

Xi Chen

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Date of Preparation: April 11, 2019

Research Interests

Theoretical Computer Science, including Algorithmic Game Theory and Economics, Complexity Theory, Graph Isomorphism Testing, and Property Testing.

Academic Training

B.S. Physics / Mathematics, Tsinghua University, Sep 1999 – Jul 2003

Ph.D. Computer Science, Tsinghua University, Sep 2003 – Jul 2007

Advisor: Professor Bo Zhang, Tsinghua University

Thesis Title: The Complexity of Two-Player Nash Equilibria

Academic Positions

Associate Professor (with tenure), Columbia University, Mar 2016 – Now

Associate Professor (without tenure), Columbia University, Jul 2015 – Mar 2016

Assistant Professor, Columbia University, Jan 2011 – Jun 2015

Postdoctoral Researcher, Columbia University, Aug 2010 – Dec 2010

Postdoctoral Researcher, University of Southern California, Aug 2009 – Aug 2010

Postdoctoral Researcher, Princeton University, Aug 2008 – Aug 2009

Postdoctoral Researcher, Institute for Advanced Study, Sep 2007 – Aug 2008

Honors and Awards

Best Paper Award

The Computational Complexity Conference, 2017

SIAM Outstanding Paper Award, 2016

EATCS Presburger Award, 2015

Alfred P. Sloan Research Fellowship, 2012

NSF CAREER Award, 2012

Best Paper Award

The 4th International Frontiers of Algorithmics Workshop, 2010

Best Paper Award

The 20th International Symposium on Algorithms and Computation, 2009

Silver Prize, New World Mathematics Award (Ph.D. Thesis)

The 4th International Congress of Chinese Mathematicians, 2007

Best Paper Award

The 47th Annual IEEE Symposium on Foundations of Computer Science, 2006

Advising**Current PhD Students:**

Tim Randolph, co-advised with Rocco A. Servedio

Erik Waingarten, co-advised with Rocco A. Servedio

Timothy Sun, co-advised with Rocco A. Servedio

Graduated PhD Students:

Jinyu Xie (currently at Pinterest)

Xiaorui Sun (currently assistant professor at University of Illinois at Chicago)

PhD Thesis Committee Served:

Dr. David Durfee, Georgia Institute of Technology, 2018

Dr. Zeinab Abbassi, Columbia University, 2016

Dr. Igor C. Oliveira, Columbia University, 2015

Dr. Li-Yang Tan, Columbia University, 2014

Dr. Yun-Kuen Cheung, New York University, 2014

Dr. Imran Khan, Columbia University, 2011

Service**Program Committees:**

IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS), 2019

International Conference on Randomization and Computation (RANDOM), 2018

Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2013, 2008

ACM Symposium on the Theory of Computing (STOC), 2013

ACM Conference on Electronic Commerce (ACM EC), 2016, 2013, 2012

Conference on Theory & Applications of Models of Computation (TAMC), 2013, 2009

International Symposium on Algorithms and Computation (ISAAC), 2013

International Workshop on Internet and Network Economics (WINE), 2012, 2008, 2006

Conference on Algorithmic Aspects in Information and Management, 2012, 2011, 2008

International Symposium on Algorithmic Game Theory (SAGT), 2016, 2010

International Frontiers of Algorithmics Workshop (FAW), 2009

International Computing and Combinatorics Conference (COCOON), 2016

Organizing Committees:

Organizer of the Spring 2016 Program on Counting Complexity and Phase Transitions
at Simons Institute for the Theory of Computing, Berkeley, Jan 2016 – May 2016
New York Area Theory Day, Fall 2012 and Spring 2013
New York Computer Science and Economics Day, 2011

Tutorials:

Mini-course on Algorithmic Game Theory
Princeton University, jointly with Alex Fabrikant, Fall 2008
Shanghai Jiao Tong University, jointly with Ning Chen, Summer 2012

Proposal Review Panel:

Natural Science Foundation, Fall 2018 and Spring 2008

Editorial Board:

Algorithmica, Springer, Jan 2016 – Now
Journal of Discrete Algorithms, Elsevier, Jan 2015 – Sep 2018

Department Service:

MS admissions committee (chair), Spring 2019 – Now
SEAS undergraduate advisor, Spring 2012 – Now

Talks and Presentations

Rutgers Theoretical Computer Science Seminar, March 2019
New York Colloquium on Algorithms and Complexity, Nov, 2016
Institute for Advanced Study, Oct 2016
Invited Talk at China Theory Week, Aug, 2016
Counting Complexity and Phase Transitions Boot Camp, Berkeley, Jan, 2016
Invited Talk at ICALP for the EATCS Presburger Award, Jul 2015
New York Colloquium on Algorithms and Complexity, Nov 2014
Dagstuhl Seminar, Jan 2013, Aug 2014
DIMACS Theoretical Computer Science Seminar, Dec 2007, Nov 2008, Oct 2013
IBM Thomas J. Watson Research Center, Nov 2012
Shanghai Jiao Tong University, Jun 2012
Workshop on Counting, Inference, and Optimization on Graphs, Princeton, Nov 2011
Panel discussion, 13th Computing in the 21st Century Conference, Oct 2011
Tsinghua University, Oct 2011
University of Liverpool, Aug 2011

Institute for Advanced Study, Dec 2006, Nov 2007, Jan 2009, Mar 2011
University of Wisconsin-Madison, Apr 2009, Mar 2010
University of Rochester, Mar 2010
University of California, Merced, Mar 2010
Information Theory and Application Workshop, San Diego, Feb 2010
University of Southern California, Feb 2010
Microsoft Research Silicon Valley, Dec 2009
Georgia Institute of Technology, Nov 2009
Bell Labs (Theory Seminar), Jun 2009
California Institute of Technology, Mar 2009
University of Michigan (Theory Seminar), Oct 2008
The University of Hong Kong (Computer Science Seminars), Jan 2007
The Chinese University of Hong Kong (Seminar Series), Jan 2007
Boston University (Theory Seminar), Dec 2006
Northeastern University (CCIS Colloquia), Dec 2006
The Hong Kong University of Science and Technology (Theory Seminar), Mar 2005

Publications: Books and Surveys

1. Jin-Yi Cai and Xi Chen, *Complexity Dichotomies for Counting Problems: Volume I, Boolean Domain*, Cambridge University Press, 2017.
2. Xiaotie Deng and Xi Chen, *Recent Development in Computational Complexity Characterization of Nash equilibrium*, Computer Science Review 1(2): 88–99, 2007.
3. Xi Chen, Neeraj Kayal and Avi Wigderson, *Partial Derivatives in Arithmetic Complexity and Beyond*, Foundations and Trends in Theoretical Computer Science 6(1-2): 1–158, 2011.
4. Xi Chen, *Complexity Dichotomies of Counting Problems*, ACM SIGACT News, Complexity Theory Column 72, 42(4): 54–76, December 2011.

Publications: Conference Papers

1. Xi Chen and Erik Waingarten, *Testing Unateness Nearly Optimally*, In Proceedings of the 51th ACM Symposium on Theory of Computing (STOC), 2019.
2. Xi Chen, Zhengyang Liu, Rocco Servedio, Ying Sheng and Jinyu Xie, *Distribution-free Junta Testing*, In Proceedings of the 50th ACM Symposium on Theory of Computing (STOC), 2018.

3. Xi Chen, George Matikas, Dimitris Paparas and Mihalis Yannakakis, *On the Complexity of Simple and Optimal Deterministic Mechanisms for an Additive Buyer*, In Proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018.
4. Xi Chen, Erik Waingarten and Jinyu Xie, *Boolean Unateness Testing with $O(n^{3/4})$ Adaptive Queries*, In Proceedings of the 58th Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2017.
5. Xi Chen, Rocco Servedio, Li-Yang Tan and Erik Waingarten, *Adaptivity is Exponentially Powerful for Testing Monotonicity of Halfspaces*, In Proceedings of the 21st International Workshop on Randomization and Computation, 2017.
6. Xi Chen, Adam Freilich, Rocco Servedio and Timothy Sun, *Sample-Based High-Dimensional Convexity Testing*, In Proceedings of the 21st International Workshop on Randomization and Computation, 2017.
7. Xi Chen, Rocco Servedio, Li-Yang Tan, Erik Waingarten and Jinyu Xie, *Settling the Query Complexity of Non-adaptive Junta Testing*, In Proceedings of the Computational Complexity Conference (CCC), 2017.
8. Xi Chen, Erik Waingarten and Jinyu Xie, *Beyond Talagrand Functions: New Lower Bounds for Testing Monotonicity and Unateness*, In Proceedings of the 49th ACM Symposium on Theory of Computing (STOC), 2017.
9. Xi Chen, Igor C. Oliveira and Rocco A. Servedio, *Addition is Exponentially Harder than Counting for Shallow Monotone Circuits*, In Proceedings of the 49th ACM Symposium on Theory of Computing (STOC), 2017.
10. Xi Chen, Yu Cheng and Bo Tang, *Well-Supported versus Approximate Nash Equilibria: Query Complexity of Large Games*, In Proceedings of the 8th Innovations in Theoretical Computer Science Conference (ITCS), 2017.
11. Xi Chen, Yu Cheng and Bo Tang, *On the Recursive Teaching Dimension of VC Classes*, In Proceedings of the 30th Annual Conference on Neural Information Processing Systems (NIPS), 2016.
12. Xi Chen, Igor C. Oliveira, Rocco A. Servedio and Li-Yang Tan, *Near-Optimal Small-Depth Lower Bounds for Small Distance Connectivity*, In Proceedings of the 48th ACM Symposium on Theory of Computing (STOC), 2016.
13. Xi Chen and Jinyu Xie, *Tight Bounds for the Distribution-Free Testing of Monotone Conjunctions*, In Proceedings of the 27th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2016.

14. Xi Chen, Ilias Diakonikolas, Anthi Orfanou, Dimitris Paparas, Xiaorui Sun and Mihalis Yannakakis, *On the Complexity of Optimal Lottery Pricing and Randomized Mechanisms*, In Proceedings of the 56th Annual Symposium on Foundations of Computer Science (FOCS), 2015.
15. Xi Chen, Anindya De, Rocco A. Servedio and Li-Yang Tan, *Boolean Function Monotonicity Testing Requires (Almost) $n^{1/2}$ Non-Adaptive Queries*, In Proceedings of the 47th ACM Symposium on Theory of Computing (STOC), 2015.
16. Xi Chen, David Durfee and Anthi Orfanou, *On the Complexity of Nash Equilibria in Anonymous Games*, In Proceedings of the 47th ACM Symposium on Theory of Computing (STOC), 2015.
17. Xi Chen, Rocco A. Servedio and Li-Yang Tan, *New Algorithms and Lower Bounds for Monotonicity Testing*, In Proceedings of the 55th Annual Symposium on Foundations of Computer Science (FOCS), 2014.
18. Xi Chen, Ilias Diakonikolas, Dimitris Paparas, Xiaorui Sun and Mihalis Yannakakis, *The Complexity of Optimal Multidimensional Pricing*, In Proceedings of the 25th ACM-SIAM Symposium on Discrete Algorithms (SODA), 2014.
19. László Babai, Xi Chen, Xiaorui Sun, Shang-Hua Teng and John Wilmes, *Faster Canonical Forms for Strongly Regular Graphs*, In Proceedings of the 54th Annual Symposium on Foundations of Computer Science (FOCS), 2013.
20. Xi Chen, Xiaorui Sun and Shang-Hua Teng, *Multi-Stage Propagation and Quasipolynomial-Time Isomorphism Testing of Steiner 2-Systems*, In Proceedings of the 45th ACM Symposium on Theory of Computing (STOC), 2013.
21. Xi Chen, Dimitris Paparas and Mihalis Yannakakis, *The Complexity of Non-Monotone Markets*, In Proceedings of the 45th ACM Symposium on Theory of Computing (STOC), 2013.
22. Xi Chen, Martin Dyer, Leslie Ann Goldberg, Mark Jerrum, Pinyan Lu, Colin McQuillan and David Richerby, *The Complexity of Approximating Conservative Counting CSPs*, In Proceedings of the 30th Symposium on Theoretical Aspects of Computer Science (STACS), 2013.
23. Jin-Yi Cai and Xi Chen, *Complexity of Counting CSP with Complex Weights*, In Proceedings of the 44th ACM Symposium on Theory of Computing (STOC), 2012.
24. Jin-Yi Cai, Xi Chen, Heng Guo and Pinyan Lu, *Inapproximability after Uniqueness Phase Transition in Two-Spin Systems*, In Proceedings of the 6th International Conference on Combinatorial Optimization and Applications (COCOA), 2012.

25. Jin-Yi Cai, Xi Chen and Pinyan Lu, *Non-negatively Weighted #CSP: An Effective Complexity Dichotomy*, In Proceedings of the 26th Conference on Computational Complexity (CCC), 2011.
26. Xi Chen and Shang-Hua Teng, *A Complexity View of Markets with Social Influence*, In Proceedings of the 2nd Symposium on Innovations in Computer Science, 2011.
27. Jin-Yi Cai, Xi Chen and Pinyan Lu, *Graph Homomorphisms with Complex Values: A Dichotomy Theorem*, In Proceedings of the 37th International Colloquium on Automata, Languages and Programming (ICALP), 2010.
28. Jin-Yi Cai and Xi Chen, *A Decidable Dichotomy Theorem on Directed Graph Homomorphisms with Non-negative Weights*, In Proceedings of the 51st Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2010.
29. Boaz Barak, Mark Braverman, Xi Chen and Anup Rao, *How to Compress Interactive Communication*, In Proceedings of the 42th ACM Symposium on Theory of Computing (STOC), 2010.
30. Jin-Yi Cai, Xi Chen, Richard Lipton and Pinyan Lu, *On Tractable Exponential Sums*, In Proceedings of the 4th International Frontiers of Algorithmics Workshop (FAW), 2010, Best paper award.
31. Xi Chen and Shang-Hua Teng, *Spending is Not Easier than Trading: On the Computational Equivalence of Fisher and Arrow-Debreu Equilibria*, In Proceedings of the 20th Symposium on Algorithms and Computation, 2009, Best Paper Award.
32. Xi Chen, Decheng Dai, Ye Du and Shang-Hua Teng, *Settling the Complexity of Arrow-Debreu Equilibria in Markets with Additively Separable Utilities*, In Proceedings of the 50th Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2009.
33. Jin-Yi Cai, Xi Chen and Dong Li, *A Quadratic Lower Bound for the Permanent and Determinant Problem over any Characteristic $\neq 2$* , In Proceedings of the 40th ACM Symposium on Theory of Computing (STOC), 2008.
34. Xi Chen, Xiaoming Sun and Shang-Hua Teng, *Quantum Separation of Local Search and Fixed Point Computation*, In Proceedings of the 14th Annual International Computing and Combinatorics Conference (COCOON), 2008.
35. Xi Chen and Shang-Hua Teng, *Paths Beyond Local Search: A Tight Bound for Randomized Fixed-Point Computation*, In Proceedings of the 48th Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2007.
36. Xi Chen, Shang-Hua Teng and Paul Valiant, *The Approximation Complexity of Win-Lose Games*, In Proceedings of the 18th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2007.

37. Jing Zhang, Xi Chen and Ming Li, *Computing Exact p-Value for Structured Motif*, In Proceedings of the 18th Annual Symposium on Combinatorial Pattern Matching (CPM), 2007.
38. Xi Chen and Xiaotie Deng, *Settling the Complexity of 2-Player Nash-Equilibrium*, In Proceedings of the 47th Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2006, Best Paper Award.
39. Xi Chen, Xiaotie Deng and Shang-Hua Teng, *Computing Nash Equilibria: Approximation and Smoothed Complexity*, In Proceedings of the 47th Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2006.
40. Xi Chen, Xiaotie Deng and Shang-Hua Teng, *Sparse Games are Hard*, In Proceedings of the 2nd Workshop on Internet and Network Economics, 2006.
41. Xi Chen, Li-Sha Huang and Shang-Hua Teng, *Market Equilibria with Hybrid Linear-Leontief Utilities*, In Proceedings of the 2nd Workshop on Internet and Network Economics (WINE), 2006.
42. Xi Chen and Xiaotie Deng, *A Simplicial Approach for Discrete Fixed Point Theorems*, *Algorithmica*, 53(2): 250–262, 2009. In Proceedings of the 12th Annual International Computing and Combinatorics Conference (COCOON), 2006.
43. Xi Chen, Xiaotie Deng and Becky Jie Liu, *On Incentive Compatible Competitive Selection Protocols*, In Proceedings of the 12th Annual International Computing and Combinatorics Conference (COCOON), 2006.
44. Xi Chen and Xiaotie Deng, *On the Complexity of 2D Discrete Fixed Point Problem*, In Proceedings of the 33rd International Colloquium on Automata, Languages and Programming (ICALP), 2006.
45. Xi Chen and Xiaotie Deng, *Lattice Embedding of Direction-Preserving Correspondence Over Integrally Convex Set*, In Proceedings of the 2nd International Conference on Algorithmic Aspects in Information and Management (AAIM), 2006.
46. Lan Liu, Xi Chen, Jing Xiao and Tao Jiang, *Complexity and Approximation of the Minimum Recombination Haplotype Configuration Problem*, In Proceedings of the 16th Annual Symposium on Algorithms and Computation (ISAAC), 2005.
47. Xi Chen and Xiaotie Deng, *Matching Algorithmic Bounds for Finding a Brouwer Fixed Point*, In Proceedings of the 37th Symposium on Theory of Computing (STOC), 2005.

Publications: Journal Papers

Under Submission:

1. Jin-Yi Cai and Xi Chen, *A Decidable Dichotomy Theorem on Directed Graph Homomorphisms with Non-negative Weights*, accepted by Computational Complexity.
2. László Babai, Xi Chen, Xiaorui Sun, Shang-Hua Teng and John Wilmes, *Faster Canonical Forms for Strongly Regular Graphs*, invited to the FOCS 2013 special issue of SIAM Journal on Computing.

Published:

1. Zhengyang Liu, Xi Chen, Rocco A. Servedio, Ying Sheng and Jinyu Xie, *Distribution-free Junta Testing*. ACM Transactions on Algorithms 15(1): 1–23, 2019.
2. Xi Chen, Rocco A. Servedio, Li-Yang Tan, Erik Waingarten and Jinyu Xie, *Settling the Query Complexity of Non-adaptive Junta Testing*, Journal of the ACM 65(6): 40:1–40:18, 2018.
3. Xi Chen, Ilias Diakonikolas, Dimitris Paparas, Xiaorui Sun and Mihalis Yannakakis, *The Complexity of Optimal Multidimensional Pricing for a Unit-demand Buyer*, Games and Economic Behavior 110: 139–164, 2018.
4. Xi Chen, Dimitris Paparas and Mihalis Yannakakis, *The Complexity of Non-Monotone Markets*, Journal of the ACM 64(3): 19:1–19:39, 2017.
5. Jin-Yi Cai and Xi Chen, *Complexity of Counting CSP with Complex Weights*, Journal of the ACM 64(3): 20:1–20:56, 2017.
6. Jin-Yi Cai, Xi Chen and Pinyan Lu, *Non-negative Weighted #CSP: An Effective Complexity Dichotomy*, SIAM Journal on Computing 45(6): 2177–2198, 2016.
7. Xi Chen, Martin Dyer, Leslie Ann Goldberg, Mark Jerrum, Pinyan Lu, Colin McQuillan and David Richerby, *The Complexity of Approximating Conservative Counting CSPs*, Journal of Computer and System Sciences 81(1): 311–329, 2015.
8. Jin-Yi Cai, Xi Chen and Pinyan Lu, *Graph Homomorphisms with Complex Values: A Dichotomy Theorem*, SIAM Journal on Computing, 42(3), 924–1029, 2013.
9. Boaz Barak, Mark Braverman, Xi Chen and Anup Rao, *How to Compress Interactive Communication*, SIAM Journal on Computing 42(3): 1327–1363, 2013.
10. Xi Chen, Xiaotie Deng and Becky Jie Liu, *On Incentive Compatible Competitive Selection Protocols*, Algorithmica 61(2): 447–462, 2011.
11. Jin-Yi Cai, Xi Chen and Dong Li, *A Quadratic Lower Bound for the Permanent and Determinant Problem over any Characteristic $\neq 2$* , Computational Complexity 19(1): 37–56, 2010.

12. Xi Chen, Xiaoming Sun, Shang-Hua Teng, *Quantum Separation of Local Search and Fixed Point Computation*, *Algorithmica* 56(3): 364–382, 2010.
13. Xi Chen, Xiaotie Deng and Shang-Hua Teng, *Settling the Complexity of Computing Two-Player Nash Equilibria*, *Journal of the ACM*, 56(3): 1–57, 2009.
14. Xi Chen, Li-Sha Huang and Shang-Hua Teng, *Market Equilibria with Hybrid Linear-Leontief Utilities*, *Theoretical Computer Science*, 410(17): 1573–1580, 2009.
15. Xi Chen and Xiaotie Deng, *On the Complexity of 2D Discrete Fixed Point Problem*, *Theoretical Computer Science*, 410(44): 4448–4456, 2009.
16. Xi Chen and Xiaotie Deng, *A Simplicial Approach for Discrete Fixed Point Theorems*, *Algorithmica*, 53(2): 250–262, 2009.
17. Xi Chen and Xiaotie Deng, *Matching Algorithmic Bounds for Finding a Brouwer Fixed Point*, *Journal of the ACM*, 55(3): 1–26, 2008.
18. Lan Liu, Xi Chen, Jing Xiao and Tao Jiang, *Complexity and Approximation of the Minimum Recombination Haplotype Configuration Problem*, *Theoretical Computer Science*, 378(3): 316–330, 2007.
19. Yongxi Cheng, Xi Chen and Yiqun L. Yin, *On Searching a Table Consistent with Division Poset*, *Theoretical Computer Science*, 370(1–3): 240–253, 2007.

Manuscripts

1. Xi Chen, Amit Levi and Erik Waingarten, *Nearly Optimal Edge Estimation with Independent Set Queries*, 2019.
2. Frank Ban, Xi Chen, Adam Freilich, Rocco A. Servedio and Sandip Sinha, *Beyond Trace Reconstruction: Population Recovery from the Deletion Channel*, 2019.
3. Frank Ban, Xi Chen, Rocco A. Servedio and Sandip Sinha, *Efficient Average-case Population Recovery in the Presence of Insertions and Deletions*, 2019.