



EC305 Aug 2:1

Quantitative Ecology: Research Design and Statistical Inference

Instructor

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Department: Centre for Ecological Sciences

Course Time:

Lecture venue:

Detailed Course Page:

Announcements

Brief description of the course

This course focuses on study design and statistical modelling in ecology. We examine elements of effective study design, common pitfalls in study design and data collection, and the confrontation of ecological hypotheses with data using different statistical approaches and frameworks of inference. The course aims to provide proficiency to carry out various statistical techniques commonly used in ecology using the software R. It is open to graduate students and senior undergraduate students. Every week combines lectures with hands-on sessions in study design and statistical modelling. Students will be given short weekly assignments and a final data analysis project.

Prerequisites

Basic knowledge of ecological concepts

Syllabus

The scientific process in brief; The use of mathematical models in ecological studies in brief; Elements of study design (including replication and pseudoreplication, correlations in space, time, among individuals, interspersions, appropriate spatial and temporal scale of replicates, randomisation, some common experimental

designs, sample size and power analyses, interactions, controls, orthogonal design, non-orthogonal observational data, collinearity); Confronting ecological hypotheses with data, and statistical inference (probability and probability models, null hypothesis significance testing, steps during the statistical modeling process, methods based on Sums of Squares, SSQ and hypothesis testing, Analysis of variance in regression, multiple regression, one-way ANOVA, Likelihood based approaches, generalized linear models “ exploring binomial and poisson GLMs); Statistical modeling strategies (hypothesis testing, parameter estimation, prediction, overfitting, phantom degrees of freedom, collinearity, missing data, nonlinearities and interactions, model specification, constructing the maximal model, selection of variables for the maximal model, model simplification); Model selection and multimodel inference using information theoretic approaches

Course outcomes

Understanding principles of good study design and statistical inference. Proficiency in using R to test design (e.g., power analyses) and run common statistical techniques used in ecology (e.g., regression, multiple regression, ANOVA, generalised linear models etc)

Grading policy

Grades will based on weekly take home assignments, participation in class discussions, and 1-2 in-class quizzes (together 50%) and a final data analysis project (50%)

Assignments

Resources