

STAT:7100 Advanced Inference I (Fall 2021)

Time and Location MWF 10:30 AM-11:20 AM, 61 SH.

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Prerequisites STAT:5101 (22S:194) and STAT:5120 (22S:190), or equivalent courses.

Office Hours Tuesday and Wednesday 2:00 PM-3:00 PM on Zoom or by appointment. Students are invited to drop by on Zoom during these hours to discuss questions about the course material or concerns. I am also available by appointment if you are unable to attend these office hours.

Required Textbook Van der Vaart (1998). *Asymptotic Statistics*. Cambridge University Press.

References

- Cox D. R. and Hinkley, D. V. (1974). *Theoretical Statistics*. Chapman & Hall.
- Lehmann, E. (1983). *Theory of Point Estimation*. Springer, New York.
- Van der Vaart A. W. and Wellner, J. A. (1996). *Weak Convergence and Empirical Processes*. Springer, New York.

Exams and projects There are two in-class midterm exams (10/01/2021 and 11/12/2021) and a final project. For the final project, each student is expected to give an oral presentation based on a paper on a topic of your interest and related to the course materials in the final week of the class. The presentations will be given during the week of December 6-10, the week before the final exam week.

Homework Homework is an *essential* component of the course. It will be assigned weekly and must be turned in by the beginning of class on the day they are due. Unless prior arrangements are made, late homework will not be accepted. Since our course is on Zoom, please submit an electronic version of your homework, preferably in the form of a pdf file generated from LaTeX or an MS Word file.

Attendance Attendance at lectures and participation in discussions are expected. Failure to attend class regularly will affect your grade.

Grading Homework, 30%; midterm 1, 25%; midterm 2, 25%; final project, 20%. Grade will be determined by the weighted total score. Scale runs like the following (and I may adjust it a little): A (90-100), B (75-89), C (55-74), D (40-54). A plus-minus grading system will be used.

Course Objectives

To equip Ph.D. students in statistics, biostatistics and related fields with a solid background in mathematical statistics that will be helpful to their future work in applied and theoretical statistics.

Topics to Be Covered

1. Convergence of random vectors
 - Basic convergence concepts
 - Laws of large numbers and central limit theorems
 - Delta-method
2. Estimation Methods
 - Moment estimators
 - Maximum likelihood estimators
 - M- and Z-estimators
3. Some basic results from empirical process theory
 - Stochastic convergence in metric spaces
 - Glivenko-Cantelli and Donsker classes
 - Applications to M- and Z-estimators
4. Comparisons of estimators
 - Contiguity
 - Local asymptotic normality
 - Relative efficiency of estimators
5. Selected topics in high-dimensional statistics (if time permits)

Additional UI and CLAS Policy and Procedures

Absences and Attendance Students are responsible for attending class and for contributing to the learning environment of a course. Students are also responsible for knowing their course absence policies, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, including Holy Day obligations, military service obligations, unavoidable circumstances or University authorized activities. Students may use the CLAS absence form to aid communication with the instructor who will decide if the absence is excused or unexcused. The form is on ICON in the top banner under “Student Tools.” More information is at <https://clas.uiowa.edu/students/handbook/attendance-absences.AcademicIntegrity>

Academic Integrity All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College’s Code of Academic Honesty. Misconduct is reported to the College, resulting in suspension or other sanctions, with sanctions communicated with the student through UI email. Visit this page for information: (<https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code>).

Accommodations for Disabilities UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services (SDS). The student is then responsible for discussing specific accommodations with the instructor. More information is at <https://sds.studentlife.uiowa.edu/>.

Administrative Home of the Course The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and related policies. Other colleges may have different policies. CLAS policies may be found here: <https://clas.uiowa.edu/students/handbook>.

Class Behavioral Expectations Students are expected to comply with University policies regarding appropriate classroom behavior as outlined in the Code of Student Life. This includes the policies and procedures that all students have agreed to regarding the Steps Forward for Fall 2020 in response to the COVID-19 pandemic. Particularly, all students are required to wear a face covering when in a UI building, including a classroom. In addition, the density of seats in classrooms has been reduced; in some instances, this will allow 6 feet or more between students while other cases, it may be less. Regardless, wearing a face covering and maintaining as much distance as possible are vital to slowing the spread of COVID-19. In the event that a student disrupts the classroom environment through their failure to comply with the reasonable directive of an instructor or the University, the instructor has the authority to ask that the student immediately leave the space for the remainder of the class period. Additionally, the instructor is asked to report the incident to the Office of Student Accountability for the possibility of additional follow-up. Students who need a temporary alternative learning arrangement related to COVID-19 expectations should contact Student Disability Services arrangements/ (+1 319 335-1462) (<https://sds.studentlife.uiowa.edu/fall-2020/covid-19-temporary-learning-arrangements/>.)

Class Recordings: Privacy and Sharing Some sessions of a course could be recorded or live-streamed. Such a recording or streaming will only be available to students registered for the course. These recordings are the intellectual property of the faculty, and they may not be shared

or reproduced without the explicit written consent of the faculty member. Students may not share these sessions with those not in the class; likewise, students may not upload recordings to any other online environment. Doing so is a breach of the Code of Student Conduct and, in some cases, a violation of the Federal Education Rights and Privacy Act (FERPA).

Communication and the Required Use of UI Email Students are responsible for official correspondences sent to the UI email address (uiowa.edu) and must use this address for all communication within UI (Operations Manual, III.15.2).

Complaints Students with a complaint about an academic issue should first visit with the instructor or course supervisor and then with the Chair of the department or program offering the course; students may next bring the issue to the College of Liberal Arts and Sciences; see this page for more information: <https://clas.uiowa.edu/students/handbook/student-rights-responsibilities>.

Final Examination Policies The final exam schedule is announced around the fifth week of classes; students are responsible for knowing the date, time, and location of a final exam. Students should not make travel plans until knowing this information. No exams of any kind are allowed the week before finals with very few exceptions made (for labs, ESL and some world language courses, and off-cycle courses): <https://registrar.uiowa.edu/final-examination-scheduling-policies>.

Nondiscrimination in the Classroom The University of Iowa is committed to making the classroom a respectful and inclusive space for people of all gender, sexual, racial, religious, and other identities. Toward this goal, students are invited in MyUI to optionally share the names and pronouns they would like their instructors and advisors to use to address them. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity (<https://diversity.uiowa.edu/eod>; +1 319 335-0705 or diversity.uiowa.edu).

Sexual Harassment Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, please see <https://osmrc.uiowa.edu/>.