

Ao LIU

Ph.D. in Computer Science

Software Engineer at Google

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Summary

Research Interests Machine Learning (Recommendation Systems, Learning to Rank, Personalization, LLM), Differential Privacy, Computational Social Choice, and Theoretical Computer Science

Experience 1+ years of industry experience in personalization, recommendation systems, LLM, theoretical computer science, differential privacy, learning to rank, and adversarial robustness

Academic Published 20+ papers, filed 2 patents, and received 300+ citations to date.
Reviewed 50+ papers for top AI conferences or journals.

Education

- 1/2018–5/2023 **Ph.D. in Computer Science**, Rensselaer Polytechnic Institute (RPI) Troy, NY
Thesis: *Group Decision Makings from Partial Preferences* [\[Link\]](#) GPA: 4.00/4
- 8/2015–5/2018 **M.Eng. in Material Engineering**, Rensselaer Polytechnic Institute (RPI) Troy, NY
Received *Presidential Graduate Research Fellowship* GPA: 3.83/4
- 8/2010–5/2014 **B.S. in Mathematics and Physics**, Tsinghua University Beijing, China
Minor in Computer Technology, and in *Academic Talent Program* GPA: 85/100

Experience

- 7/2023–Present **Software Engineer at Google Core ML** Mountain View, CA
Design / research more efficient & flexible models for personalized recommendation systems
- 5/2022–8/2022 **Research Intern at Google Core ML** Mountain View, CA
Project: Unbiased Learning to Rank with a More Accurate Position Bias Estimator
- Significantly more accurate ($\sim 6\%$) on predictions *v.s.* state-of-the-art without any cost
 - Proposed a novel probabilistic model to more accurately estimate position bias and designed an unbiased recommendation system based on it.
 - Implemented the data pipeline and ML model for the proposed unbiased recommendation system. (Python, TensorFlow, C/C++)
- 5/2019–8/2019 **Visiting Scholar at MIT-IBM Watson AI Lab** Cambridge, MA
and Project: Certifiably Robust Interpretation via Rényi Differential Privacy
- 9/2018–1/2019
- Delivered one academic paper (on top AI journal and conference) and two patents.
 - Significantly more robust ($\sim 12\%$) and more accurate *v.s.* state-of-the-art without any cost. Note that we improved two trade-off properties at the same time.
 - Designed the first-ever algorithm with theoretically guaranteed top- k robustness against ℓ_∞ -norm attacks, where the theoretical proofs use Rényi differential privacy.
 - Implemented the proposed algorithm and tested its robustness, accuracy & efficiency on interpretation, classification & objective-detection tasks. (PyTorch, TorchRay, TensorFlow, MATLAB)

Review Services

Journal Information Sciences, ACM ToIS, TMLR, DMLR, Sankhya B

Conference NeurIPS (20, 21, 22, 23 & 24), ICML (22, 23 & 24), ICLR (23, 24 & 25), AAAI (21 & 22), AISTATS-25 and IJCAI-22

Skills

Coding Python, C/C++, TensorFlow, PyTorch, TorchRay, MATLAB, \LaTeX

Design & Theory Algorithm design, Time & Sample-complexity analysis, User-modeling, MCMC, Statistics, Privacy analysis, Robustness analysis, Model identifiability, Smoothed analysis

Selected Publications

- TMLR* **Smoothed Differential Privacy** [\[PDF\]](#)
Ao Liu, Yu-Xiang Wang, and Lirong Xia
- UAI-23* **Accelerating Voting by Quantum Computation** [\[PDF\]](#)
Ao Liu, Qishen Han, Lirong Xia, and Nengkun Yu
- AIJ* and **Certifiably Robust Interpretation via Rényi Differential Privacy** [\[Link\]](#) [\[ArXiv\]](#)
AAAI-23 (oral) *Ao Liu*, Xiaoyu Chen, Sijia Liu, Lirong Xia, and Chuang Gan
- AAAI-22* **The Semi-Random Likelihood of Doctrinal Paradoxes** [\[PDF\]](#)
Ao Liu and Lirong Xia
- UAI-20* (oral) **How Private Are Commonly-Used Voting Rules?** [\[PDF\]](#)
Ao Liu, Yun Lu, Lirong Xia, and Vassilis Zikas
- AAAI-19* (oral) **Near-Neighbor Methods in Random Preference Completion** [\[PDF\]](#)
Ao Liu, Qiong Wu, Zhenming Liu, and Lirong Xia
- AAAI-19* (oral) **Learning Plackett-Luce Mixture from Partial Preferences** [\[PDF\]](#)
Ao Liu, Zhibing Zhao, Chao Liao, Pinyan Lu, and Lirong Xia
- ETRA-19* (oral) **Differential Privacy for Eye-Tracking Data** [\[PDF\]](#)
Ao Liu, Lirong Xia, Andrew Duchowski, Reynold Bailey, Kenneth Holmqvist, and Eakta Jain
- UAI-25* **Trading Off Voting Axioms for Privacy** [\[PDF\]](#)
Zhechen Li, *Ao Liu*, Lirong Xia, Yongzhi Cao, and Hanpin Wang
- AAAI-23* (oral) **Differentially Private Condorcet Voting** [\[PDF\]](#)
Zhechen Li, *Ao Liu*, Lirong Xia, Yongzhi Cao, and Hanpin Wang
- IJCAI-22* (oral) **Learning Mixtures of Random Utility Models with Features from Incomplete Preferences**
Zhibing Zhao, *Ao Liu*, and Lirong Xia [\[PDF\]](#)
- JAIR* and **Learning to Design Fair and Private Voting Rules** [\[PDF\]](#)
IJCAI-23 (oral) Farhad Mohsin, *Ao Liu*, Pin-Yu Chen, Francesca Rossi, and Lirong Xia
- ETRA-20* **Let It Snow: Adding Pixel Noise to Protect the Users Identity** [\[Link\]](#)
Adjunct Brendan John, *Ao Liu*, Lirong Xia, Sanjeev Koppal, and Eakta Jain
- Polymer* **Simulation of Pulse Responses of Lithium Salt-Doped Poly-Ethyleneoxide** [\[Link\]](#)
Physics *Ao Liu*, F. Zeng, Y. Hu, S. Lu, W. Dong, X. Li, C. Chang, and D. Guo
- **View All Publications at** [\[Personal Website\]](#) [\[Google Scholar\]](#)

Patents

- US 11687777 B2 **Certifiably Robust Interpretation** [\[PDF\]](#)
Ao Liu, Sijia Liu, Bo Wu, Lirong Xia, Qi Cheng Li, and Chuang Gan
- US 11341598 B2 **Interpretation Maps with Guaranteed Robustness** [\[PDF\]](#)
Ao Liu, Sijia Liu, Abhishek Bhandwaldar, Chuang Gan, Lirong Xia, and Qi Cheng Li

Awards and Teaching

- 9/2019 – 5/2022 **RPI-IBM AI Horizon Scholarship**
- 9/2016 – 5/2017 **RPI Presidential Graduate Research Fellowship** [\[Certificate\]](#)
- 1/2023 – 5/2023 **Teaching Assistant** of CSCI 4150: Introduction to AI
- 9/2017 – 1/2018 **Teaching Assistant** of MATH 1020: Calculus II
- 4/2021 **Guest Lecture** at CSCI 4967/6967: Economics and Computation