



# THE UNIVERSITY OF WINNIPEG

## APPLIED COMPUTER SCIENCE DEPARTMENT

### GACS-7206-001 Advanced Machine Learning

**Instructor:** Dr. Sheela Ramanna      **E-mail:** [s.ramanna@uwinnipeg.ca](mailto:s.ramanna@uwinnipeg.ca)

**Office Hours:** Thursday 2:30 - 3:30pm (via Zoom)

**Class Meeting Time:** T, Th 10:00 - 11:15am (via Zoom)

**Course Web page:** <http://www.acs.uwinnipeg.ca/7206>

#### **Important Dates**

- First Class: January 7, 2021
- Final Withdrawal Date w/o academic penalty: March 16 (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).
- Reading Week Break: February 14-20, 2021 (No classes)
- Term Exam: March 4, 2021
- Last Class: April 6, 2021
- Final Project Presentation and report due date: 2<sup>nd</sup> week of April, 2021
- The university will be closed on February 15 (Louis Riel Day), April 2 (Good Friday)

#### **Additional Course Related Information**

- When it is necessary to cancel a class due to exceptional circumstances, instructors will make every effort to inform you via uwinnipeg email, as well as the departmental assistant and Chair/Dean so that class cancellation forms can be posted outside classrooms.
- Your uwinnipeg email address will normally be used for course related correspondence.
- 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.

## **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 and Social Network Analysis 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.

## **Tentative List of 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** 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)
- **SVM Overview**
- **Other Topics**
  - Dimensionality reduction, Discretization, Ensemble methods
- **Applications**
  - Natural Language Processing
  - Social Networks

## **Remote Learning**

All course material will be available on the course website.

Lectures will be delivered live during the scheduled times via Zoom. RECORDING IS NOT PERMITTED. Video of lectures WILL NOT BE POSTED. Students must be available via Zoom during scheduled class meeting times. In addition:

- Students must display their real/full name
- Use of Video is optional.
- Participants must be muted when not speaking
- Students may interact via chat.

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

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

## **Evaluation Criteria**

Term Exam (in class and closed book)	40%
Project Proposal Report + Presentation (on Feb 11)	10%
Final Project	47%
Final Project Presentation	3%

*Course Project will involve:*

- Preparing a project proposal (max. 5 pages)
- Reading a few 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) working software, ii) innovative solution, iii) technical soundness and completeness, iv) readability of the project report and v) presentation. 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.

**NO LATE WORK** will be accepted. **Term 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.

*Please contact us as soon as possible* if extenuating circumstances require you to miss a class, deadline, quizzes/tests/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.

*Keep a copy of all class work* (e.g., exam, project) handed back in case there is an error in recording of marks by the instructor.

## **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%		

## **Exam Requirements**

- Term exam delivery and submission is **via** email and **proctored via Zoom**. Students must have video capability, and video must be turned on for the duration of the exam for proctoring.
- Students may contact the instructor to ask questions
- External resources (or any material not listed above) are **NOT PERMITTED**
- Communication with others (except the instructor) is **NOT PERMITTED**

## **Reading List\***

- WEKA Book (freely downloadable)
- Z.Markov and D.T. Larose, Data Mining the Web, Wiley 2007 (notes will be provided)
- Course notes

**Prerequisite Information** (This information can be found in the UW Graduate calendar)  
Consent of the Department Graduate Program Committee Chair or Instructor.

## **Email Communication**

Emails from accounts at uwinnipeg.ca are usually not filtered by the UofW email filter. Thereby it is recommended electronic communication used for the course utilize a UofW email account to minimize the risk of filtering.

## **Services for Students**

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 786-9771 or [accessibilityservices@uwinnipeg.ca](mailto:accessibilityservices@uwinnipeg.ca) to discuss appropriate options. All information about a student's disability or medical condition remains confidential <http://www.uwinnipeg.ca/accessibility> .

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 2017-18 Undergraduate Academic Calendar.

All students, faculty and staff have the right to participate, learn, and work in an environment that is free of harassment and discrimination. The UW Respectful Working and Learning Environment Policy may be found online at [www.uwinnipeg.ca/respect](http://www.uwinnipeg.ca/respect) .

## **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>.

More information:

- Zoom and Privacy: <https://www.uwinnipeg.ca/privacy/zoom-privacy-notice.html>
- Testing/Proctoring: <https://www.uwinnipeg.ca/privacy/zoom-test-and-exam-proctoring.html>

## **Misuse of Computer Facilities, Plagiarism, and Cheating**

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

*Avoiding Academic and Non-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>
- 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>

*Misuse of Filesharing Sites.* 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.

*Avoiding Copyright Violation.* Course materials are owned by the instructor who developed them. Examples of such materials are course outlines, assignment descriptions, lecture notes, test questions, and presentation slides. 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 photographing or recording slides, presentations, lectures, and notes on the board.**

*Research Ethics.* Students conducting research interviews, focus groups, surveys, or any other method of collecting data from any person, including a family member, must obtain research ethics approval before commencing data collection. Exceptions are research activities done in class as a learning exercise. For submission requirements and deadlines, see <http://www.uwinnipeg.ca/research/human-ethics.html>.