Julia Chuzhoy

Associate Professor,
Toyota Technological Institute at Chicago

Contact Information

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Research Interests

Combinatorial optimization; Approximation algorithms; Hardness of approximation; Graph theory.

Appointments

2012-current	Associate Professor Toyota Technological Institute at Chicago
2013-current	Associate Professor (part time) Department of Computer Science, University of Chicago
2007-2012	Assistant Professor Toyota Technological Institute at Chicago
2007-2013	Assistant Professor (part time) Department of Computer Science, University of Chicago
2006-2007	Member, School of Mathematics, Institute for Advanced Study
2005-2006	Postdoctoral Associate, Department of Computer and Information Science, University of Pennsylvania
2004-2006	Postdoctoral Associate, Computer Science and Artificial Intelligence Lab, Massachusetts Institute of Technology

Education

2000-2004	Technion, Israel	Ph.D. in Computer Science Thesis title: "Hardness of Approximation and New Approximability Classes" Advisor: Prof. S. Naor
1998-2000	Technion, Israel	M.Sc. in Computer Science Thesis title: "Approximation Algorithms for Hard Cut Problems" Advisor: Prof. Y. Rabani
1995-1998	Technion, Israel	B.A. in Computer Science (Summa Cum Laude)

Awards and honors

- Invited section speaker at International Congress of Mathematicians, Mathematical Aspects of Computer Science section. 2014
- FOCS 2012 Best Paper Award for "A Polylogarithimic Approximation Algorithm for Edge-Disjoint Paths with Congestion 2" co-authored with Shi Li. 2012
- Alfred P. Sloan Research Fellowship 2011
- NSF CAREER award 2009
- Rothschild Postdoctoral Fellowship 2004
- Scholarship from the Planning and Budgeting Committee (Vatat) of the Council for Higher Education in Israel 2000-2003
- Intel Ph.D. Fellowship 2001
- Wolf Prize for outstanding Ph.D. students 2003
- Wolf Prize for outstanding M.Sc. students 2000
- Excellent Teaching Assistant award (Technion) 1998, 1999, 2000
- Undergraduate studies via the Technion Excellence Program 1995-1998

Teaching Experience

2009-current	Toyota Technological Institute at Chicago Courses: Algorithms Approximation Algorithms
2000-2003	Computer Science Department, Technion Courses: Discrete Mathematics Security in Computer Systems

Ph. D. Students

- Parinya Chalermsook (University of Chicago; co-supervised with Janos Simon). Graduated in 2012.
- David H. K. Kim (University of Chicago; co-supervised with Laszlo Babai). Expected graduation: 2018.
- Rachit Nimavat (TTIC). Expected graduation: 2021.

Summer Interns Supervised

- Sepideh Mahabadi (MIT; co-mentored with Yury Makarychev) - 2016
- Vivek Madan (UIUC) - 2016
- Joshua Kaplan (undergraduate student; University of Chicago) - 2015
- David Kim (University of Chicago) - 2014 and 2015
- David Witmer (CMU; co-mentored with Yury Makarychev) - 2014
- Euiwoong Lee (CMU; co-mentored with Yury Makarychev) - 2014
- Rajesh Chitnis (University of Maryland) -2013
- Siyu Young (Princeton Unversity) - 2013
- Alina Ene (University of Illinois at Urbana-Champaign) - 2011, 2012
- Shi Li (Princeton University) - 2011
- Yuan Zhou (CMU; co-mentored with Yury Makarychev) - 2010
- Aravindan Vijayaraghavan (Princeton University; co-mentored with Yury Makarychev) - 2010
- MohammadHossein Bateni (Princeton University) - 2009
- Deeparnab Chakrabarty (Georgia Tech) - 2008

Program Committees

- 55th Annual IEEE Symposium on Foundations of Computer Science (FOCS) 2014.
- Innovations in Theoretical Computer Science (ITCS) 2013.
- 45th ACM Symposium on the Theory of Computing (STOC) 2013.
- 14th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2011.
- 51st Annual IEEE Symposium on Foundations of Computer Science (FOCS) 2010.
- 11th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2008.
- 48th Annual IEEE Symposium on Foundations of Computer Science (FOCS) 2007.
- 10th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2007.
- 8th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2005.

Journal Editing

- SIAM Journal on Computing, 2014 - current
- Editor of SICOMP Special Issue for FOCS 2014
- Algorithmica, 2011-2015

Publications

Journal Papers

- J. Chuzhoy, Y. Makarychev, A. Vijayaraghavan and Y. Zhou. Approximation algorithms and hardness of the k-route cut problem. *ACM Transactions on Algorithms (TALG) - Special Issue on SODA'12*, 12(1), article no. 2, 2016. Preliminary version appeared in *Proc. of the Twenty-Third Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 780-799, 2012.
- M. Bateni and J. Chuzhoy. Approximation algorithms for the directed k-tour and k-stroll problems. *Algorithmica*, 65(3), pp. 545-561, 2013. Preliminary version appeared in *Proc. of APPROX 2010*, Lecture Notes in Computer Science 6302, pp. 25–38, 2010.
- J. Chuzhoy and S. Khanna. An $O(k^3 \log n)$-Approximation Algorithm for Vertex-Connectivity Survivable Network Design. *Theory of Computing*, 8(1), pp. 401-413, 2012. Preliminary version appeared in *Proc. of the 50th Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 437-441, 2009.
- Matthew Andrews, Julia Chuzhoy, Venkatesan Guruswami, Sanjeev Khanna, Kunal Talwar, and Lisa Zhang. Inapproximability of edge-disjoint paths and low congestion routing on undirected graphs. Combinatorica 30 (5), pp. 485-520, 2010. Preliminary version appeared in *Proc. 46th IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 226-244, 2006.
- J. Chuzhoy and S. Khanna. Polynomial flow-cut gaps and hardness of directed cut problems. *Journal of the ACM*, 56 (2), Article 6, 2009. Preliminary version appeared in *Proc. 39th ACM Symposium on Theory of Computing (STOC)*, pp. 179-188, 2007.
- C. Chekuri, J. Chuzhoy, L. Lewin-Eytan, S. Naor and A. Orda. Non-cooperative multicast and facility location games. *IEEE Journal on Selected Areas in Communications: Non-Cooperative Behavior in Networking* (special issue of EC 2006), Volume 25(6), pp. 1193-1206, 2007. Preliminary version appeared in *Proc. of the 7th ACM Conference on Electronic Commerce (EC)*, pp. 72-81, 2006.
- J. Chuzhoy, A. Gupta, S. Naor and A. Sinha. On the approximability of some network design problems. ACM *Transactions on Algorithms (TALG)*, (special issue of SODA 2005), Volume 4(2), 2008. Preliminary version appeared in *Proc. 16th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 943-951, 2005.
- J. Chuzhoy and S. Naor. The hardness of metric labeling. *SIAM Journal on Computing*, Volume 36(5), pp. 1376 – 1386, 2006. Preliminary version appeared in *Proc. 45th Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 108-114, 2004.
- J. Chuzhoy and S. Naor. New hardness results for congestion minimization and machine scheduling. *Journal of the ACM*, Volume 53(5), pp. 707 – 721, 2006. Preliminary version appeared in *Proc. 36th Annual ACM symposium on Theory of computing (STOC)*, pp. 28-34, 2004.

- J. Chuzhoy, S. Guha, E. Halperin, G. Kortsarz, S. Khanna, R. Krauthgamer and S. Naor. Asymmetric k-center is log*n-hard to approximate. *Journal of the ACM*, Volume 52, Issue 4, pp. 538-551, 2005. Preliminary version appeared in *Proc. 36th Annual ACM Symposium on Theory of Computing (STOC)*, pp. 21-27, 2004.
- J. Chuzhoy, S. Naor. Covering problems with hard capacities. *SIAM Journal on Computing*, Volume 36 (2), pp. 498-515, 2006. Preliminary version appeared in *Proc. 43rd Annual Symposium on Foundations of Computer Science (FOCS)*, pp. 481-489, 2002.
- J. Chuzhoy, R. Ostrovsky and Y. Rabani. Approximation algorithms for the job interval selection problem and related scheduling problems. *Mathematics of Operations Research*, Volume 31(4), pp. 730-738, 2006. Preliminary version appeared in *Proc. 42nd Annual Symposium on Foundations of Computer Science (FOCS)*, pp. 348-356, 2001.

Papers in Refereed Conferences

- J. Chuzhoy and A. Ene. On Approximating Maximum Independent Set of Rectangles. FOCS 2016, to appear.
- J. Chuzhoy, D. H. K. Kim and Shi Li. Improved Approximation for Node-Disjoint Paths in Planar Graphs. In *Proc. of the 48th Annual ACM SIGACT Symposium on Theory of Computing (STOC)*, pages 556-569, 2016.
- J. Chuzhoy and D. H. K. Kim. On Approximating Node-Disjoint Paths in Grids. In *Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques (APPROX/RANDOM)*, pages 187–211, 2015.
- J. Chuzhoy. Excluded Grid Theorem: Improved and Simplified. *Proceedings of the Forty-Seventh Annual ACM on Symposium on Theory of Computing (STOC)*, pages 645-654, 2015.
- C. Chekuri and J. Chuzhoy. Degree-3 Treewdith Sparsifiers. In *Proc. of the 26th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 242–255, 2015.
- J. Chuzhoy. Improved Bounds for the Flat Wall Theorem. In *Proc. of the 26th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 256–275, 2015.
- C. Chekuri and J. Chuzhoy. Polynomial Bounds for the Grid-Minor Theorem. In *Proc. of the 46th Annual Symposium on the Theory of Computing (STOC)*, pages 60–69, 2014. Invited to the SICOMP STOC 2014 special issue.
- C. Chekuri and J. Chuzhoy. Large-Treewidth Graph Decompositions and Applications. In *Proc. of the 45th Annual ACM Symposium on Theory of Computing (STOC)*, pages 291–300, 2013.
- J. Chuzhoy and S. Li. A Polylogarithimic Approximation Algorithm for Edge-Disjoint Paths with Congestion 2. In *Proc. of the 53rd Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 233–242, 2012. Co-winner of the Best Paper Award.
- P. Chalermsook, J. Chuzhoy, S. Kannan and S. Khanna. Improved Hardness Results for Profit Maximization Pricing Problems with Unlimited Supply. In *APPROX 2012*, Lecture Notes in Computer Science 7408, pp. 73–84.
- P. Chalermsook, J. Chuzhoy, A. Ene and S. Li. Approximation Algorithms and Hardness of Integral Concurrent Flow. In *Proc. of the 44th Symposium on Theory of Computing (STOC)*, pp. 689-708, 2012.
- J. Chuzhoy. On Vertex Sparsifiers with Steiner Nodes. In *Proc. of the 44th Symposium on Theory of Computing (STOC)*, pp. 673-688, 2012.

- J. Chuzhoy. Routing in Undirected Graphs with Constant Congestion. In *Proc. of the 44th Symposium on Theory of Computing (STOC)*, pp. 855-874, 2012. Invited to the SICOMP STOC 2012 Special Issue.
- J. Chuzhoy, Y. Makarychev, A. Vijayaraghavan and Y. Zhou. Approximation algorithms and hardness of the k-route cut problem. In *Proc. of the Twenty-Third Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 780-799, 2012.
- J. Chuzhoy. An algorithm for the graph crossing number problem. In *Proc. of the 43rd annual ACM Symposium on Theory of computing (STOC)*, pp. 303-312, 2011.
- J. Chuzhoy, Y. Makarychev and A. Sidiropoulos. On graph crossing number and edge planarization. In *Proc. of the Twenty-Second Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 1050–1069, 2011.
- M. Bateni and J. Chuzhoy. Approximation algorithms for the directed k-tour and k-stroll problems. In *Proc. of APPROX 2010*, Lecture Notes in Computer Science 6302, pp. 25–38, 2010.
- P. Chalermsook and J. Chuzhoy. Resource minimization for fire containment. In *Proc. of the Twenty-First Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 1334-1349, 2010.
- D. Chakrabarty, J. Chuzhoy and S. Khanna. On allocating goods to maximize fairness. *Proc. of the 50th Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 107-116, 2009.
- J. Chuzhoy and S. Khanna. An $O(k^3 \log n)$-approximation algorithm for vertex-connectivity survivable network design. *Proc. of the 50th Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 437-441, 2009.
- J. Chuzhoy and P. Chalermsook. Maximum independent set of rectangles. *Proc. of the Nineteenth Annual ACM -SIAM Symposium on Discrete Algorithms (SODA)*, pp. 892-901, 2009.
- J. Chuzhoy and S. Khanna. Algorithms for single-source vertex-connectivity. *Proc. of the 2008 49th Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 105-114, 2008.
- T. Chakraborty, J. Chuzhoy and S. Khanna. Network design for vertex connectivity. *Proc. of the 2008 ACM Symposium on Theory of Computing (STOC)*, pp. 167 - 176, 2008.
- J. Chuzhoy and S. Khanna. Polynomial flow-cut gaps and hardness of directed cut problems. *Proc. 39th ACM Symposium on Theory of Computing (STOC)*, pp. 179-188, 2007.
- J. Chuzhoy, V. Guruswami, S. Khanna and K. Talwar. Hardness of routing with congestion in directed graphs. *Proc. 39th ACM Symposium on Theory of Computing (STOC)*, pp. 165-178, 2007.
- J. Chuzhoy and S. Khanna. Hardness of cut problems in directed graphs. *Proc. 38th ACM Symposium on Theory of Computing (STOC)*, pp. 527-536, 2006.
- M. Bădoiu, J. Chuzhoy, P. Indyk and A. Sidiropoulos. Embedding ultrametrics into low-dimensional spaces. *Proc. 22nd ACM Symposium on Computational Geometry (SOCG)*, pp. 187-196, 2006.
- M. Andrews, J. Chuzhoy, S. Khanna and L. Zhang. Hardness of the undirected edge-disjoint paths problem with congestion. *Proc. 46th IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 226-244, 2006.
- C. Chekuri, J. Chuzhoy, L. Lewin-Eytan, S. Naor and A. Orda. Non-cooperative multicast and facility location games. *Proc. of the 7th ACM Conference on Electronic Commerce (EC)*, pp. 72-81, 2006.

- M. Bădoiu, J. Chuzhoy, P. Indyk and A. Sidiropoulos. Low-distortion embeddings of general metrics into the line. *Proc. 37th Annual ACM Symposium on Theory of Computing (STOC)*, pp. 225-233, 2005.
- J. Chuzhoy, A. Gupta, S. Naor and A. Sinha. On the approximability of some network design problems. *Proc. 16th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 943-951, 2005.
- J. Chuzhoy and Y. Rabani. Approximating k-median with non-uniform capacities. *Proc. 16th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 952-958, 2005.
- J. Chuzhoy, S. Guha, S. Khanna and S. Naor. Machine minimization for scheduling jobs with interval constraints. *Proc. 45th Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 81-90, 2004.
- J. Chuzhoy and S. Naor. The hardness of metric labeling. *Proc. 45th Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pp. 108-114, 2004.
- J. Chuzhoy and S. Naor. New hardness results for congestion minimization and machine scheduling. *Proc. 36th Annual ACM symposium on Theory of computing (STOC)*, pp. 28-34, 2004.
- J. Chuzhoy, S. Guha, E. Halperin, G. Kortsarz, S. Khanna, and S. Naor. Asymmetric k-center is log*n-hard to approximate. *Proc. 36th Annual ACM Symposium on Theory of Computing (STOC)*, pp. 21-27, 2004.
- R. Bhatia, J. Chuzhoy, A. Freund and S. Naor. Algorithmic aspects of bandwidth trading. *Proc. 30th International Colloquium on Automata, Languages, and Programming (ICALP)*, 2003. Lecture Notes in Computer Science 2719, pp. 751-766, Springer-Verlag, 2003.
- J. Chuzhoy, S. Naor. Covering problems with hard capacities. *Proc. 43rd Annual Symposium on Foundations of Computer Science (FOCS)*, pp. 481-489, 2002.
- J. Chuzhoy, R. Ostrovsky and Y. Rabani. Approximation algorithms for the job interval selection problem and related scheduling problems. *Proc. 42nd Annual Symposium on Foundations of Computer Science (FOCS)*, pp. 348-356, 2001.

Theses

- Hardness of approximation and new approximability classes. Ph.D. thesis, Technion, 2004.
- Approximation algorithms for hard cut problems. M.Sc. thesis, Technion, 2000.

Other Professional Activities

- Organized TTI workshop on approximation algorithms and their limitations, Feb. 2009
- Co-organized the Fall 2010 Midwest Theory day
- Organizer of Distinguished Lecture Series at TTI, 2014 – current
- Participated as invited speaker in "Women in Theory" workshops in 2008 and 2014, and in Association for Women in Mathematics Symposium in 2015. The workshops and the symposium were geared towards undergraduate and graduate female students in the areas of theoretical computer science and mathematics. As part of the "Women in Theory" 2008 program, I mentored three graduate female students: Sudeepa Roy (UPenn), Noga Zewi (Technion), and Kshipra Bhawalkar (Stanford).

- Co-organizer of BIRS workshop "Approximation Algorithms and the Hardness of Approximation" (to take place in 2017)
- Member of Program Committee of "Highlights of Algorithms", (to take place in summer 2016)
- Member of the search committee for the Chair of the Department of Computer Science at the University of Chicago, 2015

Major Invited Talks

- Invited speaker at the Workshop on Graph Classes, Optimization, and Width Parameters (GROW), Oct. 2015
- Invited speaker at International Symposium on Mathematical Programming (ISMP), Jul. 2015
- Plenary speaker, annual conference of Simons Collaboration on Algorithms and Geometry, May 2015.
- Invited speaker at Association for Women in Mathematics Symposium, Apr. 2015.
- Invited section speaker at International Congress of Mathematicians, Aug. 2014
- Invited speaker at Women in Theory workshop, May 2014.
- Plenary speaker, Workshop on Flexible Network Design, Fields Institute, Toronto, Jul. 2013.
- Invited speaker at FOCS 2013 workshop on Bidimensional Structures: Algorithms and Combinatorics, Oct. 2013
- Plenary speaker at Bertinoro Workshop on Algorithms and Graphs, Dec 2013
- Invited distinguished speaker at University of Maryland Theory Day, Oct. 2012
- Invited speaker at APPROX, Aug 2012.
- Plenary speaker at BIRS workshop on approximation algorithms and hardness of approximation, Nov. 2011.
- Invited speaker at workshop on approximation algorithms, Princeton, Jun. 2011.
- Invited speaker at International Symposium on Mathematical Programming (ISMP), Aug. 2009
- Invited speaker at Women in Theory workshop, Jun. 2008.
- Invited speaker at the IBM Research/NYU/Columbia Theory Day, Dec. 2006.