DSC395T: Data Science for Health Discovery and Innovation

Spring 2024

Course Description
The purpose of this course is to introduce students to biostatistical methods i.e., methods commonly used for health-specific applications. At the end of this course, the students will be able to determine the appropriate method for a particular setting, apply the method, and interpret results. Equal emphasis will be given to the theoretical background of the methods and application to data. The course will cover the following topics: (1) Survival analysis, including censoring and functions, nonparametric and parametric estimation, competing risks, and prediction; (2) Longitudinal data analysis including linear and generalized mixed effect models and generalized estimating equations; (3) Design and analysis of observational studies including propensity score analysis; (4) Design and analysis of randomized studies including sample size and power calculations, intent-to-treat analysis, and noncompliance.

Learning Outcomes
By the end of this course you will be able to:

- Identify the appropriate statistical method to be used to test or explore a hypothesis
- Explain and assess the appropriateness of assumptions needed in order to apply a particular method
- Analyze survival data, longitudinal data, and observational and clinical trial data and interpret results
- Critically identify potential sources of bias e.g. unmeasured confounding, unknown dependence between subjects, dependent censoring

Prerequisites
This course is designed to be accessible to graduate students interested in learning biostatistical methods and how to appropriately apply them to health and medical data. Necessary background includes familiarity with probability, regression, and mathematical statistics including likelihood estimation and inference. Must have experience and be comfortable working in R.

Instructor, TA, Office Hours
Instructor: Layla Parast, Associate Professor, Department of Statistics and Data Sciences
Dr. Parast will hold virtual office hours by appointment.

TA: Rebecca Knowlton
Rebecca will hold virtual office hours at regularly-scheduled times and by appointment. There will also be additional learning facilitators (LFs) that will hold additional virtual office hours at regularly-scheduled times.

Communication and Ed Discussion
This course is on Canvas; it is not on edX. The Canvas link is here. For more resources on using Canvas, please see here. Please ask questions about course content and syllabus through the Ed Discussions platform only (emails about content and syllabus questions will not be answered). The TA, LFs, and the instructor will be very active on Ed Discussions, but students are encouraged to engage to answer each other's questions. Trying to explain a concept you have learned is the best way to understand it more deeply. Private inquiries not related to course content or the syllabus can be emailed to: onlinehealthdiscovery@austin.utexas.edu.

Materials and Lectures
There is no required textbook. Book and article references will be given throughout the course notes. This

course will use R; download and install R and/or RStudio (both are free) on your computer. Lectures will involve a mix of lecturing, activities, and R code demonstrations.

No materials used in this class, including, but not limited to, course lecture notes, code, videos, exams, and homeworks may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am aware of the sites used for sharing materials. Any materials found online that are associated with you or any suspected unauthorized sharing of materials will be reported to the Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

Grading
The course grade will be based on 6 homework assignments and 2 exams. The final course grade is determined by the following components:

Homeworks: 50% Midterm Exam: 25% Final Exam: 25%

The lowest homework grade will be dropped from the calculation of the final grade. Final letter grades in the course will be determined based on the performance across the entire class. There will be no pre-set number of As, Bs, Cs, etc. or pre-set numerical thresholds to achieve each grade; the grade cutoffs and number of students receiving each grade will depend on the distribution of performance.

Homework
Homeworks will be assigned roughly every two weeks and will generally consist of multiple choice problems, many of which will require the use of R code. Homework due dates are: Feb 2, Feb 16, Mar 1, Mar 29, Apr 12, and Apr 26. Students are expected to work independently on homework assignments. While course discussion boards (Ed Discussions) can be used for general questions on the material, class discussion should not pertain directly to the questions on the homework assignments. All questions regarding homework assignments should be directed to the TA(s). Homework solutions/answers are not posted; if you would like to know the correct answer to a problem that you did not get correct, you must come to office hours.

Exams
There will be one midterm and one final exam. Exams will require the use of R code. Students are expected to work independently on exams. All questions regarding exams should be by email, not on Ed Discussion. Exams will be open for a 48-hour period only. **The midterm exam will be March 22-23, 2024. The final exam will be May 3-4, 2024.** Exam solutions/answers are not posted; if you would like to know the correct answer to a problem that you did not get correct, you must come to office hours.

Late Policy
Homework assignments and exams will not be accepted late. There are no exceptions; please do not contact the instructor or TA to request an exception.

Weekly Organization and Course Schedule
The course content has been organized by week of the course, designed to entail a roughly equal amount of lecture videos and assignments. Most of the course content will be available from the start of the course, but following the weekly schedule is strongly encouraged. Students may choose to proceed through the course at a faster pace, but all students must adhere to specified assignment due dates and any submitted homework assignments will not be graded until the specified due date. Importantly, the instructor and TA will not respond to inquiries about course content in future weeks of the course.

Academic Integrity in This Online Course
The online course format allows for multiple methods of identity verification, collusion, collaboration and plagiarism monitoring and detection. A violation of the course policy may include (but is not limited to)

the following:

- Use of artificial intelligence (AI) to obtain answers to assignments or exams e.g. ChatGPT

- Using (posting, viewing, answering) information about course material from any online "homework help" website such as Chegg.com or Quizlet.com

- Use of any assignments provided through previous offerings of the course or communication about these materials with students who have taken the course previously

- Sharing information pertaining to exam content with another student

- Providing your UT EID to any other person

- Collaborating or sharing information with another person regarding the material on any discussion, assessment or assignment, before, during and/or after any discussion, assessment or assignment

- Recording any discussion, assessment or assignment material in any format

- Failing to properly cite language, ideas, data, or arguments that are not originally yours

- The public (such that it can be viewed by more than one person) posting of any form of a test bank or group of questions from any assignment

- Consulting forbidden materials or sources of information

The University of Texas at Austin Academic Integrity principles call for students to avoid engaging in any form of academic dishonesty on behalf of yourself or another student. Grade-related penalties are routinely assessed ("F" in the course is not uncommon), but students can also be suspended or even permanently expelled from the University for scholastic dishonesty. If you have any questions about what constitutes academic dishonesty, please refer to the Dean of Students website or contact the instructor for this course. You must agree to abide by the Honor Code of the University of Texas.

Accommodations
The University of Texas at Austin guarantees that students with disabilities have access to appropriate accommodations. You may request an accommodation letter from the Division of Diversity and Community Engagement, Services for Students with Disabilities. If you have approved accommodations for the course, please contact us to arrange them. Please do this as soon as possible, so that you can have the benefit of the accommodations throughout the duration of the course.

Course Etiquette
We expect that you will treat online discussions as though you are having a civil, respectful discussion with your fellow classmates in the same classroom. Please refrain from using profanity or any euphemisms for profanity. Please do not bait other commenters or personally attack them. Please do not use sarcasm in a way that can be misinterpreted negatively. And please do not make the same point over and over again. In short, please just respect the right of your colleagues to ask questions and discuss their opinions about the subject matter of our course on the discussion board. Violators of these discussion rules will simply be shut out from all class communications—email, Ed Discussions, and office hours.

Non-Discrimination Policy
In accordance with federal and state law, UT Austin prohibits unlawful discrimination, including harassment, on the basis of race, skin color, religion, national origin, gender, gender identity, gender expression, sexual orientation, age, disability, citizenship, and veteran status.

Additional Academic Support
If you have additional questions or require support from an academic advisor, please contact the program coordinator at msdsgradcoordinator@utexas.edu.

This syllabus is subject to change. Updated: January 15, 2024