Xiaohui Bei

Division of Mathematical Sciences
School of Physical and Mathematical Sciences

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Research Appointments

- **Associate Professor**, August 2021 - present
  School of Physical and Mathematical Sciences   Nanyang Technological University

- **Nanyang Assistant Professor**, March 2016 - August 2021
  School of Physical and Mathematical Sciences   Nanyang Technological University

- **Assistant Professor**, September 2015 - March 2016
  School of Physical and Mathematical Sciences   Nanyang Technological University

- **Research Fellow**, September 2014 - August 2015
  Algorithms and Complexity Department   Max Planck Institute for Informatics
  Host: Kurt Mehlhorn

- **Research Fellow**, September 2012 - July 2014
  School of Physical and Mathematical Sciences   Nanyang Technological University
  Host: Ning Chen

Education

- **Ph.D.** Computer Science, Tsinghua University, 2008.9 - 2012.7

  - Dissertation: Budget Feasible and General Mechanism Design in Prior-Free and Bayesian Settings
  - Advisor: Andrew Chi-Chih Yao

- **B.E.** Computer Science and Technology, Tsinghua University, 2004.9 - 2008.7

Research Interests

Computational Economics (Algorithmic Game Theory and Mechanism Design)
Efficiency and Fairness in Resource Allocation
Algorithm and Combinatorial Optimization

Publications

Conference Papers

1. Xiaohui Bei, Pinyan Lu, Zhiqi Wang, Tao Xiao, Xiang Yan: **Optimal Auction Design for Mixed Bidders.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2025.

2. Xiaohui Bei, Alexander Lam, Xinhang Lu, Warut Suksompong: **Welfare Loss in Connected Resource Allocation.** In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2024.

3. Hongtao Lv, Xiaohui Bei, Zhenzhe Zheng, Fan Wu: **Auction Design for Bidders with Ex Post ROI Constraints.** In *Conference on Web and Internet Economics (WINE)*, 2023.

4. Xiaohui Bei, Shengxin Liu, Xinhang Lu: **Fair Division with Subjective Divisibility.** In *Conference on Web and Internet Economics (WINE)*, 2023.

5. Xiaohui Bei, Biaoshuai Tao, Jiajun Wu, Mingwei Yang: **The Incentive Guarantees Behind Nash Welfare in Divisible Resources Allocation.** In *Conference on Web and Internet Economics (WINE)*, 2023.

6. Xinhang Lu, Jannik Peters, Haris Aziz, Xiaohui Bei, Warut Suksompong: **Approval-Based Voting with Mixed Goods.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2023.

7. Xiaohui Bei, Nick Gravin, Pinyan Lu, Zhihao Gavin Tang: **Bidder Subset Selection Problem in Auction Design.** In *ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2023.

8. Xiaohui Bei, Zihao Li, Junjie Luo: **Fair and Efficient Multi-Resource Allocation for Cloud Computing.** In *Conference on Web and Internet Economics (WINE)*, 2022.

9. Zihao Li, Xiaohui Bei, Zhenzhen Yan: **Proportional Allocation of Indivisible Resources under Ordinal and Uncertain Preferences.** In *Conference on Uncertainty in Artificial Intelligence (UAI)*, 2022.

10. Hao Wang, Xiaohui Bei: **Real-time Driver-Request Assignment in Ridesourcing.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2022.

11. Xiaohui Bei, Xinhang Lu, Warut Suksompong: **Truthful Cake Sharing.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2022.

12. Xiaohui Bei, Shengyu Zhang: **The Secretary Problem with Competing Employers on Random Edge Arrivals.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2022.

13. Sijun Tan, Jibang Wu, Xiaohui Bei, Haifeng Xu: **Least Square Calibration for Peer Reviews.** In *Conference on Neural Information Processing Systems (NeurIPS)*, 2021.

14. Chunxue Yang, Xiaohui Bei: **Learning Optimal Auctions with Correlated Valuations from Samples.** In *International Conference on Machine Learning (ICML)*, 2021.

15. Xiaohui Bei, Shengxin Liu, Xinhang Lu, Hongao Wang: **Maximin Fairness with Mixed Divisible and Indivisible Goods.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2021.

16. Xiaohui Bei, Ayumi Igarashi, Xinhang Lu, Warut Suksompong: **The Price of Connectivity in Fair Division.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2021.

17. Xiaohui Bei, Warut Suksompong: **Dividing a Graphical Cake.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2021.

18. Xiaohui Bei, Shengxin Liu, Chung Keung Poon, Hongao Wang: **Candidate Selections with Proportional Fairness Constraints.** In *International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2020

19. Xiaohui Bei, Zihao Li, Jinyan Liu, Shengxin Liu, Xinhang Lu: **Fair Division of Mixed Divisible and Indivisible Goods.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2020
Outstanding Student Paper Award

20. Xiaohui Bei, Shiteng Chen, Ji Guan, Youming Qiao, Xiaoming Sun: **From independent sets and vertex colorings to isotropic spaces and isotropic decompositions: Another bridge between graphs and alternating matrix spaces.** In *Innovations in Theoretical Computer Science (ITCS)*, 2020.

21. Xiaohui Bei, Xiaoming Sun, Hao Wu, Jialin Zhang, Zhijie Zhang, Wei Zi: **Cake Cutting on Graphs: A Discrete and Bounded Proportional Protocol.** In *ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2020.

22. Nixie Lesmana, Xuan Zhang, Xiaohui Bei: **Balancing Efficiency and Fairness in On-Demand Ridesourcing.** In *Conference on Neural Information Processing Systems (NeurIPS)*, 2019.

23. Taoan Huang, Bohui Fang, Hoon Oh, Xiaohui Bei, Fei Fang: **Dynamic Trip-Vehicle Dispatch with Scheduled and On-Demand Requests.** In *The Conference on Uncertainty in Artificial Intelligence (UAI)*, 2019.

24. Xiaohui Bei, Xinhang Lu, Pasin Manurangsi, Warut Suksompong: **The Price of Fairness for Indivisible Goods.** In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2019.

25. Taoan Huang, Bohui Fang, Hoon Oh, Xiaohui Bei, Fei Fang: **Optimal Trip-Vehicle Dispatch with Multi-Type Requests.** In *International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, extended abstract, 2019.

26. Xiaohui Bei, Nick Gravin, Pinyan Lu, Zhihao Gavin Tang: **Correlation-Robust Analysis of Single Item Auction.** In *ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2019.

27. Chaoli Zhang, Fan Wu, Xiaohui Bei: **An Efficient Auction with Variable Reserve Prices for Ridesourcing.** In *Pacific Rim International Conference on Artificial Intelligence (PRICAI)*, 2018.

28. Xiaohui Bei, Guangda Huzhang, Warut Suksompong: **Truthful Fair Division without Free Disposal.** In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2018.

29. Chaoli Zhang, Xiang Wang, Fan Wu, Xiaohui Bei: **Efficient Auctions with Identity-Dependent Mixed Externalities.** In *International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, extended abstract, 2018.

30. Xiaohui Bei, Shengyu Zhang: **Algorithms for Trip-Vehicle Assignment in Ride-Sharing.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2018.

31. Xiaohui Bei, Jugal Garg, Martin Hoefer, Kurt Mehlhorn: **Earning Limits in Fisher Markets with Spending-Constraint Utilities.** In *International Symposium on Algorithmic Game Theory (SAGT)*, 2017.

32. Xiaohui Bei, Youming Qiao, Shengyu Zhang: **Networked Fairness in Cake Cutting.** In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2017.

33. Guangda Huzhang, Xin Huang, Shengyu Zhang, Xiaohui Bei: **Online Roommate Allocation Problem.** In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2017.

34. Xiaohui Bei, Ning Chen, Guangda Huzhang, Biaoshuai Tao, Jiajun Wu: **Cake cutting: Envy and Truth.** In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2017.

35. Xiaohui Bei, Jugal Garg, Martin Hoefer, Kurt Mehlhorn: **Computing Equilibria in Markets with Budget-Additive Utilities.** In *European Symposium on Algorithms (ESA)*, 2016.

36. Xiaohui Bei, Jugal Garg, Martin Hoefer: **Ascending-Price Algorithms for Unknown Markets.** In *ACM Conference on Economics and Computation (EC)*, 2016.

37. Xiaohui Bei, Wei Chen, Jugal Garg, Martin Hoefer, Xiaoming Sun: **Learning Market Parameters using Aggregate Demand Queries.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2016.

38. Xiaohui Bei, Ning Chen, Shengyu Zhang: **Solving Linear Programming with Constraints Unknown.** In *International Colloquium on Automata, Languages, and Programming (ICALP)*, 2015.

39. Xiaohui Bei, Ning Chen, Liyu Dou, Xiangru Huang, Ruixin Qiang: **Trial and Error in Influential Social Networks.** In *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2013.

40. Xiaohui Bei, Ning Chen, Shengyu Zhang: **On the Complexity of Trial and Error.** In *ACM Symposium on the Theory of Computing (STOC)*, 2013.
    Invited to a special issue of *SIAM Journal on Computing (SICOMP)* for selected papers from STOC 2013.

41. Xiaohui Bei, Ning Chen, Xia Hua, Biaoshuai Tao, Endong Yang: **Optimal Proportional Cake Cutting with Connected Pieces.** In *AAAI Conference on Artificial Intelligence (AAAI)*, 2012.

42. Xiaohui Bei, Ning Chen, Nick Gravin, Pinyan Lu: **Budget Feasible Mechanism Design: From Prior-Free to Bayesian.** In *ACM Symposium on the Theory of Computing (STOC)*, 449-458, 2012.

43. Xiaohui Bei, Zhiyi Huang: **Bayesian Incentive Compatibility via Fractional Assignments.** In *ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 720-733, 2011.

44. Xiaohui Bei, Wei Chen, Shang-Hua Teng, Jialin Zhang, Jiajie Zhu: **Bounded Budget Betweenness Centrality Game for Strategic Network Formations.** In *European Symposium on Algorithms (ESA)*, 227-238, 2009.

Journal Papers

1. Xiaohui Bei, Edith Elkind, Erel Segal-Halevi, Warut Suksompong: **Dividing a Graphical Cake.** In *SIAM Journal on Discrete Mathematics (SIDMA)*, 39(1), 2025.

2. Xinhang Lu, Jannik Peters, Haris Aziz, Xiaohui Bei, Warut Suksompong: **Approval-Based Voting with Mixed Goods.** In *Social Choice and Welfare* 62: 643677, 2024.

3. Xiaohui Bei, Xinhang Lu, Warut Suksompong: **Truthful Cake Sharing.** In *Social Choice and Welfare*, 2024.

4. Hao Wang, Zhenzhen Yan, Xiaohui Bei: **A Nonasymptotic Analysis for ReSolving Heuristic in Online Matching.** In *Production and Operations Management (POMS)*, 31(8): 3096-3124, 2022.

5. Xiaohui Bei, Ayumi Igarashi, Warut Suksompong: **The Price of Connectivity in Fair Division.** In *SIAM Journal on Discrete Mathematics (SIDMA)*, 36(2): 1156-1186, 2022.

6. Xiaohui Bei, Shengxin Liu, Chung Keung Poon, Hongao Wang: **Candidate Selections with Proportional Fairness Constraints.** In *Autonomous Agents and Multi-Agent Systems (JAAMAS)*, 36(1): 5, 2022.

7. Xiaohui Bei, Shengxin Liu, Xinhang Lu, Hongao Wang: **Maximin Fairness with Mixed Divisible and Indivisible Goods.** In *Autonomous Agents and Multi-Agent Systems (JAAMAS)*, 35(2): 34, 2021.

8. Xiaohui Bei, Xinhang Lu, Pasin Manurangsi, Warut Suksompong: **The Price of Fairness for Indivisible Goods.** In *Theory of Computing Systems*, 65(7), 1060-1093, 2021.

9. Xiaohui Bei, Shiteng Chen, Ji Guan, Youming Qiao, Xiaoming Sun: **From Independent Sets and Vertex Colorings to Isotropic Spaces and Isotropic Decompositions: Another Bridge between Graphs and Alternating Matrix Spaces.** In *SIAM Journal on Computing (SICOMP)*, 50(3): 924-971, 2021.

10. Xiaohui Bei, Zihao Li, Jinyan Liu, Shengxin Liu, Xinhang Lu: **Fair Division of Mixed Divisible and Indivisible Goods.** In *Artificial Intelligence (AIJ)*, Vol. 293, April 2021, 103436.

11. Xiaohui Bei, Guangda Huzhang, Warut Suksompong: **Truthful Fair Allocation Without Free Disposal.** In *Social Choice and Welfare*, 2020.

12. Xiaohui Bei, Jugal Garg, Martin Hoefer, Kurt Mehlhorn: **Earning and Utility Limits in Fisher Markets.** In *ACM Transactions on Economics and Computation* 7(2), article 10, 2019.

13. Xiaohui Bei, Jugal Garg, Martin Hoefer: **Ascending-Price Algorithms for Unknown Markets.** *The ACM Transactions on Algorithms.* 15(3), article 37, 2019.

14. Xiaohui Bei, Ning Chen, Nick Graven, Pinyan Lu: **Prior-Free Mechanism Design via Bayesian.** In *SIAM Journal on Computing (SICOMP)*, 46(4): 1428-1448, 2017.

15. Xiaohui Bei, Wei Chen, Shang-Hua Teng, Jialin Zhang, Jiajie Zhu: **Bounded Budget Betweenness Centrality Game for Strategic Network Formations.** In *Theoretical Computer Science*, 412(52): 7147-7168, 2011.

Teaching Experience

- 2024 Fall, 2023 Fall, 2021 Fall, 2020 Fall, 2019 Fall:
  MH4320 Computational Economics, Nanyang Technological University.

- 2024 Fall, 2023 Fall, 2021 Fall, 2020 Fall, 2018 Fall, 2017 Fall, 2016 Fall, 2015 Fall:
  MAS714 Algorithms and Theory of Computing, Nanyang Technological University.

- 2024 Fall:
  SC1007 Data Structures and Algorithms, Nanyang Technological University.

- 2019 Spring, 2018 Spring, 2017 Spring, 2016 Spring:
  MH1301 Discrete Mathematics, Nanyang Technological University.

- 2015 Spring:
  Algorithmic Game Theory, Max-Planck-Institute for Informatics, Germany.

Research Grants

- *Learning Dynamics In Non-equilibrium Mean Field Games*. NTU SPMS Collaborative Research Award
  31/1/2025-30/1/2026, Principal Investigator, S$75,000

- *Mixed Fair Division with Subjective Divisibility*. AcRF Tier 1 Grant
  1/3/2024-28/2/2026, Principal Investigator, S$100,000

- *Demand Allocation Algorithms in Ridesourcing*. AcRF Tier 2 Grant
  1/2/2020-1/1/2023, Principal Investigator, S$790,532

- *Exploring Hidden and Private Data in Rich Domains*. Nanyang Assistant Professorship Grant
  1/5/2016-31/3/2020, Principal Investigator, S$869,800

- *Balancing Efficiency and Fairness in Resource Allocation Problems*. Start-up Grant from NTU
  1/9/15-31/3/2019, Principal Investigator, S$100,000

Selected Honors, Awards and Fellowships

- SPMS Young Researcher Award, Nanyang Technological University, 2020.

- Nanyang Assistant Professorship, Nanyang Technological University, 2016.

- Excellent Dissertation Award, Tsinghua University, 2012

- Microsoft Research Asia Fellowship, 2011

Ph.D. Student Supervised

- - Yang Chunxue (Fall 2019 - Fall 2023)

- - Wang Hao (Fall 2017 - Spring 2022)

- - Lu Xinhang (Fall 2017 - Fall 2021)

- - Huzhang Guangda (Fall 2014 - Fall 2018)

Co-Supervisor

- - Tan Jinin Liang (Fall 2018 - Fall 2024)

Professional Services

- Editorial Board: Theoretical Computer Science

- Conference program committees

    – EC 2025, COCOON 2025, WINE 2024 (senior PC), EC 2024, AAAI 2024, WINE 2023 (senior PC), EC 2023, EC 2022, SAGT 2021, WWW 2021, AAMAS 2021, ITCS 2020, WWW 2020, FAW 2020, WINE 2020, AAAI 2020, FAMAS 2019, NCTCS 2019, ISAAC 2019, IJCAI 2019, AAMAS 2019, AAAI 2019, EC 2018, SAGT 2018, IJCAI 2018, AAAI 2018, FAW 2018, AAAI 2017, WWW 2017, WINE 2017, COCOA 2017, AAAI 2016, WINE 2016, TAMC 2016, AAAI 2015

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