Biostatistics EEB 411

Instructor:
Instructor: James Fordyce (4-2925) jfordyce@utk.edu
Office: 540 Hesler Hall
Office hours: Monday following class or by appointment
MWF 1:25-2:15 (427 HBB)

TA: Zach Marion zmarion@utk.edu (office hours: TBD)

Communication: Blackboard. Supplemental reading and assignments will be posted there.

Text: Crawley, M.J. 2012. The R Book. Wiley (this is free through the utk library site)
Text (Recommended): Quinn, G.P. & M.J. Keough 2009. Experimental Design and Data Analysis for Biologist, Cambridge

Course Objectives: The use of statistics is ubiquitous in the fields of ecology and evolution. An understanding of statistics is not only important for the design of experiments and analysis of one's own data, but also for the ability to critically read the literature (including literature that you might be asked to review). It is important for scientists to understand *what* various statistical approaches are doing and exactly what hypotheses are being tested, rather than simply focusing on 'significance'. The goal of this course is to introduce basic statistical approaches in a way that we might understand what statistical hypothesis is being addressed and how we might interpret this biologically. No course (certainly not this one) can cover the whole body of statistical approaches used by researchers. One objective of this course is for you to feel confortable with the language of statistics so that you can use books or consultants efficiently. Another objective of the course is to encourage (strongly) carefully thinking about the design of a study – from idea, to question, to hypothesis, to experimental design, to analysis, to (finally) interpretation of analysis. In a perfect world (and we all want a perfect world) all these steps should be done before the first datum is collected. One should never collect data and then ask, "How should I analyze this?". In this course we will cover basic probability, the use of distributions for hypothesis testing, and linear models. We will also explore some of the multivariate analyses that are frequently used in the fields of ecology and evolutionary biology. Have fun – stats are fun.

Assessment:
Exercises (8)   60%
Mid-term   20% - October (take home given 14th to be returned 19th)
Final   20% - December 10th (2:45-4:45)

The assignments will consist of analyses and description (including figures, etc. if necessary) of experimental data provided. Documents should be emailed to <eebbiostatistics@gmail.com>.

Software:
We will be using the statistical programming language, R.
R is free at http://www.r-project.org/. R has become a standard tool in ecology and evolutionary biology (look through a recent issue of Evolution or Ecology and you'll notice R is commonly used). R also has great graphics abilities. We will like R. We will like it very much.

Exercises will be assigned a minimum of four days before they are due. They will largely consist of annotated computer code. The code should be emailed to me at <eebbiometry@gmail.com> by 11:15am the day they are due.

Tentative Schedule

Date	Topic
20-Aug	Introduction
22-Aug	Types of data / Intro R
25-Aug	Intro R
27-Aug	Distributions / Probability
29-Aug	Distributions / Probability
1-Sep	Laborday
3-Sep	Distributions / Probability
5-Sep	Distributions / Probability
8-Sep	Location & Spread
10-Sep	Summary Statistics
12-Sep	Summary Statistics
15-Sep	EDA
17-Sep	Bivariate relationships
19-Sep	Correlation
22-Sep	Correlation
24-Sep	Linear Models
26-Sep	Regression
29-Sep	Regression
1-Oct	Regression
3-Oct	Regression
6-Oct	Multiple Regression
8-Oct	Multiple Regression
10-Oct	Multiple Regression
13-Oct	Model Selection
15-Oct	No class (mid term time)
17-Oct	Fall Break
20-Oct	Comparing two groups
22-Oct	ANOVA
24-Oct	ANOVA
27-Oct	Multiple Comparisons
29-Oct	ANOVA
31-Oct	mixed-models
3-Nov	ANCOVA
5-Nov	Generalized linear models
7-Nov	Related Samples
10-Nov	Related Samples
12-Nov	Categorical data
14-Nov	Categorical data
17-Nov	Categorical data
19-Nov	Experimental Design
21-Nov	Experimental Design
24-Nov	Ordination
26-Nov	Ordination
28-Nov	Thanksgiving Break
1-Dec	Discussion

Final Exam 10 Dec (2:45-4:45)