STA238 Probability, Statistics, and Data Analysis II (LEC5101)
Summer 2021 (July-Aug)

Instructor: Jessie Yeung
Course Email: sta238@utoronto.ca
Instructor Email: jessie.yeung@mail.utoronto.ca (Only use for matters unrelated to the course)
Synchronous Lecture Schedule: MW 6:00-9:00PM (EDT/Toronto local time)
Instructor Office Hours: MW 8:00-9:00PM (last hour of lectures)
TA Office Hours: TA office hours will be posted on Quercus

Course Description
An introduction to statistical inference and practice. Statistical models and parameters, estimators of parameters and their statistical properties, methods of estimation, confidence intervals, hypothesis testing, likelihood function, the linear model. Use of statistical computation for data analysis and simulation.

Prerequisite
One of: STA237H1/STA247H1/STA257H1/STAB52H3/STA256H5

Please note that all prerequisites for all STA courses are strictly enforced and your instructor cannot waive them. Any questions about prerequisites should be directed to ug.statistics@utoronto.ca.

Email Communication
We will be using sta238@utoronto.ca for emails regarding course administration. This includes reporting missed assessments, re-mark requests, extension requests, etc. Please note that this email will not be monitored after the end of August and such emails may be received by another instructor thereafter.

Course Format
This class will meet every Monday and Wednesday from 6:00-9:00PM (EDT/Toronto local time).

We will be using a flipped classroom in this course. This means that pre-recorded lecture videos will be released at least 2 days prior to each lecture. It is expected that students will watch the lecture videos ahead of each synchronous lecture. You can expect 1-2h of pre-recorded lecture content prior to each synchronous lecture.

During the synchronous component of the class, we will typically reinforce material introduced in the pre-recorded lectures, solve problems, answer student questions, and/or have live coding demos. You can expect each synchronous lecture to last 1-2h.

Suggested Weekly Routine

Monday	Tuesday	Wednesday	Thursday to Sunday
Attend synchronous lecture	Watch pre-recorded lecture and work on problem sets	Attend synchronous lecture	Work on assignment, work on problem sets, and watch pre-recorded lecture

Course Assessments
In this class, you should expect an assessment almost every week. Since this course is offered in an accelerated format, you should naturally expect to do twice the amount of work in a given week than in a fall or winter course during the academic year.

Assessment	Weight	Due Date
Beginning of Course Activity	5%	Sunday, July 11 at 11:59pm (EDT)
Assignment 1	15%	Sunday, July 18 at 11:59pm (EDT)
Assignment 2	15%	Sunday, August 1 at 11:59pm (EDT)
Assignment 3	15%	Sunday, August 8 at 11:59pm (EDT)

Test	25%	Monday, August 16 at 7am OR 7pm (EDT)
Project	25%	Monday, August 23 at 11:59pm (EDT)

Assignments

All assignments are to be submitted on Quercus. You should expect assignments to involve coding in R, solving theoretical questions and/or written communication.

Tests

There will be one test during the course which will take place at the end of the term.

Tests are timed assessments. You will write the test on the test date specified above at either 7am OR 7pm. You will have the opportunity to choose time slot you prefer. **By enrolling in this offering of STA238, you are affirming that you are available during the test time slot.**

Grace Period for Assignments and Project

A one-hour grace period will be provided for assignments and the project. These assessments are due on the due date at 11:59PM. You will be provided one additional hour past the due date to submit your assignment/project. This hour is for you to resolve any technical issues related to submission. Extensions will not be granted for technical issues.

The grace period policy does **not** apply to tests.

Textbooks & Resources

We will be using the following resources, all of which are freely available. Specific practice problems will be recommended from these resources as we progress through each lecture.

1. [MIPS] A Modern Introduction to Probability by Dekking et. al., available through the library here: https://librarysearch.library.utoronto.ca/permalink/01UTORONTO_INST/14bjeso/alma991106910545806196
2. [E&R] Probability and Statistics: The Science of Uncertainty by M.J. Evans and J.S. Rosenthal (2003). W.H. Freeman and Co.
   Available in pdf here: http://www.utstat.toronto.edu/mikevans/jeffrosenthal.
3. [MMSA] Modern Mathematical Statistics with Applications, 2nd ed. by Devore and Berk available through the library here: https://librarysearch.library.utoronto.ca/permalink/01UTORONTO_INST/14bjeso/alma991106895484906196
4. [238 Supplementary] Supplementary materials have been written to correspond to the sections we will be covering in each of the above textbooks.
   Available here: https://awstringer1.github.io/sta238-book/index.html

Course Schedule

Date	Topic and Readings	Reminders
Mon. July 5	Lecture 1 • Course Introduction • Intro to R and R Markdown	
Wed. July 7	Lecture 2 • Numerical Summaries • Graphical Summaries • Intro to tidyverse and ggplot in R	Beginning of Course Activity Due on Sunday, July 11
Mon. July 12	Lecture 3	

	• Approximations and Limiting Theorems	
Wed. July 14	Lecture 4 • Statistical Models • Unbiased Estimators • Efficiency and MSE	Assignment 1 Due on Sunday, July 18
Mon. July 19	Lecture 5 • Maximum Likelihood Estimators	
Wed. July 21	Lecture 6 • Intro to Bayesian Statistics	
Mon. July 26	Lecture 7 • Bayesian Estimation • Proposing Models	
Wed. July 28	Lecture 8 • Bootstrap	Assignment 2 Due on Sunday, August 1
Mon. Aug 2	No Lecture	Civic Holiday
Wed. Aug 4	Lecture 9 • Confidence Intervals	Assignment 3 Due on Sunday, August 8
Mon. Aug 9	Lecture 10 • Bootstrapped CI • Intro to Hypothesis Testing	
Wed. Aug 11	Lecture 11 • Hypothesis Testing • Relationship between CI and HT	
Mon. Aug 16	Lecture 12 • Test	Test during class time; Project due on August 23

Minimum Passing Requirement

To pass the course, all students must complete and submit all of the following:
- Test
- Project

If you do not meet the minimum passing requirements, you will not be able to pass this course. If there are extenuating circumstances that will affect your performance in the course in the long term, it will be your responsibility to contact the instructor as early as possible.

Missed Assessments & Extensions

Missed term work due to legitimate reasons (e.g., injury, illness, or other exceptional circumstances) should be communicated to the instructor. See below for a more detailed explanation for each assessment type.

- *Missed Assignments*: No extensions will be provided for missed assignments under any circumstances. Assignments that are not submitted by the due date or within the grace period will receive a grade of 0.

- *Missed Projects*: Short extensions may be granted for projects, at the discretion of the instructor.

  Requests should be made at least 24 hours before the project due date via the course email. Requests for extensions made later than this will not be considered except in extenuating circumstances. All extensions must align with the University's academic dates and deadlines for the summer 2021 term.

  Projects that are not submitted by the due date (or due date of extension, if applicable) will receive a grade of 0.

- *Missed Tests*: If the test is missed due to an illness or personal emergency, you must contact me via the course email within one week of the missed test. Your email must:
  - be received within one week of the test date,
  - must include 'STA238 Reporting Test Absence' in the subject line,
  - must include your full name and student number,
  - must include a screenshot/photo of your self-declared absence on Acorn, and
  - must include the following two sentences:

    "I affirm that I am experiencing an illness or personal emergency and I understand that to falsely claim so is an offence under the Code of Behaviour on Academic Matters. I understand that an alternative assessment will be arranged at the instructor's discretion (including an oral exam and/or a make-up assessment in August, after the lecture period)."

  If you miss the test and complete the accommodation procedure correctly (described above), an alternative assessment will be arranged at the instructor's discretion. Note that this alternative assessment may have a different format (e.g., oral assessment) and may be scheduled after classes end.

Remark Requests

Mistakes occasionally happen when marking. If you feel there is an issue with the marking of a test/assignment, you may request that it be re-marked. The course re-mark policy exists to correct mistakes, and any request should clearly identify the error (for example, a question that was not marked, or a total incorrectly calculated). Requests to correct such mistakes must be sent by email to sta238@utoronto.ca. For consideration, any email for a re-mark request:

- must **not** be sent within the first 24 hours of the release of the assessment grade,
- must be received within two weeks of the date that the marks for the assessment became available,
- must include 'STA238 Regrade Request [Assessment Name]' in the subject line of the email,
- must include your full name and student number, and
- must give a specific, clear, and concise reason for each request, referring to a possible error or omission by the marker. Re-mark requests without a specific reason will not be accepted.

Please note that your entire test/assignment may be re-marked when submitting a remarking request. It is possible that a remark request will result in a lower mark. For the final project, the re-mark process will be handled by the Department of Statistical Sciences.

Communication

Synchronous lectures will take place on Blackboard Collaborate (BB Collaborate) on our course Quercus site.

We will be using Piazza as the platform for discussions related to the course material and assessments. You can find our course page at: http://www.piazza.com/utoronto.ca/summer2021/sta238. Students can post anonymously to classmates on Piazza, but the identity of the author of all posts is viewable by instructors.

All posts and conduct on Piazza must remain professional. Posts regarding personal matters such as inquiries about grades, reporting absences, regrade requests, etc. should be communicated via email (at sta238@utoronto.ca) and **NOT** be posted on Piazza. Piazza is intended for students to receive support regarding course information and content and thus should be an overall positive and professional environment. Postings that do not align with this environment will be removed. Be sure to read Piazza's Privacy Policy and Terms of Service carefully. Take time to understand and be comfortable with what they say. They provide for substantial sharing and disclosure of your personal information held by Piazza, which affects your privacy. When you use Piazza, only provide content that you are comfortable sharing under the terms of the Privacy Policy and Terms of Use.

Again, email (sta238@utoronto.ca) is appropriate only for personal matters that cannot be shared with the rest of the class. To be fair to all students, we are not able to answer questions about the course material by email. These questions should be asked on the discussion forum or during office hours. If you contact the teaching team at sta238@utoronto.ca with a course contact question, you will be directed to Piazza or office hours.

Announcements and other course information will be posted on Quercus. Students are expected to check Quercus regularly.

Etiquette

When communicating with anyone in any way – but especially via email – make sure you courteous and respectful. This means using full sentences, not slang like "yo prof, I wanna get the lecture notes" (a real email received by a fellow instructor), etc. This is good practice for your eventual transition into industry or grad school. Make us want to reply to you. Importantly, *we reserve the right to simply ignore any emails that don't follow these guidelines*. If you email me or anyone, here are some general guidelines.

- Use a subject line that includes "STA238" along with a few words describing the topic of your email
- Start the email with "Hi Jessie, ..." – or with "Jessie" replaced by whomever you're emailing
- End the email with a "Thank you", "Regards", or something that indicates that the email is over
- Include your full name and UofT Student Number in the email

Computing

Programming and analysis using the R statistical software is a core learning objective of this course. As such, we will be using it regularly.

You need to first install R, and then R Studio, both of which are freely available. R can be downloaded for free from http://cran.r-project.org. R Studio can be downloaded for free from http://www.rstudio.com/products/rstudio/download/. Additionally, you can also use R Studio through the U of T Jupyterhub, by selecting the RStudio option and logging in with your UTORid and password, available here: https://jupyter.utoronto.ca.

Some resources for using R and R Markdown:
- The [238 Supplementary] gives guidelines on installing and getting started with R and R Studio.
- A short intro to R workshop is available here: https://awstringer1.github.io/ssu-r-workshop/ssu-r-workshop.html
- Hands-On Programming with R by Garrett Grolemund, available here: https://rstudio-education.github.io/hopr
- R for Data Science by Hadley Wickham and Garrett Grolemund, available here: https://r4ds.had.co.nz
- An R Markdown Cheat Sheet is available at https://rstudio.com/resources/cheatsheets

Course Materials

All course materials are copyrighted. If they are from the textbook, the copyright belongs to the textbook publisher. If they are provided by an instructor (for example, lecture notes, computer code, assignments, tests, solutions) the copyright belongs to the instructor. Distributing materials online or sharing them with anyone in any way is a copyright violation and, in some situations, an academic offence.

Class Recordings

This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

Course videos and materials belong to your instructor, the University, and/or other source depending on the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download session videos and materials for **your own academic use**, but you should not copy, share with anyone, or use them for any other purpose without the explicit permission of the instructor.

For questions about recording and use of videos in which you appear please contact your instructor.

Accessibility Needs

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom, or course materials, please contact Accessibility Services as soon as possible: accessibility.services@utoronto.ca or http://www.accessibility.utoronto.ca.

Academic Integrity
Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the University of Toronto degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves. Familiarize yourself with the University of Toronto's Code of Behaviour on Academic Matters available at http://academicintegrity.utoronto.ca.

Discussion about lecture materials, textbook concepts and course concepts with your classmates and the teaching team is encouraged, but **it is expected that you work independently on all assessments**. Please note, you may not submit for credit any work that was completed by someone else. This includes, but is not limited to, partially or fully completed code, written answers, answers to problems, communication of solutions, and plagiarism. In particular, you are expected to complete and submit independent work for assignments, the tests, and the final project. Specifically, you are expected to work on your STA238 assessments, individually and independently. You may discuss lecture materials and general course concepts, but it is expected that you work individually and independently through all STA238 assessments. You may use code provided by your STA238 instructors without providing a citation. If you use code from any other source, you must provide the source. To protect yourself from potential academic integrity offences, do not share your code and written submissions anywhere (including on social media sites). Discussion or sharing of test questions and/or solutions with others during (or after) the tests is not permitted.

Academic offenses will be taken very seriously and dealt with accordingly. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact your instructor via email at sta238@utoronto.ca, or by visiting office hours.

COVID-19 & Mental Health Resources
This iteration for STA238 will be running during the COVID-19 pandemic, and will be completely online. There may be times where extensions for students are needed, and/or instructors and TAs may take longer than usual to respond to emails and/or marking needs. It is recommended to please stay active in the course as much as possible (attend lectures, visit office hours, post on Piazza, etc.). If you are experiencing exceptional circumstances that will affect your performance in the course in the long term, it is your responsibility to contact your college registrar and the STA238 teaching team as early as possible.

The Faculty of Arts and Science have put together the following list of Frequently Asked Questions (FAQs) regarding COVID-19: https://www.artsci.utoronto.ca/covid19-artsci-student-faqs.

Additionally, learning online can be more challenging than learning in-person. If you need help regarding mental health, please do not hesitate to find support. Here are some UofT mental health resources:
- https://prod.virtualagent.utoronto.ca/.
- https://studentlife.utoronto.ca/department/health-wellness/.