Data Science 2000B / Integrated Science 2002B
Introduction to Data Science
Course Outline

1. Course Information

Course Information
Data Science 2000B
Integrated Science 2002B
Winter Semester 2022/23

Lecture:
Thursday 10:30am – 12:30pm, NCB-117

Lab:
Friday 12:30pm-2:30pm, AHB-1B08
or
Friday 2:30pm-4:30pm, HSB-9

List of Prerequisites
1.0 courses from Mathematics, Calculus, or Applied Mathematics (numbered 1000 and higher) with a minimum mark of 60%. Data Science 1000A/B (with a minimum grade of 60%) can be used to meet 0.5 of the 1.0 mathematics course requirements.

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.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Prof. Jörn Diedrichsen (Course Coordinator)	jdiedric@uwo.ca	WIRB 4138	x86994	Upon request
Ladan Shahshahani	lshahsha@uwo.ca			-
Jingyu Cui	jcui92@uwo.ca			Mondays, 09:30 -10:30 AM https://westernuniversity.zoom.us/j/4384606333 Meeting ID: 438 460 6333

Lingling Lin	llin285@uwo.ca			Monday, 11:00am-12:00pm https://westernuniversity.zoom.us/j/92466794139 Passcode: 591840

All subject-specific questions must be asked in the OWL forum.

Emails are reserved **strictly** for private and confidential communications. We will not answer any course-related questions via email. Office hours are to be determined and will be posted on OWL.

3. Course Syllabus, Schedule, Delivery Mode

The course covers three basic concepts of data science together with the corresponding techniques:
* Sampling to estimate properties of a population (Bootstrap),
* Random assignment and experiments to make causal inferences (Randomization test),
* Model selection to enable good predictions (Cross-validation).
Emphasizes practical data handling and programming skills in Python.

Week starting with	Lecture concepts	Tutorial / Homework
Jan 09	Intro to class Data Basics (O1.2) Examining numerical data (O1.6) Mean, Median, Mode Standard deviation	HW1 Python and Pandas basics Pandas basics Histograms Descriptive Statistics
Jan 16	Examining categorical data (O1.7) Probability (O2.1-O2.2, O2.4)	HW2 Plotting and analyzing categorical data Probabilities Descriptive by Category
Jan 23	Estimation, Confidence Intervals, Bootstrap Types of studies (O1.4, 1.5)	HW3 Bootstrap and confidence intervals
Jan 30	Foundations of Inference (R2) Hypothesis testing	HW4 Randomization Test
Feb 06	Chi-square test of independence. Monte-carlo simulations, Decision errors and Power	HW5 More Randomization test and Monte Carlo simulation
Feb 13	Bayes rule Bayesian Inference	HW6 Bayesian inference + Midterm practice
Feb 20	Reading week	

Feb 27	Midterm (during lecture Thursday 27th)	
Mar 06	Simple linear regression: Cost function and optimization parameter estimation, Outliers (O7.3-O7.4)	HW7 Outlier detection and exclusion Optimization of squared error cost function
Mar 13	Outliers and robust techniques, Polynomial regression, Cross-validation	HW8 Optimization of Mean-absolute deviation cost function (Median regression) Polynomial regression Crossvalidation
Mar 20	Multiple regression: Model comparison and correlation of regressors	HW9 Multiple regression Bootstrap with multiple regression Co-variance of estimators
Mar 27	Discrete variables and logistic regression	HW10 Regression with discrete variables: dummy coding Logistic regression
Apr 03	Model selection Stepwise regression Summary	HW11 Final practice
TBD	Final	

Contingency plan for an in-person class pivoting to 100% online learning
In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

4. Course Materials

Students are responsible for checking the course OWL site (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.

Helpful resources are:
Python for Data Analysis: (P)
https://www.amazon.ca/Python-Data-Analysis-Wrangling-IPython/dp/1491957662
Open Intro Statistics (O):
https://www.openintro.org/stat/textbook.php?stat_book=os
Open Intro Stat with Randomization and Simulation (S):

If students need assistance with the course OWL site, 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.

Technical Requirements

A laptop with internet connection and working browser is required for homework assignments, midterms and final. The computer must have an appropriate installation of Python (>3.6), including the required software packages (details available in the first week of classes).

5. Methods of Evaluation

Weekly Assignments: 30%
Each assignment accounts for 3%. Late assignments will be accepted for a 24hr grace period, but they will only be awarded 50% of the achieved points. After that, any missed homework will be marked with 0%. Only the best 10 of 11 will be counted, so every student can drop one assignment. **There will be no further accommodations or makeup for homework assignments.**
Midterm: 30%.
Final: 40%

The midterm will be likely 2hrs and the Final 3 hrs (please check on OWL for updates and the exact times). Midterm and Final will likely contain both a closed-book and an open-book section.
If a student misses the midterm for documented reasons (needs to be submitted through faculty student counselling), the Final will be counted with 70%. There will be no other makeup for the midterm.

6. Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

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

The Student Medical Certificate is available at

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

You can drop one of the 11 homework assignments. There will be no further accommodations or makeup for homework assignments. If you miss the midterm for documented reasons (needs to be submitted and approved through faculty student counselling), the Final will be counted with 70%. There will be no other makeup for the midterm.

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

Note: missed work can *only* be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is **not** sufficient on its own.

7. Accommodation and Accessibility

Religious Accommodation
When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

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

Accommodation Policies
Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

   https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf.

8. Academic Policies

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

In accordance with policy,

   https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

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 their official university address is attended to in a timely manner.

Both Midterm and Final will contain both a closed-book and an open-book section. In the closed-book section, you will be allowed one A4 cheat-sheet.
For the open-book section you have access to any materials of your choice, but you are not allowed to exchange information with any intelligent agent (be it human or artificial).

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 submissions 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 materials 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).

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/.

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

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.