

# STAT:7520 (22S:238): BAYESIAN ANALYSIS

Spring 2018

## **TIME AND LOCATION:**

M/W/F 10:30–11:20 AM in 3 SH

## **PREREQUISITES:**

22S:164 (STAT:5200), 22S:166 (STAT:5400), and 22S:194 (STAT:5101).

## **INSTRUCTOR:**

Joyee Ghosh, Dept. of Statistics and Actuarial Science  
Office: 372 SH; Phone: 335-0816; E-mail: joyee-ghosh@uiowa.edu

## **OFFICE HOURS:**

M/W/F 11:30 AM–12:30 PM, or by appointment.

## **DEO:**

Professor Joseph B. Lang; Office: 241 Schaeffer Hall; Phone: 335-0712;  
Email: joseph-lang@uiowa.edu

## **TEXTBOOK:**

Required: Bayesian Data Analysis, Andrew Gelman, John B. Carlin, Hal S. Stern, David B. Dunson, Aki Vehtari and Donald B. Rubin, Chapman & Hall/CRC Text in Statistical Science, 3rd ed.

## **ICON:**

ICON will be used for posting grades, assignments etc. All students registered for the course should have access.

## **COURSE INFORMATION:**

### **Goals**

We aim to give a relatively comprehensive treatment of the statistical analysis of data from a Bayesian perspective. Different models will be considered, including linear regression models, hierarchical models, and generalized linear models. Issues of model formulation, computation, model checking, and sensitivity analysis will be considered, and illustrated with real statistical analyses.

### **Description**

We will try to cover chapters 1-6, 9-11, 14, and 16 of the textbook, not necessarily in this order. We may also cover other topics as time permits.

## **COMPUTING:**

We will mainly use the statistical language R for this course, which can be downloaded from <http://cran.us.r-project.org/>.

## **GRADING:**

A plus-minus grading system will be used. As a rough guide A,A-: 88%–100%, B+,B,B-: 70%–88%, C+,C,C-: 50-70%. I may lower the cut-offs depending on the difficulty of the exams.

- Homework assignments (20%)
- Presentation (10%)
- Midterm exam (35%)
- Final exam (35%)

### **Homework assignments**

I plan to give homework assignments every 2-3 weeks covering theory and/or applied problems. You can discuss homework assignments with me or other students, but the final write-up should be from your own understanding.

### **Presentation**

I will post a few papers later in the semester. Your task would be to read a paper and present it to your classmates using pdf/powerpoint slides. You will work in groups (size  $\approx 2$ ), and I will ask each group to rank the papers according to preference to decide which paper gets assigned to whom. If a particular paper is selected by multiple groups, I will randomly assign it to one of them, so there will be a bit of randomness. I will select the papers according to the mathematical and computational level of this class, so hopefully none of them would be difficult to present.

The main goal would be to demonstrate that you can independently read a paper in a mainstream journal in statistics (JASA, Annals of Applied Statistics, The American Statistician etc.), and that you can summarize and present the key concepts to an audience who may not be familiar

with that particular area in Bayesian statistics. I expect you to focus on the big picture than spending all your time trying to understand every minute detail (if you do understand all details that's terrific). Some points that you want to think about for your presentation are: why is this an important topic/contribution, what are the challenges in the problem the authors are trying to address, what is the novelty in the paper, what are possible applications of the methods, what are some of the limitations, etc.

The presentations will most likely be in the week of April 23 or around that week. I will create a dropbox on ICON to submit your slides before the presentation. I will post more details about how much time each student/group will get when we are closer to the date.

## **Exams**

There will be a **closed** book 50 minutes midterm exam in class, tentatively on Friday, March 9, 2018. You may bring a 8.5" × 11" hand-written formula sheet (\*use one side only\*).

There will be a **closed** book two hours comprehensive final exam (date to be announced later). You may bring a 8.5" × 11" hand-written formula sheet (\*you may use both sides\*).

If an exam is missed, a make-up exam will be permitted only if the circumstances of missing the exam satisfy university policy (documentation will be required in such a case).

## **LATE WORK AND ABSENCES:**

Barring illness and family emergencies, credit will not be given for late work. If you have to miss a class, please read the material covered on that day before coming to the next class. This will help you get the most out of lectures. Please talk with me and make arrangements ahead of time, if you need to miss a class due to mandatory religious obligations.

## **CLASSROOM ENVIRONMENT:**

Activities which are unacceptable are (1) prolonged conversation with a fellow student, (2) the use of cell phones, and (3) the use of laptops/tablets etc. in class. **Please remember to switch your phones to silent mode before class starts and put away laptops/tablets/phones etc. when in class.**

## College of Liberal Arts and Sciences: Policies and Procedures

### **Administrative Home**

The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at <http://clas.uiowa.edu/students/handbook>.

### **Electronic Communication**

University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences. (Operations Manual, III.15.2. Scroll down to k.11.)

### **Accommodations for Disabilities**

The University of Iowa is committed to providing an educational experience that is accessible to all students. A student may request academic accommodations for a disability (which includes but is not limited to mental health, attention, learning, vision, and physical or health-related conditions). A student seeking academic accommodations should first register with Student Disability Services and then meet with the course instructor privately in the instructor's office to make particular arrangements. Reasonable accommodations are established through an interactive process between the student, instructor, and SDS. See <http://sds.studentlife.uiowa.edu/> for information.

### **Nondiscrimination in the Classroom**

The University of Iowa is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. 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, [diversity@uiowa.edu](mailto:diversity@uiowa.edu), or visit [diversity.uiowa.edu](http://diversity.uiowa.edu).

### **Academic Honesty**

All CLAS students or students taking classes offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty: "I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (see CLAS Academic Policies Handbook).

## **CLAS Final Examination Policies**

The final examination schedule for each class is announced by the Registrar generally by the fifth week of classes. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar's web site and will be shared with instructors and students. It is the student's responsibility to know the date, time, and place of a final exam.

## **Making a Suggestion or a Complaint**

Students with a suggestion or complaint should first visit the instructor (and the course supervisor), and then the departmental DEO. Complaints must be made within six months of the incident. See the CLAS Student Academic Handbook.

## **Understanding 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 have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Office of the Sexual Misconduct Response Coordinator for assistance, definitions, and the full University policy.

## **Reacting Safely to Severe Weather**

In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Public Safety website.