

STAT417

Statistical Theory (3 credits)

Dr. Qifan Song, MATH 208
qfsong@purdue.edu, 765-494-4058

Lectures Time:

MWF 12:30 am - 01:20 pm (CRN 42902 - STAT 41700 - 002)

Classroom: University Hall 217

Office hours: W 2:00-3:00 pm virtually via Webex meeting <https://purdue.webex.com/meet/qfsong>) or by appointment.

Grader: (All inquiries about homework/exam grading should be sent directly to Dr. Song, the grader will not directly response to students' requests)

Mr. Raghav Sharma (sharm635@purdue.edu)

Course Description and Learning Outcomes:

This course is an introduction to the mathematical theory of statistical inference, emphasizing inferences for standard parametric families of distributions. The covered topics in this course include: Properties of estimators; Bayes and maximum likelihood estimation; Sufficient statistics; Properties of test of hypotheses; Distribution theory for common statistics based on normal distributions. After this course, students shall gain principle understandings for mathematical statistics and are able to perform proper statistical inferences for basic parametric models.

Prerequisites:

STAT 416 or an equivalent course.

Texts/references:

Probability and Statistics: The Science of Uncertainty (Second Edition) by Michael J. Evans, and Jeffrey S. Rosenthal. You can find the full text of this book online at <http://www.utstat.toronto.edu/mikevans/jeffrosenthal/book.pdf>. Errata for the text book is available at <http://www.utstat.utoronto.ca/mikevans/mathstat2/book.html>.

Course website:

All teaching materials, announcements, homework will be posted on Brightspace website <http://purdue.brightspace.com>.

Accommodation for Covid-19:

The instructor strictly follow the university's Covid Protocols. Under current protocols (<https://protect.purdue.edu/updates/protect-purdue-updates-for-the-spring-2023-semester/>),

face masks are optional indoors on the West Lafayette campus. If you test positive, you should execute your personal isolation plan and stay away from others as much as possible. For precaution purpose, my office hours will be hold virtually via Webex service (<https://purdue.webex.com/meet/qfsong>), and all homework shall be submitted through Brightspace electronically. Upon requests (from students in isolation or quarantine due to COVID-19), in-class videos can be captured by Boilercast system and shared with those students. Note that the hardware and software of Boilercast system are operated and maintained by ITAP and the instructor doesn't have full responsibility for the video quality and availability. Subject to the university protocols and the instructor's health condition, these policies may change upon unversity's approval). Further announcement will be given if necessary.

Grading Rule:

Assignments (all assignments have equal weight): 30%; Midterm Exam: 35%; Final Exam: 35%. The percentage grades needed to achieve an A, B, C, or F will follow approximately the following scale: $90 - 100 = A$, $80 - 89 = B$, $70 - 79 = C$, $60 - 69 = D$, below 60 is F. The instructor reserves the right to change the rule of letter grade assignment and assign "+" or "-" letter grades.

Examinations:

Midterm Exam: Thu 03/02, 2023, 6:30p - 7:30p, LILY 3118

Final Exam: To be announced by Office of Registrar

Under current protocols, the exams are all in-person. The allowed exceptions are:

- Students who are under COVID isolation can attend the exam virtually during the SAME exam time. Further instruction on exam delivery and submission will be posted later. Those students must send request to Dr. Song before the exam date and provide proof that s/he is and will still be under quarantine/isolation on the exam date.
- Students who registered with DRC can take the exam at DRC facility. Those students must contact Dr. Song asap to discuss the exam time and submit a DRC test request at <https://www.purdue.edu/drc/testing/requesting-an-exam.php>, at least one week prior to the exam date.
- Students who have schedule conflict may take the exam at a different time upon Dr. Song's approval. Acceptable excuses include Grief, Military, Jury Duty Absences and etc. Those students must contact Dr. Song asap, and provide necessary proof.
- Students who have medical conditions, e.g., is hospitalized due to COVID-19 or have a medical emergency on the exam date, may take the exam at a different time upon Dr.

Song's approval. Those students must contact Dr. Song asap with proper doctor's note.

Students, who are eligible for the above exceptions, but fail to contact Dr. Song properly and don't attend the in-person exam, will be considered absent from the exam and receive 0 pt for the midterm.

Attendance, Homework, Exam policy:

- Class attendance is an important part of your success in the class. The syllabus, homework assignments, exam dates, etc. may be changed by in-class announcements. The posted teaching videos are meant to help the students who are quarantined due to COVID-19, but not to encourage absence from classroom. Low attendance without proper excuses may cause penalty to the final grade.
- The homework will be assigned approximately one week before its due date and will also be posted on the class website. The homework must be finished (written) independently. Discussion is okay, but identical copies are not acceptable since your homework must reflect YOUR understanding of the material. If identical solutions are found, all the parties involved will receive a 0 on that assignment. Homework shall be submitted directly on the course website.
- No late assignments will be graded. To allow for illness, family emergencies, etc., the lowest homework score will be dropped at the end of the fall semester.
- A makeup examination will be only given to the students who could provide satisfactory evidence that the absences are due to some causes beyond their control (e.g., Grief, Military, and Jury Duty Absences). Contact me as soon as possible if you are unable to take an exam at the scheduled time. It is STUDENT'S responsibility to contact me IN ADVANCE to check if a make-up is possible. I will not accept the request of make-up exam AFTER the exam time with non-emergency excuses.

ADA, Plagiarism, Academic Integrity and Nondiscrimination Statement:

- STATEMENT ON DISABILITIES: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation for their disabilities.

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome

to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center (DRC) at: drc@purdue.edu or by phone: 765-494-124. If you have registered with DRC and have an Accommodation Letter from DRC, or you are in need of academic accommodations, please contact me as soon as possible.

- **STATEMENT ON PLAGIARISM:** The handouts used in this course are copyrighted. By "handouts," I mean all materials generated for this class, which include but are not limited to syllabi, quizzes, exams, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission. As commonly defined, plagiarism consists of passing off as one's own ideas, words, writing, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated.

- **ACADEMIC INTEGRITY STATEMENT:**

Academic integrity is one of the highest values that Purdue University holds. Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, University Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972].

Individuals are encouraged to alert university officials to potential breaches of this value by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

The Purdue Honor Pledge "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue".

Any confirmed academic misconduct activity in this course leads to punitive grading.

- **NONDISCRIMINATION STATEMENT:** Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.
- **VIOLENT BEHAVIOR POLICY:** Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activities.
- **EMERGENCY PREPARATION:** In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

Guidelines regarding ensuring access to emergency information:

- Keep your cell phone on to receive a Purdue ALERT text message
- Log into a Purdue computer connected to the network to receive any Desktop Popup Alerts
- If you have a “no cell phone” in class policy allow one or two students who have signed up for Purdue ALERT to keep their phones on to receive any alerts

Course Schedule (subject to change):

Day	Date	Topics
Mon.	Jan. 9	Review of Probability Theory (STAT 416)
Wed.	Jan. 11	Review of Probability Theory (STAT 416)
Fri.	Jan. 13	Review of Probability Theory (STAT 416)
Mon.	Jan. 16	NO CLASSES - MARTIN LUTHER KING JR.

Day	Date	Topics
Wed.	Jan. 18	Review of Probability Theory (STAT 416)
Fri.	Jan. 20	Review of Probability Theory (STAT 416)
Mon.	Jan. 23	Chapter 5 of the textbook
Wed.	Jan. 25	Chapter 5 of the textbook
Fri.	Jan. 27	Chapter 6.1 of the textbook
Mon.	Jan. 30	Chapter 6.1 of the textbook
Wed.	Feb. 1	Chapter 6.1 of the textbook
Fri.	Feb. 3	Chapter 6.2 of the textbook
Mon.	Feb. 6	Chapter 6.2 of the textbook
Wed.	Feb. 8	Chapter 6.3.1 of the textbook
Fri.	Feb. 10	Chapter 6.3.1 of the textbook
Mon.	Feb. 13	Chapter 6.3.2 of the textbook
Wed.	Feb. 15	Chapter 6.3.2 of the textbook
Fri.	Feb. 17	Chapter 6.3.2 of the textbook
Mon.	Feb. 20	Chapter 6.3.3 of the textbook
Wed.	Feb. 22	Chapter 6.3.3 of the textbook
Fri.	Feb. 24	Chapter 6.3.4 of the textbook
Mon.	Feb. 27	Midterm Review
Wed.	Mar. 1	Class canceled (for midterm exam)
Fri.	Mar. 3	Chapter 6.3.5 of the textbook
Mon.	Mar. 6	Chapter 6.3.5 of the textbook
Wed.	Mar. 8	Chapter 6.3.6, 6.4.1 of the textbook
Fri.	Mar. 10	Chapter 6.4.2 of the textbook
Mon.	Mar. 13	NO CLASSES - SPRING BREAK
Wed.	Mar. 15	NO CLASSES - SPRING BREAK
Fri.	Mar. 17	NO CLASSES - SPRING BREAK
Mon.	Mar. 20	Chapter 6.4.2 of the textbook
Wed.	Mar. 22	Chapter 6.4.3 of the textbook
Fri.	Mar. 24	Chapter 7.1 of the textbook
Mon.	Mar. 27	Chapter 7.1 of the textbook
Wed.	Mar. 29	Chapter 7.1 of the textbook
Fri.	Mar. 31	Chapter 7.2.1 of the textbook
Mon.	Apr. 3	Chapter 7.2.2-7.2.3 of the textbook
Wed.	Apr. 5	Chapter 7.2.3 of the textbook
Fri.	Apr. 7	Chapter 7.2.3-7.2.4 of the textbook
Mon.	Apr. 10	Chapter 7.2.4 of the textbook

Day	Date	Topics
Wed.	Apr. 12	Chapter 7.4 of the textbook
Fri.	Apr. 14	Chapter 9.1 of the textbook
Mon.	Apr. 17	Chapter 9.1 of the textbook
Wed.	Apr. 19	Chapter 9.1 of the textbook
Fri.	Apr. 21	Chapter 9.1 of the textbook
Mon.	Apr. 24	Chapter 9.2 of the textbook
Wed.	Apr. 26	Review
Fri.	Apr. 28	Review