STA 37GH: Statistics and Modeling

Spring 2019

Session 1, 04700, Monday & Wednesday 3:30 PM - 5:00 PM, Room: UTC 4.132

Instructor: Jared S. Murray, Ph.D., Assistant Professor of Statistics

Office: CBA 6.482 (east side of the building that faces the entrance of Gregory Gym)

Email: `jared.murray@mccombs.utexas.edu`

Website: `http://jaredsmurray.github.io/`

Office Hours: TBD, or by appointment. Please email me to set appointments; this ensures that I'm prepared for your visit, and that you don't waste time trying to drop in when I'm not available.

Teaching Assistant:

Ylin He, `ylin.he@mccombs.utexas.edu`, IROM PhD Student

Office Hours: TBD

Course Website: `https://jaredsmurray.github.io/sta371g_s18/`

Course Description: This course introduces statistical methods and data analysis tools to model uncertainty and make decisions. After a brief review of basic probability and statistics, we will discuss decision making, regression models, and time series analysis. Simulation with statistical software will be incorporated into these topics and used throughout the semester. Statistical analysis and modeling will be illustrated with a large number of real examples, such as those in finance, marketing, economics, politics, and sports. We will analyze real datasets using the statistical software `R`. The techniques taught in the course will also be useful in performing data analysis in other BBA courses.

By the end of the course, you will be equipped with the necessary statistical knowledge and skills to solve real-world business problems. Specifically, you will learn how to choose an appropriate statistical model to analyze data, perform computation with statistical software, validate the output of the model, and draw appropriate conclusions from the results of a statistical analysis.

Course Communication: The course website will be updated regularly. I will make announcements via Canvas. **Please make sure your Canvas account is set up so that you get notifications of announcements by email.** You are welcome to email me with any questions, concerns, etc. The TA is also available to answer questions about course material, homework, or exams, but any requests for make-up exams, deadline extensions, or other policy exceptions should be directed to me via email, not to the TA. I will typically respond to emails within 24 hours during the week.

Materials:

- Text:

  (a) OpenIntro Statistics by Diez, Barr and Çetinkaya-Rundel, 3rd Edition, available for free at http://www.openintro.org/stat/textbook.php. This book provides a review of basic probability and statistics, as well as introductory material on linear regression.

  (b) Other readings and class notes will be made available via Canvas and/or the course website.

  (c) Business cases for homework assignments and in-class demonstrations:

  1. Amore Frozen Food, UVA-QA-0317
  2. Waite First Securities, UVA-QA-0453
  3. Milk and Money, KEL343
  4. Orion Bus Industries: Contract bidding strategy, IVEY 9B03E005
  5. Oakland A's A, UVA-QA-0282
  6. Oakland A's B, UVA-QA-0283
  7. Northern Napa Valley Winery, Inc, IVEY 9A98E046
  8. Freemark Abbey, Harvard 9-181-027

- Software:

  R and RStudio (free software). I will use R for class demonstrations, and code will be available before class for you to follow along. This will help you better understand randomness and uncertainty, and practice your data analysis skills.

  The ability to code in R is a highly marketable skill and I encourage you all to avail yourselves of this chance to learn some R coding. However, your exams will **not** require you to code in R (although you will have to understand key commands and appropriately interpret its output). Your homework will require you to use some statistical software and while you are free to use the software of your choice, we will only provide support for R. Additional R resources will be available on the course website.

Tentative Course Schedule:

This schedule represents my current plans and objectives. The time spent on any particular topic may vary from what is outlined below if we need to speed . Such changes, communicated clearly, are not unusual and should be expected.

- Week 1: Introduction and course overview. Simulation in R.
- Week 2: Review of elementary discrete probability. Joint, conditional and marginal distributions, Bayes rule, expected value and variance.
- Week 3: Decisionmaking under uncertainty and expected utility maximization.

- Week 4: Covariance and correlation. The Gaussian and other continuous distributions.
- Week 5: Inference on model and population parameters. Confidence intervals and hypothesis tests.
- Week 6: Review and Exam 1
- Week 7: Simple linear regression (SLR). Model formulation and interpretation, estimation by least squares, prediction intervals.
- Week 8: SLR inference and hypothesis testing
- (Spring Break)
- Week 9: Multiple linear regression (MLR). Model formulation and interpretation, estimation by least squares, prediction intervals.
- Week 10: Inference for MLR. R^2, ANOVA and F-tests.
- Week 11: MLR: Categorical predictors and interactions. Diagnostics and transformations
- Week 12: Regression models for time-dependent data
- Week 13: Review and Exam 2
- Week 14: Model selection
- Week 15: Special topics

The final project will be due on May 10.

Grading:

Your grade will be determined as follows:

Homework (15%)
In-class Quizzes (5%)
Midterm Exam 1 (20%)
Midterm Exam 2 (25%)
Final Exam (35%)

A final weighted average percentage will guarantee you *at least* the letter grade in the table below. I will not curve your grades down under any circumstances. I reserve the right to curve your final grades *up*, and commonly do so. Any curve will be determined at the end of class based on final weighted averages – letter grades are not assigned to specific exams or the project.

Percentage	Grade
93 - 100	A
90 - 92	A-
87 - 89	B+
83 - 86	B
80 - 82	B-
77 - 79	C+
73 - 76	C
70 - 72	C-
60 - 69	D
<60	F

Homework: You will be assigned weekly homework assignments throughout most of the semester. You may (and are encouraged to) work in groups to complete homework assignments. Each group may consist of no more than four members. If you elect to work in groups you should be working together, rather than "dividing and conquering" the assignment. Each group should submit one copy of the homework, indicating all members of the group. Late homework is not accepted except under extenuating circumstances, but I will drop the lowest homework grade. Homework will be mostly graded for completeness, and occasionally for correctness.

In-class quizzes: There will be approximately six short in-class quizzes, which will be graded for effort and completeness only. These quizzes are intended to be a quick way for me and you to assess your comprehension of key concepts. You will receive full credit for this portion of your grade if you thoughtfully complete at least 2/3 of the quizzes.

Exams:

- Midterm Exam 1 will be on Wednesday, February 27 during class.
- Midterm Exam 2 will be on Wednesday, April 10 during class.
- The final exam will be given during the University's final exam period, at a date and time to be determined by the University registrar.

You will not be allowed a make-up for a missed exam without a documented and verifiable medical excuse, or documentation that a family emergency prevented you from attending. The only documentation I will accept for this purpose is an electronic or written letter from Student Emergency Services in the Office of the Dean of Students notifying me of your absence. The Dean of Students will, in turn, require supporting documentation from you (e.g. a doctors note or letter from primary care provider) in order to verify your illness, injury, or emergency. While this policy may seem strict, it is the only way we can be fair to everyone.

If you will be out of town representing the University on an academic, athletic, or student-organization trip, you must speak with me and provide me with appropriate documentation at least 2 weeks in advance so alternative accommodations can be made. If you must miss an exam for the observance of a religious holy day, inform me at least 2 weeks

before the exam, so that alternative arrangements can be made in conjunction with the Dean and the relevant university offices.

Clerical errors (typos in grade entry, addition errors, etc) in grading will be corrected without hassle. Other regrading requests must be submitted in writing within one week (7 days) of the exam's return. Keep in mind that the entire exam will be subject to regrading.

Quantitative Reasoning Flag: This course carries the Quantitative Reasoning flag. Quantitative Reasoning courses are designed to equip you with skills that are necessary for understanding the types of quantitative arguments you will regularly encounter in your adult and professional life. You should therefore expect a substantial portion of your grade to come from your use of quantitative skills to analyze real-world problems.

University of Texas Honor Code: The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.

Academic Integrity: Each student in this course is expected to abide by the University of Texas Honor Code. Any work submitted by a student in this course for academic credit will be the student's own work.

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e-mail, an e-mail attachment file, a diskette, or a hard copy.

Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Code can also be extended to include failure of the course and University disciplinary action.

During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Students with Disabilities: Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259, http://www.utexas.edu/diversity/ddce/ssd/.

Religious Holy Days: By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Policy on Scholastic Dishonesty: The official McCombs policy on academic dishonesty is as follows: The McCombs School of Business has no tolerance for acts of scholastic dishonesty. The responsibilities of both students and faculty with regard to scholastic dishonesty are described in detail in the BBA Program's Statement on Scholastic Dishonesty at http://www.mccombs.utexas.edu/BBA/Code-of-Ethics.aspx. By teaching this course, I have agreed to observe all faculty responsibilities described in that document. By enrolling in this class, you have agreed to observe all student responsibilities described in that document. If the application of the Statement on Scholastic Dishonesty to this class or its assignments is unclear in any way, it is your responsibility to ask me for clarification. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since dishonesty harms the individual, all students, the integrity of the University, and the value of our academic brand, policies on scholastic dishonesty will be strictly enforced. You should refer to the Student Judicial Services website at http://deanofstudents.utexas.edu/sjs/ to access the official University policies and procedures on scholastic dishonesty as well as further elaboration on what constitutes scholastic dishonesty.

Campus Safety: Please note the following recommendations regarding emergency evacuation, provided by the Office of Campus Safety and Security, 512-471-5767, http://www.utexas.edu/safety:

- Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation should inform the instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors.
- Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- Behavior Concerns Advice Line (BCAL): 512-232-5050
- Further information regarding emergency evacuation routes and emergency procedures can be found at: http://www.utexas.edu/emergency.