STA437/2005

Methods for multivariate data

Winter 2025 Syllabus

Course Contacts

Course Website: https://pzwiernik.github.io/sta437/

Instructor: Piotr Zwiernik
Email: piotr.zwiernik@utoronto.ca
Office Hours and Location: Tuesday, 13:30-15:00 (UY 9033)
Additional Notes: For general questions, please use Piazza. For personal questions try to approach the instructor after the lecture.

Course Overview

Practical techniques for the analysis of multivariate data; fundamental methods of data reduction with an introduction to underlying distribution theory; basic estimation and hypothesis testing for multivariate means and variances; regression coefficients; principal components and partial, multiple and canonical correlations; multivariate analysis of variance; profile analysis and curve fitting for repeated measurements; classification and the linear discriminant function.

Basic techniques for the analysis of multivariate data; multivariate normal distribution; examples of modelling non-Gaussian data (elliptic distributions, copulas, Gaussian mixture models); fundamental methods of data reduction; principal components and partial, multiple and canonical correlations; modern dimension reduction techniques; graphical models and high-dimensional data; tensor data.

Course Learning Outcomes

By the end of this course students will have a deep understanding of the multivariate statistics fundamentals. They will also get introduced to modern dimension reduction techniques and how to use them in R/Python.

Prerequisites: STA302H1/STAC67H3/STA302H5
Corequisites: None
Exclusions: STAD37H3, STA437H5
Recommended Preparation: MAT224H1/MAT247H1
Credit Value: 0.5

Course Materials

The lecture is based on lecture notes that will be updated weekly and on lecture slides.

Marking Scheme

Assessment	Percent	Details	Due Date
Midterm 1	20%		2025-02-07
Midterm 2	20%		2025-03-14
Final Project	20%	Group of 1-2 people per project. The details come during the reading week.	2025-04-04
In-Person Final Exam	40%		Final Exam Period

Late Assessment Submissions Policy

A penalty of 10% of the total mark for the final project will be applied per day (including weekends and holidays).

Policies & Statements

Late/Missed Final Projects

For the final project ten percent of the value will be deducted for each late day (up to 3 days, then submission is blocked). No credit will be given for assignments submitted after 3 days.

Make-Up Tests

- If a test is missed for a valid reason, you must submit documentation to the course instructor.
- If a test is missed for a valid medical reason, you must submit the absence declaration form

and let your instructor know immediately.

- The form will only be accepted as valid if the form is filled out according to the instructions

on the form.

There will be no make-up tests.

- If a midterm test is missed for a valid reason then the final test will be worth 60% of your final grade. If prior approval is not received for non-medical reasons then you will receive a term test grade of zero.

- If two midterms are missed for valid reasons then the final test will be worth 60% of your final grade and an oral examination will be organized for the remaining 20% of the grade.

Re-marking Policy

Any requests to have graded work re-evaluated must be made within one week of the date the grade is released. Re-evaluation may result in a decrease in the grade.

Collaboration policy on the final project

The final projects can be handed individually or by a group of two people. No collaboration between groups is allowed.

Plagiarism Detection Tool

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (https://uoft.me/pdt-faq).

Use of Generative AI

The final project is designed to reinforce lecture content and provide valuable learning experiences outside of class. While students are encouraged to utilize artificial intelligence tools, including generative AI, as learning aids or for assistance with teh assignment, it is important to remember that the ultimate responsibility for the submitted work rests with the students. Grasping complex concepts often involves a layered learning process and intellectual engagement, which cannot be fully substituted by even the most creative use of tools like chat-GPT.

Academic Integrity

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters (https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019). If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, please reach out to me. Note that you are expected to seek out additional information on academic integrity from me or from other institutional resources. For example, to learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at http://www.writing.utoronto.ca. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see A&S Student Academic Integrity (https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity) and the University of Toronto Website on Academic Integrity (https://www.academicintegrity.utoronto.ca).

Accommodation for Personal Reasons

There may be times when you are unable to complete course work on time due to non-medical reasons. If you have concerns, speak to me or to an advisor in your College Registrar's office; they can help you to decide if you want to request an extension or other forms of academic consideration. They may be able to email your instructors directly to provide a College Registrar's letter of support and connect you with other helpful resources on campus.

Recording Lectures (by Student)

The content of this lecture is written down in detail (and beyond) in the provided lecture notes. The lecture slides will be provided as well. Students are asked not to take pictures or make recordings during class.