

YANG (ALINA) XU

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2310 Crescent Creek Dr. 307A, Raleigh, North Carolina 27606

EDUCATION

North Carolina State University (NCSU), USA

Ph.D. Candidate in Statistics (GPA: 4.0/4.0, Advisor: Dr. Rui Song and Dr. Wenbin Lu) Aug. 2021–Now
Anticipated Graduation Date: May 2025

Nankai University (NKU), China

B.S. in Statistics (GPA: 3.9/4.0, The only outstanding graduate in statistics major) Aug. 2016–June. 2020

Programming Languages: Python, R, SQL, MATLAB, SAS, C++.

Research Interests: I have broad interests in the intersection of causal inference and reinforcement learning, with a particular emphasis on offline policy evaluation, bandits problems, causal reasoning, and their applications in advertising markets and clinical trials.

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PUBLICATIONS AND PREPRINTS

1. **Xu, Y.**, Zhu, J., Shi, C., Luo, S., Song, R. (2023, July). An instrumental variable approach to confounded off-policy evaluation. In International Conference on Machine Learning (pp. 38848-38880). PMLR.
2. **Xu, Y.**, Shi, C., Luo, S., Wang, L., Song, R. (2022). Quantile Off-Policy Evaluation via Deep Conditional Generative Learning. arXiv preprint arXiv:2212.14466.
3. **Xu, Y.**, Lu, W., Song, R. (2024). Linear Contextual Bandits with Interference. arXiv preprint arXiv:2409.15682.
4. **Xu, Y.**, Lai, K. T., Xiong, P., Wu, Z. (2024, October). Multi-Preview Recommendation via Reinforcement Learning. In Proceedings of the 18th ACM Conference on Recommender Systems (pp. 1180-1183).
5. **Xu, Y.**, Srinivasan, A., Xue, L. (2021). A Selective Overview of Recent Advances in Spectral Clustering and Their Applications. Modern Statistical Methods for Health Research, 247-277.
6. Ge, L., **Xu, Y.**, Chu, J., Cramer, D., Li, F., Paulson, K., Song, R. (2024). Multi-Task Combinatorial Bandits for Budget Allocation. In AdKDD.
7. Shen, Y., **Xu, Y.**, Song, R. (2024). Dynamic Causal Bandits via Matrix Completion. (In review).

RESEARCH EXPERIENCE

An Instrumental Variable Approach to Confounded OPE [Python] Feb. 2022 – Feb. 2023

- Develops an instrumental variable (IV)-based method for consistent off-policy evaluation in sequential decision making problems with confounding issues, which is extended to high-order confounded MDPs and partially observable MDPs (POMDPs). This method can be widely applied in the context of advertising online digital advertising, precision medicine, etc with extensive numerical studies.

Quantile Off-Policy Evaluation [Python]

Jun. 2021 – Feb. 2022

- Proposed a Doubly Robust (DR) quantile estimator in multi-stage settings to stably evaluate the entire distribution for a given target policy under a heavy-tailed reward distribution, with deep conditional generative learning to handle parameter-dependent nuisance function estimation, which is able to decrease the MSEs of the original doubly robust mean estimator by 50% for heavy-tailed reward distributions.

A Tutorial on Causal Decision Making [Jupyter book & Python package] Feb. 2022 – Present

- Developed an integrated framework for causal inference and general decision making problems in bandits, reinforcement learning, dynamic treatment regime and beyond. The current notebook is available at <https://causaldm.github.io/Causal-Decision-Making/Overview.html>.

Multi-Task Combinatorial Bandits for Budget Allocation [Python] July. 2023 – July 2024

- Designed a multi-task combinatorial bandit framework using Bayesian hierarchical models to solve large-scale budget allocation problems across multiple ad lines in various campaigns. An online experiment with Amazon data demonstrated a 12.7% reduction in cost-per-click.

Dynamic Causal Bandits via Matrix Completion [Python] Aug. 2023 – July 2024

- Developed an algorithm for Multi-Agent Multi-Armed Bandits (MAMAB) to address nonstationarity and latent variables. The algorithm leverages the stationary nature of treatment effects to manage nonstationarity and uses matrix completion for latent variable estimation, achieving the lowest average regret compared to other approaches.

WORK EXPERIENCE

Microsoft - Data Scientist Intern May. 2024–Aug. 2024 *Microsoft AI* *Seattle, WA*

- Proposed a reinforcement learning framework for multi-preview notification recommendation on Windows system, which bridges the gap between combinatorial RL and classical multi-step optimization procedure, and improves the daily active users (DAU) by 1.05% in online testing.

Amazon - Applied Scientist Intern May. 2023–Aug. 2023 *Amazon SPARC* *Seattle, WA*

- Proposed a causal-based heterogeneous treatment effect (HTE) evaluation framework for third-party seller targeting in Amazon, which provides detailed evaluation on seller potential, seller ranking, and personalized seller assistance, which expect to improve the future-twelve-month Gross Merchandise Sales (GMS) by 20% in 2024.

Amazon - Applied Scientist Intern May. 2022–Dec. 2022 *Amazon CoreAI* *Seattle, WA*

- Developed a localized Double Machine Learning (LDML) approach for HTE estimation under massive unbalanced datasets. Comparing with Generalized Random Forest (GRF), our method achieved a remarkable reduction of 21.8% in both group and individual-level Mean Squared Errors (MSE), while requiring only 1/20th of the time for computation.
- Utilized Wasserstein Generative Adversarial Networks (WGAN) for causal-based validation.

INVITED PRESENTATIONS

1. [ICML](#), 2023, HI. An instrumental variable approach to confounded off-policy evaluation (Poster).
2. [JSM](#), 2023, Toronto, Canada. Quantile off-policy evaluation via deep conditional generative learning (20-Min Invited Talk, [Student Paper Award](#)).
3. [AAAI](#), 2024, Vancouver, Canada. [Foundations, Practical Applications, and Latest Developments in Causal Decision Making](#) (3.5-Hour Tutorial).
4. [Workshop on Translational Research on Data Heterogeneity](#), 2024, WUSTL, MO. Quantile off-policy evaluation via deep conditional generative learning (Invited Poster).
5. [RecSys](#), 2024, Bari, Italy. Multi-preview recommendation via reinforcement learning (Poster).