Instructor information

Instructor: Dr. Alan M. Polansky
Office: Du Sable 361D
Hours: 10:00am–11:00am on Monday Wednesday and Friday or by appointment.
Email: polansky@math.niu.edu

Topical Syllabus

- **The Roots of the Bootstrap: The Jackknife**: A review of the jackknife method of Quenouille for reducing the bias of an estimator. We will also consider extensions of this method to other problems, notably studied by Tukey.

- **Functional Parameters and Plug-In Estimates**: These topics will get us ready to understand the bootstrap. The ideas of functional parameters and plug-in estimators are crucial to the development and understanding of the bootstrap.

- **Basic Applications of the Bootstrap**: The basic development of the bootstrap estimator of the sampling distribution of a plug-in estimator. The performance of this estimator will be discussed in terms of theory as well as some empirical results. A notable failure of this estimator will also be discussed. We will also develop the bootstrap estimators of the bias and standard error of a plug-in estimator.

- **Bootstrap Confidence Intervals and Regions**: An in-depth discussion of bootstrap methods for computing confidence intervals and regions. We will begin with a short review of confidence intervals in the classical case with an emphasis on pivots. We will then discuss several methods for computing bootstrap intervals and will explore their properties (correctness and accuracy) using both theory and empirical results. Finally, we will explore the complex problem of constructing multivariate confidence regions.

- **Hypothesis Testing and the Bootstrap**: Methods for using the bootstrap to perform hypothesis tests, including the inversion of confidence regions and estimated $p$-values.

- **The Bootstrap and Linear Models**: The application of bootstrap methods to linear models, and in particular to regression models. We will explore several methods of using the bootstrap in these models including resampling residuals, resampling pairs, and the wild or external bootstrap. We will also briefly explore the special properties that the bootstrap maintains for regression models.

- **The Bootstrap and Dependent Data**: Application of the bootstrap to dependent data such as stochastic processes and time series.

Grade Computation

- A midterm examination will be given on Friday, March 7, 2003 during regular class time. This exam will be given in two parts: an in-class portion and a take-home portion. The take home portion will be assigned when the in class exam portion is turned in and will be due two weeks later. This exam will count for a total of 30% of the final grade of the course, 15% for each part.

- A final project will be assigned during the final month of class, and will be due during final exam week. This project will count for 30% of the final grade in the course.

- Several homework projects will be assigned throughout the semester. The average over these assignments will count for 40% of your final grade.

Grading Scale

The final course grade is based on the percentage of the maximum points that you earn in this course. A scale of 90%, 87%, 83%, 80%, 77%, 73%, 70%, 65%, 60%, will be used as cut-points for the grades A, A-, B+, B, B-, C+, C, C-, D respectively; an F grade will result if you score less than 60%.
Homework Assignments

- Homework will be assigned on blackboard. Due dates will also be given on blackboard. No late assignments will be accepted for any reason.

- Assignments are to be neat and presented logically on loose-leaf paper. If more than one sheet of paper is used, the assignment must be stapled together. Please do not ask faculty for use of a stapler. Spiral paper is unacceptable. You are to show all your work. If your assignments are messy, disorganized or do not follow the previously stated instructions, you will not receive credit for that assignment.

Homework Assignments

- The exam is closed book. When the instructor calls "Time", all exams and exam materials must be turned in within the next minute; otherwise you will get a 0 on the exam.

- Make-up exams will not be given. If there is a serious medical problem which prevents you from taking an exam or if there is a death in the immediate family, contact me as soon as possible. In such a case where missing an exam is warranted, your final exam will be re-weighted to reflect the missing exam. The remaining aspects of your grade will be computed as outlined above.

Important Notes

- The instructor reserves the right to amend the syllabus at any time. Changes will be announced in lecture.

- There is no extra credit given in this course. Don’t even ask!

- Please note that mistakes in your grades on homework, and/or exams may occur. You have one week from the time the paper was handed back to notify me of the mistake. If you wait longer than the one week, no change will be made to the grade.

- Due to privacy concerns, I will not discuss grades using email or the telephone. You must meet with me in person to discuss your grades.

- Good academic work must be based on honesty. The attempt of any student to present as his or her own work that which he or she has not produced is regarded by the faculty and administration as a serious offense. Students are considered to have cheated if they copy the work of another during an examination or turn in a paper or an assignment written, in whole or in part, by someone else. Students are responsible for plagiarism, intentional or not, if they copy material from books, magazines, or other sources without identifying and acknowledging those sources or if they paraphrase ideas from such sources without acknowledging them. Students responsible for, or assisting others in, either cheating or plagiarism on an assignment, quiz, or examination may receive a grade of F for the course involved and may be suspended or dismissed from the university.

- A faculty member has original jurisdiction over any instances of academic misconduct that occur in a course which the faculty member is teaching. The student shall be given the opportunity to resolve the matter in meetings with the faculty member and the department chair. If the facts of the incident are not disputed by the student, the faculty member may elect to resolve the matter at that level by levying a sanction no greater than an F for that course. The faculty member shall notify the student in writing whenever such action is taken, and the Office of Community Standards and Student Conduct shall receive a copy of the Academic Misconduct Incident Report indicating final disposition of the case, which will be placed in the student’s judicial file. In all matters where the charge of academic misconduct is disputed by the student or if the faculty member feels a sanction greater than an F in the course is appropriate (such as repeated offenses or flagrant violations), the faculty member shall refer the matter to the Office of Community Standards and Student Conduct making use of the Academic Misconduct Incident Report. Additional sanctions greater than an F in a course can be levied only through the University Judicial System. With regards to finding the student either responsible or not responsible for his or her action, the ruling of the Judicial Hearing Board shall be binding. In cases
where there is either a finding of responsibility or an admission of responsibility by the student, any recommendations by the hearing board regarding the course grade are non-binding on the instructor, who remains solely responsible for assigning a course grade, consistent with the policies set forth in the course syllabus.

- The university does not use a "cut" system. Each instructor decides whether to excuse class absences and determines how to permit make-up work.

- If a student will be absent from classes for a week or more because of an accident, illness, or other emergency, instructors will be notified of the absence only if students or their parents request it through the Division of Student Affairs. Health Services will not release information about students unless they provide a written request.

- Leaves of absence will be granted for volunteer services related to disaster relief in accordance with applicable Illinois statutes or executive orders issued by the State of Illinois in response to emergency situations. To initiate a leave of absence, students should contact their College Dean’s office, or the vice provost (or the vice provost’s delegate) for any student who has no college affiliation. Following the period of volunteer service, Registration and Records will facilitate re-enrollment of the student.

- Students are expected to comply with each individual instructor’s established attendance policy. It is recommended that students avoid registering for classes in which they would amass significant absences. In the case of an absence due to required attendance at a university-sponsored event such as a department trip, performing arts activity, ROTC function, or athletic competition, reasonable attempts shall be made by faculty members to allow the student to make up missed work. Students are responsible for completing the work assigned and/or due on the days they are absent for university-sponsored events. Both the sponsoring unit and the student should inform the faculty member as soon as possible in the semester in order for arrangements to be made for completing missed assignments, examinations or other required course work. The student is required to provide each instructor with an official notification in advance of the absence (e.g., a letter from the chair of the sponsoring department, the head of the sponsoring unit, or the coach).

- A student who believes that reasonable accommodations with respect to course work or other academic requirements may be appropriate in consideration of a disability must (1) provide the required verification of the disability to the Disabilities Resource Center, (2) meet with the Disabilities Resource Center to determine appropriate accommodations, and (3) inform the faculty in charge of the academic activity of the need for accommodation. Students are encouraged to inform the faculty of their requests for accommodations as early as possible in the semester, but must make the requests in a timely enough manner for accommodations to be appropriately considered and reviewed by the university. If contacted by the faculty member, the staff of the Disabilities Resource Center will provide advice about accommodations that may be indicated in the particular case. Students who make requests for reasonable accommodations are expected to follow the policies and procedures of the Disabilities Resource Center in this process, including but not limited to the Student Handbook.

- A wide range of services can be obtained by students with disabilities, including housing, transportation, adaptation of printed materials, and advocacy with faculty and staff. Students with disabilities who need such services or want more information should contact the Disabilities Resource Center at 815-753-1303.