COMP-767: Machine learning applied to climate change

This seminar will explore how machine learning can be applied in fighting climate change. We will look at ways that machine learning can be used to help mitigate greenhouse gas emissions and adapt to the effects of climate change – via applications in electricity systems, buildings, transportation, agriculture, disaster response, and many other areas. Particular emphasis will be given to understanding exactly when machine learning is relevant and helpful, and how to go about scoping, developing, and deploying a project so that it has the intended impact.

Instructor
David Rolnick
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Office hours: TBD

Class times: Mon, Wed 10-11:30 am

Prerequisites: This course is aimed at graduate students with at least some prior experience in machine learning. Prior experience with climate change-related topics is not required, but willingness to learn about these topics is.

Textbooks: None. However, some of the material in the course will follow the overview paper "Tackling Climate Change with Machine Learning" (https://dl.acm.org/doi/10.1145/3485128), and some of the assigned readings will be drawn from works cited within this paper.

Course structure: The course will be divided into modules covering different areas relevant to climate change: Electricity, transportation, buildings, land use, climate science, adaptation, and additional topics. Each module will begin with a brief introductory lecture on the topic, its context within global climate change strategies, and the roles machine learning can play in this area. Subsequent classes within the module will be discussions on specific papers assigned as reading, and students will take turns presenting these papers to the class.

Students will form small groups during the course to develop and present final projects. Each project will propose a question to investigate at the intersection of machine learning and climate change, and will include preliminary results to explore the question.

Grading
Students will be evaluated on the following:
- 10%, participation during class. Note that participation is not about "getting the right answer," but is about being prepared for class discussions and engaging with the ideas. Live participation is required for this course.
- 10%, short quizzes to check comprehension of readings.
- 30%, paper presentations, in which students will rotate in presenting the reading assignments to the rest of the class. Students will get to choose several papers to

present over the course of the semester, with at most two students signing up for each paper and presenting it together. Each presentation will include a set of slides outlining the paper, as well as discussion with other students in the class, and will be evaluated with reference to the key components outlined below.

- 50%, final projects proposing a topic for investigation and presenting initial work, including a proposal (10%), final presentation (15%) and final writeup (25%).

Key components of the paper presentations, and the final project, will be:
- Background and context within climate change work
- What the specific problem is and why ML can help
- The ML techniques involved
- Pathways to implementation and impact
- Considerations for implementation (e.g. ethical or other societal considerations)

Language of Submission
In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Inclusivity
As the instructor of this course, I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, please do not hesitate to discuss them with me or the Office for Students with Disabilities (514-398-6009).