CS614 – Prof. Berardi Name:___________________________________

HW4

Due November 28, 2018

1. On Slide 13 of the Lecture 9 slides, we performed a random intercept model on the `ant111b` data, with the only fixed effect being the intercept, i.e., average. Repeat this analysis eight times, where within each reproduction, you eliminate one of the sites. For each of these runs, calculate the variance partitioning coefficient, i.e. $\frac{\sigma_L^2}{\sigma_L^2+\sigma_W^2}$. Can you explain the results that you observe? The figure on Slide 6 may help your interpretation. What do you suppose would happen if instead of removing one site at random, you simply removed one plot at random from each of the 8 sites?

2. The data set `Guns` from the `MEMSS` package reports the number of rounds fired per minute, by each of nine teams of gunners, each tested twice, once each with two different methods. Of the nine teams, three were comprised of men with slight builds, three with average builds, and three with heavy builds. Does the number of rounds fired significantly vary based on build or firing method? What proportion of the total variance is due to between-team versus within-team considerations, i.e. what is the variance portioning coefficient?

3. The data set `MathAchieve` describes math achievement scores from various schools. The binary variables `Minority` and `Sex` and the continuous variable SES are obviously fixed-effects variables. However, the `School` variable can be chosen as either fixed or random effect. Discuss how different purposes for the study might result in you treating `School` as either a fixed or random effect. Carry out the random effect analysis and detail the results, in terms of the significance of the fixed effects and the contributions of variances. Which model better fits the data, a random-intercept or random slope model?

4. Repeat the multiple baseline model that was outlined on Slide 49, but allow for change in slope as a result of the intervention in addition to change level. Do random slopes make sense? Summarize your results.