

YUWEI CHENG

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EDUCATION

PhD	University of Chicago Chicago, IL Department of Statistics Spring Consulting Cup Award (Best team for the statistical consulting program)	Sep 2021 May 2022
BS	National University of Singapore Singapore, Singapore Department of Statistics Dean's List (In recognition of excellent academic performance, 5% of the cohort) Science and Technology Scholarship (100% tuition fees waiver for outstanding students) National University of Singapore Singapore, Singapore Department of Economics Dean's List (In recognition of excellent academic performance, 5% of the cohort)	Aug 2016 2017-2020 2016-2020 Aug 2017 2017-2020

PUBLICATION

Cheng, Y. Yao, F., Liu, X., & Xu, H. (2024). Learning from Imperfect Human Feedback: a Tale from Corruption-Robust Dueling. arXiv preprint arXiv:2405.11204.

Quaye S, Cheng Y, Tan R, Prem K, Kuo A, Teo J, & Cook AC (2023). Application of the network scale-up method to estimate the sizes of key populations for HIV in Singapore using online surveys. *Journal of the International AIDS Society* 26 (3), e25973

Cheng Y, Tran Minh N, Tran Minh Q, Khandelwal S, & Clapham HE (2022). Estimates of Japanese Encephalitis mortality and morbidity: A systematic review and modeling analysis. *PLoS Negl Trop Dis* 16(5): e0010361

RESEARCH EXPERIENCE

Dept. of Computer Science, University of Chicago | Supervisor Dr. Haifeng Xu Dec 2023 – Present
Incrementality bidding via contextual reinforcement learning under mixed and delayed reward feedback

- Formulated the online incrementality bidding problem as an episodic Markov Decision Process and modeled the incrementality as a Poisson Process.
- Expanded the bandit configuration of incrementality bidding to a contextual setup, enabling online advertisers to tailor bidding strategies for various user profiles.
- Estimated the incrementality parameters using a novel algorithm that combines pairwise moment-matching and maximum likelihood estimation.
- Analyzing the regret upper bound for the contextual reinforcement learning algorithm.

Utility Observation Attack to Multi-Agent Learning in Strongly Monotone Games Aug 2023 – Present

- Introduced adversarial attack to multi-agent learning for the first time and constructed attack strategy which has the power to manipulate the Nash Equilibrium to any point by using sublinear attack budget.
- Proved that gradient-based learning algorithms can tolerate adversarial attack through strategically adjusting learning rate, trading off learning efficiency for adversarial robustness.

Toyota Technological Institute at Chicago | Supervisor Dr. Matthew Walter Mar 2023 – Jun 2023
Eliciting User Preferences for Personalized Multi-Objective Decision Making

- Investigated the real-world planning problem that required people to make sequential decisions involving balancing multiple but sometimes conflicting objectives, who's relative priority varied according to the preferences of each user. Replicated a provably efficient algorithm to estimate users' personalized policies.
- Tested the empirical performance of the proposed algorithm by creating a multi-objective gym-compatible reinforcement learning environment in PyTorch, simulating recommended trajectories, receiving pairwise feedback from users, and implementing preference estimation algorithms.
- Concluded that while no violations of the theorem were identified, the established upper bound for the absolute performance gap was not sufficiently tight. Introduced a new metric, the relative performance gap, which proved to be more effective for quantifying the algorithm's performance.

Optimization through Deep Reinforcement Learning

- Converted the lost-sale inventory model into a reinforcement learning problem and determined the optimal replenishment policy using deep reinforcement learning (DRL) algorithms, involving thorough hyperparameter tuning.
- Compared the performance of DRL algorithms with classic inventory management methods, for example, base-stock policy. Found that DRL algorithms had the potential to generate better replenish policy at a cost of extensive training.

SKILLS AND TEACHING

Services:

- The American Statistician Reviewer 2024
- BMJ Global Health Reviewer 2023
- NeurIPS Volunteer 2022

Teaching:

- Introduction to Data Science at University of Chicago 2021 - 2024
- Statistics Bootcamp at University of Chicago 2023 Summer
- Introduction to Macroeconomics at National University of Singapore 2020 Fall

SKILLS, LANGUAGES, AND INTERESTS

Technical: Python, R, Linux, LaTeX, Matlab

Languages: English (proficient), Mandarin (native)

Interests: Playing Tai Chi sword, playing guitar, prose writer