

University of Alberta
Department of Mathematical & Statistical Sciences

Statistics for Learning
STAT 541, Winter 2025

Instructor: Andrew McCormack
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Office Hours: CAB 475, MW 10:00 AM -10:50 AM
Lecture Room & Time: CAB 281, MWF 11:00 AM -11:50 AM
Course Web Page: Canvas
[Course Website](#)

1 COURSE CONTENT

Course Description:

The course focuses on statistical learning techniques, in particular those of supervised classification, both from statistical (logistic regression, discriminant analysis, nearest neighbours, and others) and machine learning background (tree-based methods, neural networks, support vector machines), with the emphasis on decision-theoretic underpinnings and other statistical aspects, flexible model building (regularization with penalties), and algorithmic solutions. Selected methods of unsupervised classification (clustering) and some related regression methods are covered as well.

Course Prerequisites and Corequisites:

It is important to prepare yourself for this course through a review of the prerequisite material. Students who do not have the required prerequisites at the time of taking this course should not expect supplementary professorial tutoring from the instructor. It is expected that you are very comfortable with regression techniques at the level of at least STAT 378. Proficiency with multivariable calculus, linear algebra and standard probabilistic computations is also required.

Course Objectives and Expected Learning Outcomes:

Topics to be covered include:

- General methodology for supervised learning problems such as decision theory, resampling methods, ensemble methods, and optimization.

- Algorithms for supervised learning such as linear models, non-parametric regression, QDA, regression trees, neural networks, and SVMs.
- Topics in unsupervised learning and probabilistic modeling such as clustering, PCA, manifold learning, factor analysis, and graphical models.

2 LEARNING RESOURCES

Recommended Textbook:

The Elements of Statistical Learning: Data Mining, Inference, and Prediction., Trevor Hastie, Jerome H. Friedman, and Robert Tibshirani, Springer, 2009.

This textbook is freely available for download for University of Alberta students [here](#).

Other Reference Books:

An Introduction to Statistical Learning: With Applications in R, Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer, 2013.

This textbook is freely available for download [here](#).

Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2006.

This textbook is freely available for download [here](#).

Modern Multivariate Statistical Techniques, Alan J Izenman, Springer, 2008.

This textbook is freely available for download [here](#).

Software:

The software R will be used in this course. This software is free and you can download it from: <http://www.r-project.org/>. You may also use Python for assignments.

Academic Success Centre:

The [Academic Success Centre](#) provides professional academic support to help students strengthen their academic skills and achieve their academic goals. Individual advising, appointments, and group workshops are available year round in the areas of Accessibility, Communication, Learning, and Writing Resources. Modest fees apply for some services.

Faculty of Science Student Services:

The [Faculty of Science Student Services](#) office is located on the main floor of the [Centennial Centre for Interdisciplinary Sciences](#) (CCIS). This office can assist with the planning of [Your Academics](#), and provide information related to [Student Life and Engagement](#), [Internships and Careers](#), and [Study Abroad](#) opportunities. Please visit [Advising](#) for more information about what Faculty Academic Advisors in the Student Services Office can assist you with.

3 GRADE EVALUATION

Grade Evaluation:

The course mark will be calculated based on the following breakdown:

Course Component	Weight of Total Mark	Tentative Date
Assignments	35%	See below
Quiz 1	15%	W Feb 5, 11:00 AM - 11:50 AM
Quiz 2	15%	W Mar 12, 11:00 AM - 11:50 AM
Final Exam	35%	TBA

The two quizzes will be held during class time.

Note: The date of the final examination is set by the Registrar. Students must verify this date on BearTracks when the Final Exam Schedule is posted.

Grades are unofficial until approved by the Department of Mathematical and Statistical Sciences.

Assignments:

There are a total of five, equally weighted assignments, which should be submitted on Canvas on or before the due date. See the late policy for more details.

Assignment No.	Tentative Due Date
Assignment 1	F Jan 24
Assignment 2	F Feb 14
Assignment 3	F Mar 7
Assignment 4	F Mar 28
Assignment 5	W Apr 9

There is a new assignment approximately every third week. Your overall grade on the assignments is equal to the average of highest 4 grades you obtained on all of your assignments. That is, your lowest assignment grade will be dropped. Each of your highest 4 assignment grades is worth 8.75% of your total mark.

Note that all due dates for the assignments and quizzes are subject to change. Changes will be clearly communicated to the class.

Past or Representative Evaluative Material: Practice questions will be made available before the final exam. Solutions to these problems will not be provided.

Statement of Expectations for the Use of Artificial Intelligence:

Any use of generative AI tools (ChatGPT or similar large language models) in your assignments will result in academic penalties and be considered an act of cheating and a violation

as outlined in the Sections 4 and 5 of Appendix A in the University of Alberta Student Academic Integrity Policy.

4 POLICIES FOR LATE AND MISSED WORK

Missed Term Work or Final Exam Due to Non-medical Protected Grounds (e.g., religious beliefs): When a term assessment or final exam presents a conflict based on [non-medical protected grounds](#), students must apply to the Academic Success Centre for accommodations via the [Register for Accommodations website](#). Students can review their eligibility and choose the application process specific for Accommodations Based on Non-medical Protected Grounds.

It is imperative that students review the dates of all course assessments upon receipt of the course syllabus, and apply AS SOON AS POSSIBLE to ensure the timely application of the accommodation. Students who apply later in the term may experience unavoidable delays in the processing of the application, which can affect the accommodation.

Missed or Late Assignments

Students who miss any assignment due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for an excused absence. To apply for an excused absence, you must contact the instructor within two working days of the assignment due time or as soon as the student is able, having regard to the circumstances underlying the absence. If an excused absence is granted, then the weight for the assignment will be added to the final. An excused absence is a privilege and not a right. There is no guarantee that an absence will be excused. Misrepresentation of facts to gain an excused absence is a serious breach of the Student Academic Integrity Policy. In all cases, instructors may request adequate documentation to substantiate the reason for the absence at their discretion.

Assignments are to be submitted on Canvas before 11:59 PM Mountain Standard Time on the date that they are due. For every n days/partial days that an assignment is late, including weekends, $n \times 25\%$ will be deducted from the grade of the assignment. For instance, if the assignment is due on Monday and you submit it at 9:00 AM on Wednesday your mark for this assignment will equal (Initial Grade – 50%) as it is two days late. Any assignment that is four or more days/partial days late will receive 0%. Note that your lowest assignment score will be dropped.

Deferred Final Examination: A student who cannot write the final examination due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for a deferred final examination. Such an application must be made to the student's Faculty office within two working days of the missed examination and must be supported by appropriate documentation or a Statutory Declaration (see calendar on [Attendance](#)). Deferred examinations are a privilege and not a right; there is no guarantee that a deferred examination will be granted. The Faculty may deny deferral requests in cases where less than 50% of

term work has been completed. Misrepresentation of facts to gain a deferred examination is a serious breach of the Student Academic Integrity Policy.

5 STUDENT RESPONSIBILITIES

Academic Integrity and Student Conduct:

The University of Alberta is committed to the highest standards of academic integrity and honesty, as well as maintaining a learning environment that fosters the safety, security, and the inherent dignity of each member of the community, ensuring students conduct themselves accordingly. Students are expected to be familiar with the standards of academic honesty and appropriate student conduct, and to uphold the policies of the University in this respect.

Students are particularly urged to familiarize themselves with the provisions of the [Student Academic Integrity Policy](#) and the [Student Conduct Policy](#), and avoid any behaviour that could potentially result in suspicions of academic misconduct (e.g., cheating, plagiarism, misrepresentation of facts, participation in an offence) and non-academic misconduct (e.g., discrimination, harassment, physical assault). Academic and non-academic misconduct are taken very seriously and can result in suspension or expulsion from the University.

All students are expected to consult the [Academic Integrity website](#) for clarification on the various academic offences. All forms of academic dishonesty are unacceptable at the University. Unfamiliarity of the rules, procrastination or personal pressures are not acceptable excuses for committing an offence. Listen to your instructor, be a good person, ask for help when you need it, and do your own work – this will lead you toward a path to success. Any academic integrity concern in this course will be reported to the College of Natural and Applied Sciences. Suspected cases of non-academic misconduct will be reported to the Dean of Students. The College, the Faculty, and the Dean of Students are committed to student rights and responsibilities, and adhere to due process and administrative fairness, as outlined in the [Student Academic Integrity Policy](#) and the [Student Conduct Policy](#). Please refer to the policy websites for details on inappropriate behaviours and possible sanctions.

The College of Natural and Applied Sciences (CNAS) has created an [Academic Integrity for CNAS Students eClass](#) site. Students can self enroll and review the various resources provided, including the importance of academic integrity, examples of academic misconduct and possible sanctions, and the academic misconduct and appeal process. They can also complete assessments to test their knowledge and earn a completion certificate.

“Integrity is doing the right thing, even when no one is watching.” – C.S. Lewis

Appropriate Collaboration:

Copying assignments is not allowed. Students will receive academic penalties for copying

assignments.

Students Eligible for Accessibility-Related Accommodations: In accordance with the University of Alberta's [Discrimination, Harassment, and Duty to Accommodate policy](#), accommodation support is available to eligible students who encounter limitations or restrictions to their ability to perform the daily activities necessary to pursue studies at a post-secondary level due to medical conditions and/or non-medical protected grounds. Accommodations are coordinated through the [Academic Success Centre](#), and students can learn more about eligibility on the [Register for Accommodations website](#).

It is recommended that students apply AS SOON AS POSSIBLE in order to ensure sufficient time to complete accommodation registration and coordination. Students are advised to review and adhere to published deadlines for accommodation approval and for specific accommodation requests (e.g., exam registration submission deadlines). Students who request accommodations less than a month in advance of the academic term for which they require accommodations may experience unavoidable delays or consequences in their academic programs, and may need to consider alternative academic schedules.

Exam Conduct:

- Your student photo I.D. is required at exams to verify your identity.
- Students must arrive at the specified time to take the exam. Once the exam has started, students must remain in the physical in-person or remote environment for at least 30 minutes. Students who arrive more than 30 minutes late for an in-person exam will not be permitted to take the exam.
- All cell phones, smartwatches, and electronic devices must be turned off and stored in your bags.
- If you need to use the restroom facilities during an exam you are required to remove your jacket and empty your pockets.

Cell Phones:

Cell phones are to be turned off during lectures, labs and seminars.

Recording and/or Distribution of Course Materials: Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Learning and Working Environment:

The Faculty of Science is committed to ensuring that all students, faculty and staff are able to

work and study in an environment that is safe and free from discrimination and harassment. It does not tolerate behaviour that undermines that environment.

If you are experiencing harassment, discrimination, fraud, theft or any other issue and would like to get confidential advice, please contact any of these campus services:

- [Office of Safe Disclosure & Human Rights](#): A safe, neutral and confidential space to disclose concerns about how the University of Alberta policies, procedures or ethical standards are being applied. They provide strategic advice and referral on matters such as discrimination, harassment, duty to accommodate and wrong-doings. Disclosures can be made in person or online using the [Online Reporting Tool](#).
- [University of Alberta Protective Services](#): Peace officers dedicated to ensuring the safety and security of U of A campuses and community. Staff or students can contact UAPS to make a report if they feel unsafe, threatened, or targeted on campus or by another member of the university community.
- [Office of the Student Ombuds](#): A confidential and free service that strives to ensure that university processes related to students operate as fairly as possible. They offer information, advice, and support to students, faculty, and staff as they deal with academic, discipline, interpersonal, and financial issues related to student programs.
- [Office of the Dean of Students](#): They can assist students in navigating services to ensure they receive appropriate and timely resources. For students who are unsure of the support they may need, are concerned about how to access services on campus, or feel like they may need interim support while you wait to access a service, the Dean of Students office is here to help.

Feeling Stressed, Anxious, or Upset? It's normal for us to have different mental health experiences throughout the year, particularly as we adjust to returning to campus as we move through a pandemic. Know that there are people who want help. You can reach out to your friends and access a variety of supports available on and off campus at the [Need Help Now](#) webpage or by calling the 24-hour Distress Line: 780-482-4357 (HELP).

Policy about course outlines can be found in [Course Requirements, Evaluations Procedures and Grading](#) of the University Calendar.

Land Acknowledgement:

The University of Alberta respectfully acknowledges that we are situated on Treaty 6 territory, traditional lands of First Nations and Métis people.

To learn more about the significance of this land acknowledgement, please read this useful article and associated links to more information.

Disclaimer:

Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this syllabus.

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