University of Rhode Island

Computer Science and Statistics Department
STA 550, Ecological Statistics, Section 0001, Fall 2014

Instructor: Gavino Puggioni, PhD
Office Location: 246 Tyler Hall
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Email: puggioni@cs.uri.edu
Office Hours: Th 11:00 am – 1:00 pm
Class Days/Time: W 4:00 pm – 6:45 pm
Classroom: CBLS 010

Course Description

STA 550 is designed as a graduate level course in Ecological Statistics. Through this course, students are expected to learn to analyze ecological problems using modern statistical methods in the Frequentist, Likelihood, and Bayesian frameworks: Optimization, Design of Experiments, Generalized Linear Models, Zero-inflated models, introduction to time series and spatial models, multilevel models, dynamic models. Implementation is explained using the freeware statistical language R.

Course Goals

- To develop statistical thinking
- To learn modern ecological modeling through statistical methods
- To understand advantages and limitations of the proposed methods
- To acquire computational skills (using R)

Student Learning Outcomes
Upon successful completion of this course, each student will be able to:

- Perform an accurate statistical data analysis
- Identify the correct methodology to use for a given ecological application
- Write working computer code in R to perform the estimation
- Use R additional packages if needed
- Perform parameter estimation
- Quantify estimates uncertainty
- Interpret the results in relation to the original scientific goal
- Compare different approaches to solve the same problem

**Required Texts/Readings**

**Textbook**
Benjamin M. Bolker: "Ecological Models and Data in R", Princeton University Press, 2008. Available at the URI bookstore, the Princeton University Press website or Amazon.com We will use material from the book website: http://people.biology.ufl.edu/bolker/emdbook/index.html

**Other Readings**


**Other equipment / material requirements**
R statistical software will be used in class. Students are required to install R in their personal computers. R is available at: www.r-project.org
Sakai will be used extensively

**Classroom Protocol**
Participation is strongly encouraged. Students are expected to arrive on time, keep a respectful behavior, and avoid cellphone use.

**Assignments and Grading Policy**
The final grade will be a combination of the following:

- Lab homework 20%
- Additional questions homework 25%
- Final project/take home final 55%
- Participation (Extra credit) 5%

Grading policy:

- Labs: There will be weekly labs. Students are expected to replicate the labs from the textbook and encouraged to experiment and work with their own data.
- Additional Questions. Roughly every two weeks students will have to work on a problem set. Students can collaborate but required to write and submit an individual document.
- The final will include a problem set and a data set analysis using the methods acquired in the course. Those students who have data on their own can use it as a substitute for the assigned dataset.
- Participation is evaluated by attendance, participating to class discussions with comments or questions.

Grading Scale:

- A  94-100
- A-  90-93
- B+  87-89
- B   83-86
- B-  80-82
- C+  77-79
- C   73-77
- C-  70-72
- D+  67-69
- D   60-66
- F   <60
Here is a timetable and schedule for the course. Contents and assignment are subject to change.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Due Dates, Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>09/03/2014</td>
<td>Introduction to Statistical Ecology, statement of course objectives. Installation and introduction to R. Lab 1 out. Read Chapter 1.</td>
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<tr>
<td>3</td>
<td>09/17/2014</td>
<td>Deterministic functions typically used in an Ecological Context. Lab 2 due. Lab 3 out. Read Chapter 3.</td>
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<tr>
<td>5</td>
<td>10/01/2014</td>
<td>Introduction to Simulation methods. Lab 4 due. Lab 5 out. Read Chapter 5.</td>
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<tr>
<td>6</td>
<td>10/08/2014</td>
<td>Power analysis and Design of Experiments. Read additional material provided by the instructor.</td>
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<tr>
<td>9</td>
<td>10/29/2014</td>
<td>Linear models and nonlinear least squares. Lab 7 due. Lab 8 out. Read Chapter 8.</td>
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<tr>
<td>11</td>
<td>11/19/2014</td>
<td>Generalized linear models: Zero inflated distributions. Read additional material provided by the instructor.</td>
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<tr>
<td>13</td>
<td>12/03/2014</td>
<td>Modeling Variance: General Multilevel models. Read additional material provided by the instructor.</td>
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<tr>
<td>14</td>
<td>Make up class?</td>
<td>Introduction to Dynamic Models. Lab 10 due. Read Chapter 11.</td>
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<td>Final Exam</td>
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<td>Take Home Project</td>
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