Data Analysis I
Fall 1993

Syllabus

I. Introduction
   A. General linear model
   B. t, F, and r as special instances of GLM
II. How probability enters into statistics
   A. Statistical decision problem
   B. Elementary rules for calculating probabilities
   C. Conditional probability and Bayes' theorem
   D. Binomial distribution
   E. Tchebycheff's inequality
III. Basic statistical concepts
   A. Distinction between population parameters and sample statistics
   B. Expectation and Variance operators
   C. Definitions of error and properties of estimators
   D. Central limit theorem
   E. Probability distributions: z, t, X^2 and F
   F. Controlling type I and type II errors and power
IV. One sample hypothesis testing and estimation
   A. One sample z test and t test
   B. Mathematical equivalence of t test and confidence interval
   C. One sample F test
   D. Mathematical equivalence of t and F tests
   E. One-parameter ANOVA model
V. Two sample hypothesis testing and estimation
   A. Independent and dependent samples
   B. Homogeneity of variances
   C. Significance and effect size
   D. Relation of t test, F test, and linear-correlation
   E. Least-squares regression equation
   F. Two-parameter ANOVA and Regression cases of the general linear model
VI. One-way ANOVA comparing three or more groups
   A. Fixed effects model
   B. Partitioning of total sums of squares and model assumptions
   C. Expected mean squares
   D. Confidence Intervals
   E. Effect size and power
   F. Robustness
   G. Contrasts: t and F tests
   H. Multiple comparisons and controlling Familywise error
   I. Orthogonal polynomials
VII. Two-way ANOVA
   A. Partitioning of total sums of squares in a fixed effects model
   B. Partitioning of total sums of squares in a mixed effects model (within subject design)
   C. Analyses of main effects, simple effects, and interactions
   D. Contrasts of main effects, simple effects, and interactions

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Psy 611
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HOMEWORK 1

1. The scores below represent agreement toward the statement made by the President, "The economy has improved since the election". Scores ranged from 7 (strongly agree) to 1 (strongly disagree). The scores come from a freshman writing class. The investigator was interested in the attitudes of this year's freshman class.

3 6 5 5 7 4 2 6 5

(a) Calculate the range, mean, median, and mode.
(b) Calculate the standard deviation.
(c) Do the numbers constitute a sample or a population? Why?
(d) Define a population, a sample, and a sampling distribution.

2. In a game of cards, there were 20 blue cards, 15 red cards, 10 green cards, and 5 white cards. Each card is replaced after drawing it.

(a) What is the probability of drawing a blue card?
(b) What is the probability of drawing a blue or a green card?
(c) What is the probability of drawing a blue card first and a green card second?
(d) Draw a theoretical distribution of the four kinds of cards.

3. Every year high school seniors who are going to college take the SAT exam. One year the mean of the math section of the SAT was 466, the standard deviation, 117.

(a) What proportion of high school seniors would be excluded by an engineering school that had 600 as the lowest acceptable score for admission?
(b) What proportion of the population would be expected to score between 350 and 550?
(c) What would the cutoff score be for a college that decided not to admit anyone who was in the bottom 15 percent of the population?
(d) In working the above problems you have been making an important assumption about the distribution of math SAT scores. What is that assumption?