IMPROVE LIFE.

College of Engineering and Physical Sciences

School of Computer Science

Course Outline (Fall 2021)

CIS*4020 – Data Science

Instructor	Neil Bruce School of Computer Science Office: Reynolds 2222 Email: brucen@uoguelph.ca Office Hours: To be determined Web: socs.uoguelph.ca/~brucen/4020/
Prerequisites	STAT*2040 Statistics I, CIS*2750 Software Systems Development and Integration MATH*1160 Linear Algebra I
Calendar Description	Data Science focuses on extracting the important relations in data. The course is intended as a survey of the discipline and focuses on applied computational methods for data analysis. Topics include algorithms, computational and machine learning methods, software tools, and modeling, as they apply to the analysis of and discovery in big data.
Reference Textbooks	No textbook is required, and course notes / slides will provide the most relevant coverage. Following are some recommended textbooks for additional reference. Please also see the course web page for additional resources.
Course Organization	See the course web page for details on course organization. socs.uoguelph.ca/~brucen/4020/
Topics Covered	**Overview of Data Science** • Overview of Data Science

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What is “big data”?
Factors that affect what we can do with the data
types of data collection

Dealing with Data

Ways of collecting data and different formats and data types
Languages and tools for analysis and data capture (emphasis on Python for data processing, ML and statistical tests)
Filtering and sanitizing data

Mathematics / Statistics Review

review of probability distributions, linear algebra
Review of basic statistics, populations, sampling, evaluation metrics

Machine Learning

Overall, a deep look at algorithms for different outcomes including classification, clustering, and prediction, supervised and unsupervised learning

Naïve Bayes classification, k-nearest neighbors, data mining techniques, classifiers including Support-Vector Machines, linear and non-linear regression, decision trees and related approaches

Data Visualization

Different approaches to visual display of data for exploratory analysis, or communicating results
Dimensionality reduction (PCA, t-SNE, etc.)

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<tr><td>Learning Objectives</td><td>At the end of the course, a successful student will be able to:
1. Understand fundamental principles, ideas and techniques in data science
2. Understand appropriate methods and algorithms for collection, analysis, processing and visualization of data for a variety of different purposes</td></tr>
<tr><td>Evaluation & Feedback</td><td>
<table>
<tr><td>Assignments (2)</td><td>40 %</td></tr>
<tr><td>Term Test</td><td>30 %</td></tr>
<tr><td>Course Project</td><td>30 %</td></tr>
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Assignment due dates are as follows
(all times are Eastern Daylight Time EDT):
A1: Handed out October 5, Due 11:59pm October 26th

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	A2: Handed out Nov 2nd, Due 11:59 pm December 1st Term Test: Will take place in class, November 22nd Project: Handed out October 5th, Due December 9th
Grading requirements	To pass the course you require at least 50% of the total course marks.
Information Technology and electronic devices	Please exercise appropriate use of laptop computers and other electronic devices in the classroom, and refrain from use of cellular phones except in the case of urgent or extenuating circumstances.
Evaluation Guidelines	● Assignments will be graded according to the rubric provided with each assignment. There will be 2 assignments (20%, 20%) that will involve in depth practical application of theory to problems defined for each assignment. ● The course project will involve identifying a domain of Data Science to address through appropriate acquisition of data, analysis and insight, algorithmic implementation, visualization strategies or whatever combination of these elements may be appropriate. The rubric will be provided with the project description.
Missed Evaluations	When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml
Communication with Students	Only University of Guelph e-mail accounts are to be used for communication with students or the instructor. ***Emails sent from other accounts may not be answered!*** E-mails should be written in a way that is appropriate for a professional context. Indicate your course and section, formulate your question clearly, check spelling (names AND content) and use a polite language. Read the course outline before contacting the instructor or seminar leaders, you might find the answer here.
Course Content	See the course webpage for the most up to date details concerning class schedule and announcements. The course webpage is: socs.uoguelph.ca/~brucen/4020/
Accessibility	The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should

	contact Student Accessibility Services as soon as possible. For more information, contact SAS at 519-824-4120 ext. 56208 or email sas@uoguelph.ca or see the website: https://wellness.uoguelph.ca/accessibility/
Academic Misconduct	The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor. The Academic Misconduct Policy is detailed in the Undergraduate Calendar: https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml
Diversity and Inclusion Statement	In this course I would like to create a learning environment that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.)
Land Acknowledgement	The University of Guelph is in the 'Dish With One Spoon Territory'. The Dish With One Spoon is a treaty between the Anishinaabe, Mississaugas and Haudenosaunee that bound them to share the territory and protect the land. Subsequent Indigenous Nations and peoples, Europeans and all newcomers have been invited into this treaty in the spirit of peace, friendship and respect.
COVID Related	**Disclaimer** Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email. This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

	Illness Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment). For information on current safety protocols, follow these links: https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-your-safe-return/ https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.