Accuracy} = \frac{TP + TN}{T.N}$$

$$= \frac{5 + 2}{10}$$

$$= \frac{7}{10} = 0.7$$

$$\text{Precision} = \frac{TP}{TP + FN} = \frac{5}{5 + 1} = \frac{5}{6} = 0.83$$

$$\text{Sensitivity} = \frac{TP}{TP + FN} = \frac{5}{5 + 1} = \frac{5}{6} = 0.83$$

$$\text{Specificity} = \frac{TN}{TN + FP} = \frac{2}{2 + 2} = \frac{2}{4} = 0.5$$

	FPR	TPR
0.5	0.6	0.8
0.7	0.6	0.8
0.4	0.6	0.8
0.2	1	1

