

1. General Course Information

Course Information

INTRODUCTION TO DATA SCIENCE I
CS4414A/CS9637A/CS9114A
Fall 2020

Lecture: Online Asynchronous - OWL
Tutorial/Q&A: Thursday 3:30pm to 4:30pm – Zoom and/or mechanism TBA
Place: Online

List of Prerequisites

Antirequisite(s): [Computer Science 4437A/B/Y](#) if taken during Fall/Winter 2015 or 2016.

Prerequisite(s): 0.5 course from Biology 2244A/B, Statistical Sciences 2035, Statistical Sciences 2141A/B, Statistical Sciences 2143A/B, Statistical Sciences 2244A/B or Statistical Sciences 2858A/B; 1.0 course from Computer Science 1025A/B, Computer Science 1026A/B, Computer Science 1027A/B, Computer Science 1037A/B, Computer Science 2120A/B, Computer Science 2121A/B, Digital Humanities 2220A/B, Digital Humanities 2221A/B, Engineering Science 1036A/B; and 0.5 course from Mathematics 1229A/B, Mathematics 1600A/B, Applied Mathematics 1411A/B; or permission of the Department.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

For graduates: There are no set prerequisites for the class. However, a decent working knowledge of probability, linear algebra, and basic programming in Python is required. A more detailed self-assessment on whether students have the required background is available at:
<https://www.csd.uwo.ca/~dlizotte/teaching/IDS/index.html>

2. Instructor Information

Dan Lizotte, Assistant Professor
Working from Home Unless Otherwise Notified
Middlesex College MC363 | Kresge Building K3D

Students must make contact by OWL message. In the case of a general question, students should check the OWL forum first for an answer and then post the question to the OWL forum.

3. Course Description/Syllabus

Introduces machine learning and statistical methods for data analysis through applied examples. Particular emphasis is placed on how to rigorously evaluate an analysis of data. Students will develop a data science analysis project using the methods covered in class. Also suitable for non-Computer Science students with appropriate background.

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Topics include:

- Supervised Learning and Model Fitting
- Statistics, Prediction, and Maximum Likelihood
- Introduce test set/out-of-sample idea.
- Classification, Evaluation, Logistic regression Regularization, Multi-class problems
- Estimating Performance, Quantifying Uncertainty on parameter estimates and on model predictions
- Test error, Cross-validation, Model Selection, Bias-Variance tradeoff
- Feature Selection and Regularization (L1 and L2)
- Trees, Random Forest
- Neural Networks, Gradients, learning
- Autoencoders, Dimensionality reduction, PCA, NMF, tSNE
- Clustering, K-means, hierarchical clustering
- Model limitations, Causality.

4. Course Materials

Lecture and Tutorial Videos

Lecture and Tutorial videos will be available on OWL.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Recommended Texts

HTF: *The Elements of Statistical Learning* by Hastie, Tibshirani and Friedman. [**Free online**]

MLPP: *Machine Learning: a Probabilistic Perspective* by Kevin P. Murphy [**Free online**]

Students must check OWL (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Graduate

- Weekly Assignments - 40%
- Midterm - 25%
- Data Science Project - 35%

Undergraduate

- Weekly Assignments - 40%
- Midterm - 25%
- Final Exam - 35%

For Undergraduates and Graduates:

Weekly Assignment:

Assignments will be released after week, with due dates of the following week. No late Assignments will be accepted, but will be graded with 0%. If the student submits a self-reported absence before the due date of the assignment, a 48hr extension of the deadline will be granted.

Midterm:

The midterm exam will be held during lab on Thursday, 29th of October, 14:30pm to 16:30pm. The midterm will cover concepts up to and including those covered up to this point.

The midterm will be a practical examination in the form of a timed assignment. Students will be given a data set and a set of practical data analytic problems to solve, similar to the structure of the weekly assignments. The exam is “open book & open web”, meaning that students can access any notes or any documents on the web. Electronic communication with other people inside or outside class is prohibited.

A grade of 50% or higher on the midterm is required to write the final examination (undergraduates) or to submit the final project (graduates).

For Undergraduates:

The final exam will be scheduled by the Registrar. The final exam will cover concepts from the entire course and is in structure similar to the midterm exam. A grade of 50% or higher on the final examination is required to pass the course. The midterm will be a practical examination; each student will need a laptop to complete the midterm.

For Graduates:

Graduate students will undertake projects in teams of two or three on a data science topic of their choosing; details will be provided through OWL. Projects may not be submitted individually. The final project report is due at 5pm on 8 December and must be submitted via OWL. No late projects will be accepted, but will be graded with 0%.

6. Accommodation and Accessibility

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf

and for the Student Medical Certificate (SMC), see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

7. Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html> the centrally administered e-mail account provided to students will be considered the individual’s official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

On the midterm and exam, students are allowed to use any document and source on their computer and look up documents on the internet. *However they are not allowed to share documents, or communicate in any other way with people inside or outside the class room during the test.*

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

8. Support Services

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at 661-2147 if you have any questions regarding accommodations.

The policy on Accommodation for Students with Disabilities can be found here: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf

The policy on Accommodation for Religious Holidays can be found here: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western (http://www.health.uwo.ca/mental_health) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.