Statistics 5303
Fall 2013

Exam #2 Data

Our second exam is Friday, November 22. The exam is open book and open notes. Those of you who have your text and notes electronically on you laptops may bring and use your laptop (or tablets) to access the book and notes. However, you may not use R during the exam or communicate during the exam.

Answer the exam questions on these data using your notes; your solutions should refer to specific analyses on specific pages of your notes (e.g., see Box-Cox plot on page 3). Attach your notes to your exam when done.

In your analyses, remember to check for assumptions and study interactions. Your analysis should go beyond just the ANOVA and what is significant; it should try to explain what is going on in the data.

This preliminary analysis should be considered part of your exam. *Do your own work!* Discuss these data only with the instructor.

One of the steps in a molecular biological analysis is the quantification of DNA. This can be done by measuring the absorbance of ultra-violet light at 260 nm (called the optical density). The absorption of light in the spectrophotometer should be proportional to concentration of DNA, but should not depend on the volume of sample used. However, there is a general belief that small samples, say less than 40 μl, lead to erroneous results. In addition, the proportionality cited above only holds over a range of concentrations; outside that range nonlinear effects come into play. In theory, $OD_{260} = 0.02 \times C$, where C is the concentration in ng/μl.

This experiment measures the optical density at five concentrations (10, 30, 60, 120, 480 ng/μl) and six volumes (15, 20, 30, 40, 50, 100 μl). Three analysts are chosen at random from the 16 in the lab. Each of the analysts prepares two samples at each volume/concentration combination and measures the optical density. The data are in the file dna.txt on the class web page (in a format suitable for read.table).

Analyse these data. Which factors are important? What is the range of linearity (proportionality)?