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 270+ 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 and more flexible models for personalized ML 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 (∼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 and 9/2018 – 1/2019 **Visiting Scholar** at **MIT-IBM Watson AI Lab** Cambridge, MA
Project: Certifiably Robust Interpretation via Rényi Differential Privacy
- Delivered one academic paper (on top AI journal and conference) and two patents.
- Significantly more robust (∼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)

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

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

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 *AAAI-23* (oral) **Certifiably Robust Interpretation via Rényi Differential Privacy** [Link] [ArXiv]
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

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 *IJCAI-23* (oral) **Learning to Design Fair and Private Voting Rules** [PDF]
Farhad Mohsin, *Ao Liu*, Pin-Yu Chen, Francesca Rossi, and Lirong Xia

ETRA-20 Adjunct **Let It Snow: Adding Pixel Noise to Protect the Users Identity** [Link]
Brendan John, *Ao Liu*, Lirong Xia, Sanjeev Koppal, and Eakta Jain

Polymer Physics **Simulation of Pulse Responses of Lithium Salt-Doped Poly-Ethyleneoxide** [Link]
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