# Fan Yao

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## Education

**University of Virginia** — Charlottesville, US
Ph.D. in Computer Science, Co-advised by Dr. Hongning Wang and Dr. Haifeng Xu — 2019–Current

- Research Interest: AI for social good, game theoretical modeling in multi-agent environments, Learning from human feedback, Online learning, Information retrieval systems

**Peking University** — Beijing, China
M.S. in Applied and Computational Mathematics, Advisor: Dr. Tiejun Li — 2013–2016

B.S. in Mathematics, double major in Philosophy — 2009–2013

## Experience

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

- Multi-agent modeling for digital content market.

**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.

4. *__F. Yao__, *Y. Cheng, E. Wei, and H. Xu, "Single-Agent Poisoning Attacks Suffice to Ruin Multi-Agent Learning", *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. Cheng, __F. Yao__, X. Liu, and H. Xu, "Learning from Imperfect Human Feedback: a Tale from Corruption-Robust Dueling", arXiv preprint, arXiv:2405.11204.

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

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

## Journal Articles

J2. *J. Wu, *H. Xu, and *__F. Yao__, "Uncoupled Bandit Learning towards Rationalizability: Benchmarks, Barriers, and Algorithms", *under major revision at* **JMLR**. (Supersedes C3.)

J1. *R. Sundaram, *A. Vullikanti, *H. Xu, and *__F. Yao__, "Pac-Learning for Strategic Classification", Journal of Machine Learning Research, **JMLR**, 2023. (Supersedes C1.)

## Selected Conference Publications

C10. __F. Yao__, Y. Liao, J. Liu, S. Nie, Q. Wang, H. Wang, "Mechanism Design Through Exploration Control: Optimizing the Trade-Off Between User and Creator Engagement", **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.

   Also accepted to be presented at Econometric Society Interdisciplinary Frontiers (ESIF) conference on Economics and AI+ML.

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 (2.4%), 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 (3%), 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 C9.)

## Invited Talks

- INFORMS, Seattle, "Optimizing Competition-Driven Content Ecosystems". 2024.10
- George Mason University, "Understanding Competition-Driven Content Ecosystems". 2024.6
- 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