

This syllabus is subject to change; the final version will be made available for enrolled students at the start of the semester.

Course Information for STAT:7400 Computer Intensive Statistics

Semester: Spring 2021

Lectures: MWF 11:30PM – 12:20PM

Room: Zoom

Instructor: Luke Tierney, Schaeffer 209, luke-tierney@uiowa.edu.
Office Hours: Zoom; 10:30 – 11:20 or by appointment.
Web Page: <http://www.stat.uiowa.edu/~luke/classes/STAT7400-2021>
DEO: Kung-Sik Chan, 241 SH, 335-0712

Outline

The goal of this course is to develop skills, knowledge, and tools useful in applying modern computationally intensive statistical methods to research in any field. Topics will be selected from random variate generation, design and analysis of simulation experiments, optimization algorithms for model fitting, bootstrap, Markov chain Monte Carlo, smoothing, machine learning and data mining, parallel computing, data technologies, and graphical methods. Most topics will be presented in the context of the R statistical computing language.

Prerequisites

The prerequisites for this course are STAT:5200 or BIOS:5610 and proficiency in Fortran or C or C++ or Java. These prerequisites imply a basic familiarity with mathematical statistics and with R.

Recommended Textbooks

Geof H. Givens, Jennifer A. Hoeting (2005). *Computational Statistics*, Wiley-Interscience.

Norman Matloff (2011). *The Art of R Programming: A Tour of Statistical Software Design*, No Starch Press.

John Monahan (2011). *Numerical Methods of Statistics*, 2nd Edition, Cambridge University Press.

Reading and Homework

Homework assignments consisting of a mix of computational and theoretical problems will be given roughly every week. Some problems will cover material not addressed in class and may require additional reading. Assignments will be posted on the class web site. Suggested reading will also be posted on the class web site when appropriate, but you should also seek out and explore relevant references on your own. Assignments

will need to be submitted electronically. Many students find that these assignments take a long time to complete, so plan your time accordingly.

Class Project

Students registered for this class are expected to complete a class project. You can work on this project on your own or in a group of up to three students. Your project should represent about 20 hours of work on a topic of your choice that involves computation. You should start to think about the topic as soon as possible. You might investigate properties of a methodology you find interesting, you might compare several methods on a variety of problems, or you might analyze an interesting data set using methodology related to ideas introduced in the class. There are many possible choices for the topic of your project, and identifying a suitable topic is an important part of your task. The project should represent new work, not something you have done for another course or as part of your thesis.

A proposal for your project is due on Monday, March 22. The proposal should be at most two pages long. A final report on your project is due on Friday, May 7. The report should be three to five pages in length, excluding any appendices you wish to attach, and must be submitted electronically. Your project may be shared with the class through the class web page.

Grading

The course grade will be based on assignments and the class project. You may discuss general issues and approaches with your fellow students, but your work must be your own. If you use any references, including solutions to similar problems prepared by other students, you *must* cite and credit your sources.

Email and World Wide Web

Announcements on changes or clarifications of assignments or other matters may be sent by email to your university email account or posted on the class web page. You should check the class home page and your email regularly.

College of Liberal Arts and Sciences: Policies 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 course absence policies, which vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, including Holy Day obligations, unavoidable circumstances, and University authorized activities (<https://clas.uiowa.edu/students/handbook/attendance-absences>). 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 located on ICON within the top

banner under “Student Tools.”

Academic Integrity

All undergraduates enrolled in courses offered by CLAS have in essence agreed to the College’s Code of Academic Honesty. Academic misconduct affects a student’s related grade and is reported to the College which applies an additional sanction including suspension. Outcomes about misconduct are communicated through UI email (<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 a mental health, attention, learning, vision, and a 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 UI colleges may have different policies for courses offered by that college. CLAS policies may be found here: <https://clas.uiowa.edu/students/handbook>.

Classroom Expectations

Students are expected to comply with University policies regarding appropriate classroom behavior as outlined in the Code of Student Life (<https://dos.uiowa.edu/policies/code-of-student-life/>). This includes related UI policies and procedures that all students have agreed to regarding the COVID-19 pandemic. Particularly, each student must wear a face mask when in a UI building, including a classroom. The density of seats in classrooms has been reduced, and in some instances, this will allow 6 feet or more of distance while other cases, it may be less. Regardless, wearing a face mask and maintaining as much distance as is possible are vital to slowing the spread of COVID-19. In the event that a student disrupts the classroom environment through the failure to comply with a reasonable directive of an instructor or of the University, the instructor has the authority to ask that the student to leave the space immediately for the remainder of the class period. Additionally, the instructor is asked to report the incident to the UI Office of Student Accountability, with the possibility of additional follow-up with the student. Students who need temporary alternative learning arrangements (TALA) for a future semester related to

COVID-19 should visit this website for more information: <https://coronavirus.uiowa.edu/temporary-alternative-learning-arrangements-tala>.

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 who are not enrolled in the course; 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 is 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 or with 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 place 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 a few exceptions made for particular types of courses such as labs or 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/>.