

Dec 3, 2024

X	Y	\hat{Y}		Y	\hat{Y}
input	ground truth	predicted label		1	1
				1	0
				\vdots	\vdots

$$\text{accuracy} = P(Y = \hat{Y})$$

100 examples, $\begin{cases} 90 \text{ examples label } 1 \\ 10 \text{ example label } 0 \end{cases}$

90% if a classifier predicts everything as 1.

$P(\hat{y}=1 | y=1)$ True positive rate

$P(\hat{y}=0 | y=1)$ False negative rate

$P(\hat{y}=1 | y=0)$ False positive rate

$P(\hat{y}=0 | y=0)$ True negative rate

$$\text{precision} = P(\hat{y}=1 | y=1) = \frac{TP}{TP + FP}$$

$$\text{recall} = P(\hat{y}=0 | y=0) = \frac{TN}{TN + FN}$$

Confusion matrix

Actual label	predicted label		100 examples		
	1	0	90	+1	100
1	90 TP	0 FN	10	-1	0
0	10 FP	0 TN	Y	1	Y

$$\text{precision} = \frac{90}{90+10} = 0.9$$

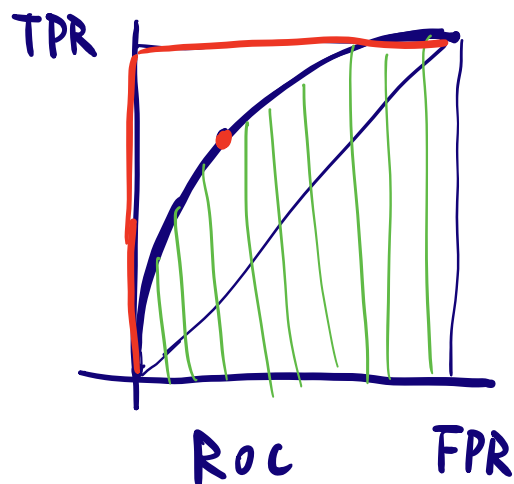
$$\text{recall} = \frac{90}{90+0} = 1$$

logistic regression $R = P(Y=1 | X=x)$

threshold = 0.5

X	Y	R	t=0.5	t=0	t=0.1	t=0.6	t=1
x ₁	1	0.8	1	1	1	1	0
x ₂	1	0.6	1	1	1	0	0
x ₃	1	0.7	1	1	1	1	:
x ₄	0	0.4	0	1	1	0	:
x ₅	0	0.3	0	1	1	0	0

t	TPR	FPR
0	1	1
0.1	:	:
0.2	:	:
:	:	:
1	0	0



AUC = area under curve
the higher the better,

$$\text{AUC} = 1$$

Independence $\hat{Y} \perp A$

$$P(\hat{Y}=1 | A=a) = P(\hat{Y}=1 | A=b)$$

Separation $\hat{Y} \perp A | Y$

$$P(\hat{Y}=1 | Y=1, A=a) = P(\hat{Y}=1 | Y=1, A=b)$$

Sufficiency $Y \perp A | R$