THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

ACS- 4953/3 – Introduction to Machine Learning

Instructor Information

Instructors: Dr. Sheela Ramanna
E-mail: s.ramanna@uwinnipeg.ca
Class Meeting Time: T, Th 10:00 – 11:15am
Office Hours: Friday 11:00 - noon VIA ZOOM*
ZOOM coordinates will be communicated via email.

Dr. Christopher Henry
E-mail: ch-henry@uwinnipeg.ca
Lecture Room No: 3D04
Office Hours: Friday @1:00pm (in person)

Important Dates

1. First Class: Jan. 5
2. Test 1: Feb. 16 (in person)
3. 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)
4. Reading Week: Feb 19-25 (No classes)
5. Last Class: April 4
6. Test 2: TBD (in person)
7. The university will be closed on February 20 (Louis Riel Day), April 7 (Good Friday)

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 the Weka/ Scikit-learn/Python Tensorflow machine learning workbenches. Evaluating predictive quality of the algorithms and assessing credibility of learned patterns with statistical methods will be also covered.

Tentative Topics:

- **Supervised Learning**
  Tree-based Classifiers, Rule-Based Classifiers, Bayesian Classifiers, k-nearest neighbour, logistic regression

- **Unsupervised Learning**
  K-means clustering, hierarchical clustering

- **Association rules** (basis for mining large data sets)

- **Other Topics (**Dimensionality reduction, Discretization, Ensemble methods (Random Forest, Gradient Boosting – time permitting)

- **Linear classifiers**, SVM and softmax loss
- **Regularization, stochastic gradient descent (SGD), learning rates**
- **MLP, CNN history and architectures**
  - batch normalization, transfer learning, AlexNet, VGG, GoogleNet RestNet
  - Training Neural Networks, activation functions, data processing, weight initialization, hyperparameter tuning, data augmentation
- Feature visualization and inversion, adversarial examples
- **Object detection and image segmentation**
- **Recurrent neural networks**

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

Assignments (4)	20%
Term Test (1)	40%
Term Test (2)	40%

NO LATE WORK will be accepted. Additional requirements will be specified when individual assignments are given. *Please contact us as soon as possible* if extenuating circumstances require you to miss a class, assignments, tests or examination. Should illness prevent participation in a test or examination, a medical certificate from a certified physician must be supplied before any adjustments are considered. Answers on exams, tests, assignments must be meaningful to achieve potential credit. English dictionary aids will be allowed as appropriate. *Keep a copy of all class work* (e.g., assignment, tests) handed back in case there is an error in recording of marks by the instructor. Method of delivery of assignments will be via NEXUS/email/cloud storage (e.g., googledrive). Details will be communicated in class.

Test / Exam Requirements

- Tests will be delivered in person.
- Photo ID is required for the tests.
- The use of computers, phones, or other electronic devices will not be permitted during tests. Specific details will be communicated in class.
- Tests are closed book.
- Tests will examine both factual knowledge and the ability to apply course material to real life situations and problems. Answers on tests 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 will be provided by the instructors

Prerequisite Information :

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

Student Wellness

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.

Regulations, Policies, and Academic Integrity

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.

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/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

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 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.