Tong (Tony) Liu (he/him)

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Research interests: Machine learning methods for observational causal inference. Data science and causal inference applications in healthcare, mental wellness, and social science.

Academic Appointments

Mount Holyoke College — Fall 2024 (incoming)
Assistant Professor of Computer Science — South Hadley, MA

Education

University of Pennsylvania — Fall 2018 — Spring 2024
Ph.D. in Computer and Information Science — Philadelphia, PA
Advisors: Lyle Ungar and Konrad Kording

Williams College — 2012 — 2016
B.A. in Computer Science, concentration in Cognitive Science — Williamstown, MA
summa cum laude, with highest honors in Computer Science

Research

Machine Learning Methods for Observational Causal Inference — 2020 — present
Developing machine learning methodology for improving efficiency of observational causal studies.
- Works: [J9, M1, C2, J4]

Data Science for Social Communication — 2018 — present
Using quasi-experiments and explainable AI (XAI) methods to study computer-mediated social communication.
- Works: [C3, C1]

Automated and Interpretable Machine Learning for Medicine — 2020 — present
Developing workflows using automated machine learning methods and post-hoc interpretability to produce robust predictions for surgical hernia risk and liquid biopsy.
- Works: [W1, A2, A1, J2, J1]

Mobile Sensing for Depression and Anxiety — 2018 — present
Analyzing digital phenotyping signals from mobile sensor data as markers for depression and anxiety.
- Works: [J10, J8, J6, J7, J3, P1]

Teaching

Instructor — Fall 2020, Fall 2021, Spring 2023
CIS 1920: Python Programming, University of Pennsylvania
- Organized and taught half-credit course for classes of 15-25 undergraduates over three semesters
- Designed and recorded lectures to support remote learning

Graduate Fellow for Teaching Excellence — Fall 2021 — Spring 2022
Center of Teaching and Learning, University of Pennsylvania
- Served as graduate student teaching observer and facilitated teaching reflections
- Organized and led nine teaching workshops within CIS department and across the university

Teaching Certificate — Fall 2020
Center of Teaching and Learning, University of Pennsylvania
- Completed CTL Course on College Teaching
- Participated in teaching observation and teaching philosophy reflection workshop

Course Content Creator — Summer 2020
Network Causality Tutorials, Neuromatch Academy
- Developed teaching material on causality for computational neuroscience summer school [J5]
- Course material is open sourced and has reached 10,000+ students [link]

Lead Teaching Assistant Fall 2019
CIS 520: Machine Learning, University of Pennsylvania
- Managed teaching assistant team for 130+ person class, wrote exam and homework material
- Gave guest lecture on Bayesian Networks

Teaching Assistant Spring 2013 – Spring 2016
Williams College
- Courses TA'd: CS 134: Introduction to Computer Science, CS 135: Diving into the Deluge of Data, CS 136: Data Structures, CS 237: Computer Organization, CS 334: Principles of Programming Languages

Conference Proceedings (C)

C3. **Tony Liu**, Lyle Ungar, Konrad Kording, and Morgan McGuire. Measuring causal effects of civility without randomization. *To appear in International AAAI Conference on Web and Social Media (ICWSM)*, 2024

C2. **Tony Liu**, Patrick Lawlor, Lyle Ungar, and Konrad Kording. Data-driven exclusion criteria for instrumental variable studies. *Conference on causal learning and reasoning (CLeaR)*, pages 485–508, 2022

C1. **Tony Liu**, Jennifer Nicholas, Max M Theilig, Sharath C Guntuku, Konrad Kording, David C Mohr, and Lyle Ungar. Machine learning for phone-based relationship estimation: the need to consider population heterogeneity. *Proceedings of the ACM on interactive, mobile, wearable and ubiquitous technologies (IMWUT)*, 3(4):1–23, 2019

Journal Papers (J)

J10. Caitlin A Stamatis, Jonah Meyerhoff, Yixuan Meng, Zhi Chong Chris Lin, Young Min Cho, **Tony Liu**, Chris J Karr, Tingting Liu, Brenda L Curtis, Lyle H Ungar, et al. Differential temporal utility of passively sensed smartphone features for depression and anxiety symptom prediction: a longitudinal cohort study. *npj Mental Health Research*, 3(1):1, 2024

J9. **Tony Liu**, Patrick Lawlor, Lyle Ungar, Konrad Kording, and Rahul Ladhania. Automated detection of causal inference opportunities: Regression discontinuity subgroup discovery. *Transactions on Machine Learning Research (TMLR)*, 2023

J8. Jonah Meyerhoff, Tingting Liu, Caitlin Stamatis, **Tony Liu**, Harry Wang, Yixuan Meng, Brenda Curtis, Chris J Karr, Garrick Sherman, Lyle H Ungar, and David C Mohr. Analyzing text message linguistic features: Do people with depression communicate differently with their close and non-close contacts? *Behavior Research and Therapy*, 2023

J7. **Tony Liu**, Jonah Meyerhoff, Johannes C Eichstaedt, Chris J Karr, Susan M Kaiser, Konrad P Kording, David C Mohr, and Lyle H Ungar. The relationship between text message sentiment and self-reported depression. *Journal of affective disorders*, 302:7–14, 2022

J6. Caitlin A Stamatis, Jonah Meyerhoff, Tingting Liu, Garrick Sherman, Harry Wang, **Tony Liu**, Brenda Curtis, Lyle H Ungar, and David C Mohr. Prospective associations of text-message-based sentiment with symptoms of depression, generalized anxiety, and social anxiety. *Depression and anxiety*, 2022

J5. Bernard t Hart, Titipat Achakulvisut, Ayoade Adeyemi, Athena Akrami, Bradly Alicea, Alicia Alonso-Andres, Diego Alzate-Correa, Arash Ash, Jesus Ballesteros, Aishwarya Balwani, ..., **Tony Liu**, et al. Neuromatch academy: a 3-week, online summer school in computational neuroscience. *Journal of Open Source Education*, 5(49):118, 2022

J4. **Tony Liu**, Lyle Ungar, and Konrad Kording. Quantifying causality in data science with quasi-experiments. *Nature computational science*, 1(1):24–32, 2021

J3. Jonah Meyerhoff, **Tony Liu**, Konrad P Kording, Lyle H Ungar, Susan M Kaiser, Chris J Karr, and David C Mohr. Evaluation of changes in depression, anxiety, and social anxiety using smartphone sensor features: longitudinal cohort study. *Journal of medical Internet research*, 23(9):e22844, 2021

J2. Omar Elfanagely, Yoshiko Toyoda, Sammy Othman, Joseph A Mellia, Marten Basta, **Tony Liu**, Konrad Kording, Lyle Ungar, and John P Fischer. Machine learning and surgical outcomes prediction: a systematic review. *Journal of Surgical Research*, 264:346–361, 2021

J1. Hanfei Shen, **Tony Liu**, Jesse Cui, Piyush Borole, Ari Benjamin, Konrad Kording, and David Issadore. A web-based automated machine learning platform to analyze liquid biopsy data. *Lab on a Chip*, 20(12):2166–2174, 2020

Submissions Under Review (R)

R1. Ben Baker, **Tony Liu**, Jordan Matelsky, Felipe Parodi, and Konrad Kording. Computational choreology: Distinguishing hip hop dance genres. 2023

Peer-Reviewed Workshop Papers (W)

W3. **Tony Liu**, Patrick Lawlor, Lyle Ungar, Konrad Kording, and Rahul Ladhania. Automated detection of interpretable causal inference opportunities: Regression discontinuity subgroup discovery. *ICML 2023 Workshop: Interpretable Machine Learning for Healthcare*, 2023

W2. **Tony Liu**, Patrick Lawlor, Lyle Ungar, and Konrad Kording. Data-driven exclusion criteria for instrumental variable studies. *ICML 2021 Workshop: Neglected Asumptions of Causal Inference*, 2021

W1. **Tony Liu** and Lyle Ungar. Towards cotenable and causal shapley feature explanations. *AAAI 2021 Workshop: Trustworthy AI for Healthcare*, 2021

Preprints (P)

P2. Jordan K. Matelsky, Felipe Parodi, **Tony Liu**, Richard D. Lange, and Konrad P. Kording. A large language model-assisted education tool to provide feedback on open-ended responses. *arXiv*, 2023

P1. **Tony Liu**, Jonah Meyerhoff, David C Mohr, Lyle H Ungar, and Konrad P Kording. Covid-19 pandemic: every day feels like a weekday to most. *medRxiv*, 2020

Manuscripts in Progress (M)

M1. **Tony Liu**, Xinyue Wang, Dante Lokitiyakul, Lyle Ungar, and Konrad Kording. Learning to efficiently use instrumental variables. 2023

Peer-Reviewed Abstracts (A)

A2. C Amro, A Desai, P Dattatri, **Tony Liu**, JY Hsu, RB Broach, LH Ungar, and JP Fischer. Leveraging natural language processing and artificial intelligence to label unstructured data for risk prediction. *British Journal of Surgery*, 2023

A1. Ankoor A Talwar, Abhishek A Desai, Phoebe B McAuliffe, **Tony Liu**, Vivek James, Ivona Percec, Robyn B Broach, Lyle Ungar, and John P Fischer. Automated machine learning for risk prediction of incisional hernia in abdominal surgery patients. *Plastic and Reconstructive Surgery–Global Open*, 2022

Student Mentees and Projects

- Dante Lokitiyakul (UPenn BS '23 → UPenn MSE): M1
- Xinyue Wang (UPenn MSE '23 → UCSD PhD): M1
- Pooja Dattatri (UPenn MSE '23 → UPenn NLP Lab): A2
- Vivek James (UPenn Wharton '22 → Stripe): A1
- Harry Wang (UPenn MSE '22 → Pinterest): J6, J8
- Zach Duey (UPenn MSE '22 → CalypsoAI): Master's thesis
- Jesse Cui (UPenn BS '19 → Facebook): J1

Industry Research

Scientist/Research Program Manager April 2022 — present
Roblox (part-time)
- Continued research on measuring causal effects of civility and safety on platform [C3]
- Coordinating external communication, grant administration, conference presence, and tech transfer across Roblox Research

Research Internship October 2021 — April 2022
Roblox
- Developed observational causal methods for estimating the impact of civility on engagement [C3]

Professional Service

Organizing Committee Member Winter 2021
AAAI AI for Behavior Change (AI4BC) Workshop 2021

Reviewer
AAAI AI4BC 2021, AAAI AI4BC 2022, SIGKDD 2023

Other Industry Experience

Advisory Software Engineer August 2016 — August 2018
IBM Watson Health

Honors and Awards

Graduate Student Fellowship for Teaching Excellence Fall 2021 — Spring 2022
University of Pennsylvania Center for Teaching and Learning ($6,000)

Travel Grant Spring 2022
SIGCSE New and Aspiring Educators Professional Development Session ($500)

Sam Goldberg Colloquium Prize Summer 2016
Williams College: Awarded for the best thesis presentations in computer science

Sigma Xi Society Associate Member Summer 2016
Williams College

Phi Beta Kappa Honor Society Member Fall 2015
Williams College

Ward Prize Summer 2015
Williams College: Awarded for the best student projects in computer science