

# STA238H1-S: PROBABILITY, STATISTICS AND DATA ANALYSIS II

Summer 2023

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<b>Instructor:</b>	Sonia Markes	<b>Lectures:</b>	M,W 12:00 - 15:00 EDT
<b>Course Website:</b>	<a href="#">Quercus</a>	<b>Location:</b>	WB 116

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**Calendar 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.

**Prerequisites:** A course in probability (STA237H1/STA247H1/STA257H1/STAB52H3/STA256H5). Comfort with the content of the calculus prerequisites of the probability prerequisite is also required. Please note that prerequisites for all STA courses fall outside the instructor's purview. Questions about prerequisites should be directed to [ug.statistics@utoronto.ca](mailto:ug.statistics@utoronto.ca).

**Accessibility:** Everyone has distinct personal needs and learning styles and all are welcome here. If or when you need support, I am happy to discuss accommodation options. If you have a disability/health condition that requires accommodations, you can contact Accessibility Services: (416) 978-8060 or [accessibility.services@utoronto.ca](mailto:accessibility.services@utoronto.ca).

For more information, see <http://www.accessibility.utoronto.ca>.

**Meetings:** Lectures will introduce new material, including examples and applications, with blocks of time for questions. Tutorials will provide support for practice problems and coursework. Lectures begin on Wednesday, July 5 and end on Monday, August 14, with exceptions on Monday, July 24 (for the midterm) and Monday, August 7 (for a provincial holiday). Tutorials begin on Thursday, July 6 and end on Thursday, Aug 10. Please note that lectures will not be recorded, but annotated slides will be uploaded to Quercus after each lecture. Anyone found to be recording the class will be asked to leave the classroom and may face further consequences.

**Communication:** Administrative and logistical information and updates will be posted to Quercus, along with annotated notes, sample code, or other content. For questions beyond that, we have the following channels:

**Piazza:** <https://piazza.com/utoronto.ca/summer2023/sta238/home>

Piazza is for discussions about course material, activities, and logistics. Out of respect for classmates, personal or individual matters should not be posted on Piazza. Posts that are off-topic may be removed. I encourage you to answer questions from fellow students. Teaching team members will check in regularly throughout the week to moderate the discussion and endorse posts, but may not respond to every post.

**Office Hours:** After class or by appointment (book using <https://calendly.com/sta238>)

Office hours are the best way to talk directly with the course instructor. There are options to book 1-1 time for private matters or for group discussions of course content. Any updates to availability will be discussed in lectures and posted to Quercus.

**Email:** [sta238@utoronto.ca](mailto:sta238@utoronto.ca)

Email is for private administrative inquiries only. I aim to return all emails within 48hrs, excluding weekends. Please start any email with "Hello Sonia, ..." or "To the STA238 Teaching Team,..." and include your preferred name in closing. Emails that do not adhere to the guidelines may not receive a response. If you do not get a response, please try another way of addressing your inquiry. Please note that this email address will not be monitored after August 31, 2023.

**Communication guidelines:**

- Choose the appropriate context. *When* and *how* to communicate appropriately in this course is outlined in this syllabus. Note that appropriateness depends on the content of the message, that is, on *what* the message is about.
- Aim for clarity. All necessary details are included and delivered in as succinctly as possible.
- Show courtesy. Some ways of being courteous include: using a gentle tone, considering the perspective of your audience, and respecting boundaries expressed by others.
- Engage in good faith. Try to participate honestly and regularly, to the best of your abilities given your current situation. Everyone else (including the teaching team) will be trying too, although they have different abilities and situations, and these are private.

**Reporting absences:** If you are unable to come to class, there is no need to report it to the instructor. You are responsible for the material covered in class—please make use of the annotated notes and tutorials to find out what you missed.

**References:** We will be relying on material from the following textbooks. All are freely available, and students are expected to have access to both.

[MIPS] F.M. Dekking, C. Kraaikamp H.P. Lopuhaä and L.E. Meester (2005). A Modern Introduction to Probability and Statistics: Understanding How and Why. Springer-Verlag.

This is the primary reference for the course. This book is available in the University of Toronto bookstore, however, a pdf version is freely available through the University of Toronto library website.

[E&R] M.J. Evans and J.S. Rosenthal (2003). Probability and Statistics: The Science of Uncertainty. W.H. Freeman and Co.

Available in pdf here: <http://www.utstat.toronto.edu/mikevans/jeffrosenthal>.

[STA238supplement]

Supplementary materials have been written to correspond to the sections we will be covering in each of the above textbooks. These materials emphasize the use of computation and include sample code and exercises. You are recommended to read the relevant chapters in the above textbooks before reading the corresponding material in STA238supplement. The supplementary materials are available at <https://awstringer1.github.io/sta238-book/index.html>.

**Course content:** The following topics will be covered:

Topic	Reference Materials*
Exploratory Data Analysis and Limit Theorems	Chapters 15, 16, 13, 14 of MIPS
Statistical Models and Estimators	Chapters 17, 18, 20 of MIPS, Section 7.1 of E&R
Statistical Inference	Chapters 18, 21, 23, 24 of MIPS, Sections 7.2.1 and 7.2.2 of E&R

\* Including the corresponding sections in STA238supplement for each topic

**Marking scheme:** Final grades will be calculated according to the following weighting of course components:

Participation .....	5%
Analysis exercises .....	$5 \times 5\% = 25\%$
Midterm .....	25%
Final Exam .....	45%

**Participation:** The participation grade is acquired cumulatively with 0.5 points gained each time a survey is completed. Opportunities to complete surveys will be offered in-class and at the end of the week.

**Analysis exercises:** Each week, a link to an exercise based on the week's material and requiring code will be given out on Monday to be submitted by Friday, when a discussion question will be posted on Quercus and will remain open until the following Tuesday. Completion of each coding exercise is worth 3 points, with an additional 2 points for participating in the discussion.

**Practice problems:** Practice problems from the textbooks will be assigned for each topic. It is recommended that you complete all exercises in the reference material including the "quick exercises" in MIPS and the exercises provided in STA238supplement. *All of the assigned practice problems are strongly recommended as preparation for the midterm and final exams.*

**Midterm:** To be held during the lecture period on July 24, 2023 (location: EX 100).

**Late or missed assessments:** The policies for late or missed assessments vary depending on the type of assessment.

- **Missed participation:** Many more opportunities will be given for participation than are needed to get full marks, and thus, accommodation for missing some surveys is structurally included.
- **Late or missed analysis exercise:** There is an automatic late penalty of 1 point per day for the coding component of the analysis exercises. Any analysis exercises not submitted within 3 days of the due date will receive a mark of 0, unless an extension was arranged. Requests for extensions must be made before 12 p.m. (noon) on the Friday that the coding portion is due, using the appropriate Quercus survey (see the Administration section). Extensions beyond the end of the discussion period will not be offered.
- **Missed midterm:** If the midterm is missed, a request for a makeup midterm may be made through a Quercus survey (see the Administration section). The request can be made up to 24 hours before the midterm and must be submitted within 24 hours of the midterm. The makeup midterm will be online and will only be available for 3 days following the scheduled midterm. The online midterm will also be weighted differently in the final marking scheme than the regular midterm. It will be worth 10% of the final grade, shifting the weight to the final exam to 60%. If no request for a makeup midterm is made or if the online midterm is also missed, a mark of 0 will be given for the midterm and no weight will be shifted to the final.
- **Missed final exam:** Instructors are not authorized to excuse a student from the final exam or offer alternatives. If you are unable to attend the final exam, you must petition through your College Registrar's Office or work through Accessibility Services, if it is a matter of accommodation.

**Marking concerns:** If you completed the analysis exercise but did not receive credit, please speak with the TA in your tutorial about it. If you notice a mistake in how your midterm was marked, you can request to have your paper re-evaluated. There will be an administrative survey made available on Quercus for this purpose 24 hours after grades are released. It will only be available for 5 days. Please note that regrade requests will only be considered to fix mistakes. Some examples of justifications for regrade requests that

will not be considered include feeling that more marks were deserved, a friend wrote the same thing but received a better mark, or the need for an increase in the overall mark. If there is ambiguity as to whether or not there is a mistake, the original mark will stand.

**Academic honesty:** Discussion about your work with classmates and the teaching team is encouraged, but you may not submit work completed by another student or group. You may use code provided by your instructors without providing a citation. If you use code from any other source, you must provide the source. It is expected that you understand any code that you use and that you are not sharing your completed work for this course. Academic offences can carry serious penalties. You are expected to be familiar with the University of Toronto's Code of Behaviour on Academic Matters, available at <http://academicintegrity.utoronto.ca>.