Fan Yao

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Education

University of Virginia — Charlottesville, US
Ph.D. in Computer Science, Co-advised by Dr. Haifeng Xu and Dr. Hongning Wang — 2019.8 –present

- Research Interest: AI for social good, multi-agent systems, online learning and optimization, computational game theory, recommender systems

Peking University — Beijing, China
M.S. in Applied and Computational Mathematics, Advisor: Dr. Tiejun Li — 2013.9–2016.7

B.S. in Mathematics, double major in Philosophy — 2009.9–2013.7

Experience

University of Chicago — Chicago, IL, US
Visiting Student at Computer Science Department Advisor: Dr. Haifeng Xu — 2023.5-present

- Game-theoretic modeling for online content creation dynamics, adversarial attack to multi-agent systems.

Meta Research — Menlo Park, CA, US
Student Researcher at Modern Recommender System Group Host: Dr. Qifan Wang — 2023.12-2024.7

- Deploy mechanism design solutions for improving user engagement on Instagram Reels.

Google Research — Mountain View, CA, US
Student Researcher at Forsight Manager: Dr. Craig Boutilier, Host: Dr. Chih-wei Hsu — 2022.5-2022.9

- Work on Bayesian preference elicitation in interactive recommender systems using Concept Activation Vectors.

ByteDance — Remote in US
Research Intern at AML Lab Manager: Dr. Chong Wang, Host: Dr. Taiqing Wang — 2021.5-2021.8

- Enhance the recommendation diversity and mitigate the Echo chamber effect of TikTok via collaborative Thompson sampling approach and gradient-based Determinantal Point Processes.

Alibaba Group — Beijing, China
Algorithm Engineer at Taobao Manager: Dr. Xin Li — 2017.8-2019.7

- Design and maintain content recommendation system for Taobao main page, mainly focusing on deep-learning based match/ranking solution.

Awards

- UVa Copenhaver Bicentennial Graduate Research Fellowship ($12k). 2024
- UVa Graduate Teaching Award. 2021
- Outstanding Graduate Student Award of Peking University. 2016
- Bronze Medalist in Team Contest of Applied and Computational Mathematics, Shing-Tung Yau College Student Mathematics Contests (Ranked top 6 nation-wide). 2012
- Gold Medalist in Chinese Mathematics Olympics (Ranked top 40 individually nation-wide). 2009

Working Papers

*Equal contribution; authors listed in alphabetical order.

5. H. Kiyohara, **F. Yao**, S. Dean, "Policy Design for Two-sided Platforms with Participation Dynamics", preprint at arXiv:2502.01792.

4. Y. Yu, **F. Yao**, S. Pan, "Beyond Self-Interest: How Group Strategies Reshape Content Creation in Recommendation Systems?", *under review*.

3. *S. Ahmadi, *A. Blum, *H. Xu, ***F. Yao**, "Strategic Filtering for Content Moderation: Free Speech or Free of Distortion?", *under review*.

2. Y. He, **F. Yao**, Y. Yu, X. Qiu, M. Li, H. Xu, "The Complexity of Tullock Contests", preprint at arXiv:2412.06444.

1. E. Biyik, **F. Yao**, A. Haig, Y. Chow, C. Hsu, M. Ghavamzadeh, and C. Boutilier, "Preference Elicitation with Soft Attributes in Interactive Recommendation", preprint at arXiv:2311.02085.

Journal Articles

J3. *J. Wu, *H. Xu, and ***F. Yao**, "Uncoupled Bandit Learning towards Rationalizability: Benchmarks, Barriers, and Algorithms", *under major revision at* **JMLR**. (Supersedes C3.)

J2. *R. Sundaram, *A. Vullikanti, *H. Xu, and ***F. Yao**, "Pac-Learning for Strategic Classification", Journal of Machine Learning Research, **JMLR**, 2023. (Supersedes C1.)

J1. **F. Yao**, F. Li, T. Li, "Mean Field Study of a Propagation-Turnover Lattice Model for the Dynamics of Histone Marking", **Science China Physics**, Mechanics & Astronomy 60, 1-15, 2017.

Conference Publications

C12. ***F. Yao**, *Y. Cheng, E. Wei, and H. Xu, "Single-Agent Poisoning Attacks Suffice to Ruin Multi-Agent Learning", **ICLR**, 2025.

C11. Y. Cheng, **F. Yao**, X. Liu, and H. Xu, "Learning from Imperfect Human Feedback: a Tale from Corruption-Robust Dueling", **ICLR**, 2025.

Selected for NSF poster awards (15 out of 116 accepted posters) at the Midwest Machine Learning Symposium, 2024.

C10. **F. Yao**, Y. Liao, J. Liu, S. Nie, Q. Wang, H. Xu, H. Wang, "Unveiling User Satisfaction and Creator Productivity Trade-Offs in Recommendation Platforms", **Neurips**, 2024.

C9. **F. Yao**, Y. Liao, M. Wu, C. Li, Y. Zhu, J. Yang, J. Liu, Q. Wang, H. Xu, and H. Wang, "User Welfare Optimization in Recommender Systems with Competing Content Creators", **KDD**, 2024.

C8. **F. Yao**, C. Li, D. Nekipelov, H. Wang, and H. Xu, "Human vs. Generative AI in Content Creation Competition: Symbiosis or Conflict?", **ICML**, 2024.

C7. **F. Yao**, C. Li, K. Sankararaman, Y. Liao, Y. Zhu, Q. Wang, H. Wang, and H. Xu, "Rethinking Incentives in Recommender Systems: Are Monotone Rewards Always Beneficial?", **Neurips**, 2023.

C6. **F. Yao**, C. Li, D. Nekipelov, H. Wang, and H. Xu, "How Bad is Top-K Recommendation under Competing Content Creators?", **ICML**, Oral presentation, 2023.

C5. M. Wu, **F. Yao**, and H. Wang, "An End-to-End Solution for Spatial Inference in Smart Buildings", **BuildSys**, Best Paper Nomination, 2023.

C4. **F. Yao**, C. Li, D. Nekipelov, H. Wang, and H. Xu, "Learning from a Learning User for Optimal Recommendations", **ICML**, 2022.

Also selected for spotlight presentation (5 out of 38 accepted posters) at the ICML 2023 Workshop on Interactive Learning with Implicit Human Feedback.

C3. *J. Wu, *H. Xu, and ***F. Yao**, "Multi-Agent Learning for Iterative Dominance Elimination: Formal Barriers and New Algorithms", **COLT**, 2022.

C2. **F. Yao**, C. Li, D. Nekipelov, H. Wang, and H. Xu, "Learning the Optimal Recommendation from Revealed Preferences", **AAAI**, 2022.

C1. *R. Sundaram, *A. Vullikanti, *H. Xu, and ***F. Yao**, "Pac-Learning for Strategic Classification", **ICML**, Oral presentation, 2021.

Workshop Papers

W1. **F. Yao**, R. Cai, and H. Wang, "Reversible Action Design for Combinatorial Optimization with Reinforcement Learning", Workshop on Machine Learning for Operations Research, **AAAI**, 2022.

Impact on Real-World Systems

- Optimizing Incentivize Mechanisms for Instagram Content Creators

  To promote desirable content distribution across Instagram Reels, I successfully live-tested a novel mechanism impacting over 5 million content creators and 5 million users. This system delivered a 1.13% improvement in the industry-standard metric, the like-through-rate (LTR)—the probability a user will "like" the content after viewing it. For context, a 1% improvement in LTR is already considered top-tier performance in real-world systems. Additionally, our mechanism consistently enhanced key metrics such as content consumption diversity and daily active users (DAU) among creators, demonstrating robust, scalable impact. (see C11.)

Invited Talks

- University of North Carolina at Chapel Hill, job talk at STOR, "Towards a Sustainable Content Creation Ecosystem: From Theory to Practice". 2025.1
- The Hong Kong University of Science and Technology (Guangzhou), job talk at Fintech Thrust, "Understanding and Optimizing Multi-Agent Content Ecosystems". 2025.1
- Carnegie Mellon University, guest lecture, "Modeling Competition-Driven Content Ecosystems". 2024.11
- INFORMS, Seattle, "Optimizing Competition-Driven Content Ecosystems". 2024.10
- Cornell University, ESIF Economics and AI+ML Meeting, "Human v.s. GenAI Competition". 2024.8
- George Mason University, seminar talk, "Understanding Competition-Driven Content Ecosystems". 2024.6
- Northwestern University, Midwest Workshop on Control and Game Theory, "Understanding Competition-Driven Content Ecosystems". 2024.4
- Mila & Vector Institute, seminar talk, "Understanding Competition-Driven Content Ecosystems". 2024.4
- Cornell University, seminar talk, "Understanding Competition-Driven Content Ecosystems". 2024.2
- Meta Research, "How Bad is Top-K Recommendation under Competing Content Creators?". 2023.8
- Uber Research, "Learning from a Learning User for Optimal Recommendations". 2022.6

Teaching

- **Teaching Assistant** at University of Virginia — Spring 2023
  Introduction to Algorithmic Economics
- **Teaching Assistant** at University of Virginia — Fall 2022
  Introduction to Reinforcement Learning
- **Teaching Assistant** at University of Virginia — Spring 2021
  Topics in Learning and Game Theory
- **Teaching Assistant** at University of Virginia — Fall 2020
  Algorithms
- **Teaching Assistant** at Peking University — Spring 2016
  Linear Algebra

Services

- ICML PC — 2021,2022,2023,2024
- Neurips PC — 2022,2023,2024
- KDD PC — 2022,2023,2024
- AAAI PC — 2021,2022,2023,2024
- IJCAI PC — 2022,2023,2024

List of References

- **Dr. Haifeng Xu**, assistant professor at the University of Chicago
  ***Email**: haifengxu@uchicago.edu*
  ***Access letter from Interfolio**: send.Xu.DA1B69E436@interfoliodossier.com*
- **Dr. Hongning Wang**, associate professor at the University of Virginia/Tsinghua University
  ***Email**: hw5x@virginia.edu*
  ***Access letter from Interfolio**: send.Wang.AAF70EC633@interfoliodossier.com*
- **Dr. Denis Nekipelov**, associate professor at the University of Virginia
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- **Dr. Ermin Wei**, associate professor at Northwestern University
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- **Dr. Sarah Dean**, assistant professor at Cornell University
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