MATH 4650.001 Statistics

Spring 2026 Syllabus

Instructor: Professor Kai-Sheng Song

Office: GAB 440G

Office Hours: TR: 1:00 pm–1:50 pm and 5:00 pm–6:00 pm. Students unable to see me during these times may request an appointment.

Email: kai-sheng.song@unt.edu.

Communication Expectations: Please use the above email address for all communications. Students can expect to receive my response to emails as soon as possible within 48 hours.

Course Description:
This course is intended to introduce students to some topics of mathematical statistics and data analysis. They include various parameter estimation methods such as method of moments, method of maximum likelihood, and Bayesian method; Neyman-Pearson theory; generalized likelihood ratio tests; two-sample /paired sample inferences; analysis of variance and method of least squares. Real data analysis and examples are also included in this course as well as computer simulations and graphical displays such as quantile-quantile plots to illustrate the important role played by computers in statistics.

Course Prerequisites: Math 3680 and Math 4610

Course Objectives: By the end of this course, students will be able to:

- have a good understanding of the basic concepts and methods of parameter estimation and statistical inference
- master method of moments, method of maximum likelihood, and Bayesian method
- understand some basic asymptotic theory of the maximum likelihood estimator
- apply various parameter estimation methods and techniques to solve some nontrivial problems
- compute bias, standard error, and mean squared error of commonly used estimators

- conduct generalized likelihood ratio tests
- analyze categorical data
- perform analysis of variance and linear least squares regression

Required Text: Most of my lectures and HW assignments are based on the following textbook:

> *Mathematical Statistics and Data Analysis* by John A. Rice, 3rd Edition.

Data Analysis Software: R
Lecture Time: TR: 2:00 p.m.-3:20 p.m.

Classroom: GAB 111H

Grading Policies:

The final course grade will be based on regular homework, tests, and a final exam/project. The weights are as follows:

Homework	20%
Test 1 (tentatively scheduled on February 17)	25%
Test 2 (tentatively scheduled on March 31)	25%
Final Exam/Project (Monday, May 4, 2026 at 3:00 p.m.)	30%

The grade cut-off points based on the weighted average (WA) are: A : $WA \geq 90$; B: $80 \leq$ WA < 90; C: $70 \leq$ WA < 80; D: $60 \leq$ WA < 70; F: WA < 60.

Homework Policies: Homework will be assigned regularly. Homework assignments, their due dates, and solutions are posted on UNT Canvas in a PDF format. Some problems may be included in the assignments to introduce complements and extensions to the material covered in lectures. **You are required to submit your homework solutions in a PDF format online via UNT Canvas on the due date before the deadline specified in Canvas**. Late homework assignments will **NOT** be accepted (two of your lowest homework scores will be dropped). **Please plan accordingly!**

Attendance, Tests and Exam Policies:

- Students are expected to attend class meetings regularly. It is important that you communicate with the professor prior to being absent. Please inform the professor if

you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

- All tests and exams are closed-book, closed-notes. However, you are allowed to have one page of notes and formulae for each test/exam.

  Make-up for missed tests will be allowed ONLY if I am notified of the University-excused/authorized absence (see UNT Policy 06.039) **BEFORE** the test. Such students must provide official written verification/documentation of such a University-authorized absence within 48 hours of the missed test. Students missing a test for unauthorized reasons will receive 0 (zero) points on the test.

- Calculators will be needed for tests/exams.

Course Schedule:

Topic	Lecture	Week
Chapter 8: Parameter Estimation	1	Jan 13-Jan 15
Method of Moments	2	
Chapter 8: Parameter Estimation	3	Jan 20-Jan 22
Method of maximum likelihood	4	
Chapter 8: Parameter Estimation	5	Jan 27-Jan 29
Method of maximum likelihood	6	
Chapter 8: Parameter Estimation (MLE)	7	Feb 3-Feb 5
Chapter 8: Bayesian Method	8	
Chapter 8: Parameter Estimation	9	Feb 10-Feb 12
Bayesian Method	10	
Test 1	11	
Chapter 9: Hypothesis Testing and Goodness of Fit	12	Feb 17-Feb 19
Chapter 9: Hypothesis Testing and Goodness of Fit	13	Feb 24- Feb 26
Chapter 9: Hypothesis Testing and Goodness of Fit	14	
Chapter 9: Hypothesis Testing and Goodness of Fit	15	March 3- March 5
Chapter 9: Hypothesis Testing and Goodness of Fit	16	
Chapter 10: Histograms and Density Curves	17	March 17- March 19
Chapter 10: Histograms and Density Curves	18	
Chapter 11: Comparing Two Samples	19	March 24- March 26
Chapter 11: Comparing Two Samples	20	
Test 2	21	
Chapter 12: Analysis of Variance	22	March 31 -April 2
Chapter 12: Analysis of Variance	23	April 7 -April 9
Chapter 12: Analysis of Variance	24	
Chapter 13: Analysis of Categorical Data	25	April 14 -April 16
Chapter 14: Simple Linear Regression	26	
Chapter 14: Linear Least Squares	27	April 21 -April 23
Chapter 14: Linear Least Squares	28	
Chapter 14: Multiple Linear Regression	29	April 28- April 30
Final Review	30	

Syllabus Change Policy

This syllabus is subject to change at the discretion of the Professor. Changes, if any, will be posted on Canvas.

Welcome to UNT!

As members of the UNT community, we have all made a commitment to be part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation. UNT's full Non-Discrimination Policy can be found in the UNT Policies section of the syllabus.

Online Course System

The University is committed to providing a reliable online course system to all users. However, part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UIT Help Desk: UIT Student Help Desk site (https://www.unt.edu/helpdesk)

Email: helpdesk@unt.edu

Phone: 940-565-2324

In Person: Sage Hall, Room 130

Walk-In Availability: 8am-9pm

Telephone Availability:

- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm

For additional support, visit Canvas Technical Help (https://community.canvaslms.com/docs/DOC-10554-4212710328)

UNT Policies

Academic Integrity Policy

According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication,

facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

ADA Accommodation Statement

UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website .

Emergency Notification & Procedures

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

Acceptable Student Behavior

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT's Code of Student Conduct to learn more.