

Syllabus

Bayesian Statistics - STAT 438 (Spring 2021)

I Course Information

Course Details:

- Course Number: STAT 438
- Course Title: Bayesian Statistics
- Section: 500
- Time: Monday / Wednesday: 4:15 – 5:30 pm
- Location: **Online via zoom**
- Credit Hours: 3

Instructor Details:

- Instructor: Dr. Debdeep Pati
- Office: Blocker 401 C **Not available in Spring 2021 in the office**
- Phone: (979) 845-3141
- E-Mail: debdeep@stat.tamu.edu (*When you send me an e-mail, use subject-line “[STAT438]”*)
- Office Hours: Monday / Wednesday: 3:00 – 4:00 pm (*If you are unable to meet at these times, then schedule an appointment with the instructor for an alternative time.*) **Online via zoom**

Teaching Assistant Details:

- Se Yoon Lee
- Office: Blocker 422
- Phone: (979) 845-3141
- E-Mail: seyoonee@stat.tamu.edu (*When you send him an e-mail, use subject-line “[STAT438]”*)
- Responsibility: Homework grading and holding office hours. Any grading related questions should be directed to him.
- Office Hours: Tuesday / Thursday: 8 a.m to 9 a.m. (*If you are unable to meet at these times, then schedule an appointment with Se Yoon for an alternative time.*) **Online via zoom**

Course description: Bayes rule; conjugate priors; Bayesian hypothesis testing; MCMC in non-conjugate models, Hierarchical Bayesian models; Bayesian generalized linear models; Data analysis using R.

Course Prerequisites: MATH 221; STAT 408 or equivalent.

Course Learning Outcomes: This course will cover introductory topics in Bayesian inference. Some homeworks will involve writing programs in R (using JAGS and STAN) for data-analysis.

Textbooks (Recommended): The material taught in the class will be based on

- *Doing Bayesian Data Analysis: A Tutorial with R, JAGS and STAN* by John Kruschke.
- *Statistical Rethinking: A Bayesian Course with Examples in R and STAN* by Richard McElreath

Course Webpage:

- **Class website:** http://stat.tamu.edu/~debdeep/438_s21.html (will be available by January 19, 2020).
- The class web site will have important information about the course.
- **Ecampus:** To access the blackboard site go to <http://ecampus.tamu.edu> and login using your NetID and password. Homework / exam submission will be made through ecampus and grades will be posted there. All remaining information will be posted on the course webpage.

Grading policies: Your grade will be based on attendance and class participation (5%), homeworks (15%), 2 mid-terms (25% each) and final (30%). The grade cutoffs are 90.0% for the lowest A, 80.0% for the lowest B, and 70.0% for the lowest C. However, these grade cutoffs may be adjusted downward at my discretion. Note that all the exams will be open book and open notes.

Exam dates:

- Midterm 1: March 3 (Wed), online through ecampus during class hours.
- Midterm 2: April 7 (Wed), online through ecampus during class hours.
- Final exam: May 6 (Thurs 5 p.m. - 7:30 p.m.), online through Ecampus.

Late Work Policy: Late homeworks/exams are not accepted.

Course topics & calendar of activities (subject to change): Tentatively, we will cover following topics.

- Introduction and a review of probability and statistics ([Weeks 1-2](#))
- Bayes Rule; parameters, prior, posterior ([Week 2](#))
- Conjugate priors: examples ([Week 3](#))
- Using R for Bayes ([Week 4](#))
- Non-conjugate priors and introduction to MCMC ([Week 5](#))
- Bayesian hypothesis testing ([Week 6](#))
- Bayesian model selection ([Week 7](#))
- Using JAGS in R for MCMC & Examples ([Week 8](#))
- Bayesian hierarchical models ([Week 9](#))
- Bayesian hierarchical models ([Week 10](#))
- Generalized linear models ([Week 11](#))
- Generalized linear models ([Week 12](#))
- Using STAN in R for MCMC & Examples ([Week 13](#))
- More examples ([Week 14](#))
- Review ([Week 14](#))

Software: We will primarily use R and MATLAB for data analysis. Refer to <http://cran.r-project.org/doc/manuals/R-intro.pdf> for an R introduction. You are free to use whichever software you prefer.

Homework give out dates:

- Homework 0: End of first week.
- Homework 1: End of third week.
- Homework 2: End of fifth week.

- Homework 3: End of ninth week.
- Homework 4: End of eleventh week.

Other important dates:

- First date of classes: January 20
- Last day for adding/dropping courses for the fall semester. Jan 25, 5 p.m.
- Last day for all students to drop courses with no penalty (Q-drop). April 15, 5 p.m.
- Last date of classes: April 26.

Attendance: You will get the 5% points for attendance and class participation if you do not miss more than four classes and actively participate in the discussion. Please note that if you miss more, except in very special cases, you will get 0% on attendance. You are strongly encouraged to attend all classes. Regarding the university attendance policy, refer to [Student Rule 7](#).

II University Policies

Attendance policy: The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments. Please refer to [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy: Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student’s grade, for the reasons stated in [Student Rule 7](#), or other reason deemed appropriate by the instructor. Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor ([Student Rule 7, Section 7.4.1](#)).

“The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence” ([Student Rule 7, Section 7.4.2](#)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](#)).

Academic Integrity Statement and Policy:

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case. ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

Americans with Disabilities Act (ADA) Policy: Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Title IX and Statement on Limits to Confidentiality: Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention - including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need. Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services \(CAPS\)](#). Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

Statement on Mental Health and Wellness: Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

COVID-19 Temporary Amendment to Minimum Syllabus Requirements: The Faculty Senate temporarily added the following statements to the minimum syllabus requirements in Fall 2020 and Spring 2021 as part of the university's COVID-19 response.

Campus Safety Measures: To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, Texas A&M University has adopted policies and practices for the Fall 2020 and Spring 2021 academic term to limit virus transmission. Students must observe the following practices while participating in face-to-face courses and course-related activities (office hours, help sessions, transitioning to and between classes, study spaces, academic services, etc.):

- Self-monitoring: Students should follow CDC recommendations for self-monitoring. Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely and should not participate in face-to-face instruction.
- Face Coverings: [Face coverings](#) (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Description of face coverings and additional guidance are provided in the [Face Covering policy](#) and [Frequently Asked Questions \(FAQ\)](#) available on the [Provost website](#).
- Physical Distancing: Physical distancing must be maintained between students, instructors, and others in course and course-related activities.
- Classroom Ingress/Egress: Students must follow marked pathways for entering and exiting classrooms and other teaching spaces. Leave classrooms promptly after course activities have concluded. Do not congregate in hallways and maintain 6-foot physical distancing when waiting to enter classrooms and other instructional spaces.
- To attend a face-to-face class, students must wear a face covering (or a face shield if they have an exemption letter). If a student refuses to wear a face covering, the instructor should ask the student to leave and join the class remotely. If the student does not leave the class, the faculty member should report that student to the [Student Conduct office](#) for sanctions. Additionally, the faculty member may choose to teach that day's class remotely for all students.

Personal Illness and Quarantine: Students required to quarantine must participate in courses and course-related activities remotely and must not attend face-to-face course activities. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities.

Students experiencing personal injury or illness that is too severe for the student to attend class qualify for an excused absence (See [Student Rule 7, Section 7.2.2.](#)) To receive an excused absence, students must comply with the documentation and notification guidelines outlined in [Student Rule 7](#). While [Student Rule 7, Section 7.3.2.1](#), indicates a medical confirmation note from the student's medical provider is preferred, for Fall 2020 only, students may use the Explanatory Statement for Absence from Class form in lieu of a medical confirmation. Students must submit the Explanatory Statement for Absence from Class within two business days after the last date of absence.

Operational Details for Fall 2020 and Spring 2021 Courses: For additional information, please review the [FAQ](#) on Fall 2020 courses at Texas A&M University. For changes during Spring 2021, read [updates](#).

III College and Department Policies

College and departmental units may establish their own policies and minimum syllabus requirements. As long as these policies and requirements do not contradict the university level requirements, colleges and departments can add them in this section.