An Exercise

How to make an ROC

How to make an ROC

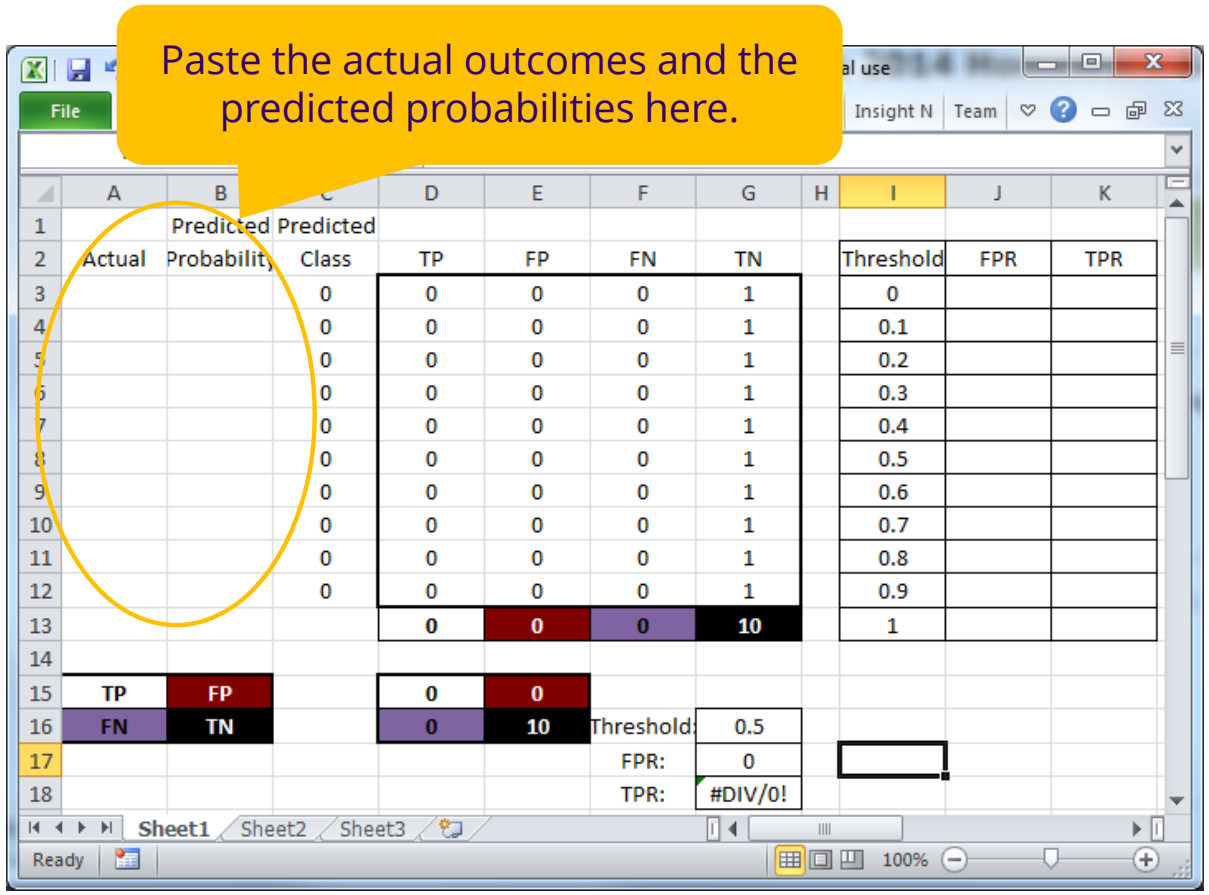
An ROC starts with probabilities from test cases in a binary classification:

1. Test case probabilities are compared to a probability threshold
2. If a test case probability is greater than the threshold, then the prediction is for the class.
3. A confusion matrix is created. The True Positive rate (TPR) and the False Positive rate (FPR) are calculated.
4. This TPR, FPR pair is one point on the ROC curve.
5. Change the probability threshold and repeat the process.

How to make an ROC

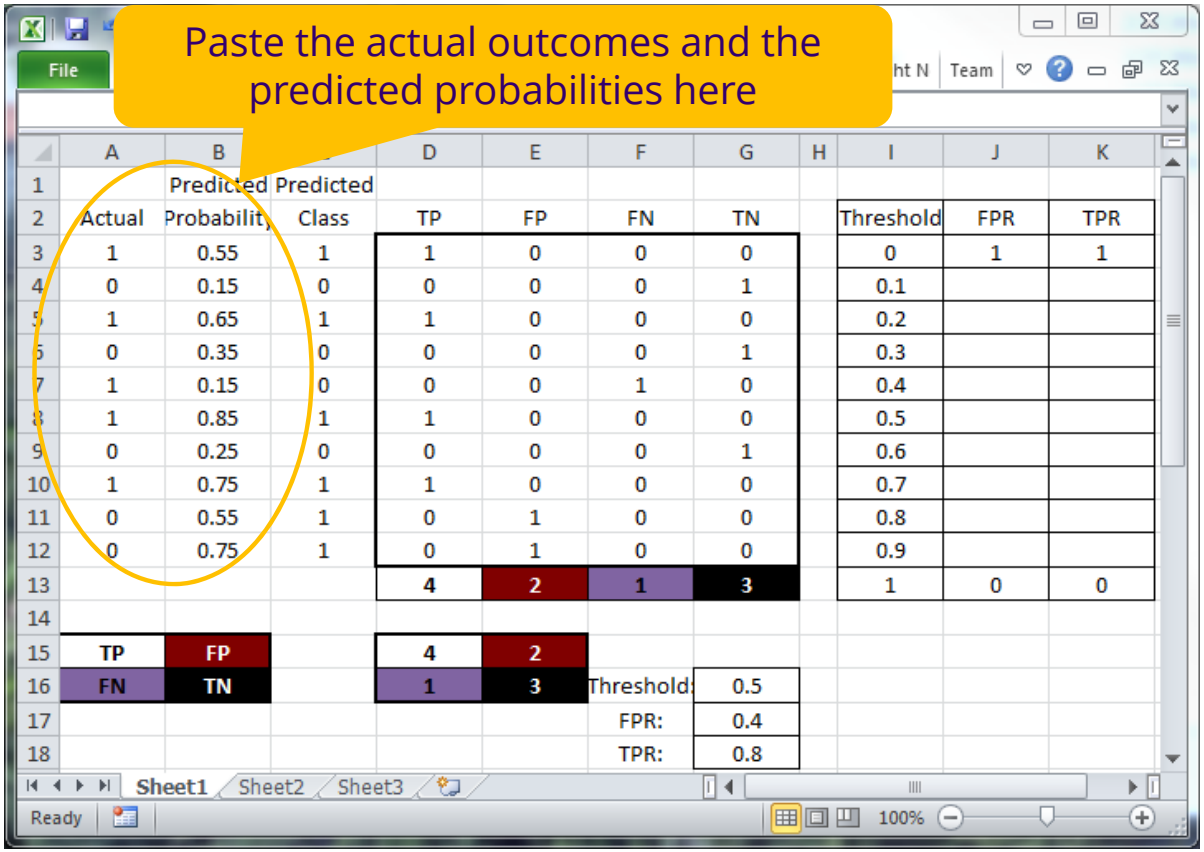
- For this exercise open the Excel workbook, named **HowToMakeAnROC.xls**
- Note that at the bottom of the worksheet are two sets of actual outcomes predicted probabilities. These datasets are called **Exercise 1** and **Exercise 2**.
- Example A and Example B are completed examples and are not part of the exercise.

How to make an ROC



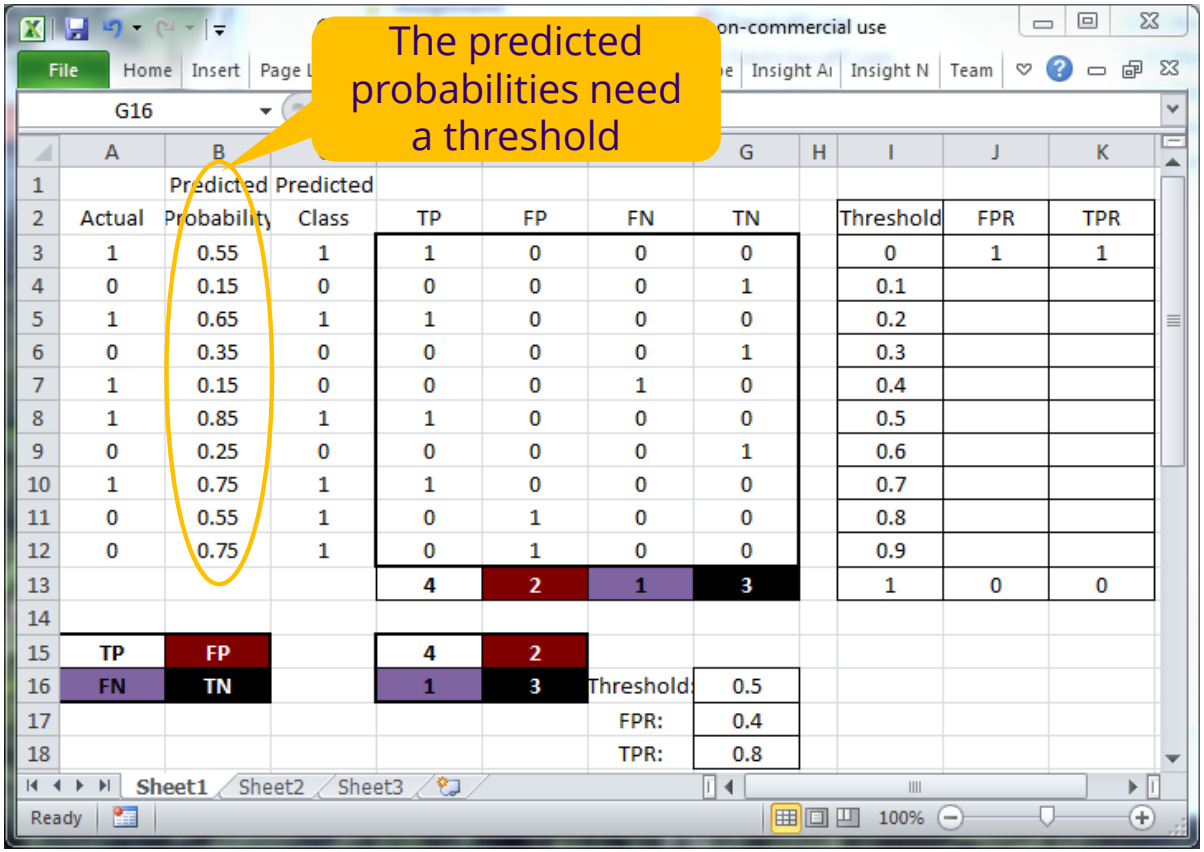
	A	B	C	D	E	F	G	H	I	J	K
1		Predicted	Predicted								
2	Actual	Probability	Class	TP	FP	FN	TN		Threshold	FPR	TPR
3			0	0	0	0	1		0		
4			0	0	0	0	1		0.1		
5			0	0	0	0	1		0.2		
6			0	0	0	0	1		0.3		
7			0	0	0	0	1		0.4		
8			0	0	0	0	1		0.5		
9			0	0	0	0	1		0.6		
10			0	0	0	0	1		0.7		
11			0	0	0	0	1		0.8		
12			0	0	0	0	1		0.9		
13				0	0	0	10		1		
14											
15	TP	FP		0	0						
16	FN	TN		0	10	Threshold:	0.5				
17						FPR:	0				
18						TPR:	#DIV/0!				

How to make an ROC



	A	B	C	D	E	F	G	H	I	J	K
1		Predicted	Predicted								
2	Actual	Probability	Class	TP	FP	FN	TN		Threshold	FPR	TPR
3	1	0.55	1	1	0	0	0		0	1	1
4	0	0.15	0	0	0	0	1		0.1		
5	1	0.65	1	1	0	0	0		0.2		
6	0	0.35	0	0	0	0	1		0.3		
7	1	0.15	0	0	0	1	0		0.4		
8	1	0.85	1	1	0	0	0		0.5		
9	0	0.25	0	0	0	0	1		0.6		
10	1	0.75	1	1	0	0	0		0.7		
11	0	0.55	1	0	1	0	0		0.8		
12	0	0.75	1	0	1	0	0		0.9		
13				4	2	1	3		1	0	0
14											
15	TP	FP		4	2						
16	FN	TN		1	3	Threshold:	0.5				
17						FPR:	0.4				
18						TPR:	0.8				

How to make an ROC



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5	1	0.65	1	1	0	0	0		0.2		
6	0	0.35	0	0	0	0	1		0.3		
7	1	0.15	0	0	0	1	0		0.4		
8	1	0.85	1	1	0	0	0		0.5		
9	0	0.25	0	0	0	0	1		0.6		
10	1	0.75	1	1	0	0	0		0.7		
11	0	0.55	1	0	1	0	0		0.8		
12	0	0.75	1	0	1	0	0		0.9		
13				4	2	1	3		1	0	0
14											
15	TP	FP		4	2						
16	FN	TN		1	3	Threshold:	0.5				
17						FPR:	0.4				
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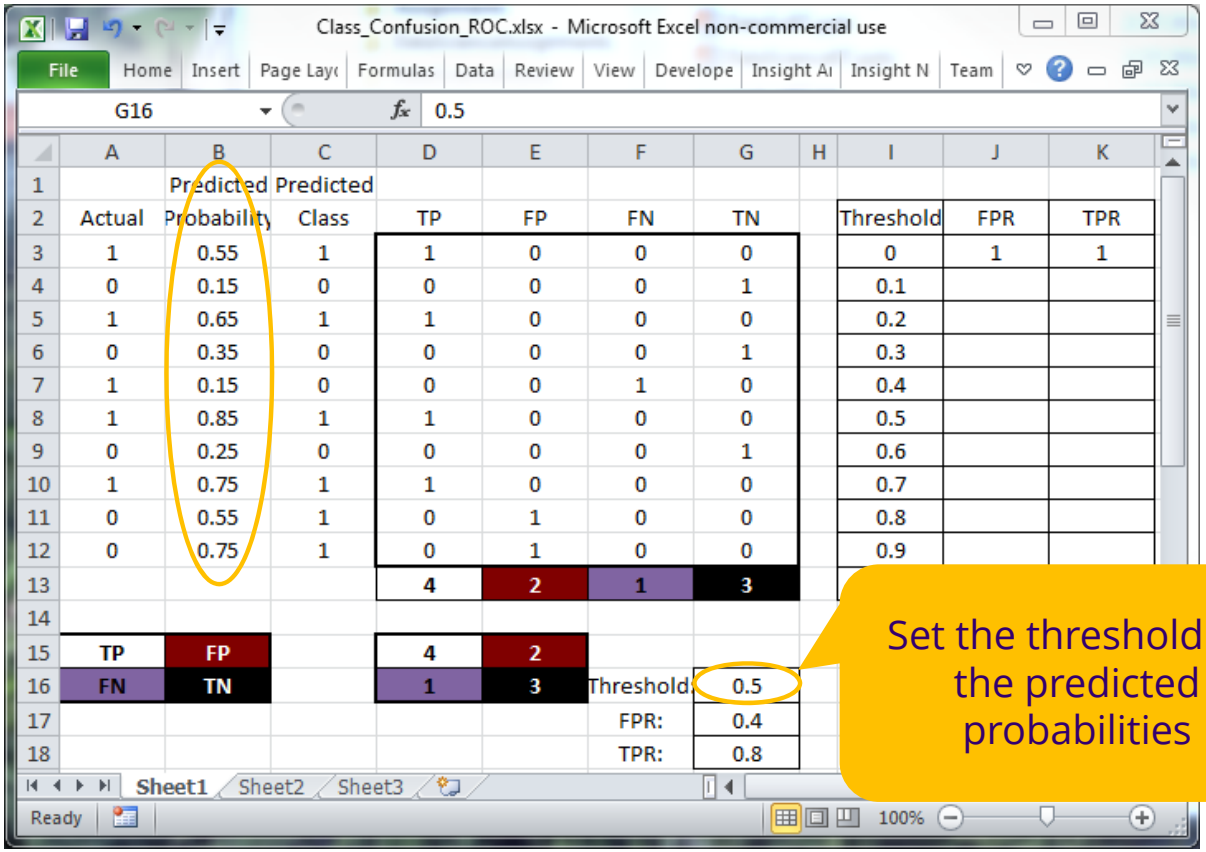
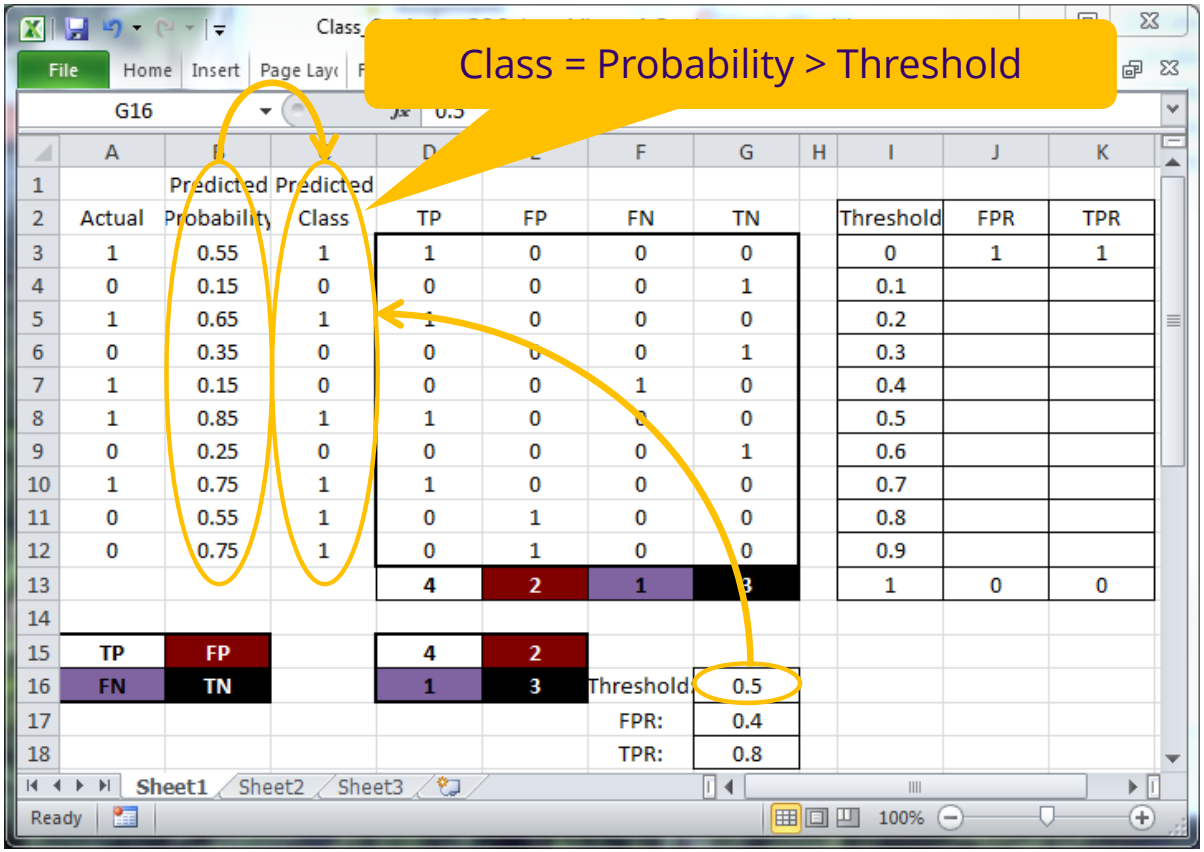
How to make an ROC



How to make an ROC



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2	Actual	Probability	Class	TP	FP	FN	TN		Threshold	FPR	TPR
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4	0	0.15	0	0	0	0	1		0.1		
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6	0	0.35	0	0	0	0	1		0.3		
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12	0	0.75	1	0	1	0	0		0.9		
13				4	2	1	3		1	0	0
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16	FN	TN		1	3	Threshold:	0.5				
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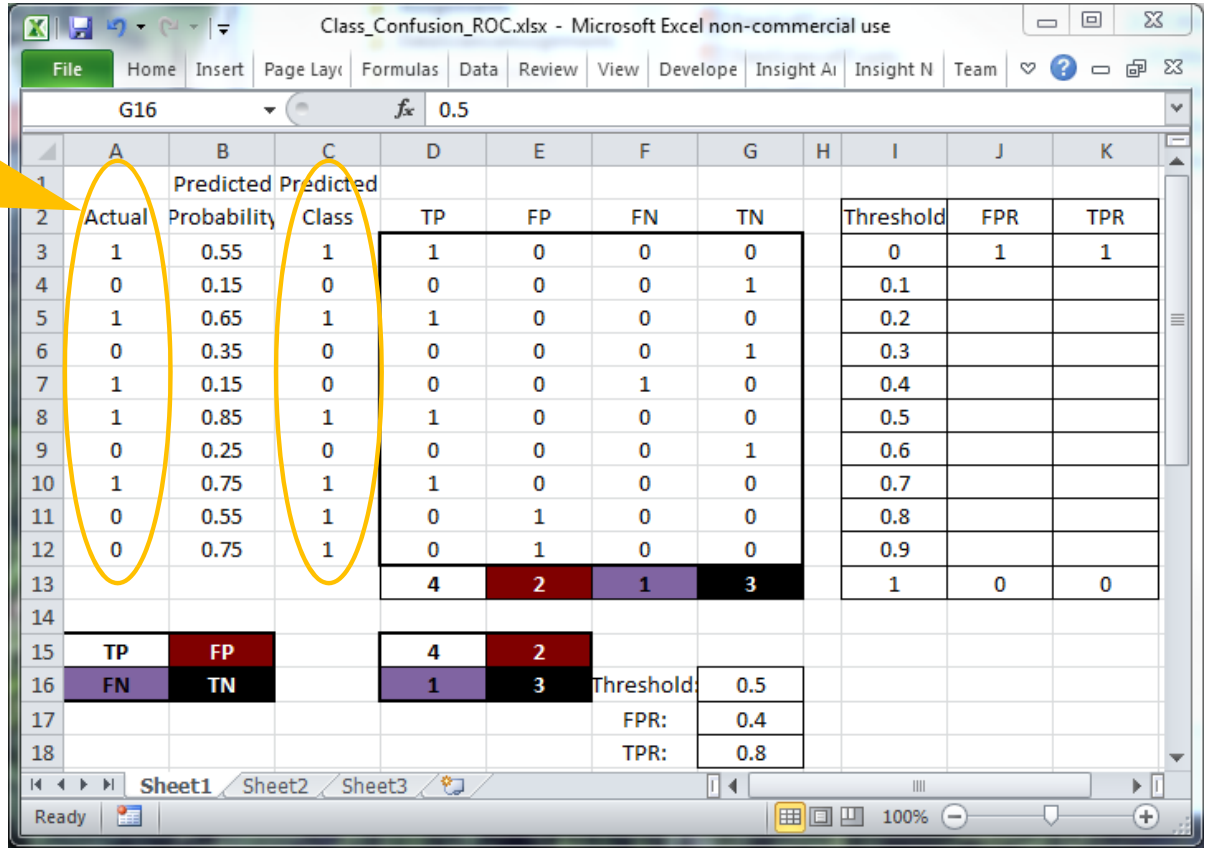
How to make an ROC

Compare the predicted class to the actual values



	A	B	C	D	E	F	G	H	I	J	K
1		Predicted	Predicted								
2	Actual	Probability	Class	TP	FP	FN	TN		Threshold	FPR	TPR
3	1	0.55	1	1	0	0	0		0	1	1
4	0	0.15	0	0	0	0	1		0.1		
5	1	0.65	1	1	0	0	0		0.2		
6	0	0.35	0	0	0	0	1		0.3		
7	1	0.15	0	0	0	1	0		0.4		
8	1	0.85	1	1	0	0	0		0.5		
9	0	0.25	0	0	0	0	1		0.6		
10	1	0.75	1	1	0	0	0		0.7		
11	0	0.55	1	0	1	0	0		0.8		
12	0	0.75	1	0	1	0	0		0.9		
13				4	2	1	3		1	0	0
14											
15	TP	FP		4	2						
16	FN	TN		1	3	Threshold:	0.5				
17						FPR:	0.4				
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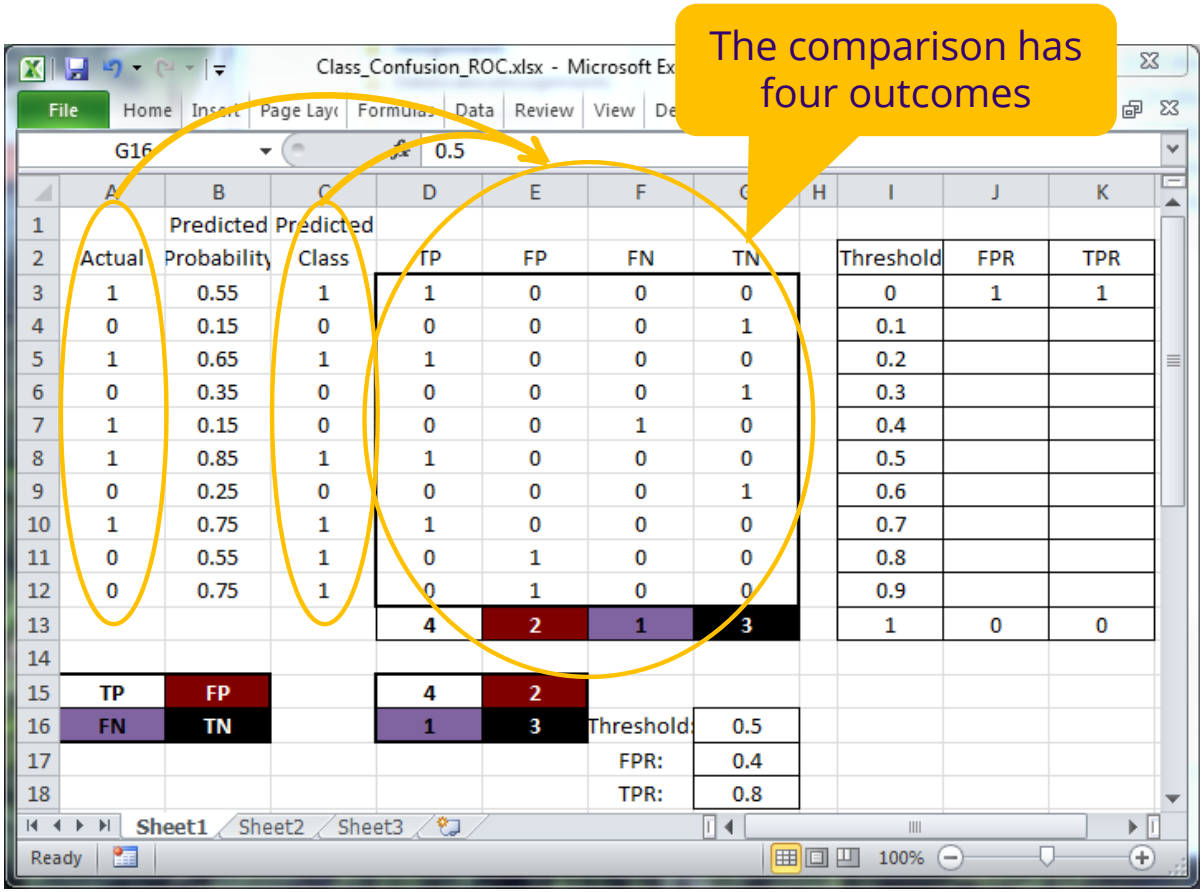
How to make an ROC



	A	B	C	D	E	F	G	H	I	J	K
1		Predicted	Predicted								
2	Actual	Probability	Class	TP	FP	FN	TN		Threshold	FPR	TPR
3	1	0.55	1	1	0	0	0		0	1	1
4	0	0.15	0	0	0	0	1		0.1		
5	1	0.65	1	1	0	0	0		0.2		
6	0	0.35	0	0	0	0	1		0.3		
7	1	0.15	0	0	0	1	0		0.4		
8	1	0.85	1	1	0	0	0		0.5		
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13				4	2	1	3		1	0	0
14											
15	TP	FP		4	2						
16	FN	TN		1	3	Threshold:	0.5				
17						FPR:	0.4				
18						TPR:	0.8				

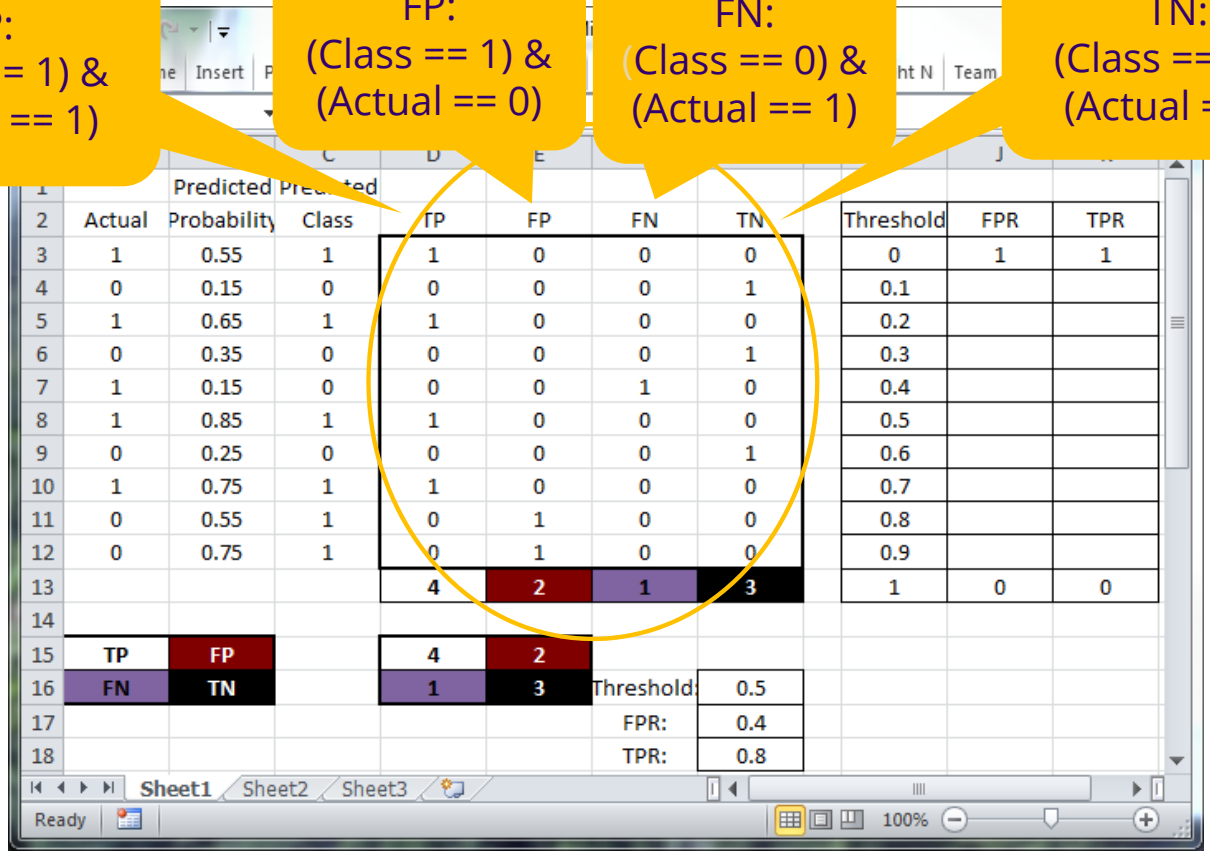
How to make an ROC

TP:
(Class == 1) &
(Actual == 1)

FP:
(Class == 1) &
(Actual == 0)

FN:
(Class == 0) &
(Actual == 1)

TN:
(Class == 0) &
(Actual == 0)



	Actual	Predicted Probability	Predicted Class	TP	FP	FN	TN
3	1	0.55	1	1	0	0	0
4	0	0.15	0	0	0	0	1
5	1	0.65	1	1	0	0	0
6	0	0.35	0	0	0	0	1
7	1	0.15	0	0	0	1	0
8	1	0.85	1	1	0	0	0
9	0	0.25	0	0	0	0	1
10	1	0.75	1	1	0	0	0
11	0	0.55	1	0	1	0	0
12	0	0.75	1	0	1	0	0
13				4	2	1	3

Threshold	FPR	TPR
0	1	1
0.1		
0.2		
0.3		
0.4		
0.5		
0.6		
0.7		
0.8		
0.9		
1	0	0

TP	FP
FN	TN

4	2
1	3

Threshold:	0.5
FPR:	0.4
TPR:	0.8

Sheet1 Sheet2 Sheet3

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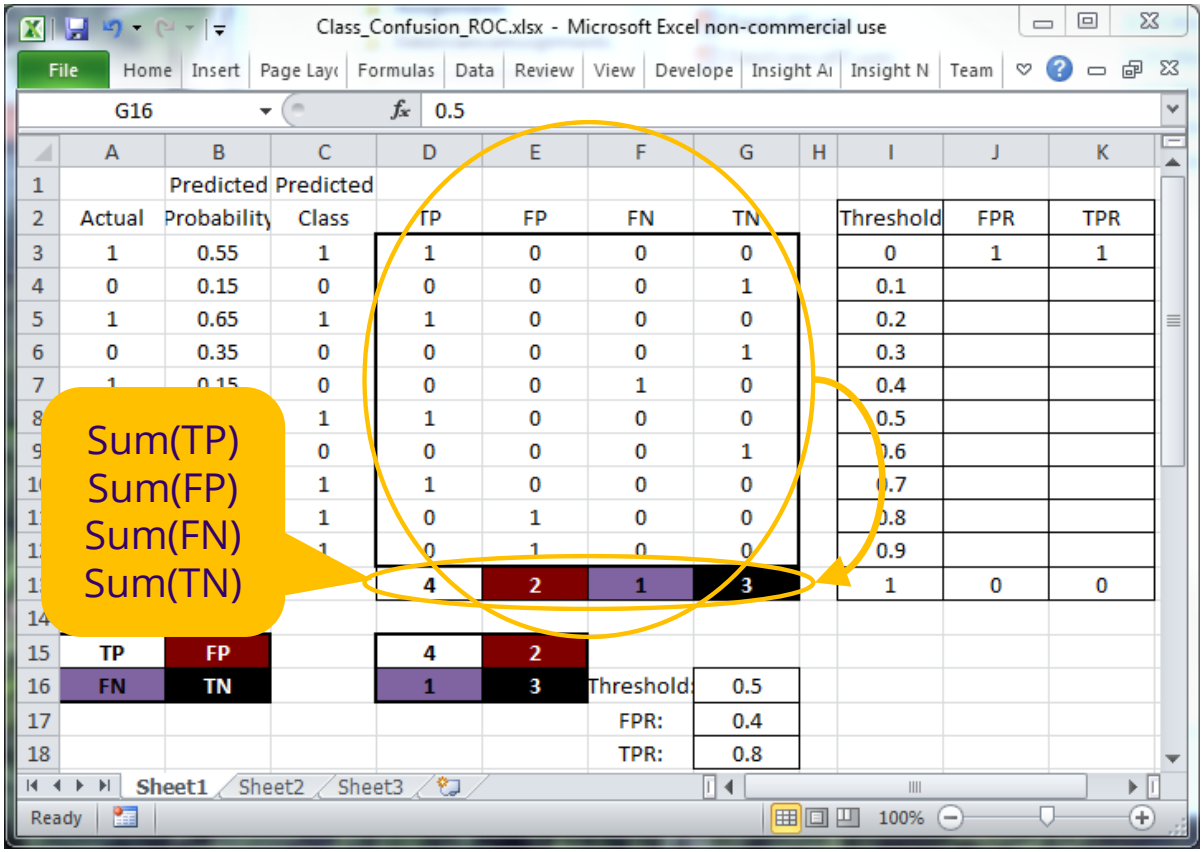
How to make an ROC (9)



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5	1	0.65	1	1	0	0	0		0.2		
6	0	0.35	0	0	0	0	1		0.3		
7	1	0.15	0	0	0	1	0		0.4		
8			1	1	0	0	0		0.5		
9			0	0	0	0	1		0.6		
10			1	1	0	0	0		0.7		
11			1	0	1	0	0		0.8		
12			1	0	1	0	0		0.9		
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16	FN	TN		1	3	Threshold:	0.5				
17						FPR:	0.4				
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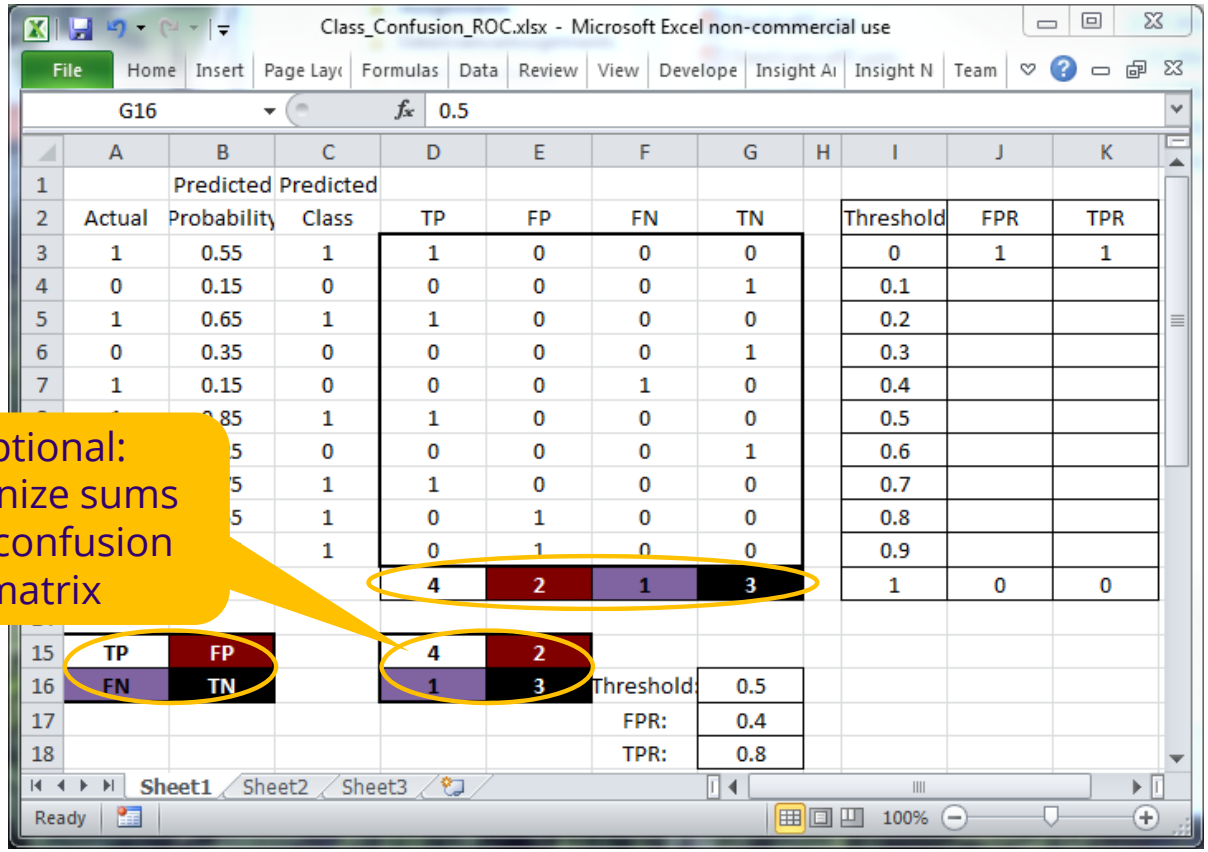
How to make an ROC



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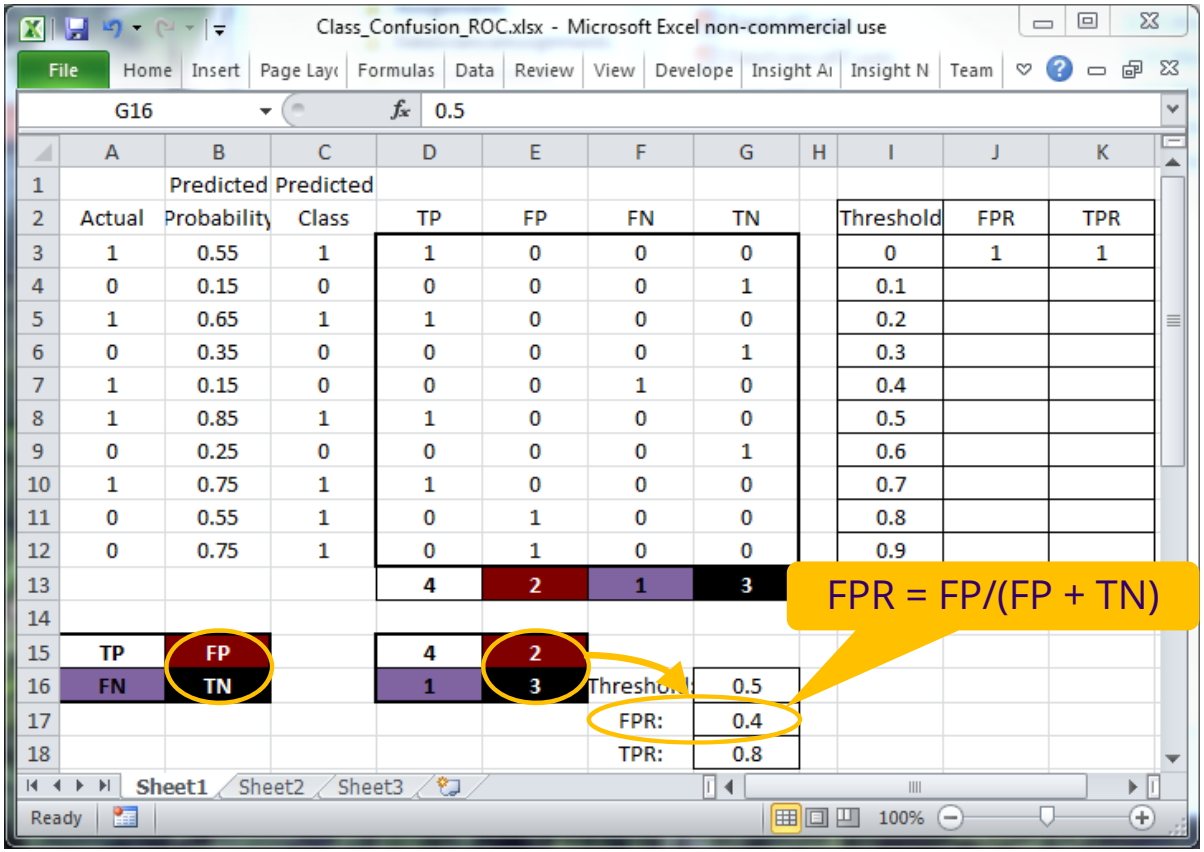
7	1	0.15	0	0	0	1	0		0.4		
		0.85	1	1	0	0	0		0.5		
		5	0	0	0	0	1		0.6		
		5	1	1	0	0	0		0.7		
		5	1	0	1	0	0		0.8		
			1	0	1	0	0		0.9		
				4	2	1	3		1	0	0

How to make an ROC



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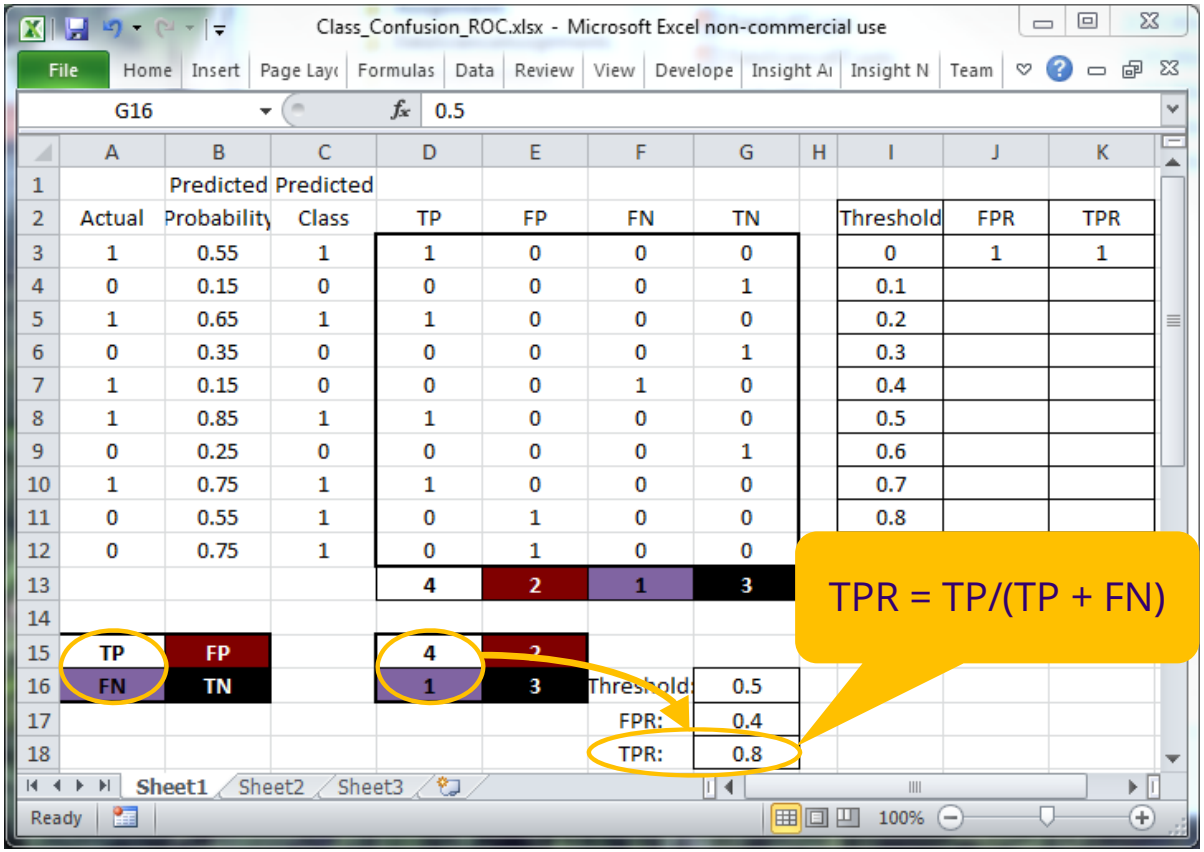
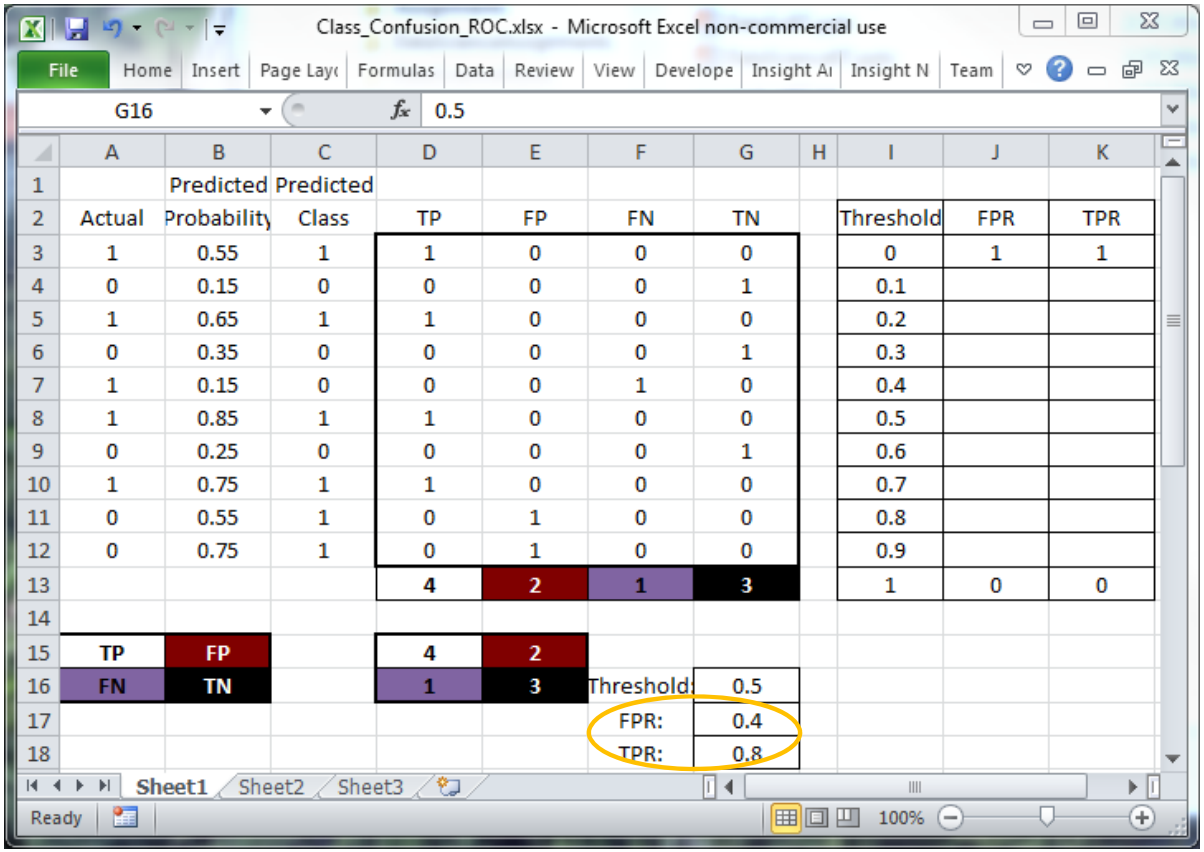


How to make an ROC



Class_Confusion_ROC.xlsx - Microsoft Excel non-commercial use

	A	B	C	D	E	F	G	H	I	J	K
1		Predicted	Predicted								
2	Actual	Probability	Class	TP	FP	FN	TN		Threshold	FPR	TPR
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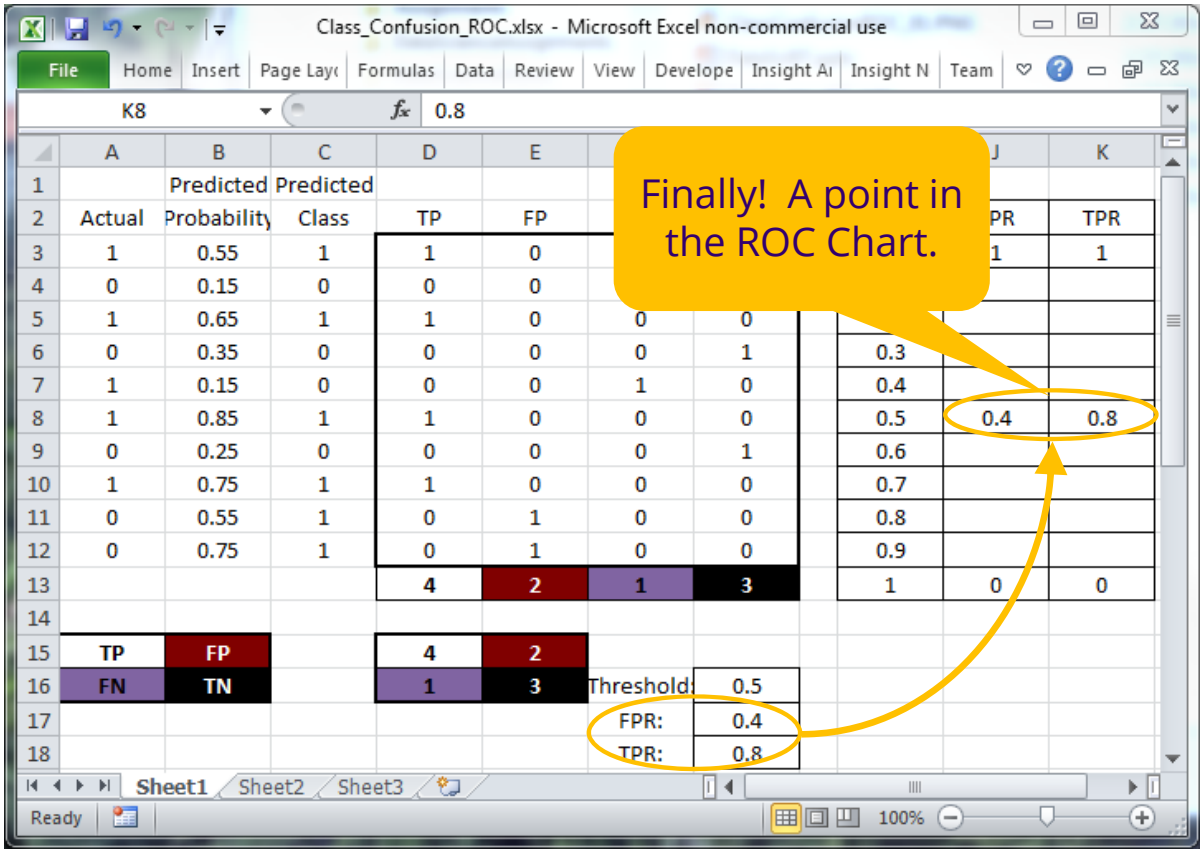
Sheet1 Sheet2 Sheet3

Ready 100%

How to make an ROC



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