Carleton University
Institute of Data Science
DATA1517A – *Data Modelling I* – Fall 2026

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Lectures: Tuesdays and Thursdays from 8:35 am to 9:55 am.

Tutorials: Tuesdays from 11:35 am to 12:25 pm and 2:35 pm to 3:25 pm. Tutorials will demonstrate how to use R to generate and/or analyze data for some assignment questions.

Office Hours: Mondays from 2:30 pm – 4:00 pm and Thursdays from 10:00 am to 11:30 am.

Recommended Textbook:

- *Introduction to Probability and Statistics for Data Science*, by Steven E. Rigdon et al. Students are not required to buy this book. Costs to purchase the book can be found here.
- *Introduction to Probability and Statistics*, 4th Canadian Edition, by Mendenhall et al. Students are not required to buy this book, but it contains the suggested exercises. Costs to rent or purchase the book can be found here.

Course description: Introduction to formulating statistical problems and analyzing data using open-source software. Graphical and numerical descriptives. combinatorial formulae, Bayes' Theorem, probability, Discrete and continuous distributions, means and variances. Point and interval estimates, and hypothesis tests for one- and two-samples using Central Limit Theorem, and permutation tests. R will be the statistical software package used.

Prerequisites: An Ontario Grade 12 university-preparation Mathematics or equivalent, or permission of the Institute of Data Science.

Evaluation: Your final grade will be calculated as:

- Term Mark (60%)
  - Tests (50%)
  - Assignments (10%)
- Final Examination Mark (40%)

Assignments

There will be four assignments, each worth 2.5% of your final grade. Assignments are to be uploaded to the assignment folder on Brightspace before 2:00 PM on the due date. To be accepted for grading, assignments must adhere to the *Assignment Submission Regulations* posted on Brightspace. You are given two weeks to complete each assignment, but the second week is a built-in one-week extension to account for extenuating circumstances you may encounter. No additional extensions will be given.

Assignment	Available	Due BEFORE 2:00PM	Assignment Tutorial (Tentative)
Assignment 1	Friday, Sept 18th	Friday, Oct 2nd	Tuesday, Sept 22nd and Wednesday, Sept 23rd
Assignment 2	Friday, Oct 2nd	Friday, Oct 16th	Tuesday, Oct 6th and Wednesday, Oct 7th
Assignment 3	Friday, Oct 23rd	Friday, Nov 6th	Tuesday, Nov 3rd and Wednesday, Nov 4th
Assignment 4	Friday, Nov 6th	Friday, Nov 20th	Tuesday, Nov 17th and Wednesday, Nov 18th

Tests
There will be two tests on **Thursday, October 22nd, 8:35 am to 9:55 am,** and **Thursday, November 26th, 8:35 am to 9:55 am**. The higher of the two tests will be worth 30% and the lower of the two tests will be worth 20%.

Final Exam: The final exam will cover all of the material given during the term and it will be scheduled by the university. The exam period runs from **December 12-23**. It is the responsibility of each student to be available during the exam period. In particular, no travel plans should be made until the examination schedule is released.

Note: The two tests and final exam will be written in-person at Carleton University. No online/distance proctoring of tests or the final exam will be permitted under any circumstances.

Allowed Material:
The following applies to tutorials, tests, and final exam.

- ***Calculators:*** Only non-programmable, non-graphing calculators are allowed. Any calculator functionality that produces values that should be calculated using a formula or obtained from a table is not allowed.
- ***Statistical Tables:*** You are only permitted to use the statistical tables provided by the instructor. You can not use any other tables.
- ***Statistical Software/Applications:*** You will be using R in the tutorials. The use of any other applications including Excel is not permitted
- ***Formula Sheet***: You will be provided with a formula sheet for the two tests and the final exam.

Academic Integrity: Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in Academic Carleton University's Academic Integrity Policy. A list of standard sanctions in the Faculty of Science can be found here.

Intellectual property notice
Classroom teaching and learning activities, including lectures, discussions, presentations, tests, exams, by instructors, guest presenters, and students, are copy protected and remain the intellectual property of the instructor or respective author(s). All course materials, including PowerPoint/pdf presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).
Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s). A student who publicly posts or sells an instructor's work, without the instructor's express consent, may be charged with misconduct under Carleton's Academic Integrity Policy and/or Code of Conduct, and may also face adverse legal consequences for infringement of intellectual property rights.

Academic Accommodations
Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the *Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances*, are outlined on the Academic Accommodations website (students.carleton.ca/course-outline).

Statement on the Use of Generative AI: Students are not permitted to use generative AI to help them answer questions or check their work on tutorials, tests, or the final exam. The use of generative AI for these purposes will be considered a violation of Carleton University's Academic Integrity Policy and reported to the Office of the Dean of Science for disciplinary action.

Student Rights & Responsibilities: Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Class Conduct:
In order to foster a positive and productive learning environment, disruptive behaviour will not be tolerated during lectures. Disruptive behaviour is defined as any action, as determined at the sole discretion of the instructor, that distracts any student or the instructor from focusing on the lecture. Examples of disruptive behaviour include, but are not limited to: (i) students socializing/talking during class; and (ii) students using electronic devices for reasons unrelated to the lecture. Students who engage in disruptive behaviour will be given one verbal warning. If a student engages in disruptive behaviour a second time, they will be asked to leave the classroom for the remainder of the lecture. A student who continually exhibits disruptive behaviour will be referred to the Dean's Office for committing an instructional offence.

Important Dates: Important dates and deadlines, including statutory holidays, can be found here

ADDITIONAL COURSE POLICIES:
1. Students are permitted to miss a **maximum of one test** due to extenuating circumstances as defined by the Academic Consideration Policy. These students must complete the Academic Consideration for Coursework Request Form within three business days of the original test. Students who correctly follow this procedure will have the missing test grade replaced by their grade on the final exam. **Please note these changes will not appear in the Brightspace gradebook and will be handled offline.** Failure to follow this procedure will result in a grade of 0% on the missed test. Students who miss a second test will be required to meet with the instructor to determine whether they will be permitted to remain in the course. To defer a final exam, students must apply through the Registrar's Office.

2. You are expected to complete the tests and final exam without any outside aid from another person or electronic device (except a permitted calculator). Any communication with other individuals or access of electronic devices during these assessments will be considered an automatic violation of Carleton University's Academic Integrity Policy. Examples of these electronic devices include, but are not limited to, smartglasses (including prescription smartglasses), smartwatches, smartphones, and listening devices. Students may be required to verify that they are not in possession of any unauthorized electronic devices before or during an assessment, and instructors or invigilators reserve the right to conduct reasonable checks to ensure compliance with these requirements. If you have concerns about these procedures, please contact the instructor at least two weeks before the first scheduled assessment so that appropriate arrangements can be discussed.
3. Concerns about grading on assessments must be brought to the instructor's attention within 72 hours of these assessments being available for review.
4. Any student wishing to review their final exam must make an appointment within a two-week period following the deferred exam period. These appointments are solely for educational purposes and are **not** to be treated as an opportunity to debate your grade.
5. In assigning course letter grades, final numerical grades are not automatically rounded up. A student must definitively earn the lower numerical limit of a letter grade category to receive that letter grade.
6. You must use your Carleton email account for all email communications. I am unable to respond to non-Carleton emails due to the Freedom of Information and Protection of Privacy Act.
7. If the time of a test in this course conflicts with the time of a test in another course, you must inform the instructor of the conflict at least two weeks in advance with a copy of the syllabus for the other course.

TENTATIVE LECTURE SCHEDULE (Section numbers are based on the first recommended textbook)			
WEEK	**START**	**SECTIONS**	**TOPICS**
1	September 9	1.1 – 1.4	Data science and statistics, population and sample, descriptive versus inferential, types of data.
2	September 14	1.5, 2.1 – 2.3	Measures of location, measures of variability, measures of how data co-vary, and Data visualization: Bar charts, Pie charts, Histograms, Box plots, and Time Series plots.
3	September 21	3.1 – 3.4	Events and sample spaces, calculating probabilities, Law of Total Probability, and Bayes' theorem.
4	September 28	4.1 – 4.4	Discrete random variables, continuous random variables, expected values, and variance
5	October 5	5.1, 5.2, 5.5, 5.6	Probability distributions for discrete random variables. Binomial distribution. Hypergeometric distribution. Poisson distribution.
6	October 12	6.1 – 6.4	Probability distributions for continuous random variables. Uniform distribution. Exponential distribution.
7	October 19	7.1 – 7.6, 8.1, 8.2, 8.3	Data collection. Sampling distribution for sums and means. Central limit theorem
FALL BREAK WEEK, OCTOBER 26 – 30			
8	November 2	8.7, 8.8, 9.1, 9.2	Sampling distribution for proportions. Techebysheff's theorem. Point estimation.
9	November 9	10.1 – 10.4	Large sample confidence intervals. Small sample confidence intervals.
10	November 16	10.5 – 10.6	Confidence intervals for differences. Determining the sample size.
11	November 23	11.1, 11.2, 11.4, 11.5, 11.6	Hypothesis testing for one mean.
12	November 30	11.7, 12.1, 12.2	Hypothesis testing for proportion. Hypothesis testing for two independent samples: Comparing two means and two proportions.
13	December 7	12.3	Testing paired samples.

This outline is subject to change depending on the progress of the course. All necessary changes will be announced in class and on Brightspace. It is the responsibility of the student to keep up to date with any such modifications.