FALL 2018: Data management and analysis in R for Ecologists & Evolutionary Biologists

EEB698 - 1 credit
Instructor: Dr. Haldre Rogers
Monday lecture 1:10 - 2:30, Wednesday optional work session 1:10-2:30

Course description:
In this course, students will learn how to follow best practices for conducting reproducible research. Using the open-source software, R, we will practice manipulating, analyzing, and graphing the types of data commonly collected in ecology and experimental evolutionary biology. Monday's class will start off with a presentation to introduce the topic, followed by a group exercise in R where students will apply this method to an example dataset. Students will be asked to apply the skills learned in class to their own datasets for homework, which they can work on during an optional group work session on Wednesdays from 1:10-2:30. In doing the homework, students will work through the problems that inevitably arise when analyzing real, messy datasets plagued by missing values, small sample sizes, over-dispersion etc. The goal will be to produce a final analysis, complete with tables and figures that could be used in a manuscript. For the final project, each student will be expected to analyze their own dataset, and turn in the script, methods & results sections, and manuscript-quality figures/tables. We will finish the semester with a symposium where each student will give a short presentation about his or her research.

Requirements: Students are expected to have at least been introduced to R prior to the course. A basic background in statistics (e.g. STAT401(now587)/402, EEOB 590 - Advanced Biostatistics) would also be helpful. Students should bring their own dataset, ready for analysis. If you are not sure whether you are ready for this course, email the instructor (haldre@iastate.edu).

Course Objectives:
By the end of the semester, students will:
1. Be comfortable using R to import, explore, analyze, and graph data.
2. Know how to follow best practices for sharing data and code.
3. Be comfortable discussing statistical analyses and sharing code.
4. Have analyzed their own dataset, written the analysis section and the results section of a paper, and have produced manuscript-quality graphics.
5. Become part of an active community of R-users in Ecology & Evolutionary Biology at Iowa State.

Topics we will cover include:
- Intro to R, R Studio, and GitHub
- Data management plans
- Designing datasheets and databases
- Data munging/wrangling
- Data exploration
- Data visualization (base graphics and ggplot)
- Linear models (generalized, mixed effects)
- Other topics to be determined by the course participants & instructor