NRES 798 – Statistical Methods for Ecologists

Syllabus – Winter 2015

Lectures: Wednesday, Friday 16:30-17:20, room 10-3034
Labs: Monday 11:30-14:30, room 8-362

Instructor

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Office hours: Monday and Thursday 15:00-17:00, or by appointment (Che.Elkin@unbc.ca)

Course webpage

http://www.unbc.ca/che-elkin/courses

Course description

This course will provide an overview of current statistical methods commonly used by ecologists from various disciplines. The aim of the course is to provide students with the tools necessary to design statistically robust experiment, evaluate the structure of data resulting from observational and experimental studies, and analysis their ecological data using appropriate statistical methods. While the examples used will focus on ecological data, this course is appropriate for any students who want to develop a strong foundation in advanced univariate statistics.

Students should be generally familiar with the underlying theory and maths associated with basic statistical analysis. Instead of reviewing basic statistical theory and principles we will instead focus on learning ecological focused statistics from an applied perspective. We will not dwell on the computational details of the statistical techniques, but will instead focus on learning the underlying assumptions, aims, and constraints associated with a range of statistical approaches.

Labs will involve working through the analysis of test data set in the R environment.

Student Marks

Exams

A final lab exam worth 25% of the final grade will require students to apply knowledge from the lecture and lab components to analysis experimental data sets.

Projects

Each student will be required to design, implement and report on the statistical analysis of an ecological data set (or an equivalent data set) of their choosing. There will be two project deliverables that will be graded, worth 30% and 45% of the final grade respectively. The first project will be due halfway through the semester (February 13th) and will require the students to prepare a report that includes a critical evaluation of their data and compares and contrasts the applicability of various statistical methods. The second project will require the students to perform an advances statistical analysis of their data and submit the results in the format of a scientific paper (due April 17th). Students are encouraged to analyze project data that they are working on; however, suitable data sets will also be available.

Text Books (suggested)

There are **no** text book requirements for this course, however, the following text are highly useful.

Gotelli, N.J., and A.M. Ellison. 2004. A Primer of Ecological Statistics. Sinauer Associates Inc., Sunderland, MA.

Valuable resources

Hilborn, R., and M. Mangel. 1997. The ecological detective. Confronting models with data. Princeton University Pressm Princeton, NJ.

Zar, J.H.. 1999. Biostatistical Analysis. 4th edition. Prentice-Hall, Inc.

Crawley, M.J. 2009. The R Book. John Wiley and Sons, West Sussex, England.

Anderson, K.P., and D.R. Anderson. 2002. Model selection and multimodel inference: a practical information-theoretic approach (2nd edition). Springer, New York, NY.

McCarthy. M.A. 2007. Bayesian methods for ecology. Cambridge University Press, New York, NY.

Quinn, G.P., and M.J. Keough. 2002. Experimental Design and Analysis for Biologists. Cambridge University Press.

http://ecology.msu.montana.edu/labdsv/R/labs/R_ecology.html

Dishonesty and Professional Conduct

Purposeful dishonesty and plagiarism is a serious offence both in the class room and the work place. If you are unsure of what constitutes Plagiarism or Cheating please consult the UNBC Graduate Programs web site or instructor for definitions, explanation, and potential consequences. Ignorance is not a valid excuse. (http://www.unbc.ca/sites/default/files/sections/graduate-programs/unbcgraduatecalendarregulationonacademicoffences.pdf)

Lecture Outline (tentative)

Lecture	Section
1	Ecological questions and statistical approaches
2	Probability, probability distributions, and frameworks for statistical analysis 1
3	Probability, probability distributions, and frameworks for statistical analysis 2
4	Exploring data properties (Outliers, transformations)
5	Experimental and sampling design 1
6	Experimental and sampling design 2
7	Linear models 1
8	Linear models 2
9	Linear models 3
10	Linear models 4
11	Generalized linear models 1
12	Generalized linear models 2
13	Analyzing time series 1
14	Analyzing time series 2
15	Spatial statistics 1
16	Spatial statistics 2
17	Generalized Additive models 1
18	Generalized Additive models 2
19	Model selection 1
20	Model selection 2
21	Bayesian analysis 1
22	Bayesian analysis 2
23	Data mining
24	Multivariate analysis