Cornell Bowers C·IS
College of Computing
and Information Science

CS 5382 / INFO 4390/ INFO 5390:

Practical Principles for Designing Fair Algorithms

Spring 2024

Course website: https://canvas.cornell.edu/courses/63085

Ithaca section:
Faculty: Prof. Allison Koenecke (koenecke@cornell.edu)
Faculty Office Hours: Gates 227, Mondays 11:00am-12:00pm
Lead TA: Ru Zhao (rjz46@cornell.edu)

Cornell Tech section:
Faculty: Prof. Emma Pierson (emma.pierson@cornell.edu)
Faculty office hours: Bloomberg 359, Mondays 4:30 - 5:30pm
Lead TA: Gabriel Agostini (gs665@cornell.edu)

For course questions, please communicate with the faculty/TA corresponding to your section (i.e., Cornell Tech students should reach out to Cornell Tech faculty/TA; Ithaca students should reach out to Ithaca faculty/TA).

Credits and Credit Hour Options: 3.0 Credits, Letter Grade

Prerequisites/Corequisites: Students should have experience coding in Python and have taken at least one introductory course in machine learning or data science.

Time and Location: This course consists of lectures on Tuesdays and Thursdays from 11:40-12:55pm in Phillips Hall 203 (Ithaca) and Bloomberg 161 (Cornell Tech).

Course Description

Algorithms increasingly guide high-stakes decision-making across many domains. This has potential upsides, since algorithms can improve decision-making, but also serious risks, since recent years have showcased the many ways that algorithms can be biased. This

course will teach you principles for designing fair algorithms, emphasizing accessibility to a broad audience via practical takeaways which are directly relevant to the real world through case studies and guest speakers. Case studies will be drawn from diverse settings where algorithms are applied, such as large language models, speech recognition systems, healthcare, criminal justice, sustainability, and education. Students will come away with a strong understanding of how algorithm-related choices can have widespread societal impact.

Course Objectives/Student Learning Outcomes

By the end of the course, students will be able to:

- Write code in Python to computationally demonstrate biases in end-to-end algorithmic systems based on choices of data, variables, modeling, and outcomes.
- Apply mathematical definitions of fairness to real-world case studies to explain decisions made by both humans and algorithms.
- Enumerate challenges to practitioners in algorithmic-guided decision-making (including feedback loops, interpretability, and strategic behavior) and explain how these challenges can lead to broader societal impacts.

Course Materials

Course presentations and readings will be posted on Canvas in the Modules section.

Method of Assessing Student Achievement

- **Basis of Grade Determination:**

Assignment/Assessment	**Percentage of Grade/ Points**
Homework	30%
Reading Quizzes	15%
Final Project	50%
Participation	5%

- **Grading Scale:** This class adheres to Cornell's grading scale:

A+	98-100%	4.3
A	93-97%	4.0

A-	90-92%	3.7
B+	88-89%	3.3
B	83-87%	3.0
B-	80-82%	2.7
C+	78-79%	2.3
C	73-77%	2.0
C-	70-72%	1.7
D	60-69%	1.3
F	Below 60%	0.0

Collaboration and academic integrity

All students should abide by the Cornell University Code of Academic Integrity, and all writing submitted should be one's own writing. While discussing course concepts with other students is highly encouraged, plagiarism (including use of ChatGPT) will result in zero credit and/or a referral to the Office of Judicial Affairs. Please reach out if additional questions arise on what is or is not permitted.

Students with Disabilities

Your access in this course is important to us. Please give us your Student Disability Services (SDS) accommodation letter early in the semester so that we have adequate time to arrange your approved academic accommodations. If you need an immediate accommodation for equal access, please speak with us after class or send an email message to us and/or SDS at sds_cu@cornell.edu. If the need arises for additional accommodations during the semester, please contact SDS. You may also feel free to speak with Student Services at Cornell Tech who will connect you with the university SDS office. If you have, or think you may have a disability, please contact Student Disability Services for a confidential discussion: sds_cu@cornell.edu, 607-254-4545, sds.cornell.edu.
You must request your SDS accommodation letter **no later than the add/drop deadline for the semester**.

- **Students currently registered with SDS:** Once you request your accommodation letter and it is approved by SDS, it will be emailed to both you and me. Processing time can be up to 48-hours.
- **Students not registered with SDS:** The registration process for new accommodations can take up to three weeks. Once you are approved by SDS for accommodations, you will be able to request your accommodation letter for this course.
- **If you are approved for accommodations later in the semester:** you must request your accommodation letter as soon as possible.

Mental Health & Well-being

Your health and wellbeing are important to us, and you should always feel free to reach out for us for support. There are services and resources at Cornell designed specifically to bolster undergraduate, graduate, and professional student mental health and well-being. Remember, your mental health and emotional well-being are just as important as your physical health. If you or a friend are struggling emotionally or feeling stressed, fatigued, or burned out, there are many campus resources available to you:

Ithaca students: This link provides a list of resources for Ithaca students: https://mentalhealth.cornell.edu/get-support/support-students. Help is also available any time day or night through Cornell's 24/7 phone consultation (607-255-5155). You can also reach out to your college student services office or Cornell Health for support.

Cornell Tech students: This link provides a list of resources for Cornell Tech students: https://mentalhealth.cornell.edu/get-support/tech. You can additionally also contact studentwellness@tech.cornell.edu with concerns.

Late Submission & Attendance Policy

You have 5 late days over the course of the semester which you can use at any time during the term without penalty (for both assignments and projects). You can use up to 3 late days on a single assignment. The only exception is that the final project write-up cannot be submitted late because we need to grade it in a short amount of time. When submitting project work as a team, each one of you must use a late day. Once you run out of late days, you will incur a 20 percentage point penalty cumulated over each extra late day you use.

Attendance at guest lectures is expected and will be recorded as part of your participation grade. (The reasoning here is that guest lecturers are volunteers and busy people and we should be respectful by showing up.) If you cannot attend class due to extenuating circumstances (e.g., illness, religious observances, etc.), please reach out to your instructor ahead of class via email.