

## STA261, Summer 2018: Probability and Statistics II

### Instructor:

Alex Stringer, Office: SS6011

Email: alex [dot] stringer [at] mail [dot] utoronto [dot] ca

Lectures: Mondays and Wednesdays 7:00PM - 10:00PM, BA1160

Tutorials: Mondays and Wednesdays 6:00PM - 7:00PM, right before lecture. See course webpage for tutorial room assignments.

Office Hours: Mondays 4:00PM - 6:00PM, right before tutorial

**Course webpage:** [q.utoronto.ca](http://q.utoronto.ca)

### Marking Scheme:

- Quizzes: 40%. Your worst **two** quizzes will be dropped from the calculation of your final grade.
- Final Exam: 60%, scheduled by Faculty

### Course Outline:

A rigorous introduction to the theory of statistical inference and to statistical practice. Statistical models, parameters, and samples. Estimators for parameters, sampling distributions for estimators, and the properties of consistency, bias, and, variance. The likelihood function and the maximum likelihood estimator. Hypothesis tests and confidence regions. Examples illustrating statistical theory and its limitations. Introduction to the use of a computer environment for statistical analysis. (Note: STA261H1 does not count as a distribution requirement course).

**Prerequisite:** STA257H1

**Corequisite:** MAT235Y1/MAT237Y1/MAT257Y1, MAT223H1/MAT240H1

**Exclusion:** ECO227Y1/STA248H1/STA255H1

**Breadth Requirement:** The Physical and Mathematical Universes (5)

Prerequisites will be *strictly* enforced for undergraduate students. Do not approach your instructor to ask to sign a form waiving prerequisites. Undergraduate students without the appropriate prerequisites will be removed from the course.

### Textbook:

- Mathematical Statistics and Data Analysis, 3rd Edition, John A. Rice
- ISBN: 9780534399429, 0534399428

This textbook is optional. The topics covered in the course will not follow the textbook directly, but will make reference to appropriate sections when relevant. Not-for-credit practice problems may be assigned from the textbook. The textbook is available from the U of T bookstore.

## Lectures

Lectures are mandatory, and are where the majority of the course material will be delivered. They will be a combination of verbal discussion, writing on the chalkboard, and interactive code examples in R. You have to come to every class; I will not be posting annotated slides or summaries of material covered. I will be posting the annotated code for the data analyses we do in class. The full lecture schedule is below.

Lecture #	Date	Title
1	July 4	Review and Limit Theorems
2	July 9	Estimation Theory; Consistency
3	July 11	Sufficiency
4	July 16	Likelihood Function & Maximum Likelihood Estimation
5	July 18	Sampling Distributions of Estimators
6	July 23	Unbiasedness and Efficiency
7	July 25	Sampling Distribution of the Maximum Likelihood Estimator
8	July 30	Likelihood Ratios & Comparing Estimates
9	August 1	Likelihood Ratio Tests
10	August 8	Normal-Theory Hypothesis Tests and Confidence Intervals
11	August 13	Normal-Theory Hypothesis Tests and Confidence Intervals
12	August 14	Exam Review

## Tutorials and Quizzes

Tutorials are held before every lecture, with the exception of the first lecture and the make-up lecture. There is tentatively a quiz in every tutorial, covering material on the **previous** lecture. This is a very tight schedule, so you need to stay on top of your studies. Quizzes will be held during the last 20 minutes of each tutorial, from 6:40PM - 7:00PM. Bring photo ID to the quiz, as well as a pen and a non-programmable calculator.

Problem sets will be provided with every lecture, and the quiz questions will either be taken directly off the problem sets, or be very similar.

Here is the tutorial and **tentative** quiz schedule:

Tutorial #	Date	Quiz Material (tentative)
1	July 9	Lecture 1
2	July 11	Lecture 2
3	July 16	Lecture 3
4	July 18	Lecture 4
5	July 23	Lecture 5
6	July 25	Lecture 6
7	July 30	Lecture 7
8	August 1	Lecture 8
9	August 8	Lecture 9
10	August 13	Lecture 10



## Marking concerns

Any requests to have marked work re-evaluated must be made in writing within *one week* of the date the work was returned. You must print and fill out the form from the course webpage *in detail*, sign it, and put it in my departmental mailbox. Requests must include a detailed reason for the change that references objective fact, and must be made for legitimate perceived errors only. The following are unacceptable reasons for requesting a remark of any work:

- I feel my mark was unfair
- My friend got a better mark but they put the same thing
- I need a bump to get my GPA over some threshold

If you legitimately find an error, then I will happily change your mark, but in case of any ambiguity over the legitimacy of an error, I will side with the TAs over you.

Do not email me remark requests; these will be deleted with no response.

*By submitting a remark request, you are agreeing to have me (the instructor) remark your entire work, change the grade up, down, or not at all, and that the result of this represents your final mark on the work and is not to be contested further.*

## Missed Tests

There is no midterm test in this course. For the quizzes, your lowest **two** quizzes are dropped. This is to account for last minutes absences; hence, it is not expected that you will submit illness verification forms for missed quizzes, since they are not worth enough for the effort to matter, and your lowest two quizzes are automatically dropped. If you need to, though, here is the process:

If a quiz is missed for a valid reason, you must submit documentation to the course instructor.

If a quiz is missed for a valid medical reason, submit a copy of the University of Toronto Verification of Student Illness or Injury form to your instructor within two weeks of the quiz. Please **scan and email me** this form. The form is considered received when I email you back saying "Received; feel better!".

Important: The form must indicate that the degree of incapacitation on academic functioning is moderate, serious, or severe in order to be considered a valid medical reason for missing the quiz. If the form indicates that the degree of incapacitation on academic functioning is negligible or mild then this will *not* be considered a valid medical reason.

If a quiz is missed for a valid reason then the quiz will be excluded from your final quiz grade.

## Computing

Using a computer is not a mandatory part of the course, but it is recommended. We will be doing lots of examples of simulations and data analysis using R. You can download R from CRAN: <https://www.r-project.org/>

You can download RStudio from <https://www.rstudio.com/products/rstudio/#Desktop>

Get the open-source version, which is free and runs on Windows/Mac/Linux.

You will not be evaluated on R code in this course, however you are strongly recommended to do the code exercises on your own. This will help you understand the concepts covered in class.

## Calculators

You will need a calculator. Any calculator that has logarithmic functions will be sufficient. Calculators on phones or other devices equipped to communicate with the outside world (for example, through the internet or cellular or satellite phone networks) will not be permitted during the term test and the final exam.

## Online Discussion Board

This term you will have the option to use Piazza for class discussion. If you decide not to use Piazza, it will not disadvantage you in any way, and will not affect official University outcomes (e.g., grades and learning opportunities). If you choose not to opt-into Piazza, then you can ask questions or discuss course material with the instructor or TAs during office hours.

Be sure to read Piazza's [Privacy Policy](#) and [Terms of Use](#) carefully. They provide for substantial sharing and disclosure of your personal information. If you decide to participate in Piazza, only provide content that you are comfortable sharing under the terms of the Privacy Policy and Terms of Use.

<https://piazza.com/utoronto.ca/summer2018/sta261h1>

## How to communicate with your instructor

I get a lot of email, so it is important to abide by my email policy in order to ensure you receive a prompt and efficient response. You'll get a good response from me if you chat to me after lecture or in office hours. If you need to email me, make sure you are professional: full sentences, no slang like "yo prof, I wanna get the lecture notes", etc. This is good practice for your eventual transition into industry or grad school. *Make me want to reply to you.* I reserve the right to simply ignore any emails I don't like.

If you need to email me follow these steps:

- Put STA261: Student Communication in the subject line
- Start the email with your full name and student #, and "Hi Alex, ...". First name is fine.
- State the purpose of your email
- Say thank you or sincerely or something that indicates the email is over
- End with your name and student number

This policy is not designed to discourage student communication- I like communicating with you, it's my job. This policy is designed to encourage *productive* student communication, by forcing you to communicate professionally.

Example email:

"""

Hi Alex,

My name is <name>, student number <student number>, and I am a student in your STA261 class. I would like to follow up on our conversation after lecture yesterday.

<more content>

Thank you,

<name>, <student number>

"""

## Academic integrity

You are responsible for knowing the content of the University of Toronto's Code of Behaviour on Academic Matters at [www.governingcouncil.utoronto.ca/policies/behaveac.htm](http://www.governingcouncil.utoronto.ca/policies/behaveac.htm). If you have any questions about what is or is not permitted in this course, please do not hesitate to 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](mailto:accessibility.services@utoronto.ca) or <http://accessibility.utoronto.ca>.