People, Society, and Algorithms

Instructor: Jingyan Wang (jingyanw@ttic.edu)

Office Hour: 11am-noon every Thursday, or by appointment (Room 427)

Course Description: This course considers designing and analyzing algorithms with a focus on explicitly taking consideration of people and society. The course covers selected topics in this area such as data elicitation, crowdsourcing, causal inference, etc., including recent research. The course will put an emphasis on theoretical principles underlying problems in these domains, including derivations and proofs of theoretical guarantees. Some application-specific considerations and directions will also be discussed as case studies. As this is an interdisciplinary field, we will also touch upon literature in psychology and economics that study the behavior of people.

Prerequisites: Knowledge of basic probability and linear algebra

Topics include:

- **Incentives:** strictly proper scoring rules, Bayesian truth serum
- **Crowdsourcing:** learning from pairwise comparisons, crowdsourced labeling, parametric and non-parametric models and their relations, message-passing algorithms
- **Experimentation:** randomized controlled trials, interference, Simpson's paradox
- **Applications:** recommendation systems, peer review

Expected outcomes:

- Awareness of various societal considerations in the development and analysis of algorithms
- Ability to critique modeling assumptions and choices, and understand the tradeoffs they induce
- Ability to apply mathematical tools and techniques to analyze algorithms and establish theoretical guarantees
- Ability to critically read and present research papers

Evaluation:

- Homeworks (50%)
- Course project (40%)
- Participation (10%)

Schedule:

Week	Date	Material
1	Sept 30	Introduction
	Oct 2	DARPA balloon challenge: Incentives for social mobilization
2	Oct 7	Strictly proper scoring rules
	Oct 9	Eliciting subjective data: Bayesian truth serum
3	Oct 14	Bayesian truth serum (cont'd)
	Oct 16	Incentives in cryptocurrencies
4	Oct 21	Crowdsourced labeling
	Oct 23	Learning from pairwise comparisons
5	Oct 28	Fairness (guest lecture by Haifeng Xu)
	Oct 30	Miscalibration
6	Nov 4	Model evaluation for LLMs + RLHF
	Nov 6	Cognitive biases + Survey design
7	Nov 11	Peer review (guest lecture by Nihar Shah)
	Nov 13	Differential privacy
8	Nov 18	Causal inference
	Nov 20	Interference (guest lecture by Shuangning Li)
9	Dec 2	Recommendation systems
	Dec 4	Project presentations

Timeline for homeworks and project:

Project:

Proposal	Oct 24
Final report	Dec 11
Presentation	Dec 4 (last lecture)

Homework:

	release	due

Homework 1	Oct 9	Oct 21
Homework 2	Oct 31	Nov 13
Homework 3	Nov 20	Dec 8

Course Policies

Late days: You will have 2 late days in total, which you are free to allocate to the three homeworks. The number of late days you allocate to one homework needs to be an integer, so it's 0 or 1 or 2. The homeworks are designed to be short and reasonable, so no extra late days will be granted and please plan carefully.

Disability: If you have a disability and require accommodations, please contact Amy Minick in Human Resources (see "Reasonable Accommodations Policy"). I encourage you to discuss your accommodations and needs with me as early in the quarter as possible. I will work with you to ensure that accommodations are provided as appropriate.

Academic Integrity: The homeworks are designed to be completed individually without having to rely on external references. However, discussing with others and looking at references are allowed. You are **required to acknowledge the people you have collaborated with and cite the references you have used**.

Use of LLMs: You are not allowed to use tools such as ChatGPT or Github Copilot. If there are cases that you're not sure about, please come talk to me.

Care for yourself: Do your best to maintain a healthy lifestyle by eating well, exercising, getting enough sleep and taking some time to relax. Your health and well-being are important, and you are encouraged to reach out to me for support. TTIC students have access to services and resources at UChicago Student Wellness (please refer to details at https://wellness.uchicago.edu/).