

Balancing Type I and Type II Error Receiver Operating Characteristic

	<i>Predicted Y=0</i>	<i>Predicted Y=1</i>	<i>Total</i>
<i>Actual Y=0</i>	Correct Decision True Negative (TN)	Type I Error False Positive (FP)	N
<i>Actual Y=1</i>	Type II Error False Negative (FN)	Correct Decision True Positive (TP)	P
<i>Total</i>			N+P

Sensitivity and Specificity

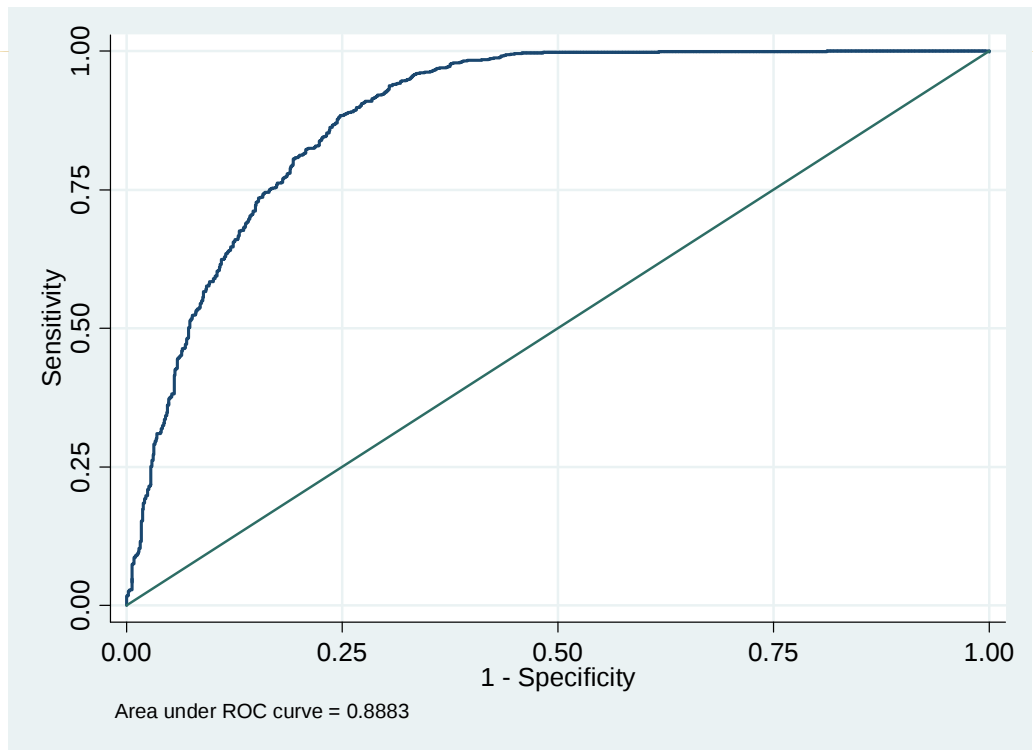
$$\text{Accuracy or Overall Counted } R^2 = \frac{TP + TN}{P + N}$$

$$\text{Sensitivity} = \frac{TP}{P}$$

$$\text{Specificity} = \frac{TN}{N}$$

Receiver Operating Characteristic

A receiver operating characteristic (ROC), or simply ROC curve, is a graphical plot of the sensitivity vs. (1-specificity) for a binary classifier system as its discrimination threshold is varied.



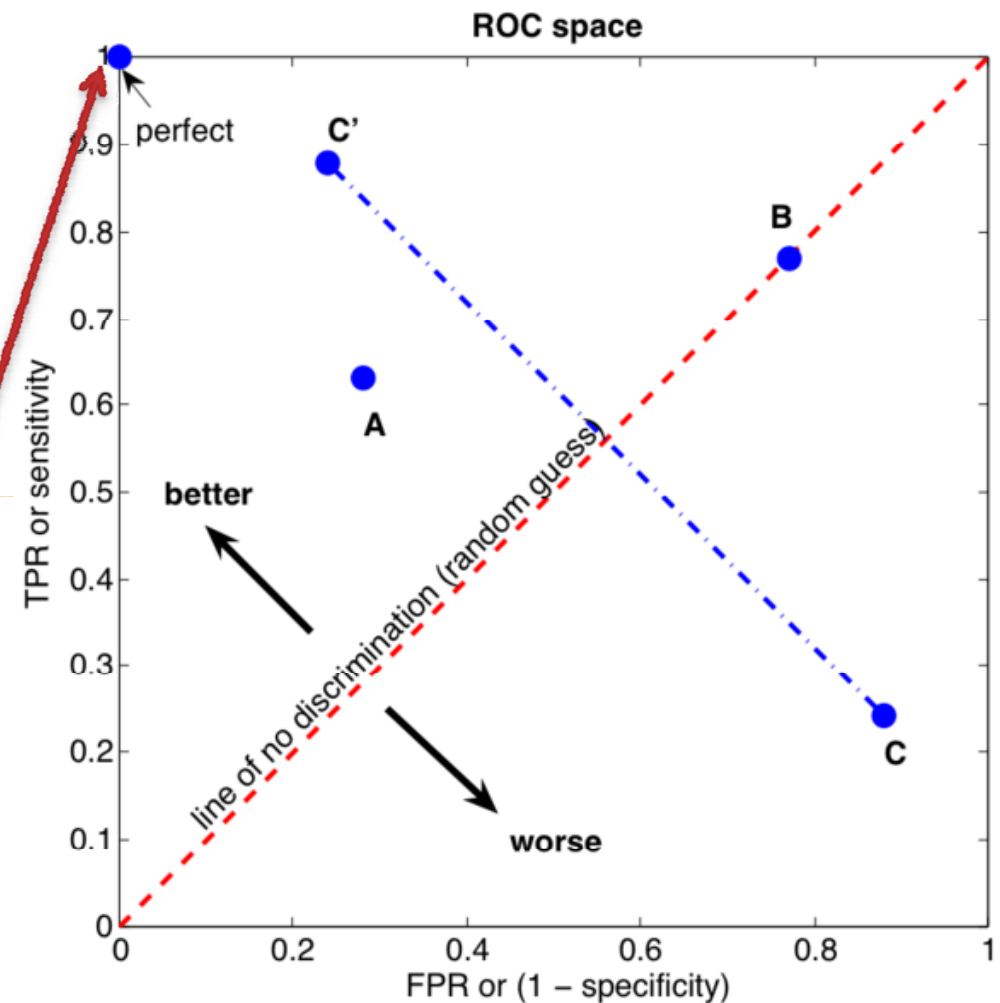
Receiver Operating Characteristic

The ROC can also be represented equivalently by plotting the fraction of true positives (TPR = true positive rate) vs. the fraction of false positives (FPR = false positive rate).

ROC (Relative Operating Characteristic) curve is a comparison of two operating characteristics (TPR & FPR) as the criterion changes.

ROC Curve

The best possible prediction method would yield a point in the upper left corner or coordinate (0,1) of the ROC space, representing 100% sensitivity (no false negatives) and 100% specificity (no false positives). The (0,1) point is also called a perfect classification.



ROC Curve

A completely random guess would give a point along a diagonal line (the so-called line of no-discrimination) from the left bottom to the top right corners. An intuitive example of random guessing is a decision by flipping coins (head or tail).

ROC can be used in helping determine the cutoff point (threshold value) in order to balance between type I and type II error in predicting $Y=0$ and $Y=1$.

Balancing Type I and Type II Error ROC Determining Cutoff Point

ROC can be used in helping determine the cutoff point (threshold value) in order to balance between type I and type II error in predicting $Y=0$ and $Y=1$.

