STAT 341: COMPUTATIONAL STATISTICS & DATA ANALYSIS
WINTER 2020

Lecture Information: T/Th 10:00am – 11:20am Mathematics 3 (M3) 1006
Tutorial Information: F 9:30am – 10:20am St. Paul's University College (STP) 105

Instructor: Nathaniel T. Stevens
Office: Mathematics 3 (M3) 3143 **Office Hours:** T/F 12:00 – 1:30pm
Email: nstevens@uwaterloo.ca **Phone:** 519-888-4567 ext. 35540

COURSE DESCRIPTION

This is a computationally focused approach to statistical reasoning in the context of real data. Functional programming in R and algorithms will be used to define interesting attributes of finite populations and their sampling characteristics. Computational approaches to inductive inference and the assessment of predictive accuracy will also be discussed.

COURSE OBJECTIVES

Any student who successfully completes this course should have achieved the following objectives:

- The fundamentals of population-based statistical analyses, as well as implicitly/ explicitly defined population attributes
- The basics of sampling and the underlying ideas/ mechanisms of probability sampling and related issues
- Inductive inference including target and study populations, measurements, comparing subpopulations, random intervals and coverage probabilities, and resampling methods such as the bootstrap
- The fundamentals of prediction and how its accuracy is measured
- The generation of high-quality visualizations and inferential analyses using R for the topics above
- The preparation of reports that communicate your statistical analyses using LaTeX and R Markdown.

COURSE TOPICS

The course will for the most part follow the topics and notes available here.

COURSE HOMEPAGE

The course homepage is on LEARN (https://learn.uwaterloo.ca). It is my expectation that you regularly visit this webpage to download course material and receive important announcements.

COURSE COMMUNICATION

Email: All email correspondence must come from your "uwaterloo" email address.

Discussion: For discussion amongst yourselves, myself and the TAs, we will use Slack, a workplace instant-messaging app. All discussions will take place within the STAT341-Winter2020 workspace. Login using your "uwaterloo" email address and the workspace URL "stat341winter2020" at https://slack.com/signin. To join the workspace, you must click the invite link below:

CLICK HERE TO JOIN SLACK FOR STAT 341

ASSESSMENT

1. Assignments (25%)
   - There will be four (4) assignments, each worth 6.25% of your final grade.
   - Assignments will be due by 11:59pm on the days listed in the table below, and they are to be submitted electronically via Crowdmark.

Assignment	Due Date
1	Friday January 24
2	Friday February 14
3	Friday March 13
4	Friday April 3

   - All assignments are to be completed in their entirety using R Markdown. R Markdown is a file format used for making dynamic documents with R. It allows you to combine mathematics (via LaTeX), R code, R output, and plain text into high quality documents.
   - You are expected to complete these assignments **independently** and submit your own work (i.e., unique solutions, code, results and interpretations). Cheating is a serious offence and will be treated as such. Please refer to the Academic Integrity section below.
   - If you fail to submit an assignment and have a **valid** reason with supporting documentation, the weight from that assignment will be shifted to the final exam. If the reason is not deemed valid or you do not have supporting documentation, you will receive a zero.
   - **Assignments up to 24 hours late will receive a penalty of 50%. Assignments more than 24 hours late will not be graded, and you will receive a zero.**

2. Tests (25%)
   - There will be two (2) closed book tests held during the Tutorial sessions on **Friday February 7** and **Friday March 13**. Each test is 50 minutes in duration and worth 12.5% of your final grade.
   - The tests will evaluate your comprehension of the course material and may consist of a series of short answer calculations, short answer written responses, multiple choice questions, proofs and R output interpretation.

- If a test is missed for a **valid** reason, and you have supporting documentation, its weight will be shifted to the final exam. If the reason is not deemed valid or you do not have supporting documentation, you will receive a zero.
- **I will not offer "make up" tests for any reason.**

3. Final Exam (50%)
   - There will be a 2.5-hour, closed book, cumulative final exam during the Winter 2020 Final Examination Period: **April 8 – April 25**. Please refrain from booking end-of-term travel before the actual exam date is scheduled.
   - The format of the final exam will mimic that of the two tests. Specifically, short answer calculations, written responses, multiple choice questions, proofs and R output interpretation can all be expected.
   - If the final exam is missed for a **valid** reason, and you have supporting documentation, you will receive an "incomplete" (INC) grade as long as you have at least 70% in the course going into the final exam. Otherwise, you will receive a zero. Documentation must be provided to me within 2 business days of the final exam.

In order to pass the course: you must have a mark of *at least 50% on the final exam as well as an overall final grade of at least 50%* according to the above grading scheme. You cannot pass the course without passing the final exam.

*Note that for all accommodations due to illness, a University of Waterloo Verification of Illness Form (VIF) is the documentation I require.

**If you have a dispute with your grade on an assignment or a test, it may be submitted to be remarked within 1 week of the assignment/ test being returned to you. Bear in mind that the entire assignment/ test is then subject to be remarked.

A NOTE ON R

R is a language and a free statistical computing and graphics software that we will use extensively throughout the course; all computational lecture examples, tutorial exercises and assignment problems will be done in R (via the RStudio development environment). R and RStudio are available on all Math Faculty Computing Facility environments. If you have a personal computer or laptop it is in your best interest install both R and RStudio. You can download both of them here.

INSTITUTIONAL REQUIRED STATEMENTS

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [See the Office of Academic Integrity for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt, please be

certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [See the Office of Academic Integrity for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline. For typical penalties, check Guidelines for the Assessment of Penalties.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals.

Note for students with disabilities: AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.