THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

Course Number: ACS-4953-001
Course Name: Introduction to Machine Learning
Website: https://nexus.uwinnipeg.ca/d2l/home/67943

Instructor Information

Instructor: Camilo Valderrama
Office: 3D06A
E-mail: c.valderrama_@uwinnipeg.ca
Office Hours: Mondays   2:00 – 3:00 pm   3D06A

Class meeting time: Tuesdays/Thursdays   1:00 – 2:15 pm   3D04

Important Dates

1. First Class: Tuesday, January 7, 2025
2. Reading Week (no classes):   February 16-22, 2025
3. Midterm Exam: Thursday, February 28, 2025
4. Final Withdrawal Date w/o academic penalty*:   Friday, March 14, 2025
5. Last Class: Thursday, April 3, 2025
6. Final Exam: TBD
7. Final Exam Period: April 9-23, 2025
8. University closures: Louis Riel Day   Monday, February 17, 2025
                          Good Friday   Friday, April 18, 2025

*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.

Course Objectives / Learning Outcomes

This course discusses methods used in practical machine learning (ML) and deep learning (DL). Emphasis is placed on the foundations of well-known ML and DL algorithms. Algorithms and tools are explored via Python Scikit-learn and PyTorch machine learning workbenches. Evaluating the predictive quality of the algorithms and assessing the credibility of learned patterns with statistical methods will also be covered.

Evaluation Criteria

1. Assignments (40%)
- 4 assignments, worth 10% each
- Individual due dates will be posted on Nexus
- Assignments will be accepted up to 1 day late with a 20% penalty
2. Term Test 1 (30%)
3. Term Test 2 (30%)

Test / Exam Requirements

- Photo ID is required for the final exam.
- The use of computers, calculators, phones, or other electronic devices is not permitted during exams.
- Midterm and final exams are closed-book.

Students should contact the instructor as soon as possible if extenuating circumstances require missing a lab, assignment, test or examination. A medical certificate from a practicing physician may be required before any adjustments are considered.

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 2024-25 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+	75 – 79%	C	60 – 64%
A	85 – 89 %	B	70 – 74%	D	50 – 59%
A-	80 – 84%	C+	65 – 69%	F	below 50%

Required Text Book / Reading List
- An Introduction to Statistical Machine Learning, by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani. Available at https://www.statlearning.com/
- Class Notes will be available on Nexus

Prerequisite Information
- ACS-3902, MATH-1401, and any 3-credit hour Statistics course with a minimum grade of C [prerequisite(s)].
- Python experience.

Regulations, Policies, and Academic Integrity
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).

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

Detailed information can be found at the following:

- Academic Misconduct Policy and Procedures:
  https://www.uwinnipeg.ca/policies/docs/policies/academic-misconduct-policy.pdf and
  https://www.uwinnipeg.ca/policies/docs/procedures/academic-misconduct-procedures.pdf
- About Academic Integrity and Misconduct, Resources and FAQs:
  https://library.uwinnipeg.ca/use-the-library/help-with-research/academic-integrity.html

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.

Academic Integrity and AI Text-generating Tools: Students must follow principles of academic integrity (e.g., honesty, respect, fairness, and responsibility) in their use of material obtained through AI text-generating tools (e.g., ChatGPT, Bing, Notion AI). Use of AI Tools is allowed in this course. When AI is used, students must cite them. According to the MLA (https://style.mla.org/citing-generative-ai/), writers should
- cite a generative AI tool whenever you paraphrase, quote, or incorporate into your own work any content (whether text, image, data, or other) that was created by it
- acknowledge all functional uses of the tool (like editing your prose or translating words) in a note, your text, or another suitable location
- take care to vet the secondary sources it cites

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:

- Respectful Working and Learning Environment Policy https://www.uwinnipeg.ca/respect/respect-policy.html,
- Acceptable Use of Information Technology Policy
- https://www.uwinnipeg.ca/policies/docs/policies/acceptable-use-of-information-technology-policy.pdf
- Non-Academic Misconduct Policy and Procedures: https://www.uwinnipeg.ca/policies/docs/policies/student-non-academic-misconduct-policy.pdf and https://www.uwinnipeg.ca/policies/docs/procedures/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/basics/copyright-policy.html

Privacy

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

Class Cancellation, Correspondence with Students and Withdrawing from Course

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 let the course instructor know if you plan on withdrawing from the course. Note that withdrawing before the VW date does not necessarily result in a fee refund.

Topics to be covered (tentative)
- **Supervised Learning**
  Tree-based Classifiers, Rule-Based Classifiers, Bayesian Classifiers, k-nearest neighbour, logistic regression
- **Unsupervised Learning**
  K-means clustering, hierarchical clustering
- **Other Topics** (Dimensionality reduction, Discretization, Ensemble methods (Random Forest, Gradient Boosting – time permitting)
- **Deep learning classifiers**, SVM and softmax loss
  - Regularization, stochastic gradient descent (SGD), learning rates
  - MLP, CNN history and architectures
  - Training Neural Networks, activation functions, data processing, weight initialization, hyperparameter tuning, data augmentation
  - GRU, LSTM

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.