IBEHS 4QZ3 Modelling of Biological Systems – Assignment 1 2021

Individual assignment due Friday October 3rd, 2021 11:59pm to the avenue dropbox.
Submit one PDF, with all code included in an appendix.

1. (15 Marks) The data **Q1.txt** contains data from routine urine tests on 48 patients enrolled in a clinical trial of a new drug Urinase™. The measures of **Red Blood Cell (RBC)** count, urine **protein** content, **glucose** levels, **specific gravity**, and **bilirubin** levels were all quantified. Based on these values, a dose of Urinase™ was given as a treatment. The dose is listed in the final column Urinase™ (mg). Assuming normality in this data, what statistical analysis should be performed to assess which variables affect the dosage the most? Perform the analysis. Include residual analysis and comment on the appropriate nature of the model. Are all of these good predictors for drug dose? If not, can the model be optimized?

2. (20 Marks) The data in **Q2.txt** was collected from 8 major Toronto hospitals. Each hospital tried 9 different fracture fixation methods over a year, and calculated the fracture callus bone mineral density (BMD) at week 6 to look at effectiveness. The methods used were **1) a custom 3d-printed cast 2) plaster cast, 3) fiberglass cast, 4) external fixator, 5) simple splinting, 6) semi-rigid external fixator, 7) spongy cast, 8) Airboot, 9) 3D printed custom splint**. The data is a 64x9 matrix where each column represents a treatment. Perform the following analysis:

a) Assume the experiment was done at 8 different hospitals, every 8 rows of the data being from a different hospital. Set this up as a RCBD experiment, where every value represents an individual person's BMD, following 6 weeks of healing. State the null and alternative hypothesis. Decide whether you need to perform a post hoc test to discern whether any of the treatments are different (and do the test if needed). Determine where variance is coming from in the design and describe.

b) Assume that this was all done at one hospital, by the same researchers. However, this time the experiment was repeated 8 times on each person using a different DEXA scanner each time Perform the appropriate analysis. State assumptions. Are any of the treatments different in this case? Perform an assessment of the sources of variance in the model and describe where they come from. What are different between this approach and that done in (a)?