ROC Curve

20CP401T

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Evaluation Metric -Confusion matrix

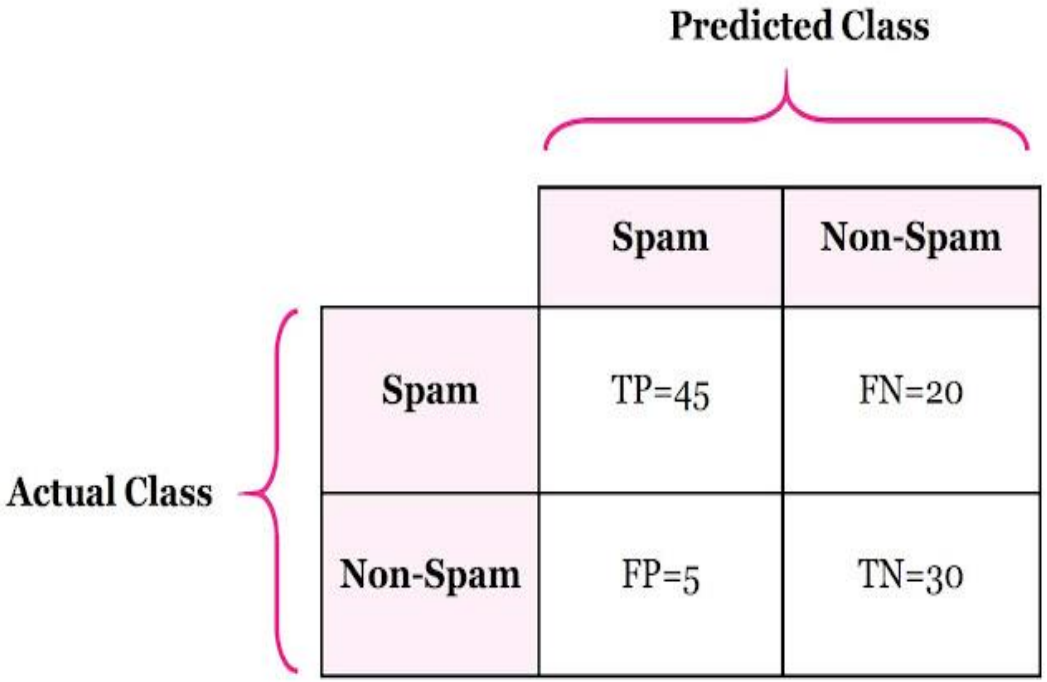
Predicted Class

Actual Class	**Positive**	**Negative**	
Positive	True Positive (TP)	False Negative (FN) **Type II Error**	**Sensitivity** $\frac{TP}{(TP+FN)}$
Negative	False Positive (FP) **Type I Error**	True Negative (TN)	**Specificity** $\frac{TN}{(TN+FP)}$
	Precision $\frac{TP}{(TP+FP)}$	**Negative Predictive Value** $\frac{TN}{(TN+FN)}$	**Accuracy** $\frac{TP+TN}{(TP+TN+FP+FN)}$

FPR = 1 - Specificity

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

Evaluation Metric -Confusion matrix



Sensitivity/Recall/TPR = 45/(45+20) = 69.23%

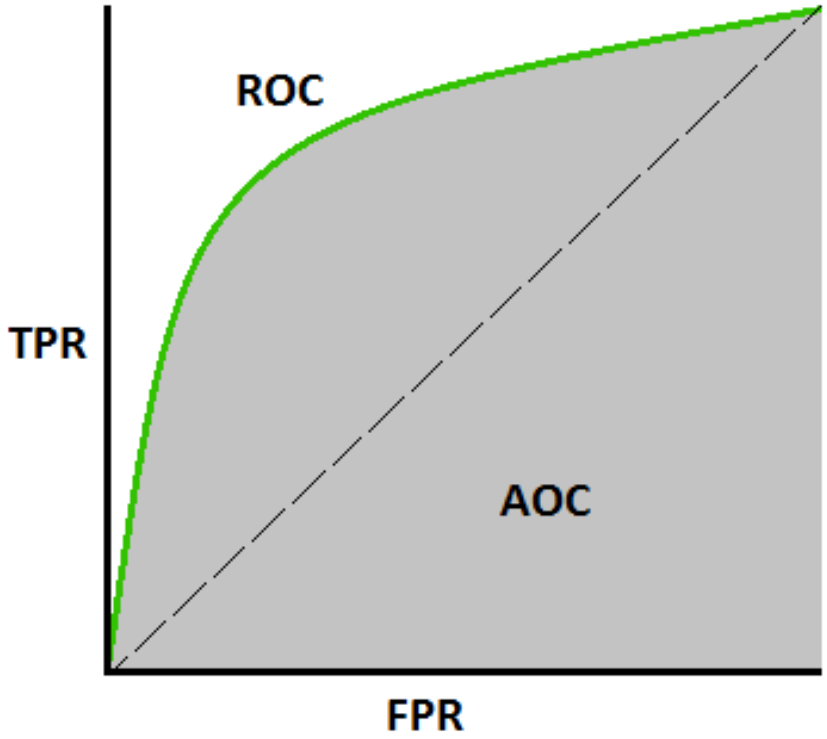
Specificity = 30/(30+5) = 85.71%

Precision = 45/(45+5)= 90%

Accuracy = (45+30)/(45+20+5+30) = 75%

F1-score = 2*(90 x 69.23)/(90+69.23) = 78.26%

Understanding AUC - ROC Curve



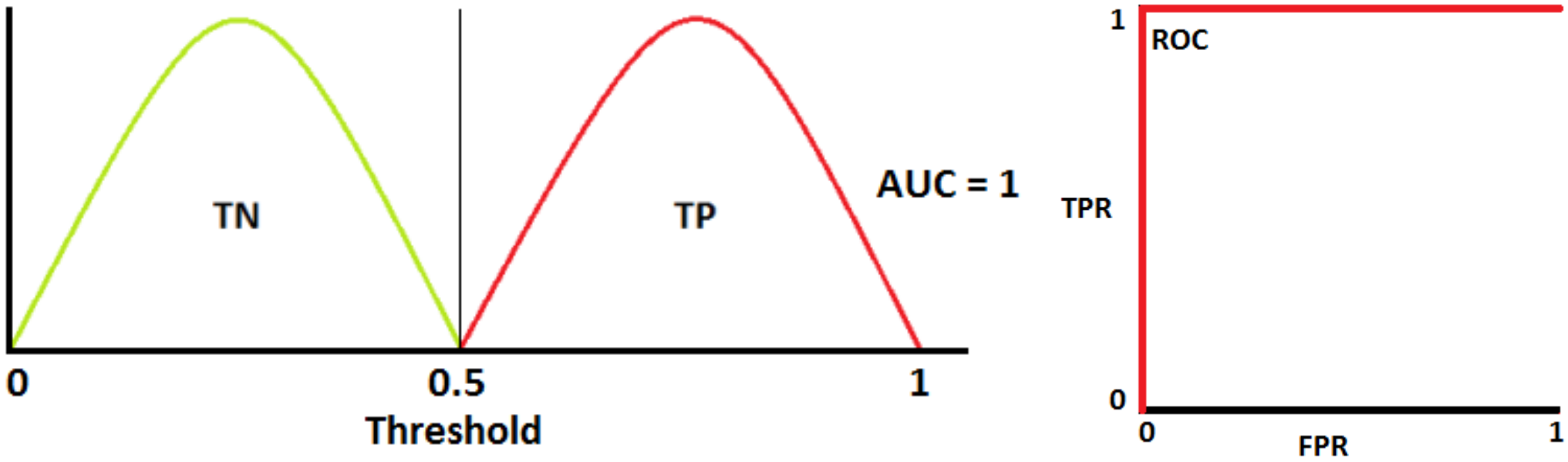
$$\text{TPR /Recall / Sensitivity} = \frac{TP}{TP + FN}$$

$$\text{FPR} = 1 - \text{Specificity}$$

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

https://towardsdatascience.com/understanding-auc-roc-curve-68b2303cc9c5

How to speculate about the performance of the model?



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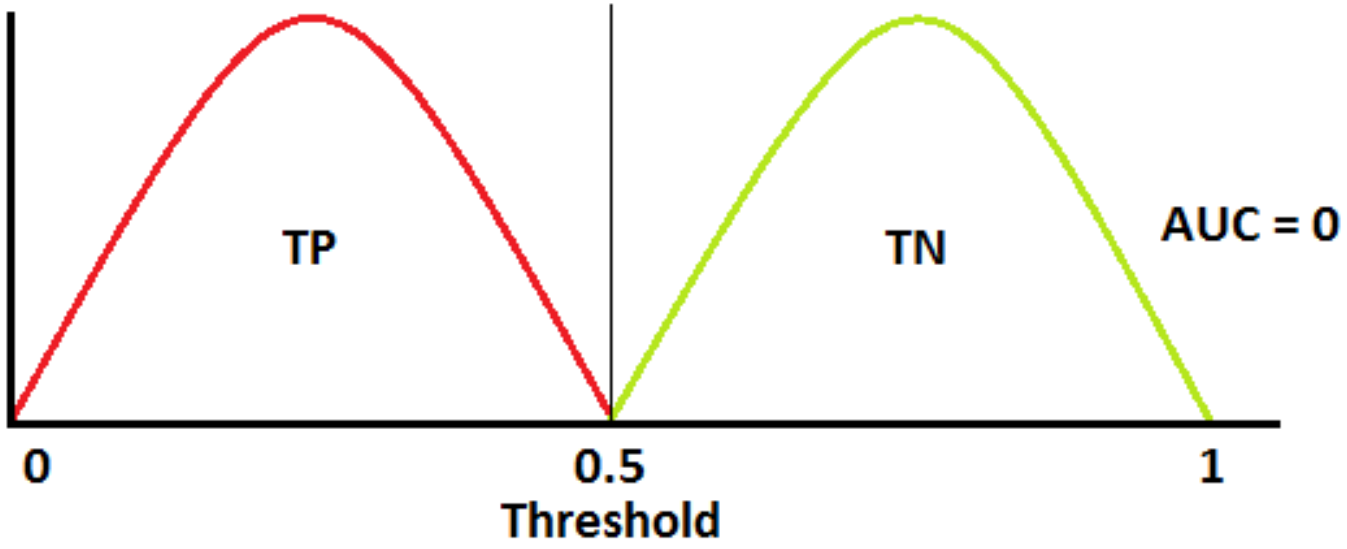

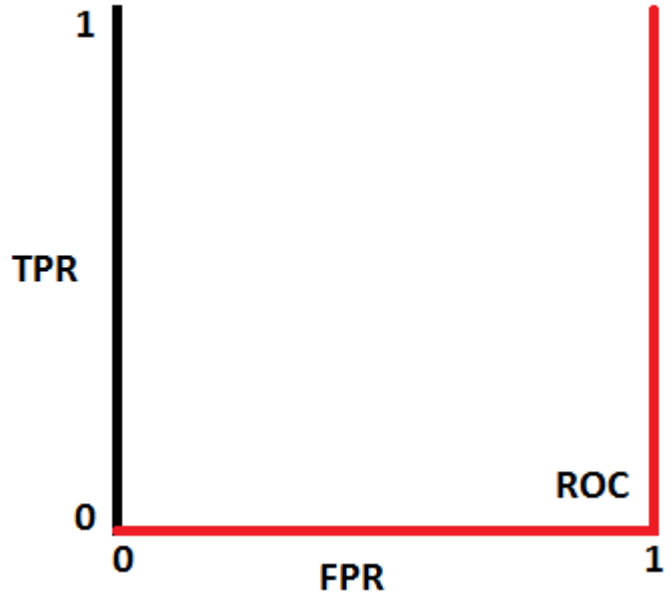

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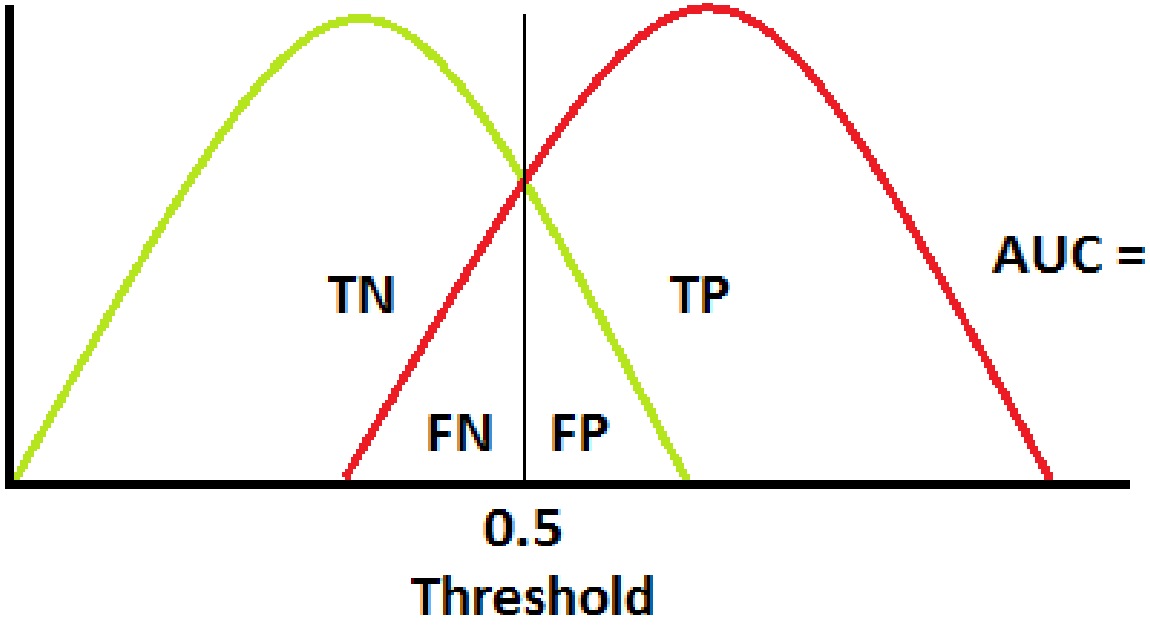
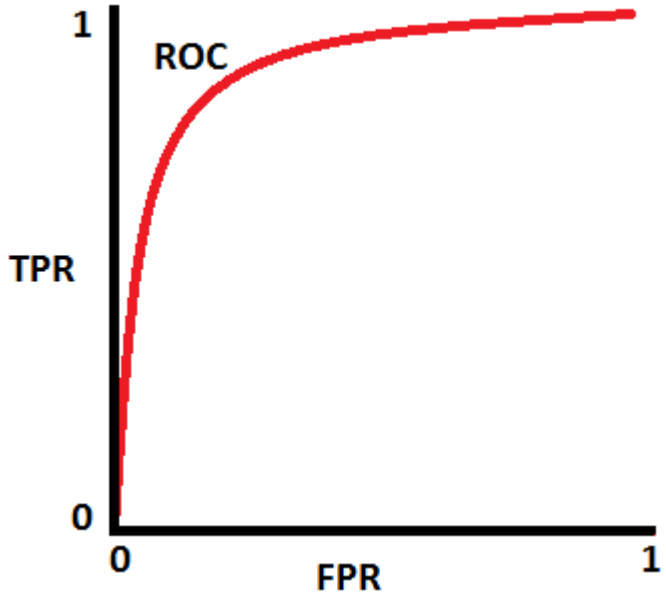
How to speculate about the performance of the model?



AUC = 0.7



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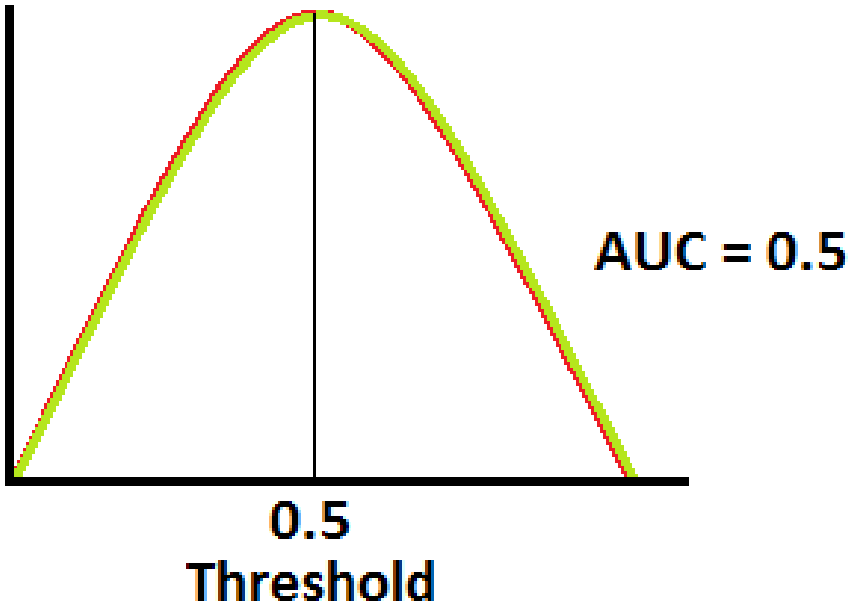

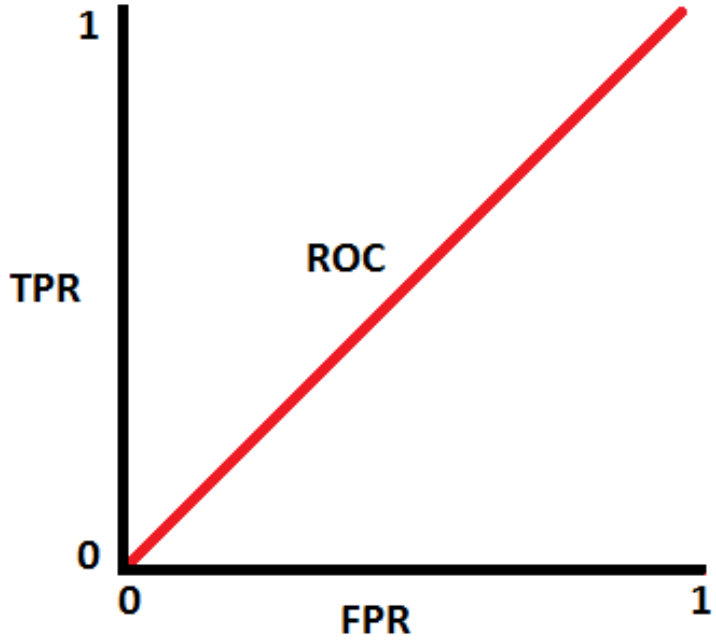

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Threshold

Y	Y_p	Y_0	$Y_{0.2}$	$Y_{0.4}$	$Y_{0.6}$	$Y_{0.8}$	Y_1
1	0.9	1	1	1	1	1	0
0	0.6	1	1	1	1	0	0
1	0.4	1	1	1	0	0	0
0	0.2	1	1	0	0	0	0

Threshold

Y	Y_p	Y_0
1	0.9	1
0	0.6	1
1	0.4	1
0	0.2	1

TP = 2	FN=0
FP=2	TN= 0

$$TPR = \frac{2}{2+0} = 1$$

$$FPR = \frac{2}{2+0} = 1$$

FPR = 1 - Specificity

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

$$\text{TPR /Recall / Sensitivity} = \frac{TP}{TP + FN}$$

Y	Y_p	$Y_{0.2}$
1	0.9	1
0	0.6	1
1	0.4	1
0	0.2	1

TP = 2	FN=0
FP=2	TN= 0

$$TPR = \frac{2}{2+0} = 1$$

$$FPR = \frac{2}{2+0} = 1$$

Threshold

Y	Y_p	$Y_{0.4}$
1	0.9	1
0	0.6	1
1	0.4	1
0	0.2	0

TP = 2	FN=0
FP=1	TN= 1

$$TPR = \frac{2}{2+0} = 1$$

$$FPR = \frac{1}{1+1} = 0.5$$

Y	Y_p	$Y_{0.6}$
1	0.9	1
0	0.6	1
1	0.4	0
0	0.2	0

TP = 1	FN=1
FP=1	TN= 1

$$TPR = \frac{1}{1+1} = 0.5$$

$$FPR = \frac{1}{1+1} = 0.5$$

Threshold

Y	Y_p	$Y_{0.8}$
1	0.9	1
0	0.6	0
1	0.4	0
0	0.2	0

TP = 1	FN=1
FP=0	TN= 2

$$TPR = \frac{1}{1+1} = 0.5$$

$$FPR = \frac{0}{0+2} = 0$$

Y	Y_p	Y_1
1	0.9	0
0	0.6	0
1	0.4	0
0	0.2	0

TP = 0	FN=2
FP=0	TN= 2

$$TPR = \frac{0}{0+2} = 0$$

$$FPR = \frac{0}{0+2} = 0$$

Threshold

T	FPR	TPR
0	1	1
0.2	1	1
0.4	0.5	1
0.6	0.5	0.5
0.8	0	0.5
1	0	0