Lewis O. Harvey, Jr.–Instructor
Brad Aisa–Assistant
MUEN D156, 09:30–10:45 TR

Homework Assignment 2 - 10 Points
Due at beginning of class, Thursday, 13 September 2007

There are two parts to this homework assignment. Each part counts 5 points. Late homework will receive a grade of zero. Your homework must be typed, not handwritten. Graphs must be prepared by computer, not hand-drawn.

Part 1:

Two radiologists were tested on their ability to detect cancer from x-ray photographs. They were shown 300 x-rays without cancer and 150 with cancer and were asked to say whether or not cancer was present. The resulting 2 x 2 contingency tables for each are presented below:

Radiologist A Response

	"yes"	"no"
Cancer present	104	46
Cancer absent	92	208

Radiologist B Response

	"yes"	"no"
Cancer present	126	24
Cancer absent	150	150

Using the **equal-variance** signal detection theory model, determine each radiologist's sensitivity (d-prime) and response bias (c) for the detection of cancer. Use Equations 9c and 12 in the Signal Detection Handout. Present your work in an orderly fashion by showing the transformations of the above response frequencies into probabilities, and the probabilities into z-scores (quantiles of the unit standard normal distribution). In R, the function qnorm() may be used to compute quantiles from probabilities. Which Radiologist would you want to evaluate your x-rays? Why?

Part 2:

Below is a set of **hit rates** and **false alarm rates** computed from the confidence judgments of a one subject in a signal detection experiment.

	1	2	3	4	5
Hit Rates	0.2898	0.5477	0.7169	0.8275	0.9229
False Alarm Rate	0.0135	0.0829	0.2386	0.4146	0.7056

Plot two ROC graphs from these data: one graph in linear probability coordinates (ranging between 0.0 and 1.0), the other in z-score coordinates (ranging from -2.5 to +2.5). Hint: the R function qnorm() converts probabilities to quantiles (z-scores). Make the x- and y-axes of your graph equal in length so that each graph forms a square. Take care to properly label your graphs and to make them neat. What is your opinion about how well the Gaussian signal detection model describes these data? In four sentences or less explain your answer.