

COMP 5900, Winter 2019

Machine Learning for Health

Meetings

Tuesdays 8:35-11:25
Start date: January 15
Paterson Hall, Room 129

Instructor

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Course Description

Newly emerging machine learning techniques are changing the future of healthcare. In this course, we examine topics in machine learning as related to health. We examine deep neural networks for healthcare applications. In addition, we consider problems characterized by small sample size. In this line, approaches in features selection and transfer learning will be examined. Feature selection is the process of selecting a subset of relevant features for use in model construction. It allows simplification of models to make them easier to interpret and enhances generalization by reducing overfitting. Transfer learning is a research problem in machine learning that focuses on storing knowledge gained while solving one problem and applying it to a different but related problem. Many applications especially in health and medicine require interpretability. We examine techniques for interpretation and understanding what a model has learned. We also examine bias in datasets and machine learning models, and algorithms to mitigate such bias.

Topics

This is an overview of the kinds of topics the course could cover.

- Dimension reduction, Feature selection,
- Convolutional Neural Networks,
- Recurrent Neural Networks,
- Word Embeddings,
- Transfer Learning,
- Interpretability,
- Ethics and Fairness,
- Application of the above approaches and techniques in health and medicine.

Prerequisite

Students are expected to have some background in machine learning and be familiar with probability, statistics, linear algebra and calculus.

Learning Objectives

- Become familiar with advanced ML methods and understand their role in health-related applications.
- Develop a general understanding of ML challenges in analyzing health-related data.
- Become familiar with some emerging research fields in machine learning for health-related applications.

Evaluation

- Weekly paper reviews (10%)
- Class participation and discussion (20%)
- Paper presentations (20%)
- Project (50%)

Information on Academic Accommodations

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. carleton.ca/pmc

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the

services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline