DALHOUSIE UNIVERSITY
Faculty of Computer Science

THERE WILL BE NO CONVERTING OF FINAL GRADES TO PASS/ILL THIS SEMESTER.
ALL LETTER GRADES WILL BE FINAL!

CICS-1109 --- Practical Data Science
Course Syllabus

Instructor Information

Instructor: Dr. Yannick Marchand **Office:** CS 204

E-mail: ymarchan@dal.ca **Hours:** By appointment

Course Homepage: https://dal.brightspace.com/

Class Meeting Time: Tuesday and Thursday (face-to-face lecture sessions):
8:35am – 9:55am (in person [**Room:** Studley Kenneth C Rowe Management 1028] if the sanitary situation permits it, otherwise online)

Lab session Face-to-face (if the sanitary situation permits it), otherwise online
B01: Monday 14:35 – 15:55 (Studley Sir James Dunn Building 304).
B02: Monday 16:05 – 17:25 (Studley Goldberg Computer Science Building 143).
B03: Tuesday 14:35 – 15:55 (Studley Goldberg Computer Science Building C134).

Important Dates

- Last day to drop the courses with no financial implications: **January 22, 2024.**
- Last day to drop the course without a "W": **February 6, 2024.**
- Last day to drop the courses with a "W": **March 6, 2024.**
- Winter study break (no classes): **February 19-23, 2024.**
- Final Exam: **Thursday April 4th, 2024, at 8:45am.**
- 7 Article/Video Quizzes at **8:45am** on **January 25; February 1, 8, 15 and 29; March 7 and 14.**
- 5 Technical/Lab Quizzes for:
  - Lab B01& B02 on Monday: **January 29, February 12; March 4 and 18; April 1.**
  - Lab B03 on Tuesday: **January 30, February 13; March 5 and 19; April 2.**
- Please note that all the above times are in Halifax time.

Course Description

Data Scientists are in increasing demand in both industry and academia. This course will provide students with a practical overview of key techniques and research methods used to effectively manipulate, process and investigate data from diverse disciplines.

Through hands-on use of Python's data science libraries (e.g. pandas, NetworkX) and publicly open datasets students will be exposed to the fundamental concepts as well as common and cutting-edge analyses related to data science (e.g. social network analysis). Furthermore, students will learn the basics of how to conduct simple analyses on various datasets.

The course content will be portrayed through a blend of lectures, readings on-line materials/articles as well as in-lab tutorials, both of which will reinforce the concepts covered in

the lectures/readings. Complementary skills such as project management and technical writing will be stressed throughout the course.

Learning Outcomes

- Understand the main methodological steps of extracting knowledge from datasets including hypothesis formulation, research design, data collection, analysis, dissemination, as applicable to course topics.
- Develop an understanding of key concepts in both descriptive and inferential statistics (e.g. correlation, p-value, dependent/independent variables).
- Obtain an introduction and basic ability to use the fundamental packages for data science with Python (e.g. NumPy).
- Describe the building blocks in graph theory: node, link, degree, clustering coefficient, degree distribution, and shortest path.
- Illustrate the use of social network analysis in diverse disciplines (e.g. linguistics, neuroscience, and medicine).
- Obtain a basic understanding of several few well-established methods in machine learning (e.g. decision-trees, k-NN technique).
- Apply data science concepts and methods to solve problems in real-world contexts.
- Critically evaluate and understand the limitations of data science findings.
- Replicate/test the key results from scientific literature.

Course Rationale

- Data is ubiquitous. This course introduces the field of data science as well as the basics of Python.

Class Format and Course Communication

- Content will be delivered via a combination of online lectures and face-to-face labs (tutorials and projects).
- Students registering for this course must provide their own laptop.
- Students must ask the instructor permission before recording class lectures.
- Course information is provided on Brightspace. Course announcements will be posted to the course mail list, which comprises the instructor's and students' Dal emails. It is the student's responsibility to check their Dal e-mail on a daily basis. To access your Dal e-mail see: https://www.dal.ca/dept/its/o365/services/email.html

Evaluation Criteria

- Article/Video Quizzes **(30%)**
  - 5 research papers to read and 2 videos to watch over the course.
  - One quiz with 5 questions for each paper/video.
  - The mark will be based on the 6 best of the 7 quizzes (i.e. your lowest quiz mark will not count).
  - Quizzes on **January 25; February 1, 8, 15, 29; March 7, 14.** All these quizzes will take place during class at **8:45am** in person if the sanitary situation permits it, otherwise online.
  - Done via Brightspace with a password and LockDown Browser.

- Technical Assignments **(50%)**
  - On Python Programming language.
  - 5 quizzes of 15 minutes.
  - The mark will be based on the 4 best of the 5 quizzes (i.e. your lowest quiz mark will not count).
  - Lab quizzes for:
    - Lab B01 and B02 on Monday: **January 29; February 12; March 4, 18; April 1 at 15:40 (lab B01) / 17:10 (lab B02).**
    - Labs B03 on Tuesday: **January 30; February 13; March 5, 19; April 2 at 15:40**.
  - All these quizzes will take place during face-to-face lab sessions if the sanitary situation permits it, otherwise online.
  - Done via Brightspace with a password and LockDown Browser.
- Final Exam **(20%)**
  - To be held during the last lecture (**Thursday April 4, 2024, at 8:45am**).
  - The exam will cover all lecture material in the course.
  - The final exam
    - Will be taken place during face-to-face lab sessions if the sanitary situation permits it, otherwise online.
    - Photo ID is required.
    - Closed book.
    - No dictionaries, notes, calculators, cell phones, PDAs, talking slide rulers, or other electronic aids allowed.

- The grade conversion scale in Section 17.1 of the Academic Regulations, Undergraduate Calendar will be used. https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=7302&topicgroupid=32188&loaduseredits=False
- **It is up to the discretion of the instructor to use remote proctoring in online testing. Students may be required to download proctoring software onto their devices. Students who cannot meet system requirements for remote proctoring should contact the instructor for an alternate assessment. (Typical system requirements are: (i) Mac OS or Windows, (ii) a web-cam, and (iii) an internet connection.)**

Student Declaration of Absence

The Student Declaration of Absence policy shall apply. https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/academic-policies/student-absence.html The student has a maximum of two (2) SDAs per course per semester. The student **must** notify the instructor of their inability to meet a deadline **before** the deadline by contacting the instructor or submitting the completed SDA. Upon notification the student has 3 days after the deadline to submit the SDA.

Academic Standards

Failure to properly attribute sources in your work will be treated as an academic standards issue and points may be deducted for not following citation requirements. For example, forgetting to quote text taken from other sources, failure to include in-text citations, or a failure to include required information in the citations or references. Please see the resources on proper citation provided by the Dalhousie Writing Center (https://dal.ca.libguides.com/c.php?g=257176&p=5001261).

Please note that if it appears that the error was made with intent to claim other people's work as your own such as a lack of both citations and references, an allegation of plagiarism will be submitted to the Faculty Academic Integrity Officer, which could result in consequences such as a course failure.

Required Texts and Resources

- The lecture slides as well as the papers to read and study for the quizzes will be posted on the learning management system (Brightspace).

Prerequisites

No prerequisites are required for this course.

Tentative List of Topics

Lectures:

- Data Science: What is Data? What is Science?
- Introduction to Social Network Analysis
- Societal Questions: Insights from Web Search Engines
- An Overview of Machine Learning
- Deep Learning: A Revolution in Artificial Intelligence

Lab sessions: Python programing language:

- Setting up/Presenting Working Environment and Basics (variables, data structure).
- Writing functions/procedures.
- Reading and visualizing data using **Pandas & Basics of Matplotlib**
- Creating and studying complex networks with **NetworkX**.

Responsible Computing Policy

Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (https://www.dal.ca/dept/university_secretariat/policies/information-management-and-technology/acceptable-use-policy-.html) and the Faculty of Computer Science Responsible Computing Policy. For more information please see https://www.dal.ca/content/dam/dalhousie/pdf/faculty/computerscience/policies-procedures/fcs_policy_local.pdf

Use of Plagiarism Detection Software

All submitted code may be passed through a plagiarism detection software, such as the plagiarism detector embedded in Codio, the Moss (https://theory.stanford.edu/~aiken/moss/) Software Similarity Detection System, or similar systems. If a student does not wish to have their assignments passed through plagiarism detection software, they should contact the instructor for an alternative. Please note, that code not passed through plagiarism detection software will necessarily receive closer scrutiny. https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/OriginalitySoftwarePolicy.pdf

Student Health and Wellness

Taking care of your health is important. As a Dalhousie student, you have access to a wide range of resources to support your health and wellbeing. Students looking to access physical or mental health & wellness services at Dalhousie can go to the Student Health & Wellness Centre in the LeMarchant Building.

The team includes: registered nurses, doctors, counsellors and a social worker. Visit **dal.ca/studenthealth** to learn more and book an appointment today.

Students also have access to a variety of online mental health resources, including telephone/texting counselling and workshops/training programs. Learn more and access these resources at d**al.ca/mentalhealth**.

Culture of Respect[1]

Every person has a right to respect and safety. We believe inclusiveness is fundamental to education and learning. Misogyny and other disrespectful behaviour in our classrooms, on our campus, on social media, and in our community is unacceptable. As a community, we must stand for equality and hold ourselves to a higher standard.

What we all need to do:

1. **Be Ready to Act:** This starts with promising yourself to speak up to help prevent it from happening again. Whatever it takes, summon your courage to address the issue. Try to approach the issue with open-ended questions like "Why did you say that?" or "How did you develop that belief?"
2. **Identify the Behaviour:** Use reflective listening and avoid labeling, name-calling, or assigning blame to the person. Focus the conversation on the behaviour, not on the person. For example, "The comment you just made sounded racist, is that what you intended?" is a better approach than "You're a racist if you make comments like that."
3. A**ppeal to Principles:** This can work well if the person is known to you, like a friend, sibling, or co-worker. For example, "I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that."
4. **Set Limits:** You cannot control another person's actions, but you can control what happens in your space. Do not be afraid to ask someone "Please do not tell racist jokes in my presence anymore" or state "This classroom is not a place where I allow homophobia to occur." After you have set that expectation, make sure you consistently maintain it.
5. **Find or be an Ally:** Seek out like-minded people that support your views, and help support others in their challenges. Leading by example can be a powerful way to inspire others to do the same.
6. **Be Vigilant:** Change can happen slowly, but do not let this deter you. Stay prepared, keep speaking up, and do not let yourself be silenced.

University Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate.
https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=111&loadusercredits=False

Territorial Acknowledgement

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

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[1] Source: Speak Up! © 2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full "Speak Up" document found at: http://www.dal.ca/dept/dalrespect.html. Revised by Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University, 902.494.4140, lyndsay.anderson@dal.ca www.dal.ca/think.

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." https://www.dal.ca/about-dal/internationalization.html

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect. As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. (read more: http://www.dal.ca/dept/university_secretariat/academic-integrity.html)

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion please contact: https://www.dal.ca/campus_life/academic-support/accessibility.html for all courses offered by Dalhousie with the exception of Truro.

Conduct in the Classroom — Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion — Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). (read more: http://www.dal.ca/cultureofrespect.html)

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative jus- tice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. (read more: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-con.html)

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. (read more: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html)

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. (read more: https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assigments-and-use-of-originality.html)

Student Use of Course Materials

These course materials are designed for use as part of the CSCI courses at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading material to a commercial third party website) may lead to a violation of Copyright law.

Learning and Support Resources

Please see https://www.dal.ca/campus_life/academic-support.html