NRES 898 Ecological Statistics FALL 2009

Instructors: Dr. Drew Tyre, atyre2@unl.edu, 472-4054 HH 416, East Campus
Location: HH 141, East Campus
Time: Lectures: MWF 10:00 – 11:00
Lab: online or 2-5pm F HARH 142
Office hours: by appointment

Description

We will cover a broad sample of statistical topics relevant to ecologists; the intent is to provide an introduction enabling student to intelligently follow a seminar or scientific paper utilizing these methods. Depending on the needs and interests of the students we will enable students to conduct analyses on their own for a subset of topics. Across all topics we will emphasize modern methods of model selection/multi-model inference and relevant study design questions. Topics will include generalized linear and additive models, mixed models, and survival analysis. We will use the software package R or specialized packages (e.g. WinBUGS) where indicated. Each student will present a data analysis problem of their choice, implement an ecological analysis, and prepare a written paper summarizing the analysis and results.

Prerequisites

Graduate standing or permission of instructor; STAT 801 or equivalent;

Learning Objectives

By the end of the course the students will be able to:

1) Use R or WinBUGS to conduct model based analyses of ecological data
2) Interpret results of an information theoretic model selection process
3) Identify critical assumptions in complex analyses
4) Understand the concept of statistical power and how it responds to design choices (sample size, replication in space and time, type I error rate)

Students will have the opportunity to

1) Critically discuss modern literature on ecological data analysis.
2) Use modern methods to analyze their own data.
3) Debate the philosophical differences between Frequentist, Information theoretic, and Bayesian approaches.

Attendance

Attendance at in class sessions is expected but not graded. Graduate students have many demands on their time outside of classes, and meeting these sometimes requires missing a class. Prior notice is appreciated so valuable class time is not wasted waiting for latecomers. Students who miss a class are still responsible for the relevant material.

Assessment

Homework assignments 40%
Project 60% (20% for written proposal and presentation, 40% for final paper)
We expect there to be 5-6 homework problems; generally these will require you to conduct an analysis of a provided dataset and interpret the results in written form.
The project will involve a more thorough analysis and writeup of a particular dataset. In the first weeks of the course students will present a dataset of their choice; students without a dataset to analyze should visit with the

instructor as soon as possible. These initial presentations will be SHORT (5 minutes) and INFORMAL, providing the following information to the class:

1) What is the ecological hypothesis or model of interest?
2) What variables were measured?
3) What do you THINK the best analysis is?

Midway through the course we will expect a written proposal for the analysis – this will be two to three pages and essentially form a draft introduction and methods/materials section for the final paper. In the last two weeks of the class students will present the results of their projects in a 10 minute formal conference presentation. The final paper will be due DECEMBER 17, 2009 at 5pm. The form of the paper should be a brief research article formatted as a manuscript suitable for submission to the journal of your choice (e.g. Journal of Wildlife Management, Biometrics). Note the final paper is in lieu of an exam.

Readings & Software

There are assigned research articles for each week. These will be available on BlackBoard. Expect to discuss these articles in class as indicated on the schedule.
Much of the software we will use can be downloaded for free. Links to websites for R and WinBUGS are on BlackBoard under Course Documents.

Lecture Topics

Topic	Weeks
Introduction to R and statistical programming	1
Review linear models	1
Information Theory and model selection	1
Generalized Linear Models	2
Mixed Models	3
Generalized Linear Mixed Models	1
Generalized Additive Models	1
Survival Analysis and derivatives	2
Power and Design	2

Textbooks

REQUIRED: Michael Crawley “The R Book”

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.