# YUWEI CHENG

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## EDUCATION

**PhD** **University of Chicago** | Chicago, IL | Department of Statistics — Sep 2021
Spring Consulting Cup Award (Best team for the statistical consulting program) — May 2022

**BS** **National University of Singapore** | Singapore, Singapore | Department of Statistics — Aug 2016
Dean's List (In recognition of excellent academic performance, 5% of the cohort) — 2017-2020
Science and Technology Scholarship (100% tuition fees waiver for outstanding students) — 2016-2020
**National University of Singapore** | Singapore, Singapore | Department of Economics — Aug 2017
Dean's List (In recognition of excellent academic performance, 5% of the cohort) — 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.

**Booth School of Business, University of Chicago** | Supervisor Dr. Varun Gupta Sep 2022 – Mar 2023
*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 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