Tong (Tony) Liu

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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.

Education

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

Williams College 2012 — 2016
Bachelor of Arts in Computer Science with concentration in Cognitive Science Williamstown, MA

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
- 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

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 5200: Machine Learning, University of Pennsylvania
- Managed teaching assistant team for 130+ person class, wrote exam and homework material
- Gave guest lecture on Bayesian Networks

Research

Machine Learning Methods for Observational Causal Inference 2020 — present
Developing interpretable machine learning methodology for improving efficiency and statistical power of observational causal studies.
- C2, J4, R3, M1

Data Science for Social Communication 2018 — present
Using quasi-experimental and explainable AI (XAI) techniques to study computer-mediated social communication.
- R2, 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.
- 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.
- J8, J6, J7, J3, P1

Conference Proceedings

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 (UbiComp)*, 3(4):1–23, 2019

Journal Papers

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*, 39(12):794–804, 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

R3. **Tony Liu**, Patrick Lawlor, Lyle Ungar, Konrad Kording, and Rahul Ladhania. Automated detection of causal inference opportunities: Regression discontinuity subgroup discovery. 2023

R2. **Tony Liu**, Lyle Ungar, Konrad Kording, and Morgan McGuire. Measuring causal effects of civility without randomization. 2023

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

Peer-Reviewed Workshop Papers

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

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*, pages 2020–05, 2020

Manuscripts in Progress

M1. **Tony Liu**, Xinyue Wang, Dante Lokitiyakul, Lyle Ungar, and Konrad Kording. Towards learning instrumental variable structure. 2023

Peer-Reviewed Abstracts

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*, 110(Supplement_2):znad080–026, 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*, 10:10, 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

Part-time Scientist/Program Manager April 2022 — present
Roblox
- Continued research on measuring causal effects of civility and safety on platform [R2]
- 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 incivility on engagement [R2]

Service

Reviewer 2021 — 2023
AAAI, SIGKDD

Organizing Committee Member Winter 2021
AAAI AI for Behavior Change Workshop 2021

Other Industry Experience

Advisory Software Engineer August 2016 — August 2018
IBM Watson Health

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)