

Statistics 3303: Bayesian Analysis and Statistical Decision Making Spring 2020 Course Syllabus

Lectures: 10:20am - 11:15am on Mondays, Wednesdays, Fridays in Caldwell Lab Room 120.

Instructor: Dr. Chkrebtti

Graduate Teaching Assistant: Renxiong Liu

Office Hours:

- Instructor: Wednesdays 1-2pm and Fridays 4-5pm, 429 Cockins Hall (CH). Individual appointments outside of office hours must be requested via email and will not be guaranteed on short notice. *An appointment request should include a list of the student's available meeting times for the next three to five business days.*
- Graduate Teaching Assistant: Wednesdays 9:10-11:20 am, Data Analytics Learning Center (DALC, Pomerene Hall, Room 151). The GTA for another section of this course will be available Wednesdays 1:50-4 pm and Thursdays 12:40-2:50 pm in DALC.

Email: *Begin subject with "STAT 3303".* In order to protect your privacy, all course email correspondence must be conducted using your valid OSU name.# email account: any email from a non-OSU account will not be answered. I will attempt to answer emails within 48 hours, however, due to the large volume of emails this may not always be possible. Also please consider whether your question would be best answered in person during office hours. If your email question may be helpful to other students, I will post the answer on Carmen.

- Instructor: chkrebtti.1@osu.edu (please do not use Carmen email tool to contact me)
- Graduate Teaching Assistant: liu.6732@osu.edu

Course Description and Learning Outcomes: This course is an introduction to Bayesian analysis and statistical decision theory, the theory of making decisions in the presence of uncertainty. Topics covered include the formulation of decision problems and the quantification of their components, optimal decisions, Bayesian modeling, simulation-based approaches to obtaining Bayesian inferences (including MCMC algorithms), and hierarchical modeling.

Upon successful completion of the course, students will be able to

1. Formulate the inputs to a decision problem including potential actions, losses and gains, and quantification of uncertainty.

2. Develop Bayesian statistical models to quantify uncertainty and obtain inferences on unknown model parameters.
3. Use posterior distributions to obtain optimal decisions based on available information.
4. Assess the impacts of departures from model assumptions on inferences and decisions.
5. Explain Bayesian statistical analyses to others, such as managers and other decision makers.

Prerequisites: C- or better in STAT 3202 and 3301, or permission of instructor.

Advising: For questions related to prerequisites and course suggestions, please contact the Statistics undergraduate advisor Jim Kilburg (614-292-6961, kilburg.3@osu.edu), or the Data Analytics academic planning specialist Brooke O’Leary (oleary.158@osu.edu).

Textbook: The required textbook for this course is:

- *Doing Bayesian Data Analysis: A Tutorial with R, JAGS, and Stan*, 2nd Edition, by John K. Kruschke, ISBN: 978-0-12-405888-0. **The OSU library has an e-book version of text available.**

Course Website: Important announcements, course materials, homework problems, computing references, and other information about the class are posted on Carmen (carmen.osu.edu, login with your web ID).

Course Requirements: Students will be required to use the R software environment for statistical computing and graphics. R can be downloaded for free at <http://cran.r-project.org>. Prior experience with R is expected. Students needing a review of programming using R should read Chapter 3 of the textbook carefully and consult the instructor for additional resources, if necessary. We will also be using the Just Another Gibbs Sampler (JAGS) software, accessed through an interface with R. No prior experience with JAGS is expected. Many students prefer to use RStudio, an IDE designed for use with R. RStudio is available for free at <http://www.rstudio.com>.

Students are responsible for all material covered in class, in the assigned readings and in homework problems. As an introductory course, the quantity of material covered in the lectures is extensive. *It is highly recommended that you do not fall behind.*

Class meetings will consist of a mix of lectures, in-class exercises, and informal discussions. Students are expected to attend all class meetings and actively participate in discussions. Regular attendance and class participation are expected and will be used, in part, to determine the small participation component of the final grade. Please let the instructor know via email if you will miss any lectures. If there are circumstance that may affect your ability to attend class regularly, please let the instructor know as early as possible.

Assignments: Homework will be assigned approximately every two weeks and will be graded. Students are expected to turn in hard copies of homework assignments at the beginning of class on the day the assignment is due. Submitted homework may be typed or handwritten, or some combination of the two. Figures and tables should be clearly referenced. All R/JAGS code should

be submitted as an appendix or you may use R Markdown to prepare your assignment. The lowest homework grade will be dropped.

Students may discuss homework assignments with other students enrolled in STAT 3303 this semester. However, you may not directly copy another student's work, including computer code and output. **Use of written solutions to homework questions that are prepared by someone else is prohibited.**

Students must show all work for all homework problems; do NOT just write the final answer. Late submissions will NOT be accepted. Academic misconduct of any sort will NOT be tolerated. Please review OSU's policies at <http://studentlife.osu.edu/csc/>.

Midterm Exams: There will be two in-class midterms that cover material from lectures, the assigned readings and homework. The second exam will be cumulative, but will emphasize the material covered after the first midterm exam. A basic calculator will be necessary for all exams (devices that can communicate with the outside world are not allowed). Cellphones must be silenced during class and are not allowed to be on the desk or otherwise accessible during exams. No make-up exams will be given.

Final Exam Project: Students will have a take-home individual final exam project rather than an in-class final exam. The individual final exam project will be assigned several weeks prior to the end of the semester and will be due by 5:00PM on TBA.

Attendance: Regular attendance and class participation is required. Please let the instructor know via email if you plan to miss several lectures. Though attendance will not be taken daily, please remember that I fully am aware of which students consistently miss class.

Grading: In order to obtain full credit on homework and exam problems you need to show a justification or full work. Answers without supporting work will not receive full credit. The following is a breakdown of the final course grade:

Homework*: 25%
Exam 1: 20%
Exam 2: 20%
Final Exam: 30%
Participation: 5%

*The lowest homework grade will be dropped at the end of the semester. The following rubric will be used to compute the final letter grade: A: 93 – 100, A-: 90 – 92.9, B+: 87– 89.9, B: 83 – 86.9, B-: 80-82.9, C+: 77-79.9, C: 73 – 76.9, C-: 70–72.9, D+: 67 – 69.9, D: 60–66.9, E: below 60. The instructor reserves the right to make appropriate changes to the above scale if necessary. However, as usual there are no exceptions nor arbitrary grade adjustments for individual students, nor grade guarantees of any kind, for any reason.

Extra Help: Graduate teaching assistants (GTAs) for Stat 3201, 3202, 3301, 3302, 3303 and 4620 will hold their office hours in the Data Analytics Learning Center (DALC) in Pomerene 151. The hours during which the GTA/grader for our course will hold office hours in PO 151 can be found at the top of the syllabus. You can meet with the GTA for our course in the DALC during his or

her office hours to discuss questions you have about the course material, homework assignments, R, etc. You are welcome to stop by the DALC when it is open even if it is not currently being staffed by the GTA for our course, e.g. if you are looking for a place to study or work on an assignment for one of the supported courses. If the DALC is staffed by a GTA for another Statistics course when you stop by, he or she will help you if possible, but may not be able to answer all of your questions. A complete list of hours during which the DALC will be staffed by GTAs for Statistics Department courses can be found at <https://data-analytics.osu.edu/dalc>. In rare situations due to last minute emergencies, the GTA assigned to the DALC may not be able to attend his or her office hours. If the DALC is closed when the schedule indicates it should be open, we recommend waiting for a few minutes. If no one shows up in a reasonable amount of time, please email your instructor to let us know about the problem. You can also contact your GTA to see about arranging a make-up time to meet.

Special circumstances: Special circumstances, such as adverse life events, health issues, or emergencies, can affect anyone. Please know that I am committed to accommodating reasonable requests for these reasons. Your success in this class is very important to me. So, if you experience a situation which may affect your progress through the class, please **email me as soon as possible** so that we may make arrangements. Note that any such accommodations will not be designed to provide an unfair advantage to anyone, and may require proof consistent with departmental policy.

Academic Misconduct: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Disability Services: The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Mental Health Statement: As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student’s ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life’s Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of

the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.