THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

GACS-7206-001 Advanced Machine Learning

Instructor Information

Instructor: Dr. Sheela Ramanna **E-mail: s.ramanna@uwinnipeg.ca**
Class Meeting Time: T, Th 11:30 – 12:45 **Lecture Room No:** 3D03
Office Hours: Friday 1:30 – 2:30pm VIA ZOOM*
ZOOM coordinates will be communicated via email.

Important Dates

1. First Class: Jan. 5
2. Midterm Exam: Feb. 28 (in-person)
3. Project Proposal Report + Presentation: March 2
4. Final Withdrawal Date w/o academic penalty: March 14
   (A minimum of 20% of the work on which the final grade is based will be evaluated and available to the student before the voluntary withdrawal date)
5. Reading Week: Feb 19-25 (No classes)
6. Last Class: April 4
7. Final Project Presentations: Week of April 10 (TBD)
8. The university will be closed on February 20 (Louis Riel Day), April 7 (Good Friday)

Additional Course Related Information

- When it is necessary to cancel a class due to exceptional circumstances, the course instructor will make every effort to inform students via uwinnipeg email and Nexus.
- Students are reminded that they have a responsibility to regularly check their uwinnipeg e-mail addresses to ensure timely receipt of correspondence from the University and/or the course instructor.
- Please note that withdrawing before the VW date does not result in a fee refund.
- Class make-up days are scheduled at the end of term for courses that conflict with holidays. None this term

Course Objectives

This course discusses methods used in practical machine learning (ML). Emphasis is placed on the foundations of well-known machine learning algorithms. Introduction to Natural Language Processing will be explored. ML algorithms and tools are explored via the Weka or scikit-learn machine learning workbench. Evaluating predictive quality of the algorithms and assessing credibility of learned patterns with statistical methods will be also covered. The course is also meant to give experience to students in preparing a peer-reviewed paper via the class project.

Tentative List of Topics

- **Supervised Learning**
  - Tree-based Classifiers, Rule-Based Classifiers, Bayesian Classifiers, k-nearest neighbour, logistic regression, SVM (time permitting)
- **Unsupervised Learning**
  - K-means clustering, hierarchical clustering
- **Association rules** and Market-basket Analysis (basis for mining large data sets)
- **Numeric prediction**
  - Linear regression, regression trees, model trees
- **Learning with neural networks** (with an overview of deep learning)
- **Other Topics (**Dimensionality reduction, Discretization, Ensemble methods (Random Forest, Gradient Boosting)
- **Case Studies**
  - Natural Language Processing (text)

Note: A permitted or necessary change in mode of delivery may require adjustments to important aspects of course outlines, like class schedule and the number, nature, and weighting of assignments and/or exams.

Evaluation Criteria

Mid Term Exam	40%
Project Proposal Report + presentation	10%
Final Project	40%
Final Project Presentation	10%

Course Project will involve:
- Preparing a project proposal (max. 5 pages)
- Reading a few high quality peer-reviewed papers related to the proposal topic
- Implementing a solution
- Preparing a project report (max 20 pages)

The Final Project will be evaluated based on: i) innovative solution, ii) working software, iii) technical soundness and completeness, and iv) quality of the project report. The report must be prepared using a standard template which will be provided in class. LaTeX typesetting software is preferred for the final project report. The final project is expected to be of publishable quality in a peer-reviewed venue (conference or journal).

NO LATE WORK will be accepted. **Midterm exam** will test both factual knowledge and the ability to apply course material to real life situations and problems. Answers must be meaningful to achieve potential credit. The method of delivery for the course project will be a combination of email/cloud storage e.g., googledrive. Details will be communicated in class. All presentations will be in-person.

Test / Exam Requirements

- Exams will be delivered in person.
- The use of computers, calculators, phones, or other electronic devices is not permitted during exams.
- Midterm exam is closed book.
- The midterm exam will test both factual knowledge and the ability to apply course material to real life situations and problems. Answers on exams must be meaningful to achieve potential credit.

Students with documented disabilities, temporary or chronic medical conditions, requiring academic accommodations for tests/exams (e.g., private space) or during lectures/laboratories (e.g., note-takers) are encouraged to contact Accessibility Services (AS) at 204-786-9771 or accessibilityservices@uwinnipeg.ca to discuss appropriate options. All information about a student's disability or medical condition remains confidential.
https://www.uwinnipeg.ca/accessibility-services.

Students may choose not to attend classes or write examinations on holy days of their religion, but they must notify their instructors at least two weeks in advance. Instructors will then provide opportunity for students to make up work examinations without penalty. A list of religious holidays can be found in the 2019-20 Undergraduate Academic Calendar online at
http://uwinnipeg.ca/academics/calendar/docs/important-notes.pdf

Final Letter Grade Assignment

Historically, numerical percentages have been converted to letter grades using the following scale. However, instructors can deviate from these values based on pedagogical nuances of a particular class, and final grades are subject to approval by the Department Review Committee.

A+	90+ - 100%	B	70 - 74%	F	below 50%
A	85 - 90%	C+	65 - 69%		
A-	80 - 84%	C	60 - 64%		
B+	75 - 79%	D	50 - 59%		

Reading List*

- Course notes and links to free materials on the topics covered in class will be shared in class.

Prerequisite Information (This information can be found in the UW Graduate calendar)

Consent of the Department Graduate Program Committee Chair or Instructor**.**

<u>**Student Wellness**</u>
The University of Winnipeg affirms the importance of student mental health and our commitment to providing accessible, culturally appropriate, and effective services for students. Students who are seeking mental health supports are encouraged to reach out to the Wellness Centre at studentwellness@uwinnipeg.ca or 204.988.7611. For community-based mental health resources and supports, students are encouraged to dial 2-1-1. This program of United Way is available 24/7 in 150 languages.

<u>**Regulations, Policies, and Academic Integrity**</u>

Academic dishonesty is a very serious offense and will be dealt in accordance with the University's policies.

Avoiding Academic Misconduct: Students are encouraged to familiarize themselves with the Academic Regulations and Policies found in the University Academic Calendar at:
https://uwinnipeg.ca/academics/calendar/docs/regulationsandpolicies.pdf
Particular attention should be given to subsections 8 (Student Discipline), 9 (Senate Appeals) and 10 (Grade Appeals). Please note, in particular, the subsection of Student Discipline pertaining to plagiarism and other forms of cheating.

Detailed information can be found at the following:

- Academic Misconduct Policy and Procedures: https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-policy.pdf and https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-procedures.pdf
- UW Library video tutorial "Avoiding Plagiarism" https://www.youtube.com/watch?v=UvFdxRU9a8g

Uploading essays and other assignments to essay vendor or trader sites (filesharing sites that are known providers of essays for use by others who submit them to instructors as their own work) involves "aiding and abetting" plagiarism. Students who do this can be charged with Academic Misconduct.

<u>*Non-academic misconduct.* Students are expected to conduct themselves in a respectful manner on campus and in the learning environment irrespective of platform being used. Behaviour, communication, or acts that are inconsistent with a number of UW policies could be considered "non-academic" misconduct. More detailed information can be found here:</u>

- <u>Respectful Working and Learning Environment Policy</u>
<u>https://www.uwinnipeg.ca/respect/respect-policy.html</u>,
- <u>Acceptable Use of Information Technology Policy</u>
https://www.uwinnipeg.ca/institutional-analysis/docs/policies/acceptable-use-of-information-technology-policy.pdf

- Non-Academic Misconduct Policy and Procedures: https://www.uwinnipeg.ca/institutional-analysis/docs/student-non-academic-misconduct-policy.pdf and https://www.uwinnipeg.ca/institutional-analysis/docs/student-non-academic-misconduct-procedures.pdf.

Copyright and Intellectual Property. Course materials are the property of the instructor who developed them. Examples of such materials are course outlines, assignment descriptions, lecture notes, test questions, and presentation slides—irrespective of format. Students who upload these materials to filesharing sites, or in any other way share these materials with others outside the class without prior permission of the instructor/presenter, are in violation of copyright law and University policy. Students must also seek prior permission of the instructor/presenter before, for example, photographing, recording, or taking screenshots of slides, presentations, lectures, and notes on the board. Students found to be in violation of an instructor's intellectual property rights could face serious consequences pursuant to the Academic Misconduct or Non-Academic Misconduct Policy; such consequences could possibly involve legal sanction under the Copyright Policy https://copyright.uwinnipeg.ca/docs/copyright_policy_2017.pdf

Privacy
Students have rights in relation of the collecting of personal data the University of Winnipeg: https://www.uwinnipeg.ca/privacy/admissions-privacy-notice.html.

 Students can find answers to frequently ask questions related to remote learning here: https://www.uwinnipeg.ca/covid-19/remote-learning-faq.html

Class Cancellation, Correspondence with Students and Withdrawing from Course

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