Integrating Theoretical and Empirical Ecology, BSC 5936

Tuesday & Friday, 2:30 – 3:45 Con 222
Office hours in Brian Inouye’s office: Con 305, by appointment
Software workshops and assistance, Jason Pienaar <Pienaar@bio.fsu.edu>, times and location TBA.

Text:
This text will be supplemented by papers and book chapters from other sources.

Course Objectives:
Students will gain an understanding of different approaches for creating a research program that attempts to mesh theoretical and empirical aspects of ecology, including the strengths and weaknesses of hypothesis testing and modeling fitting, and their statistical approaches. Upon completion students will have a basic understanding of model building, maximum likelihood-based model fitting, and Bayesian model fitting. Independent student projects will explore the use of simulations to test connections between experiments, theory, and alternative experimental designs. Additional topics to be covered will depend on the range of student interests.

Grades:
Grades will be based on participation (especially for weeks when you are responsible for more of the material), homework (1 to 3 short assignments designed to familiarize everyone with the software), and independent (or small group) projects and presentations. There will be no final.

Independent projects:
There will be two independent projects – the first will require development and simulation to explore a simple ecological or evolutionary model, the second will require data simulation and analysis as a method for comparing alternative experimental designs. I’d like to structure the second set of projects so that they could potentially lead to a group-authored publishable paper.

Software:
Students can use any software package of their choosing for their projects, however support and workshops will be available for students wanting to learn and use R (a free open-source statistical programming package for Mac / Unix / Linux / Windows) or S+ (a commercial software package very similar to R, with FSU site-licenses available).

FSU Honor Code
You are expected to know and adhere to the FSU Honor Code.

Students with disabilities needing academic accommodations should register with and provide documentation to the Student Disability Resource Center (SDRC), and then bring me a letter from the SDRC within the first week of class. This syllabus and other class materials are available in alternative format upon request.
| Week 1 | Aug 30 | Course logistics, Introduction  
|        | Sept 2 | Philosophy and Practice of Science  
|        |        | Going beyond the null  
| Week 2 | Sept 6 | Types of theory, developing new models  
|        | Sept 9 | R session  
| Week 3 | Sept 13 | Data are noisy. Adding stochasticity to models  
|        | Sept 16 | Probability review ED Ch 3  
|        |        | Loss functions. R session. Assignment #1 due.  
| Week 4 | Sept 20 | Measuring fit of a model ED Ch 5, nested models  
|        | Sept 23 | Process noise and Observation error  
| Week 5 | Sept 27 | Likelihood ED Ch 7  
|        | Sept 30 | Finish Ch 7  
| Week 6 | Oct 4 | Likelihood Examples ED Ch 8  
|        | Oct 7 | Likelihood methods ED Ch 11  
| Week 7 | Oct 11 | Information Criteria B&A Ch 1-3,  
|        | Oct 14 | Bayesian models ED Ch 9. Assignment #2 due.  
| Week 8 | Oct 18 | Bayesian examples Ch 10  
|        | Oct 21 | Power analysis review.  
| Week 9 | Oct 25 | Simulations for Experimental Design  
|        | Oct 28 | R for simulations  
| Week 10 | Nov 1 | Spatial models and analysis (Kurt)  
|        | Nov 4 | Spatial models II  
| Week 11 | Nov 8 | Quantifying relative importance  
|        | Nov 11 | Ways to present results  
| Week 12 | Nov 15, 18 | Student topics / work on projects  
| Week 13 | Nov 22 | Student topics / work on projects  
|        | Nov 25 | no class  
| Week 14 | Nov 29 | TBD  
|        | Dec 2 | Student Presentations  
| Week 15 | Dec 6 | TBD  
|        | Dec 9 | Summarizing  