Texas A&M University-Corpus Christi
Department of Mathematics and Statistics
MATH 6317.001 and MATH 6317.G01:
Mixed Effects Models for Scientists
Fall, 2013

1 Course Information

Meeting  MW 2-3:15, IH 164
Professor  Dr. Blair Sterba-Boatwright
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OfficeHrs MW 3:30-5:30 pm; T 1-3 pm; other times by appointment.

2 Course Description

This course will deal with extensions to regression and ANOVA that are frequently useful in dealing with ecological data. Topics include: maximum likelihood and AIC; generalized additive models; using generalized least squares to deal with non-homogeneous data; working with fixed and random factors; handling temporally correlated and spatially correlated data; and the generalized linear model (Poisson, logistic, and negative binomial regression).

3 Prerequisites

MATH 6315, Statistical Methods in Research I, or the equivalent.

4 Text and Software


Software  We’ll be using R, an open source statistical language that you can download to your own computers from the Comprehensive R Archive Network (CRAN) website: <www.cran.r-project.org>. For those of you not familiar with R, I have an online crash course. I have not been able to find an introduction to R book that I can recommend without hesitation; some appear to assume that you already know a lot of statistics, others that you know a lot of computer programming, and some are just bad. With that caveat in mind, here are two possible references:

* Venables, W. N., Smith, D. M., and the R Development Core Team (2012) *An Introduction to R*. This is a free pdf you can download from the CRAN website. This document spends almost no time on statistics, focusing instead on how to use R.
* Dalgaard, P. (2008) *Introductory Statistics with R, 2nd edition*. Springer-Verlag. As you can tell by the title, this book covers both how to use R and statistics, but the first two chapters are purely about R. My crash course does not directly use Dalgaard but skips through elements of the first two chapters; his book gets a little further into the computer science aspects than I’d prefer.
5 Student Learning Outcomes

At the end of the course, students will be able to:

1. Analyze experimental designs to determine appropriate statistical analyses from the list above
2. Use preliminary analysis of collected data to determine appropriate statistical methods from the list above
3. Use R to perform all necessary calculations, including minimal programming expectations for the bootstrap
4. Interpret the results of the statistical calculations in an ecological context

6 Instructional Methods and Activities

Although it’s not formalized in the course schedule as it was with MATH 6315 and MATH 6316, I am using the same lecture-lab format.

Lecture All lectures will be pre-recorded and posted on the course Blackboard site for you to download and watch. I will post lecture notes on the course Blackboard page as I get them complete.

Lab Labs will be conducted “live” over the internet using the Saba videoconferencing software. This includes students from both campuses; there will be no face-to-face lab session. Labs will use R “scripts” that will also be posted on the Blackboard page or e-mailed to you, depending on how far I get behind.

7 Evaluation and Grade Assignment

Homework (50%) There will be HW assignments for each Chapter, typically involving analyzing a dataset using the methods of that Chapter. I am going to try to have you use the standard Methods/Results/Discussion format in these assignments to help you practice writing statistics for journals.

Project (50%) There will be a project due at the end of the semester. This will be similar to the HW, but will involve substantially more analysis and writing than the HW. The project is due Monday, Dec. 16 for Corpus Christi students; I’ll work out a schedule with Galveston students. I’ll also ask you to present your project during the final exam period for the class, which is Monday, Dec. 16, 1:45-4:15 pm.

Grades are based on the $x^{1.5}$ scale, that is: A = 85-100; B = 72-84; C = 59-71; D = 46-58; F = 0-45

8 Tentative Course Schedule

- Weeks 1-2: Introduction, crash course in R
- Weeks 3-4: Generalized Additive Models
- Weeks 4-5: Generalized Least Squares
- Weeks 6-7: Mixed Effects Models
- Weeks 8-9: Temporal and Spatial Correlations
- Week 10: Exponential Families
- Weeks 11-13: Generalized Linear Models
- Week 14: Generalized Linear Mixed Models and Generalized Additive Mixed Models
9 Class Policies

- **TIMELINESS:** It is your responsibility to keep track of course deadlines and due dates. In particular:
  - Homework assignments show up on Blackboard; I also announce due dates in class. “I didn’t know it was due” is not a valid excuse.
  - If you are unable to attend a test and you wish to make it up, I need to hear from you no later than 24 hours after the missed test. You should be able to provide adequate documentation of why your absence was necessary. If you wait more than 24 hours to contact me, you will also need to provide adequate documentation of why you were unable to meet the 24-hour deadline. As an example, “I was called out of town unexpectedly on business” might be a valid reason to miss a test, but it is not an adequate reason to miss the 24-hour notification requirement.
  - The end of the semester is a busy time for me as well as you, and I do not have time to proctor final exams outside the assigned schedule. Please do not approach me with stories of non-refundable plane tickets, asking for a separate exam time. The exam schedule for this semester was posted in plenty of time for you to make the correct flight arrangements. I will only consider alternate exam times if either (i) you have three finals scheduled for the same day and invoke the University’s rule allowing you to reschedule one of them; or (ii) you have a legitimate academic or professional conflict with the scheduled time. If one of these situations applies to you, please give me adequate notice to work out an alternate time.

- A grade of I (Incomplete) will only be given in exceptional circumstances, such as a death in the family or personal injury that might prevent someone from taking the final test. In this case, it is the responsibility of the student to notify me as soon as possible, preferably by e-mail, and to complete the required "Incomplete Form" available from the University Registrar. If this is not done, a score of 0% will be assigned for any incomplete tests and a final grade will be computed using the criteria described above.

- University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one's own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a grade of 0% on that assignment or test.

- Although obviously I hope all goes smoothly for you this semester, events can sometimes occur that make dropping a course necessary or wise. I encourage you to consult with me before you decide to drop to be sure it is the best thing to do. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Friday, Nov. 15, is the last day to drop a class with an automatic grade of “W” this term.

10 University Statements

Grade Appeals

As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01.
Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html). For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs at (361) 825-2612, by e-mail at student.affairs@tamucc.edu, or in person at UC 318.

**Disability Accomodation**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Corpus Christi Hall, Room 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

**Classroom/Professional Behavior**

Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor's ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.