What's your "muddiest point" surrounding confusion matrices? *Come off mic!*

1. Assume Beatles is "positive" and Queen is "negative". Label this confusion matrix with TP, TN, FP, FN.

	Predicted Queen	**Predicted Beatles**
Actual Queen	5657	794
Actual Beatles	1116	5452

2. Calculate the *specificity*. Interpret it.
3. Calculate the *sensitivity (recall)*. Interpret it.
4. Calculate the *accuracy*. Interpret it.

	Predicted Queen	**Predicted Beatles**
Actual Queen	5657	794
Actual Beatles	1116	5452

1. Which number represents our Type I errors?
2. Which number represents our Type II errors?
3. Which type of error is worse *in this case*?

BONUS *Calculate the false positive and false negative rates!*

1. TN FP - FN TP
- tp = 5452
- fn = 1116
- tn = 5657
- fp = 794
2. Calculate specificity (TN / All N) -- 5657 / (5657 + 794) = 0.8769183072391877
- Our model correctly predicted 88% of the posts belonging to the Queen subreddit.
3. Calculate sensitivity (TP / All P) -- 5452 / (5452 + 1116) = .0.8300852618757613
- Our model correctly predicted 83% of the posts belonging to the Beatles subreddit.

1. Calculate accuracy (TP+TN) / All -- (5657 + 5452) / (5657 + 5452 + 1116 + 794) = 0.8532913434211536
*   Our model got 85% of our predictions correct.
2. Type I error: False positive ➜ 794
*   False positive rate = 1 - specificity = 12%
*   Our model incorrectly predicted 12% of the posts belonging to the Queen subreddit
3. Type II error: False negative ➜ 1116
*   False negative rate = 1 - sensitivity
*   Our model incorrectly predicted 17% of the posts belonging to the Beatles subreddit.

Confusion Matrix and ROC Curve

		Predicted Class	
		No	Yes
Observed Class	No	TN	FP
	Yes	FN	TP

TN	True Negative
FP	False Positive
FN	False Negative
TP	True Positive

Model Performance

Accuracy $= (TN+TP)/(TN+FP+FN+TP)$

Precision $= TP/(FP+TP)$

Sensitivity $= TP/(TP+FN)$

Specificity $= TN/(TN+FP)$

http://scaryscientist.blogspot.com/2016/03/confusion-matrix.html

Se**N**sitivity

When it is actually "yes" how often it predicts "Yes"

TP / All P

TP / (TP + FN)

S**P**ecificity

When it is actually "No", how often it is "No"
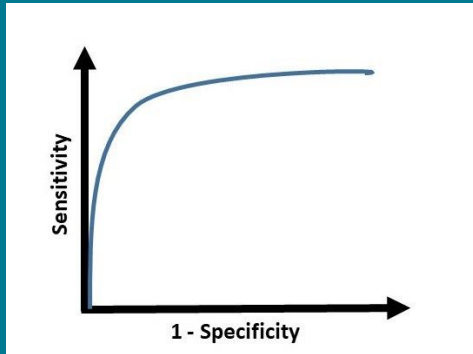
TN / All N

TN / (TN + FP)

Type **I** Error

I

False **P**ositive Rate

1 - s**p**ecificity

***the x-axis of ROC-AUC curve!
(the y-axis is the sensitivity AKA True
Positive Rate!)

Type **II** Error

II

False **N**egative Rate

1 - se**n**sitivity

Hypothesis Testing

Type I Error = incorrectly reject the
null hypothesis and accept H_A
***worse, so threshold is .05
generally

Type II Error = incorrectly accept
the null hypothesis and reject H_A

"

"Everything should be as simple as it can be, but not simpler."

-Einstein