Educational Psychology
EPSY 6005.001: Statistical Theory and Simulation, Fall 2018

Instructor: Prathiba Natesan, Ph.D. Class Location: MATT 310
Office: MH 322I Class Time: T 5:30-8:20pm
Office Phone: (940) 565-4988
E-mail: Through https://learn.unt.edu (learn email) only

Office Hours:
Tuesdays 1:00-4:00 p.m. Wednesdays 1:00-4:00 p.m.
Other: By Appointment

Course Description

“This course is designed to help students understand some basic and advanced theoretical concepts underlying statistics such as probability theory (Kolmogorov), Likelihood estimators, probability distributions, properties of commonly used univariate and multivariate distributions, simulating distributions and problems in R, advanced simulation-based techniques such as Bayesian estimation, and other related statistics topics”

The aim of the course is to inform students about the basics of probability in statistics, to gain a deeper understanding of why we do what we do in statistics, the importance of computations, and how some problems may be answered using simulations. But the ultimate goal of this course is to prepare the student to be an independent thinker of statistics, to develop the ability to question, and to propose scientific statistical solutions.

Required Text:

Recommended Texts:

Software: R
Note: R will be used in this class to conduct most analyses but you are free to use a software program of your choice.

Objectives:
1. Understand the basics of statistical theory, probability distributions, and the role of simulation in statistics
2. Become adept at using one statistical programming language (we will use R in class)
3. Comfortably simulate statistical models and consolidate and interpret results of simulations
How can I get the most out of this class?
There is a great deal of material to be covered, some of which is rather technical. Because of this, it is my general expectation that you read the material to be covered in the lecture prior to the lecture. This will allow you to get more out of the lecture, and for the lecture to move faster and smoother. Because we will be spending a fair amount of time doing in-class examples, having a cursory knowledge of the material will enable you to follow the in-class examples. Therefore, to benefit the most from this class:
1. Read the required material prior to the lecture
2. Participate in class discussion and clear any doubts you may have
3. Allow your fellow classmates to participate as well (although we are statisticians, we are part of a society!)
4. Be prepared to think outside the box!
5. Students are welcome to meet with me at any time during my office hours by appointment to discuss any concerns or questions they may have about the course. I am also willing to meet at any non-class times (subject to potential scheduling conflicts). Due to other administrative commitments I may be called into meetings even during my office hours. Therefore, it is best to set up an appointment prior to the meeting.
6. If you have any doubts or questions, please feel free to contact me. Questions about assignments should be asked before the assignment is due – not after missing the assignment.

Assessments:
Your grade will be based upon
1. 2 graded homework assignments
2. 1 in-class problem solving exercise
3. 1 article presentation - based on your review of a published peer-reviewed simulation paper
4. 1 paper progress presentation – reporting the status of your project
5. 1 final presentation based on your final project
6. 1 manuscript style (APA) final paper based on your project, and
7. quizzes and class participation.

Due dates for assignments and the final project are given in this document, so please plan accordingly. There will be NO MAKE-UP submissions, unless there is a medical emergency/condition (which requires appropriate paperwork).
There are NO make-ups for the graded homework assignments. The graded homework assignments need to be typed or written clearly. Illegible assignments will be returned for resubmission after reducing your assignment by a full letter grade. The questions will assess your understanding of both conceptual issues discussed in class and your ability to interpret data and output. Your assignments MUST be submitted in doc, docx, or pdf format. DO NOT submit several R (or other) syntax and output files hoping I will comb through it to find the answer. Copy and paste your syntax, output, and graphs onto a word document and submit as a single file so I know you are looking where you are supposed to look in the output.
If you fail to attend an exam/participate in class quiz/submit your assignment, you forfeit the points pertaining to that activity.
All submissions must be in APA style (including references, tables, and figures).
Grading Scale:
A  90-100%
B  80-89.9%
C  70-79.9%
D  60-69.9%
F  <60%

In the event that less than 15% of the students fail to score above 90%, the grades will be awarded according to your performance in comparison to your fellow classmates, i.e., if you are in the top 15%, you will receive an A, and so on.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>Article presentations</td>
<td>10</td>
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<tr>
<td>Solving in-class problems</td>
<td>10</td>
</tr>
<tr>
<td>Paper progress presentation</td>
<td>05</td>
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<tr>
<td>Final presentation</td>
<td>15</td>
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<tr>
<td>Final Paper</td>
<td>35</td>
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<tr>
<td>Graded HWs</td>
<td>(20)</td>
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<tr>
<td>Assignment 1</td>
<td>10</td>
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<tr>
<td>Assignment 2</td>
<td>10</td>
</tr>
<tr>
<td>Quiz/Participation</td>
<td>05</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
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A Word to the Student
As grad students, everyone is expected to be professional in your behavior/attitude/communication to your fellow graduate students and to your faculty.

Attendance Policy: Although there is no credit given for class attendance, absence from class is not an excuse for poor grades. However, do keep in mind that points will be awarded for in-class exercises. If you need to miss class, it is YOUR responsibility to get the notes and other information provided during that class. You and only you will be responsible for the notes that you missed in the class due to your absence. I will not go over the entire class notes with any individual if you have missed class. Questions and participation in class discussions are strongly encouraged.

Note that the lecture schedule is only approximate. Some adjustments may be desirable as a function of student background and interest to expand or reduce coverage of some of the topics. As part of the faculty evaluation process, you are required to complete your evaluation of the faculty and the course online through the SETE system.

Academic Integrity and Academic Dishonesty
Academic Integrity is defined in the UNT Policy on Student Standards for Academic Integrity. Academic Dishonesty includes cheating, plagiarism, forgery, fabrication, facilitating academic dishonesty, and sabotage. Any suspected case of Academic Dishonesty will be handled in accordance with the University Policy and procedures. Possible academic penalties range from a verbal or written admonition to a grade of “F” in the course. Further sanctions may apply to incidents involving major violations. You will find the policy and procedures at: [http://vpaa.unt.edu/academic-integrity.htm](http://vpaa.unt.edu/academic-integrity.htm).
EagleConnect
All UNT students should activate and regularly check their EagleConnect (e-mail) account. EagleConnect is used for official communication from the University to students. Many important announcements for the University and College are sent to students via EagleConnect. For information about EagleConnect, including how to activate an account and how to have EagleConnect forwarded to another e-mail address, visit https://eagleconnect.unt.edu. This is the main electronic contact for all course-related information and/or material.

SETE
The Student Evaluation of Teaching Effectiveness (SETE) is a requirement for all organized classes at UNT. This short survey will be made available to you at the end of the semester, providing you a chance to comment on how this class is taught. I am very interested in the feedback I get from students, as I work continually to improve my teaching. I consider the SETE to be an important part of your participation in this class.

Disability Accommodation
The University of North Texas (UNT) is on record as committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 – The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. If you are a student with a disability, your responsibility primarily rests with informing me of your need for accommodation by providing me with your letter from the UNT Office of Disability Accommodation.

Information regarding specific disability diagnostic criteria and policies for obtaining academic accommodations can be found at www.unt.edu/oda. Also, you may visit the Office of Disability Accommodation in the University Union (room 321) or phone (940) 565-4323.

Observation of Religious/Holy Days
If you plan to observe a religious/holy day that coincides with a class day, please notify your instructor as soon as possible.

Student Behavior in the Classroom
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 Center for Student Rights and Responsibilities 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, and field trips. The Code of Student Conduct can be found at: www.unt.edu/csrr.

Help & Resources
If you are feeling lost or overwhelmed.

1. **Succeed at UNT:** UNT endeavors to offer you a high-quality education and to provide a supportive environment to help you learn and grow. And, as a faculty member, I am committed to helping you be successful as a student. Here’s how to succeed at UNT: Show up. Find Support. Get advised. Be prepared. Get involved. Stay focused. To learn more about campus resources and information on how you can achieve success, go to success.unt.edu/

2. **Make an appointment with me:** I am more than happy to meet with you. You are welcome to email me, and we can find a time for us to meet. Many problems can be resolved through open lines of communication!

3. **Try forming a study group!** Study groups can help you by allowing you to: share notes and study tips, grapple with class material and bounce around ideas, learn class material faster and easier, and, make new friends! Consider forming a study group to help you manage the reading load for this course.

4. **Visit the Writing Center often:** You may visit the Writing Center (Sage 150) at any point in time over the course of the semester. The Writing Center offers help at any stage of the writing process, and can give you substantive feedback on your writing. You can email to schedule or call 940.565.2563.

5. **Visit one of the UNT Health and Wellness Resources for Students:** UNT has a rich set of resources for students who need a little help with a range of issues. There is the Student Health and Wellness Center, the Pohl Rec Center, and the Counseling and Testing Services. Any student who faces challenges securing their food or housing (whether it affects their performance in the course or not) is urged to contact the Dean of Students for support http://deanofstudents.unt.edu/resources/food-pantry. Furthermore, please notify me if you are comfortable in doing so. This will enable me to provide any resources that I may possess.

If you are struggling this semester, come talk to me sooner rather than later. Do not wait until the end of the semester, when it may be too late.

**Statement on preferred names:**
As a UNT student, you are able to change how your preferred/proper name shows up on class rosters, Blackboard/Canvas, and MyUNT. This option is helpful for various student populations, including but not limited to: students who abbreviate their first name; students who use their middle name; international students; and transgender students. As a faculty member, I am committed to using your proper name and pronouns. We will take time during our first class together to do introductions, at which point you can share with all members of our learning community what name and pronouns you use, as you are comfortable. Additionally, if these change at any point during the semester, please let me know and we can develop a plan to share this information with others in a way that is safe for you.

Should you want to update your preferred/proper name, you can do so by looking at the following guidelines: https://registrar.unt.edu/transcripts-and-records/update-your-personal-information
<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>28-Aug</td>
<td>Meaning of statistics, basics of probability</td>
<td>Chapter 2 - MCMC,</td>
<td>Select article for presentation</td>
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<tr>
<td></td>
<td></td>
<td>Chapter 2 - Lynch (see scan)</td>
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<tr>
<td>4-Sep</td>
<td>Distributions, generating probability distributions</td>
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<tr>
<td>11-Sep</td>
<td>Deriving ML for normal distributions, conditional and marginal probabilities</td>
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<tr>
<td>18-Sep</td>
<td>Review lectures 1-3, derive ML for uniform distributions – Do it yourself – Class will NOT meet</td>
<td>Chapter 2 - MCMC, Chapter 2 - Lynch (see scan)</td>
<td>1-page summary of the article</td>
</tr>
<tr>
<td>25-Sep</td>
<td>Review linear regression - – Do it yourself – Class will NOT meet</td>
<td>Chapters 3 &amp; 4– G&amp;H (see scan)</td>
<td>Workout at least 3 example problems at the end of the text DIY</td>
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<tr>
<td>2-Oct</td>
<td>Introduction to simulation, Introduction to R</td>
<td>Chapters 1 and 3- MCMC, 15-SPSUR (see scan)</td>
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<tr>
<td>9-Oct</td>
<td>More R, generating discrete random data</td>
<td>Chapter 4 – MCMC 16-SPSUR (see scan)</td>
<td>Assignment 1</td>
</tr>
<tr>
<td>16-Oct</td>
<td>Linear Model, Graphics in R</td>
<td>Chapter 5 - MCMC</td>
<td>Paper progress presentations</td>
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<tr>
<td>23-Oct</td>
<td>Linear models continued</td>
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<td>Article presentations I</td>
</tr>
<tr>
<td>30-Oct</td>
<td>Generalized linear models, simulating probability models</td>
<td>Chapter 6 - MCMC</td>
<td>Article presentations II</td>
</tr>
<tr>
<td>6-Nov</td>
<td>Solving small simulation problems in class*</td>
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<td>Assignment 2</td>
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<tr>
<td>13-Nov</td>
<td>Solving small simulation problems in class*</td>
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<tr>
<td>20-Nov</td>
<td>Testing theory*</td>
<td>Chapter 7 - MCMC</td>
<td>In-class work</td>
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<tr>
<td>27-Nov</td>
<td>Resampling methods*</td>
<td>Chapter 8 - MCMC</td>
<td>In-class work</td>
</tr>
<tr>
<td>4-Dec</td>
<td>Other simulation, introduction to Bayesian methods</td>
<td>Chapter 9 - MCMC</td>
<td>Final presentations</td>
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<tr>
<td>11-Dec</td>
<td>Final paper due – class will not meet</td>
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<td>Final paper</td>
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*Class attendance is compulsory on these days. Absentees will forfeit points related to these assignments. I need to see you work on your project as a team/as individuals*