

ST 517: Data Analytics I

Module 7 Homework

1. The `ergoStool` dataset in the `nlme` package contains information on an experiment comparing the `effort` required by each of 9 `Subjects` to get up from each of 4 `Types` of stools.

```
library(nlme)
?ergoStool
ergoStool
```

- (a) (1 point) Create at least one plot to explore the effects of `Type` and `Subject` on `effort`. Does there seem to be evidence of differences between stools? What about differences between subjects?
- (b) (1 point) Fit a fixed effects model with effects for `Type` and `Subject`. Use this model to answer the question: are there any significant differences in `effort` between stool `Type` T1 and the other stool types? (Remember to quantify your answer with the relevant confidence intervals).
- (c) (1 point) Why would it be more appropriate to treat `Subject` as a random effect? How will the inferences about the stool types change if `Subject` is a random effect?
- (d) (1 point) Fit a mixed effects model where `Type` is a fixed effect, and there are random intercepts for each `Subject`. Interpret the estimates of the random effect standard deviations in the context of the study.
- (e) (2 points) Fit a mixed effects model with just a single mean, and a random intercept for each subject. Compare this model with the model in part (d) using `anova()`.
 - i. You'll get a warning, research what it means and fix it.
 - ii. What hypothesis is being tested? What do you conclude?
- (f) (1 point) Repeat the inferences from part (b) using the mixed model from part (d).
- (g) (3 points) Imagine you have a 10th subject.
 - i. What would you predict for the mean `effort` of getting out of stool T1 for this subject? What would be a reasonable interval for this difference? (You don't actually have to calculate this interval, but discuss the contributors to your uncertainty in the prediction).
 - ii. What would you predict for the difference in mean `effort` between getting out of stool T1 and T2 for this subject? What would be a reasonable interval for this difference? (You don't actually have to calculate this interval, but discuss the contributors to your uncertainty in the prediction).