

## MA4413 2009 Assignment 3

### Instructions

The submission deadline is 2pm Monday 23rd November 2009. Answers should be typed, 12pt font with 1.5 line spacing, and submitted as a single pdf file with the following naming convention `Assign3-0123456.pdf` where the trailing digits are your UL Student Identification Number. Keep your answers brief and concise. Verbosity will be penalised. There should be no accompanying files. If you need to refer to any of your own R code then you should include it in your report – but only if absolutely necessary. Email your report as a single file attachment (not zipped) to `kevin.hayes@ul.ie`.

### Mammals Data

Is there a relationship between the brain weights and the body weights of mammals, and if so, what type of relationship? Data that can help answer this question were collected as part of a study in to sleep in mammals. They show the average body weight (kg) and brain weights (g) for 62 mammals.

1. Retrieve the data from `mammals.txt`. Explain why it would be reasonable to use brain weight as the response and body weight as the predictor? What problem is apparent? Take appropriate steps to remedy this problem. Explain.
2. Carry out an appropriate simple linear regression statistical analysis of the data. Write down the fitted regression line, the standard error of

the coefficients and the value of  $s$  and  $R^2$ .

3. Investigate the assumptions underpinning the simple linear regression analysis. Report.
4. Calculate a 95% confidence interval for the slope.
5. A specialist in the biology of mammals claims that brain weight is proportional to body weight raised to the power of  $\frac{3}{4}$ . Does this seem reasonable on the basis of these data? Carry out a formal hypothesis test to answer the question. Clearly state the null and alternative hypotheses.
6. Extend your analysis of these data by considering a primate versus non-primate differences. Is the relationship between brain weight and body weight sufficiently different for primates and non-primates so as to conclude a statistically important difference?
7. The smallest primate is the pen-tailed tree shrew from Malaysia which has an average body weight of 45g. Find an estimate and a 95% prediction interval for its brain weight.