CMPT 980 - G200 Special Topics in Computing Science

Instructor(s): Oliver Schulte

Calendar Objective/Description:
This course aims to give students experience to emerging important areas of computing science.

Instructor's Objectives:
Machine learning has become the main framework for building programs that perform intelligent tasks. In fields such as computer vision and natural language processing, many recent successes have been achieved using neural nets with several layers, known as deep neural nets. This course is an introduction to deep neural nets, techniques for training them from data, and significant applications. While general machine learning is not a prerequisite, the course will be difficult for students without sufficient preparation. The main learning outcomes are 1) for students to have sufficient practical experience with deep learning to apply current techniques to real-life problems and 2) for students to have sufficient theoretical understanding of deep neural nets to analyze and improve their performance.

Prerequisites:
Instructor discretion.

Topics:
- Training feedforward neural nets (backpropagation)
- Advanced training topics, including: dropout, batch normalizations, step size adaptation, hyperparameters
- Common architectures and their applications: convolutional neural networks, recurrent neural network
- Embeddings (skip-gram models, graph neural networks)
- Generative models: generative adversarial models, variational auto-encoders
- Comparison of neural networks with other machine learning approaches (linear classifiers, kernel methods)
- Adversarial attacks against neural networks
- Interpreting neural networks

Grading:
Grading will be based on written assignments (3-5), homework exercises (3-5), quizzes, a midterm, and a final. The main component of the assignments will be applying neural networks to datasets. Grading breakdown: * Assignments 30% * Exercises 10% * Quizzes 10% * Midterm Exam 20% * Final Exam 30%

Students must attain an overall passing grade on the weighted average of exams in the course in order to obtain a clear pass (C- or better).

Required Books:
Introduction to Deep Learning, Eugene Charniak, MIT Press, 2018, 9780262039512

Reference Books:
Academic Honesty Statement:

Academic honesty plays a key role in our efforts to maintain a high standard of academic excellence and integrity. Students are advised that ALL acts of intellectual dishonesty will be handled in accordance with the SFU Academic Honesty and Student Conduct Policies (http://www.sfu.ca/policies/gazette/student.html).