ECON 484/673: Econometric Methods for High-Dimensional Data, Winter 2021

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Course material on the course website
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Course Objectives

In this course, you will learn about data analysis techniques that are especially useful for potentially complex models of economic behaviour in data-rich environments. We will first discuss methods detecting what features are important for decisionmakers and hwo to examine the uncertainty in statistical estimators. Then we will turn to the way that standard statistical tools are used to detect correlations in the observed data, and the way that these tools are used to examine the causal impact of policy on individuals. Finally, we will discuss dimension reduction and nonparametric methods for measuring relationships in high-dimensional data.

References

This course will follow the basic outlines of the first reference below. However, course material will also be drawn from the second reference, which is quite helpful if this is your first exposure to these methods.

- M. Taddy (2019). *Business Data Science*, McGraw Hill.
- G. James, D. Witten, T. Hastie and R. Tibshirani (2014). *An Introduction to Statistical Learning*, Springer.

The James et al. book is available freely from an accompanying website.

The examples in the notes use R, a freely available statistical software package. You are not required to choose any particular language for assignments, although I encourage you to learn R. It is very useful, popular among social scientists and free to use.

Topics

The material will be sequenced as follows.

1. Inference, multiple testing and resampling
2. Regression and regularization
3. Classification
4. Methods for causal inference
5. Factors and principal components
6. Nonparametric methods for complex data

Evaluation

Your mark will be made up of the following parts, with relative weights in parentheses below. Everything (homework and project) will be completed in rotating assigned groups of about three people. Group assignments and a description of best practices for completing assignments will be distributed when the first assignment is posted on the course website.

1. (80%) Assignments posted over the course of the term, approximately one every two to three weeks.

2. (20%) Final assignment, which will include an oral component during the final exam period.

Other administrative details:

Academic Integrity

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

Discipline: A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. 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 professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline. For typical penalties check Guidelines for the Assessment of Penalties.

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.

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.

Accommodation for Students with Disabilities

Note for students with disabilities: The AccessAbility Services office, located on the first floor of the Needles Hall extension (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 the AS office at the beginning of each academic term.

Mental Health Support

All of us need a support system. The faculty and staff in Arts encourage students to seek out mental health supports if they are needed.

On Campus

- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 ext 32655
- MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services
- Health Services Emergency service: located across the creek form Student Life Centre

Off campus, 24/7

- Good2Talk: Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-433 ext. 6880
- Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Full details can be found online at the Faculty of ARTS website Download UWaterloo and regional mental health resources (PDF) Download the WatSafe app to your phone to quickly access mental health support information

Territorial Acknowledgement

We acknowledge that we live and work on the traditional territory of the Attawandaron (Neutral), Anishinaabeg and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes ten kilometers on each side of the Grand River.