University of Guelph
School of Computer Science
College of Engineering and Physical Science

Fall 2017
Joint Course Outline for
CIS*4780 Computational Intelligence
and
CIS*6650 Topics in Computer Science I

This course introduces contemporary topics in Soft Computing and Machine Learning. In particular, it emphasizes the application of machine learning, deep learning and convolutional networks as practiced in the world's most successful computing businesses.

Instructor Name: Dr. Stefan C. Kremer
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Office location: J.D. MacLachlan 224
Office hours: Mondays, Wednesdays, Fridays 9am-10am or by appointment.

Class Schedule: Mondays, Wednesdays and Fridays, 10:30am-11:20am, MacKinnon 225
Lab Schedule: None

Final Examination: None
Texts: Goodfellow, I., Bengio, Y. and Courville, A. *Deep Learning* MIT Press, 2016 (Available free online at http://www.deeplearningbook.org.)

Course Website
Course material, news, announcements and grades will be posted to the Courselink site. You are required to check the site regularly.

Detailed Course Description:
Emphasis will be on the application of concepts and algorithms in deep learning to practical problems in the areas of vision and pattern recognition. Assignments will be *very* challenging, but students will be provided with lots of guidance to help them to succeed.

A typical assignment will consist of 3 parts. Part I will involve programming and machine learning. Part II will involve and analysis of the software from Part I applied to one or more specific problems (this includes running experiments, documenting results). Part III will involve a discussion of the observations from Part II and relating these observations back to theoretical and mathematical expectations related to the techniques used, and a speculative component consisting of a discussion of what could be done next.

Learning Outcomes:
1. Construct and apply deep learning software to perform a variety of classification tasks.
2. Integrate architectural components of machine learning systems to create complete learning

systems.
3. Derive and explain appropriate mathematical metrics and corresponding numerical optimizations of adaptable parameters.
4. Identify advantages and limitations of learning systems and possible solutions.

Topic List and Schedule:
Week 1: Introduction to Deep Learning and Software Toolkits
Week 2: Introduction to Relevant Mathematics
Week 3: Network Architectures: Mathematics and Terminologies
Week 4: Supervised Learning
Week 5: Unsupervised Learning
Week 6: Deep Learning
Week 7: Sparse Coding
Week 8: Application: Vision
Week 9: Generative Adversarial Networks
Week 10: Application: Natural Language Processing
Week 11-12: Advanced Topics

Evaluation – ***Methods, Breakdown (% of grade) and specific due dates:***

Assignments	(4x10% each)	– Sept. 29th, Oct. 13th, Nov. 3rd, Nov. 17th.
Mid-term (in class)	(20%)	– Oct. 20th.
Project	(40%)	– Dec. 4th.

Assignments and Projects must be submitted electronically according to instructions provided in the Assignments and Projects.

All assignments are due at 10:30am on the dates indicated. In the absence of Academic Consideration…

See Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

See Graduate Calendar:
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e2223.shtml

…late assignments receive a grade of zero (i.e. hand it what you've got when its due).

Standard Statements

E-mail Communication As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration.
See Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml
See Graduate Calendar:
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e2223.shtml

Drop Date The last date to drop one-semester courses, without academic penalty, is the 40th day of classes. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Copies of out-of-class assignments Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact Student Accessibility Services as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website:
http://www.csd.uoguelph.ca/accessibility/

Academic Misconduct The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml
And the Graduate Calendar:
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e2700.shtml

Recording of Materials Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: http://www.uoguelph.ca/registrar/calendars/index.cfm?index