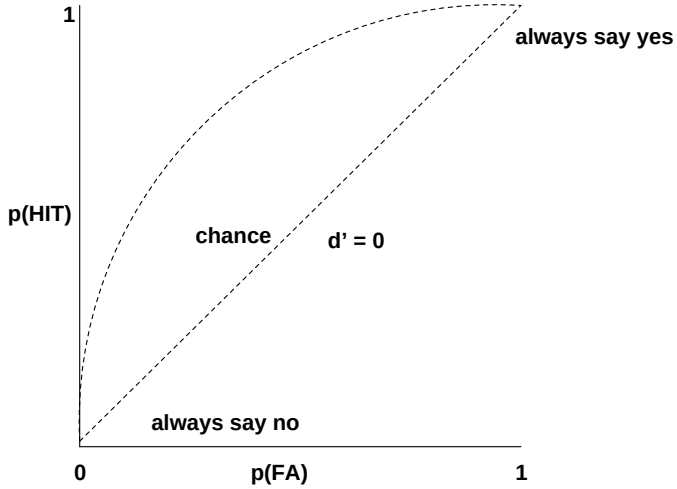
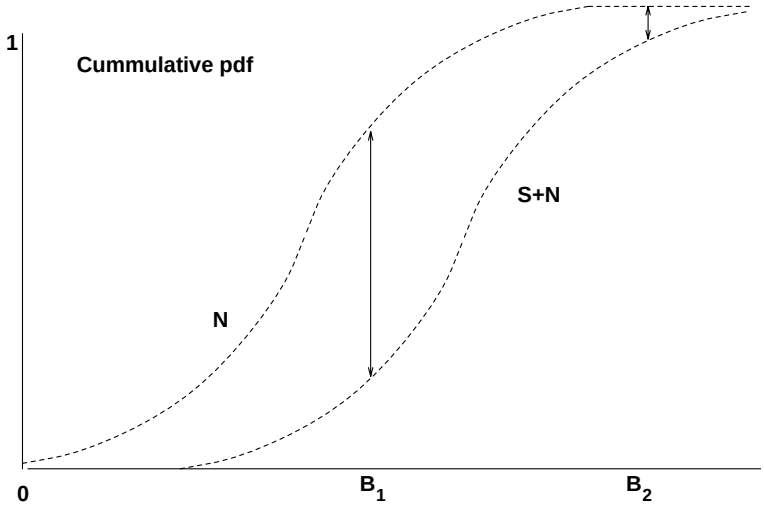
The ROC curve plots p(HIT) against p(FA). Each point along this curve corresponds to a different value of X_c.



Similarly the normality and equal variance assumptions can be examined by comparing the fit of data generated by manipulating β, to the predicted ROC curve. A convenient way to make this comparison is by plotting the curve in normal-normal coordinates. If the assumptions are met the curve will form a straight line.



Manipulating β

Since the criterion, X_c, relies on the subject's judgement rather than his ability to discriminate it can be manipulated independent of d'. One way to accomplish this is to alter the relative frequency of S+N to N trials. If S+N trials were made twice as likely, the subject should relax β to increase p(HIT) since p(FA) will increase more slowly. The optimal strategy for matching β to relative frequencies is:

$$\beta_{opt} = \frac{P(NOISE)}{P(SIGNAL)}$$

While subjects change β in the indicated direction these changes are typically less than optimal.

Another way to affect β is to influence judgements directly by altering the costs of errors or the values of correct decisions. These influences are apparent in real life decision tasks such as quality control or sonar operation. An equation summarizing these effects is:

$$\beta_{opt} = \frac{P(N)}{P(S)} \frac{V(CR)+C(FA)}{V(HIT)+C(MISS)}$$

Costs are by convention negative. There are no units associated with these values as they refer to preference ratios such as: It is twice as important to get hits (e.g. avoid misses) than it is to get correct rejections (avoid false alarms). This would result in a ration < 1, lowering

the value of β_{opt} to make decisions less conservative.

Problems

(use attached table for unit normal deviates find nearest 0-t entry and use exact tabled value without rounding or interpolation)

Find d' and locate X_c approximately on drawing of distributions

1)

Response	Stimuli	
	N	S+N
N	39	21
S+N	30	57

2) p(HIT) = .919 and p(CR) = .274

3) p(HIT) = .579 and p(FA) = .461

4) p(MISS) = .692 and p(FA) = .097

5) Can any of these examples be plotted on the same ROC curve? If so, please locate them approximately on the drawing.

Tabled values of the normal curve	
area 0-t	t
0	0
.039	.1
.079	.2
.118	.3
.155	.4
.192	.5
.226	.6
.258	.7
.288	.8
.316	.9
.341	1.0
.364	1.1
.385	1.2
.403	1.3
.419	1.4
.433	1.5
.445	1.6
.455	1.7
.464	1.8
.471	1.9
.477	2.0
.482	2.1
.486	2.2
.489	2.3
.492	2.4
.494	2.5