

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 (488 DAB)

TA: Liam Mueller lmuelle3@utk.edu (office hours: Wednesday 3:30 – 4:30, or by appointment – 790 Dabney)

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

Text: Whitlock & Schluter 2015 The analysis of Biological Data. 2nd ed. Roberts and Company.
Crawley, M.J. 2012. The R Book. Wiley (this is free through the utk library site)

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 comfortable 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:

Weekly Exercises 60% - 11 total, lowest score will be dropped
Mid-term 20% - October (take home given 10th to be returned 17th)
Final 20% - 9 December (10:15-12:15)

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 largely consist of annotated computer code. The code should be emailed to me at <eebbiostatistics@gmail.com> by 1:25 pm the day they are due.

Tentative Schedule

17-Aug Introduction
19-Aug Types of data / Intro R
22-Aug Intro R
24-Aug Distributions / Probability
26-Aug Distributions / Probability
29-Aug Distributions / Probability
31-Aug Distributions / Probability
2-Sep Location & Spread
5-Sep Labor Day
7-Sep Summary Statistics
9-Sep Summary Statistics
12-Sep Bivariate relationships
14-Sep Correlation
16-Sep Correlation
19-Sep EDA
21-Sep Linear Models
23-Sep Regression
26-Sep Regression *****ICE
28-Sep Regression *****ICE
30-Sep Regression
3-Oct Multiple Regression
5-Oct Multiple Regression
7-Oct *****Fall Break
10-Oct Multiple Regression
12-Oct Model Selection
14-Oct No Class – Mid-term
17-Oct Comparing means
19-Oct ANOVA
21-Oct ANOVA
24-Oct Multiple Comparisons
26-Oct ANOVA
28-Oct mixed-models
31-Oct ANCOVA
2-Nov Generalized linear models
4-Nov Generalized linear models
7-Nov Related Samples
9-Nov Categorical data
11-Nov Categorical data
14-Nov Categorical data
16-Nov Experimental Design
18-Nov Experimental Design
21-Nov Ordination
23-Nov No Class
27-Nov Thanksgiving Break
28-Nov Discussion
30-Nov Discussion

Final Exam 9 Dec (12:30 – 2:30)