



THE UNIVERSITY OF WINNIPEG

Applied Computer Science

Course Number: GACS-7401-003
Course Name: Current Topics in Computing (Directed Readings)

Instructor Information

Instructor: Dr. Christopher Henry
Class Room No: 3D23

Email: ch.henry@uwinnipeg.ca
Class Meeting Time: F 10:30 – 11:30 am

Important Dates

First class:	January 11 th , 2019
Winter reading week:	February 17 th – 23 rd , 2019 (No classes)
Midterm:	March 8 th , 2019
Withdrawal date w/o academic penalty¹:	March 15 th , 2019
No meeting (due to conference):	March 22 nd , 2019
Final project presentation	April 5 th , 2019
Last Scheduled Class:	April 5 th , 2018
The University is closed on the following dates (No Classes):	February 18 th , 2019 April 19 th , 2019

¹A 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.

Additional Course Related Information

1. 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.
2. Your uwinnipeg email address will normally be used for course related correspondence.
3. Please note that withdrawing before the VW date does not necessarily result in a fee refund.
4. Class make-up days are scheduled at the end of term for courses that conflict with holidays

Course Objectives/Learning Outcomes

2012 marked a pivotal milestone in neural network. The intersection of GPUs, large labelled datasets, and very larger neural networks enabled a break through in machine learning that has led to impressive results in many fields and applications (such as self-driving vehicles and real-time language translation). As a result, the focus of this course is on deep convolutional neural network theory and implementations developed since 2012. Additionally, this course will exam the application of these concepts to classification of digital images of plants and weeds.

Course Topics

- Computer vision overview
 - Including historical context
- Image Classification
 - The data-driven approach
 - K-nearest neighbour
 - Linear classification I
- Loss Functions and Optimization
 - Linear classification II
 - Higher-level representations, image features
 - Optimization, stochastic gradient descent
- Introduction to Neural Networks
 - Backpropagation
 - Multilayer perceptrons
- Convolutional Neural Networks
 - History
 - Convolution and pooling
- Training Neural Networks, part I
 - Activation functions, initialization, drop out, batch normalization
- Training Neural Networks, part II
 - Update rules, ensembles, data augmentation, transfer learning
- Deep Learning Hardware and Software
 - CPUs, GPUs, TPUs
 - TensorFlow
 - Dynamic vs Static computational graphs
- CNN Architectures
 - AlexNet, VGG, GoogLeNet, ResNet, etc.
- Visualizing and Understanding
 - Feature visualization and inversion
 - DeepDream and style transfer

Note: Topics will be covered as time permits.

Evaluation Criteria

Midterm (20%)

Final Project (60%)

Final Project Presentation (20%)

Course Project will involve:

- Reading a few papers related to the proposal topic
- Implementing a solution (mandatory)
- Preparing a project report (max 20 pages)
- Final project presentation (max 30 minutes)

The Final Project will be evaluated on the basis of i) working software ii) innovative solution

iii) technical soundness and completeness iv) readability of the technical report v) presentation

NO LATE WORK will be accepted. Class work must be typed and submitted in an 8.5x11 folder with your name and course number on the outside.

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

- A Photo ID is not required
- Cell phones are not permitted in the classroom

Student Services and Information

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 to discuss appropriate options. All information about a student's disability or medical condition remains confidential <http://www.uwinnipeg.ca/accessibility>.

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

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.

Required Textbooks

There is no textbook for the course. Most of the reading material for this course will come the course notes of *CS231n Convolutional Neural Networks for Visual Recognition* offered by Stanford (<http://cs231n.github.io/>). The instructor will also provide reading material in the form of journal papers, theses, and/or tutorials.

Prerequisite Information (This information can be found in the UW General Calendar)

Consent of the Department Graduate Program Committee Chair or Instructor.

Misuse of Computer Facilities, Plagiarism, Cheating, and Copyright Violation

Academic dishonesty is a very serious offense and will be dealt with in accordance with the University's discipline bylaw. Be sure that you have read and understood **Regulations & Policies #8**, starting on page 9, in the 2017-2018 UW Course Calendar available at: <http://www.uwinnipeg.ca/index/calendar-calendar>.

Students are strongly recommended to view the University of Winnipeg library video tutorial *Avoiding Plagiarism*, which is available at: <https://www.youtube.com/watch?v=UvFdxRU9a8g>

Avoiding Academic Misconduct. Uploading essays and other assignments to essay vendor or essay 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 same class without prior permission of the instructor/presenter, are in violation of copyright law and University policy. Students must also obtain instructor/presenter permission before photographing or recording slides, presentations, lectures, and notes on the board.