



CMPUT 622: Privacy and Fairness in Machine Learning

Instructor: Nidhi Hegde

Term: Fall 2021

1 Lecture Date and Time

Mondays and Wednesdays 9:30am - 10:50am, Sep 1 - Dec 6 2021
Online on Zoom (through the University of Alberta's zoom):
Check eclass for updated Zoom meeting ID.

2 eclass

<https://eclass.srv.ualberta.ca/course/view.php?id=72192>

3 Slack

You are encouraged to use the slack workspace for discussion, questions, and project collaboration. The invitation link to join will be on eclass.

4 Course description

This course will explore privacy and fairness issues in Machine Learning (ML). Definitions for these ethics issues and algorithms for ensuring privacy and fairness will be studied.

5 Course prerequisites

A basic understanding of ML and basic statistics and probability theory will be required. This is not a strictly theory course but students should be comfortable with mathematic formalism and notation. There will be simple programming assignments so familiarity with python notebooks will be helpful. There will be both theory through the fundamentals and practice through simple implementations.

6 Course Objectives

This course will cover privacy and fairness in machine learning through:

- an understanding of privacy and fairness through real cases,
- an understanding of widely accepted definitions that allow for assessment of ML outcomes,

- an understanding and implementation of algorithms to achieve privacy and fairness,
- understanding and practicing research problems in the area.

7 Course Structure

The course will have five parts.

Part 1 Introduction and exploration of real cases. Short lessons from this part may be interspersed throughout the semester and may be interdisciplinary.

Part 2 Definitions of privacy. We will cover early notions of privacy and focus on Differential Privacy(DP) and its variants.

Part 3 Definitions of fairness. We will cover the many definitions of fairness and where they matter by considering some real examples.

Part 4 Algorithms for privacy. This part will cover algorithms for DP and its variants, focussing on new algorithms and research questions into scenarios not considered in current literature.

Part 5 Algorithms and use cases for fairness. This part will explore real use cases where outcomes are biased and cover algorithms for ensuring fairness and new research questions.

The course will focus on new results and research questions as much as possible. The projects and paper summaries (described below) are designed to encourage a research mindset.

7.1 Lectures

The lectures present the course material. All lectures are delivered online and will be recorded as a courtesy to students in different time zones. The link for the online lectures and recordings will be available on eclass.

7.2 Learning Materials

There will be no required textbook. Learning materials such as texts, online resources, and research papers will be shared as the course progresses.

8 Coursework

There will be no exams. The coursework will consist of assignments, paper reviews, peer review, and a project.

Assignments Three assignments over the term. The assignments will contain theory and implementation.

Paper review There will be two paper reviews, where you will read a paper and submit a 1-2 page critique.

Project The main assessed component of the course will be a project. The project consists of various parts, all separately marked: project proposal, final project, and project presentation. The project is group work, and the group size is limited to a maximum of 3. All members of a given group will get the same mark on the project proposal and final project report. There will also be a short presentation on the project (time length to be determined based on number of students).

Peer review Each student will be asked to review and mark one project proposal by their colleagues.

Marking breakdown

- Assignments: 15%
- Paper critiques: 15%
- Project proposal: 15%
- Peer review of project proposals: 10%
- Final project report: 35%
- Project presentation: 10%

If any of the graded coursework is missed, the weighting of the missed work will be transferred to the final project. For example, if you miss the peer review, the 10% will be transferred to the final project report, which will then have a weight of 45%.

9 Course Policies

All assignments, paper critiques and peer reviews are individual work. You must fully understand and be able to explain your solution in any amount of detail as requested by the instructor.

Late policy. Extensions to deadlines will not be given. Each student has a 3 day budget for late submission that you can use over three submissions or one. It allows you to submit late by that amount (no smaller than a day unit). Beyond that late budget, post-budget late submissions will not be accepted. A post-budget late submission will be counted as missed work and the mark will be transferred as described above. Anything that you use in your work and that is not your own creation must be properly cited by listing the original source. Failing to cite others' work is plagiarism and will be dealt with as an academic offence.

Please consult <https://www.ualberta.ca/provost/dean-of-students/student-conduct-and-accountability> . This course is governed by CS Department policies. You are required to familiarize yourself with them: <https://www.ualberta.ca/computing-science/links-and-resources/policy-information/department-course-policies>

10 Course communication

Instructor: Nidhi Hegde, nidhi.hegde@ualberta.ca

We will use slack for general course communications. You can post questions or items for discussion here. I will monitor the slack space and answer questions or post optional material. Students are highly encouraged to use the slack space for discussions, and to answer each other's questions. Only course-related communications is allowed in this slack space. Any important course information will be communicated via email through eclass or as an announcement on eclass.

Slack: link available on eclass.

Please do not share this link outside of this course. This space is only for participants of the course.

11 Academic Integrity

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are expected to familiarize themselves with the provisions of the Code of Student Behaviour (<https://www.ualberta.ca/governance/resources/policies-standards-and-codes-of-conduct/code-of-student-behaviour.html>) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All forms of academic dishonesty are unacceptable at the University. Any suspected offence can be reported to the Faculty of Science. Anyone who is found in violation of the Code of Student Behaviour may receive a sanction. Typical sanctions include conduct probation, a mark reduction or a mark of zero on an assessment, a grade reduction or a grade of F in a course, a remark on the transcript and a recommendation for suspension or expulsion: <https://www.ualberta.ca/provost/dean-of-students/student-conduct-and-accountability>

Students are expected to familiarize themselves with the Academic Integrity resources (covering the topics of cheating, collaboration, plagiarism, and substantial assistance) on the website of the Office of the Dean of Students. (<http://ualberta.ca/current-students/academic-resources/academic-integrity/index.html>)

12 Additional Information

Students eligible for accessibility-related accommodations (i.e., students registered with Student Accessibility Services (SAS)) have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with SAS deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for the University to provide accommodations. Contact SAS <https://www.ualberta.ca/current-students/accessibility-resources> for further information. Students who require additional help in developing strategies for better time management, study skills or examination skills should contact the Academic Success Centre <https://www.ualberta.ca/current-students/academic-success-centre>.

Student Resources for Remote Learning: Online learning may be new to you. Check out tips for success and find out more about online learning on the Campus Life page (<http://ualberta.ca/campus-life/index.html>), and specifically on the Academic Skills Online & Remote Delivery Resources page (<https://www.ualberta.ca/current-students/academic-success-centre/resources/index.html>).

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Learning and Working Environment

The Faculty of Science is committed to ensuring that all students, faculty and staff are able to work and study in an environment that is safe and free from discrimination and harassment. It does not tolerate behaviour that undermines that environment.

If you are experiencing harassment, discrimination, fraud, theft or any other issue and would like to get confidential advice, please contact any of these campus services:

- **Office of Safe Disclosure & Human Rights:** A safe, neutral and confidential space to disclose concerns about how the University of Alberta policies, procedures or ethical standards are being applied. They provide strategic advice and referral on matters such as discrimination, harassment, duty to accommodate and wrong-doings. Disclosures can be made in person or online using the [Online Reporting Tool](#).
- **University of Alberta Protective Services :** Peace officers dedicated to ensuring the safety and security of U of A campuses and community. Staff or students can contact UAPS to make a report if they feel unsafe, threatened, or targeted on campus or by another member of the university community.
- **Office of the Student Ombuds:** A confidential and free service that strives to ensure that university processes related to students operate as fairly as possible. They offer information, advice, and support to students, faculty, and staff as they deal with academic, discipline, interpersonal, and financial issues related to student programs.
- **Office of the Dean of Students:** They can assist students in navigating services to ensure they receive appropriate and timely resources. For students who are unsure of the support they may need, are concerned

about how to access services on campus, or feel like they may need interim support while you wait to access a service, the Dean of Students office is here to help.

Feeling Stressed, Anxious, or Upset?

It's normal for us to have different mental health experiences throughout the year, particularly as we adjust to returning to campus as we move through a pandemic. Know that there are people who want help. You can reach out to your friends and access a variety of supports available on and off campus at the [Need Help Now](#) webpage or by calling the 24-hour Distress Line: 780-482-4357 (HELP).

Land Acknowledgement

The University of Alberta respectfully acknowledges that we are situated on Treaty 6 territory, traditional lands of First Nations and Métis people.

To learn more about the significance of this land acknowledgement, please read [this](#) useful article and associated links to more information.

Disclaimer: Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this syllabus.