

Lirong Xia

Curriculum Vitae

Assistant professor
Computer Science Department
Rensselaer Polytechnic Institute (RPI)

CONTACT INFORMATION

Computer Science Department	<i>Office:</i> Lally 306
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RESEARCH INTERESTS

Artificial intelligence, decision-making under uncertainty, algorithm design, social choice theory, game theory, mechanism design, prediction markets

EDUCATION

Duke University, Durham, North Carolina, USA

2007–2011 Ph.D., Computer Science

- Supervisor: Prof. Vincent Conitzer
- Duke CS Outstanding Ph.D. Dissertation Award

2007–2010 M.A., Economics

Tsinghua University, Beijing, China

2000–2004 B.E., Department of Computer Science and Technology

RESEARCH EXPERIENCE

Harvard University, Cambridge, Massachusetts, USA

2011–2013 Postdoc, Center for Research on Computation and Society (CRCS)

- Supported by the 2011 NSF Computing Innovation Fellows Program
- Host: Prof. David C. Parkes

Yahoo! Labs, New York City, New York, USA

2010 Summer research intern

- Project: prediction markets
- Mentor: David M. Pennock

Tsinghua University, Beijing, China

2004–2007 Research assistant
– Mentor: Prof. Mingsheng Ying

SELECTED DISTINCTIONS

2017 Invited talk at IJCAI Early Career Spotlight Track.
2015 IEEE Intelligent Systems AI’s 10 to watch.
2015 Simons-Berkeley Research Fellowship
2015–2020 NSF CAREER Award
2013 The Singapore National Research Foundation (NRF) Fellowship Award (\approx 2.4M USD research grant, declined).
2012 Research featured at Harvard School of Engineering and Applied Sciences (SEAS) News&Events
2012 AAMAS-12 best PC finalist
2011 One of the 20 NSF Computing Innovation Fellows (CIFellows)
2011 Duke CS Outstanding Ph.D. Dissertation Award
2010 Duke CS Outstanding Departmental Service Award
2010 Facebook Ph.D. Fellowship finalist
2010 One of the three featured M.A. recipients of Duke Department of Economics
2009 Featured in *Threads: Duke Computer Science Newsletter*, Volume 13 (2).
2009 Duke CS Outstanding Ph.D. Research Initiation Project Award
2007–2011 James B. Duke Fellowship

PROFESSIONAL SERVICE

2015– Associate editor of *Mathematical Social Sciences* (MSS)
2017– Editorial board member of *Artificial Intelligence* (AIJ)
2013– Editorial board member of *Journal of Artificial Intelligence Research* (JAIR)
2015 Co-chair, *The Third Conference on Auctions, Market Mechanisms and Their Applications* (AMMA)
2014–2015 Co-organizer, *Multidisciplinary Workshop on Advances in Preference Handling* (MPREF)
2013–2016 Senior program committee member, *International Joint Conference on Artificial Intelligence* (IJCAI)
2017 Senior program committee member, *International Joint Conference on Autonomous Agents and Multiagent Systems* (AAMAS)
2012–2016 Program committee member, *AAAI Conference on Artificial Intelligence* (AAAI)

- 2012–2016** Program committee member and treasurer, *ACM Conference on Electronic Commerce (EC)*
- 2013–2016** Program committee member, *International Conference on Artificial Intelligence and Statistics (AISTATS)*
- 2012–2016** Program committee member, *International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)*
- 2012** Co-organizer, *Workshop on Cooperative Games in Multiagent Systems (CoopMAS)*
- 2011** Program committee member, *International Joint Conference on Artificial Intelligence (IJCAI)*

Also reviewed papers for:

- **Computer Science Journals:** ACM Transactions on Algorithms, Annals of Mathematics and Artificial Intelligence, Algorithmica, Artificial Intelligence Journal, IEEE Transactions on Intelligent Systems, IEEE Transactions on Internet Technology, IEEE Transactions on Systems, Man, and Cybernetics, Journal of Artificial Intelligence Research, Journal of Autonomous Agents and Multi-Agent Systems, Journal of Computer and System Sciences, Journal of the ACM, Theory of Computing Systems, SIAM Journal on Computing.
- **Computer Science Conferences:** COCOON, ESA, FOCS, ITCS, SAGT, SODA, SOFSEM, WINE.
- **Economics/Business Journals:** Games and Economic Behavior, Journal of Economic Theory, Mathematical Social Sciences, Public Choice, Social Choice and Welfare.
- **Others:** The Harvard Undergraduate Research Journal, Discrete Applied Mathematics.

Grant proposal reviewer or panelist:

- NSF panelist: 2015, 2016
- Reviewer for BSF (US-Israel Binational Science Foundation): 2015, 2016
- Reviewer for NWO (the Netherlands Organisation for Scientific Research): 2014

GRANTS

- 2017–2020** Algorithmic Mechanism Design for Multi-Type Resource Allocation. NSF IIS. PI: Lirong Xia, \$373,536.
- 2017–2020** Improving Group Decision-Making by Artificial Intelligence. ONR. PI: Lirong Xia, \$433,926.
- 2015–2020** CAREER: A New Theory of Social Choice for More than Two Alternatives: Combining Economics, Statistics, and Computation. NSF IIS. PI: Lirong Xia, \$525,000.
- 2011–2013** CIFellows Project, NSF 1136996, CRA Sub Award CIF-D-020. PI. \$267,500.

RESEARCH GROUP

Ph.D. students: Sujoy Sikdar (Y5, co-advised with Sibel Adali), Zhibing Zhao (Y2), Jun Wang (Y1).

Master students: Tristan Villamil, Bobby Martino.

Alumni: Peter Piech (M.S. in CS, 2016), Kevin Hwang (M.S. in CS, 2016), Jason Ko (M.S. in CS, 2017), Binghui Deng (M.S. in CS, 2017).

Ph.D. dissertation committee member: Florent Garcin (EPFL, graduated in 2014, advisor: Boi Faltings), John Postl (RPI, graduated in 2016, advisor: Elliot Anshelevich), Shreyas Sekar (RPI, advisor: Elliot Anshelevich), Kshiteesh Hegde (RPI, advisor: Malik Magdon-Ismael).

PUBLICATIONS

Journal papers

1. Tie Luo, Sajal K. Das, Hwee Pink Tan, and Lirong Xia. Incentive Mechanism Design for Crowdsourcing: An All-Pay Auction Approach. *ACM Transactions on Intelligent Systems and Technology (TIST)*. Volume 7 Issue 3, Article No. 35, April 2016.
2. Jessica Davies, George Katsirelos, Nina Narodytska, Toby Walsh and Lirong Xia. Complexity of and Algorithms for the Manipulation of Borda, Nanson and Baldwin's Voting Rules. *Artificial Intelligence (AIJ)*, 217:20-42, 2014.
3. Yongzhi Cao, Lirong Xia, and Mingsheng Ying. Probabilistic automata for computing with words. *Journal of Computer and System Sciences (JCSS)*, 79(1): 152-172, 2013.
4. Yann Chevaleyre, Jérôme Lang, Nicolas Maudet, Jérôme Monnot, and Lirong Xia. New Candidates Welcome! Possible Winners with respect to the Addition of New Candidates. *Mathematical Social Sciences*, 64(1): 7488, 2012.
5. Lirong Xia and Vincent Conitzer. Determining Possible and Necessary Winners under Common Voting Rules Given Partial Orders. *Journal of Artificial Intelligence Research (JAIR)*, 41:25–67, 2011.
6. Jérôme Lang and Lirong Xia. Sequential composition of voting rules in multi-issue domains. *Mathematical Social Sciences* 57(3): 304-324, 2009.
7. Jing Xiao, Lan Liu, Lirong Xia, and Tao Jiang. Efficient Algorithms for Reconstructing Zero-Recombinant Haplotypes on a Pedigree Based on Fast Elimination of Redundant Linear Equations. *SIAM Journal on Computing (SICOMP)*, 38(6): 2198-2219, 2009.
8. Lirong Xia and Sanjiang Li. On minimal models of the Region Connection Calculus. In *Fundamenta Informaticae* 69(4): 427–446, 2005.

Archival conference papers

9. Lirong Xia. Improving Group Decision-Making by Artificial Intelligence. In Proceedings of **IJCAI-17**.
10. David Parkes, Paul Tylkin, and Lirong Xia. Thwarting Vote Buying through Decoy Ballots. In Proceedings of **IJCAI-17**.
11. Shreyas Sekar, Sujoy Sikdar, and Lirong Xia. Condorcet Consistent Bundling with Social Choice. In Proceedings of the 16th International Conference on Autonomous Agents and Multiagent Systems (**AAMAS-17**).
12. Sujoy Sikdar, Sibel Adali, and Lirong Xia. Mechanism Design for Multi-Type Housing Markets. In Proceedings of the 31st AAAI Conference on Artificial Intelligence (**AAAI-17**).
13. Stephen Gross, Elliot Anshelevich and Lirong Xia. Vote Until Two of You Agree: Mechanisms with Small Distortion and Sample Complexity. In Proceedings of the 31st AAAI Conference on Artificial Intelligence (**AAAI-17**).
14. Haris Aziz, Thomas Kalinowski, Toby Walsh, and Lirong Xia. Welfare of Sequential Allocation Mechanisms for Indivisible Goods. In *Proceedings of the 22nd European Conference on Artificial Intelligence* (**ECAI-16**).
15. Lirong Xia. Bayesian Estimators as Voting Rules. In Proceedings of the 32nd Conference on Uncertainty in Artificial Intelligence (**UAI-16**). **Full oral presentation, rate $\approx 9.5\%$.**
16. Zhibing Zhao, Peter Piech, and Lirong Xia. Learning Mixtures of Plackett-Luce Models. In Proceedings of the 33rd International Conference on Machine Learning (**ICML-16**).
17. Erika Mackin and Lirong Xia. Allocating Indivisible Items in Categorized Domains. In Proceedings of the 25th International Joint Conference on Artificial Intelligence (**IJCAI-16**).
18. Lirong Xia. Quantitative Extensions of The Condorcet Jury Theorem With Strategic Agents. In Proceedings of the Thirtieth AAAI Conference on Artificial Intelligence (**AAAI-16**).
19. David Hughes, Kevin Hwang, and Lirong Xia. Computing Optimal Bayesian Decisions for Rank Aggregation via MCMC Sampling. **UAI-15**.
20. Lirong Xia. Generalized Decision Scoring Rules: Statistical, Computational, and Axiomatic Properties. **ACM EC-15**.
21. Haris Aziz, Toby Walsh, and Lirong Xia. Possible and Necessary Allocations via Sequential Mechanisms. **IJCAI-15**.
22. Ethan Gertle, Erika Mackin, Malik Magdon-Ismael, Lirong Xia, and Yuan Yi. Computing Manipulations of Ranking Systems. **AAMAS-15**.

23. Haris Aziz, Simon Mackenzie, Lirong Xia, and Chun Ye. Structure and complexity of ex post efficient random assignments. **AAMAS-15** (short paper).
24. Hossein Azari Soufiani, David C. Parkes, and Lirong Xia. A Statistical Decision-Theoretic Framework for Social Choice. In *Proceedings of the Annual Conference on Neural Information Processing Systems (NIPS-14)*. **Full oral presentation, rate 20/1678=1.2%**
25. Lili Dworkin, Michael Kearns, and Lirong Xia. Efficient Inference for Complex Queries on Complex Distributions. In *Proceedings of the Seventeenth International Conference on Artificial Intelligence and Statistics (AISTAT-14)*, Reykjavik, Iceland.
26. Tie Luo, Hwee-Pink Tan, and Lirong Xia. Profit-Maximizing Incentive for Participatory Sensing. In *Proceedings of the 33rd Annual IEEE International Conference on Computer Communications (INFOCOM-14)*, Toronto, Canada.
27. Lirong Xia. Fixed-Parameter Tractability of Integer Generalized Scoring Rules. In *Proceedings of the 13th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-14)*.
28. Hossein Azari Soufiani, David C. Parkes, and Lirong Xia. Computing Parametric Ranking Models via Rank-Breaking. In *Proceedings of the 31st International Conference on Machine Learning (ICML-14)*, Beijing, China.
29. Hossein Azari Soufiani, William Chen, David C. Parkes, and Lirong Xia. Generalized Method-of-Moments for Rank Aggregation. In *Proceedings of the Annual Conference on Neural Information Processing Systems (NIPS-13)*, Lake Tahoe, Nevada, USA.
30. Hossein Azari Soufiani, David C. Parkes, and Lirong Xia. Preference Elicitation For General Random Utility Models. In *Proceedings of the 29th Conference on Uncertainty in Artificial Intelligence (UAI-13)*, Bellevue, Washington, USA.
31. Lirong Xia. Designing Social Choice Mechanisms Using Machine Learning. To be presented at the *12th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-13)*, Saint Paul, MN, USA. Challenges and Visions Track.
32. Hossein Azari Soufiani, David C. Parkes, and Lirong Xia. Random Utility Theory for Social Choice. In *Proceedings of the Annual Conference on Neural Information Processing Systems (NIPS-12)*, pp. 126–134, Lake Tahoe, Nevada, USA.
33. Jérôme Lang, Jérôme Mengin, and Lirong Xia. Aggregating Conditionally Lexicographic Preferences on Multi-Issue Domains. In *Proceedings of the 18th International Conference on Principles and Practice of Constraint Programming (CP-12)*, pp. 973–987, Quebec City, Canada.
34. Nina Narodytska, Toby Walsh, and Lirong Xia. Combining Voting Rules Together. In *Proceedings of the Twentieth European Conference on Artificial Intelligence (ECAI-12)*, pp. 612–617, Montpellier, France.

35. Dorothea Baumeister, Magnus Roos, Joerg Rothe, Lena Schend, and Lirong Xia. The Possible Winner Problem with Uncertain Weight. In *Proceedings of the Twentieth European Conference on Artificial Intelligence (ECAI-12)*, pp. 133–138, Montpellier, France.
36. David C. Parkes and Lirong Xia. A Complexity-of-Strategic-Behavior Comparison between Schulze’s Rule and Ranked Pairs. In *Proceedings of the Twenty-Sixth AAAI Conference on Artificial Intelligence (AAAI-12)*, pp. 1429–1435, Toronto, Canada.
37. Bo Waggoner, Lirong Xia, and Vincent Conitzer. Evaluating Resistance to False-Name Manipulations in Elections. In *Proceedings of the Twenty-Sixth AAAI Conference on Artificial Intelligence (AAAI-12)*, pp. 1485–1491, Toronto, Canada.
38. Lirong Xia. Computing the Margin of Victory for Various Voting Rules. In *Proceedings of the 13th ACM Conference on Electronic Commerce (EC-12)*, pp. 982–999, Valencia, Spain.
39. Vincent Conitzer, and Lirong Xia. Approximating Common Voting Rules by Sequential Voting in Multi-Issue Domains. In *Proceedings of the 13th International Conference on Principles of Knowledge Representation and Reasoning (KR-12)*, pp. 179–187, Rome, Italy.
40. Toby Walsh and Lirong Xia. Lot-based Voting Rules. In *Proceedings of the 11th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-12)*, pp. 603–610, Valencia, Spain, 2012.
41. David M. Pennock and Lirong Xia. Price-updating in Combinatorial Prediction Markets with Bayesian Networks. In *Proceedings of the 27th Conference on Uncertainty in Artificial Intelligence (UAI-11)*, pp. 581–588, Barcelona, Catalonia, Spain, 2011.
42. Vincent Conitzer, Toby Walsh, and Lirong Xia. Dominating Manipulations in Voting with Partial Information. In *Proceedings of the Twenty-Fifth AAAI Conference on Artificial Intelligence (AAAI-11)*, pp. 638–643, San Francisco, California, USA.
43. Nina Narodytska, Toby Walsh, and Lirong Xia. Manipulation of Nanson’s and Baldwin’s rule. In *Proceedings of the Twenty-Fifth AAAI Conference on Artificial Intelligence (AAAI-11)*, pp. 713–718, San Francisco, California, USA.
44. Vincent Conitzer, Jérôme Lang, and Lirong Xia. Hypercubewise Preference Aggregation in Multi-issue Domains. In *Proceedings of the 22nd International Joint Conference on Artificial Intelligence (IJCAI-11)*, pp. 158–163, Barcelona, Catalonia, Spain, 2011.
45. Lirong Xia and David M. Pennock. An Efficient Monte-Carlo Algorithm for Pricing Combinatorial Prediction Markets for Tournaments. In *Proceedings of the 22nd International Joint Conference on Artificial Intelligence (IJCAI-11)*, pp. 452–457, Barcelona, Catalonia, Spain, 2011.
46. Lirong Xia and Vincent Conitzer. A Maximum Likelihood Approach towards Aggregating Partial Orders. In *Proceedings of the 22nd International Joint Conference on*

- Artificial Intelligence (IJCAI-11)*, pp. 446–451, Barcelona, Catalonia, Spain, 2011.
47. Lirong Xia, Vincent Conitzer, and Jérôme Lang. Strategic Sequential Voting in Multi-issue Domains and Multiple-Election Paradoxes. In *Proceedings of the 12th ACM Conference on Electronic Commerce (EC-11)*, pp. 179–188, San Jose, CA, USA, 2011.
 48. Lirong Xia, Jérôme Lang and Jérôme Monnot. Possible Winners When New Alternatives Join: New Results Coming Up! In *Proceedings of the 10th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-11)*, pp. 829–836, Taipei, Taiwan, 2011.
 49. Lirong Xia and Vincent Conitzer. Strategy-proof Voting Rules over Multi-issue Domains with Restricted Preferences. In *Proceedings of the Sixth Workshop on Internet and Network Economics (WINE-10)*, pp. 402–414, Stanford, CA, USA, 2010.
 50. Lirong Xia. Computational Social Choice: Strategic and Combinatorial Aspects. In *Proceedings of the Twenty-Fourth AAAI Conference on Artificial Intelligence (AAAI-10)*, pp. 2000–2001, Atlanta, GA, USA, 2010.
 51. Lirong Xia and Vincent Conitzer. Stackelberg Voting Games: Computational Aspects and Paradoxes. In *Proceedings of the Twenty-Fourth AAAI Conference on Artificial Intelligence (AAAI-10)*, pp. 921–926, Atlanta, GA, USA, 2010.
 52. Lirong Xia and Vincent Conitzer. Compilation Complexity of Common Voting Rules. In *Proceedings of the Twenty-Fourth AAAI Conference on Artificial Intelligence (AAAI-10)*, pp. 915–920, Atlanta, GA, USA, 2010.
 53. Lirong Xia, Vincent Conitzer, and Ariel Procaccia. A Scheduling Approach to Coalitional Manipulation. In *Proceedings of the 11th ACM Conference on Electronic Commerce (EC-10)*, pp. 275–284, Cambridge, MA, USA, 2010.
 54. Lirong Xia, Vincent Conitzer, and Jérôme Lang. Aggregating Preferences in Multi-Issue Domains by Using Maximum Likelihood Estimators. In *Proceedings of the 9th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-10)*, pp. 399–408, Toronto, ON, Canada, 2010.
 55. Sayan Bhattacharya, Vincent Conitzer, Kamesh Munagala, and Lirong Xia. Incentive Compatible Budget Reporting in Multi-unit Auctions. In *Proceedings of ACM/SIAM Symposium on Discrete Algorithms (SODA-10)*, pp. 554–572, Cambridge, MA, USA, 2010.
 56. Lirong Xia and Vincent Conitzer. Finite Local Consistency Characterizes Generalized Scoring Rules. In *Proceedings of the Twenty-First International Joint Conference on Artificial Intelligence (IJCAI-09)*, pp. 336–341, Pasadena, CA, USA, 2009.
 57. Lirong Xia, Michael Zuckerman, Ariel D. Procaccia, Vincent Conitzer, and Jeffrey S. Rosenschein. Complexity of unweighted coalitional manipulation under some common voting rules. In *Proceedings of the Twenty-First International Joint Conference on Artificial Intelligence (IJCAI-09)*, pp. 348–353, Pasadena, CA, USA, 2009.

58. Lirong Xia and Jérôme Lang. A Dichotomy Theorem on the Existence of Efficient or Neutral Sequential Voting Correspondences. In *Proceedings of the Twenty-First International Joint Conference on Artificial Intelligence (IJCAI-09)*, pp. 342–347, Pasadena, CA, USA, 2009.
59. Vincent Conitzer, Jérôme Lang, and Lirong Xia. How hard is it to control sequential elections via the agenda? In *Proceedings of the Twenty-First International Joint Conference on Artificial Intelligence (IJCAI-09)*, pp. 103–108, Pasadena, CA, USA, 2009.
60. Vincent Conitzer, Matthew Rognlie, and Lirong Xia. Preference Functions That Score Rankings and Maximum Likelihood Estimation. In *Proceedings of the Twenty-First International Joint Conference on Artificial Intelligence (IJCAI-09)*, pp. 109–115, Pasadena, CA, USA, 2009.
61. Lirong Xia and Vincent Conitzer. Generalized Scoring Rules and the Frequency of Coalitional Manipulability. In *Proceedings of the 9th ACM Conference on Electronic Commerce (EC-08)*, pp. 109–118, Chicago, IL, USA, 2008.
62. Lirong Xia and Vincent Conitzer. A Sufficient Condition for Voting Rules to Be Frequently Manipulable. In *Proceedings of the 9th ACM Conference on Electronic Commerce (EC-08)*, pp. 99–108, Chicago, IL, USA, 2008.
63. Lirong Xia, Vincent Conitzer, and Jérôme Lang. Voting on Multiattribute Domains with Cyclic Preferential Dependencies. In *Proceedings of the 23rd AAAI Conference on Artificial Intelligence (AAAI-08)*, pp. 202–207, Chicago, IL, USA, 2008.
64. Lirong Xia and Vincent Conitzer. Determining Possible and Necessary Winners under Common Voting Rules Given Partial Orders. To appear in *Proceedings of the 23rd AAAI Conference on Artificial Intelligence (AAAI-08)*, pp. 196–201, Chicago, IL, USA, 2008.
65. Lirong Xia, Jérôme Lang, and Mingsheng Ying. Strongly decomposable voting rules on multiattribute domains. In *Proceedings of the 22nd AAAI Conference on Artificial Intelligence (AAAI-07)*, pp. 776–781, Vancouver, BC, Canada, 2007.
66. Lirong Xia, Jérôme Lang, and Mingsheng Ying. Sequential voting rules and multiple elections paradoxes. In *Proceedings of the 11th conference on Theoretical Aspects of Rationality and Knowledge (TARK-07)*, pp. 279–288, Brussels, Belgium, 2007.
67. Jing Xiao, Lan Liu, Lirong Xia, and Tao Jiang. Fast Elimination of Redundant Linear Equations and Reconstruction of Recombination-Free Mendelian Inheritance on a Pedigree. In *Proceedings of the ACM/SIAM Symposium on Discrete Algorithms (SODA-07)*, pp. 655–664, New Orleans, LA, USA, 2007.
68. Lei Wang, Xu Liu, Lirong Xia, Guangyou Xu, and Alfred M. Bruckstein. Image orientation detection with integrated human perception cues (or which way is up). In *IEEE International Conference on Image Processing (ICIP-03)*, vol 2: 539–542, Barcelona, Spain, 2003.

Workshop presentations (not covered above)

69. David M. Pennock and Lirong Xia. Voting Power, Hierarchical Pivotal Sets, and Random Dictatorships. Presented at *IJCAI Workshop on Social Choice and Artificial Intelligence* (WSCAI), 2011.
70. Michal Feldman and Lirong Xia. Sequential Second-Price Combinatorial Auctions: Equilibrium Analysis and Price of Anarchy. Poster presentation at the *First Cambridge Area Economics and Computation Day* (CAEC), 2011.

Miscellaneous

71. Lirong Xia. Generalized Scoring Rules: A Framework That Reconciles Borda and Condorcet. *SIGecom Exchanges*, 2014.