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# Debmalya Panigrahi

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## RESEARCH INTERESTS

I am broadly interested in *theoretical computer science*, particularly in the *design and analysis of algorithms*. My main research thrusts are graph algorithms and algorithms under uncertainty. In **graph algorithms**, I am interested in the study of network flows, graph cuts, and connectivity. Some recent highlights include *breaking the 60-year-old cubic runtime barrier for all-pairs max-flows* and *close-to-optimal algorithms for vertex connectivity and (deterministic) min-cut*. In **algorithms under uncertainty**, I am interested in classical competitive analysis of online algorithms, as well as leveraging machine learning to overcome worst-case performance barriers. Recent highlights include *poly-logarithmic competitive ratio for k-server and k-taxi via hierarchical LPs* and several results in *learning-augmented algorithms for fundamental online problems*. I am also interested in approximation algorithms, combinatorial optimization, and algorithmic game theory.

In addition to theoretical research, I am interested in the design of **algorithms for practical problems**. This includes algorithms for online search, advertising, social networks, and e-commerce, the design and management of computer networks, database management and query processing algorithms, and algorithms with applications in artificial intelligence. I have collaborated with researchers in these areas to design algorithms that are practical, implementable, and scalable. Most of this work has been published in peer-reviewed venues in the application areas, and some of it has led to patents and deployment in prototypes or products.

## EDUCATION

- **Doctor of Philosophy in Computer Science**, Massachusetts Institute of Technology, Cambridge, MA, USA. Dissertation title: Optimization Problems in Network Connectivity. Advisor: Prof. David Karger. (Committee members: Prof. Michel Goemans, Prof. Piotr Indyk, Prof. Jonathan Kelner.) Degree awarded on September 19, 2012.
- **Master of Engineering in Computer Science and Engineering**, Indian Institute of Science, Bangalore, India. Dissertation title: Fast Algorithms for Graph Connectivity. Advisor: Prof. Ramesh Hariharan. Department and Institute Rank: 1<sup>st</sup>. Degree awarded on September 23, 2006.
- **Bachelor of Computer Science and Engineering**, Jadavpur University, Kolkata, India. Department and Institute Rank: 1<sup>st</sup>. Degree awarded on December 24, 2004.

## PROFESSIONAL APPOINTMENTS

- Department of Computer Science, Duke University, Durham, NC, USA.
  - Professor (July 2022 –); Associate Professor (July 2019 - June 2022); Assistant Professor (July 2013 - June 2019)
- Google Research, Mountain View, CA, USA.
  - Visiting Faculty Researcher (September 2023 – April 2024)
- Simons Institute for the Theory of Computing, University of California, Berkeley, CA, USA.
  - Visiting Researcher (August 2023 – December 2023); Research Fellow (August 2016 – December 2016)
- Microsoft Research, Redmond, WA, USA.
  - Visiting Researcher (Spring 2014); Post-doctoral Researcher (July 2012 - June 2013)
- Bell Laboratories, Alcatel-Lucent, Bangalore, India.
  - Member of Technical Staff - 1 (July 2006 - August 2007)

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## HONORS

- **NSF CAREER Award:** National Science Foundation Faculty Early Career Development Award, 2018.
- **Top 5% of instructors** in Trinity College of Arts and Sciences, Duke University, 2017.
- **Fellowship**, Simons Institute for the Theory of Computing, UC Berkeley, 2016.
- **Top 5% of instructors** in Trinity College of Arts and Sciences, Duke University, 2016.
- **Yahoo Faculty Research and Engagement Program (FREP) Award**, 2015.
- **Google Faculty Research Award**, 2014.
- **Goldstine Post-doctoral Fellowship**, IBM Thomas J. Watson Research Center, 2012.
- **Simons Foundation Post-doctoral Fellowship**, Carnegie Mellon University, 2012.
- **MIT Presidential Fellowship**, awarded to approx. 125 incoming graduate students at the Massachusetts Institute of Technology, 2007.
- **Motorola Medal**, awarded to the best graduating M.Eng./M.Tech. student at the Indian Institute of Science, 2006.
- **H. R. Babu Seetharam Medal**, awarded for the best M.Eng. dissertation in the Division of Electrical Sciences at the Indian Institute of Science, 2006.
- **Computer Society of India (Bangalore Chapter) Medal**, awarded to the best graduating M.Eng. student in the Department of Computer Science & Automation at the Indian Institute of Science, 2006.
- All India Rank of 1 in Computer Science and Engineering in GATE, the entrance examination for all masters' courses in engineering in India, 2004.
- **Dr B C Roy Memorial Gold Centred Silver Medal**, awarded to the best graduating student across all disciplines of engineering by Jadavpur University, 2004.
- **University Medal**, awarded to the best graduating student in Computer Science & Engineering at Jadavpur University, 2004
- **Jagadis Bose National Science Talent Search Scholar**, awarded annually to 12 students in the state of West Bengal (India), 2000.
- Top 1% in **National Standard Examination in Physics** conducted for the Indian National Physics Olympiad, 2000.
- **National Talent Search Examination Scholar** (awarded annually to approx. 500 students in India), 1998.

## PAPER AWARDS AND RECOGNITION

- Paper titled "Breaking the Cubic Barrier for All-Pairs Max-Flow: Gomory-Hu Tree in Nearly Quadratic Time" invited to the **special issue of SIAM Journal on Computing** (top 5-10 papers at the conference), Annual IEEE Symposium on Foundations of Computer Science (**FOCS**), 2022.
- Paper titled "Vertex Connectivity in Poly-logarithmic Max-flows" invited to the **special issue of SIAM Journal on Computing** (top 5-10 papers at the conference), Annual ACM Symposium on Theory of Computing (**STOC**), 2021.
- Paper titled "Deterministic Min-cut in Poly-logarithmic Max-flows" invited to the **special issue of SIAM Journal on Computing** (top 5-10 papers at the conference), Annual IEEE Symposium on Foundations of Computer Science (**FOCS**), 2020.
- Paper titled "Timing Matters: Online Dynamics in Broadcast Games" invited to the **special issue of ACM Transactions on Economics and Computation** (top 5-10 papers at the conference), Conference on Web and Internet Economics (**WINE**), 2018.
- Paper titled "Minimizing Latency in Online Ride and Delivery Services" got an **Honorable mention for Best Paper Award** at The Web Conference (**WWW**), 2018.
- Paper titled "Non-Clairvoyant Online Scheduling to Minimize Energy" won the **Best Paper Award** at the ACM Symposium on Parallelism in Algorithms and Architectures (**SPAA**), 2015.

- Paper titled “Maximum Bipartite Flow in Networks with Adaptive Channel Width” invited to the **special issue of Theoretical Computer Science** (top 5-10 papers at the conference), Annual International Colloquium on Automata, Languages, and Programming (**ICALP**), 2009.
- Paper titled “An  $\tilde{O}(mn)$  Gomory-Hu Tree Construction Algorithm for Unweighted Graphs” invited to the **special issue of SIAM Journal on Computing** (top 5-10 papers at the conference), Annual ACM Symposium on Theory of Computing (**STOC**), 2007.
- Paper titled “VillageNet: A low-cost, 802.11-based mesh network for rural regions” won the **Best Paper Award**, Workshop on Wireless Systems: Advanced Research and Development (**WISARD**), 2007.

## PUBLICATIONS

Most of these publications are in theoretical computer science, where authors are listed in alphabetical order by convention.

### Journal Articles

- [1] Jason Li, Danupon Nanongkai, Debmalya Panigrahi, Thatchaphol Saranurak, Sorrachai Yingchareonthawornchai. *Vertex Connectivity in Poly-logarithmic Max-flows*. To appear in **Journal of the ACM**.
- [2] Jason Li, Debmalya Panigrahi. *Approximate Gomory-Hu Tree is Faster than  $n - 1$  Maximum Flows*. **SIAM Journal on Computing**, 53(4), 2024.
- [3] Marek Chrobak, Samuel Haney, Mehraneh Liaee, Debmalya Panigrahi, Rajmohan Rajaraman, Ravi Sundaram, Neal Young. *Online Paging with Heterogeneous Cache Slots*. To appear in **Algorithmica**.
- [4] Arun Ganesh, Bruce M. Maggs, Debmalya Panigrahi. *Universal Algorithms for Clustering Problems*. **ACM Transactions on Algorithms**, 19(2), 2023.
- [5] Kyle Fox, Debmalya Panigrahi, Fred Zhang. *Minimum Cut and Minimum  $k$ -Cut in Hypergraphs via Branching Contractions*. **ACM Transactions on Algorithms**, 19(2), 2023.
- [6] Arun Ganesh, Bruce M. Maggs, Debmalya Panigrahi. *Robust Algorithms for TSP and Steiner Tree*. **ACM Transactions on Algorithms**, 19(2), 2023.
- [7] Vincent Conitzer, Christian Kroer, Debmalya Panigrahi, Okke Srijvers, Eric Sodomka, Nicolas Stier-Moses, Christopher Wilkens. *Pacing Equilibrium in First-Price Auction Markets*. **Management Science**, 68(12), 2022.
- [8] Zhihao Jiang, Debmalya Panigrahi, Kevin Sun. *Online Algorithms for Weighted Paging with Predictions*. **ACM Transactions on Algorithms**, 18(4), 2022.
- [9] Anupam Gupta, Amit Kumar, Debmalya Panigrahi. *Caching with Time Windows and Delays*. **SIAM Journal on Computing**, 51(4), 2022.
- [10] Yossi Azar, Arun Ganesh, Rong Ge, Debmalya Panigrahi. *Online Service with Delay*. **ACM Transactions on Algorithms**, 17(3), 2021.
- [11] Shuchi Chawla, Joseph (Seffi) Naor, Debmalya Panigrahi, Mohit Singh, Seeun William Umboh. *Timing Matters: Online Dynamics in Broadcast Games*. **ACM Transactions on Economics and Computation**, 9(2), 2021.
- [12] Wai Shing Fung, Ramesh Hariharan, Nicholas J. A. Harvey, Debmalya Panigrahi. *A General Framework for Graph Sparsification*. **SIAM Journal on Computing**, 48(4), 2019.
- [13] Sungjin Im, Nathaniel Kell, Janardhan Kulkarni, Debmalya Panigrahi. *Tight Bounds for Online Vector Scheduling*. **SIAM Journal on Computing**, 48(1), 2019.
- [14] Deeparnab Chakrabarty, Alina Ene, Ravishankar Krishnaswamy, Debmalya Panigrahi. *Online Algorithms for Multi-commodity Buy-at-Bulk Network Design*. **SIAM Journal on Computing**, 47(4), 2018.
- [15] MohammadTaghi Hajiaghayi, Vahid Liaghat, Debmalya Panigrahi. *Online Node-weighted Steiner Forest and Extensions via Disk Paintings*. **SIAM Journal on Computing**, 46(3), 2017.
- [16] Yossi Azar, Aleksander Madry, Thomas Moscibroda, Debmalya Panigrahi, Aravind Srinivasan. *Maximum Bipartite Flow in Networks with Adaptive Channel Width*. **Theoretical Computer Science**, 412(24), 2011.

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## Conference Papers

In computer science, publication in highly selective, peer-reviewed conference proceedings is the primary method for dissemination of research results.

- [1] Vincent Cohen-Addad, Tommaso d’Orsi, Anupam Gupta, Euiwoong Lee, Debmalya Panigrahi. *Learning-Augmented Approximation Algorithms for Maximum Cut and Related Problems*. Proceedings of the 38<sup>th</sup> Conference on Neural Information Processing Systems (**NeurIPS24**), Vancouver, Canada. December, 2024.
- [2] Ruoxu Cen, Jason Li, Debmalya Panigrahi. *Hypergraph Unreliability in Quasi-Polynomial Time*. Proceedings of the 56<sup>th</sup> Annual ACM Symposium on Theory of Computing (**STOC24**), Vancouver, Canada. June, 2024.
- [3] Ruoxu Cen, William He, Jason Li, Debmalya Panigrahi. *Beyond the Quadratic Time Barrier for Network Unreliability*. Proceedings of the 35<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA24**), Alexandria, VA. January, 2024.
- [4] Anupam Gupta, Amit Kumar, Debmalya Panigrahi. *Poly-logarithmic Competitiveness or the  $k$ -Taxi Problem*. Proceedings of the 35<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA24**), Alexandria, VA. January, 2024.
- [5] Yossi Azar, Debmalya Panigrahi, Noam Touitou. *Discrete-Smoothness in Online Algorithms with Predictions*. Proceedings of the 37<sup>th</sup> Conference on Neural Information Processing Systems (**NeurIPS23**), New Orleans, USA. December, 2023.
- [6] Amir Abboud, Jason Li, Debmalya Panigrahi, Thatchaphol Saranurak. *All-Pairs Max-Flow is no Harder than Single-Pair Max-Flow: Gomory-Hu Trees in Almost-Linear Time*. Proceedings of the 64<sup>th</sup> Annual IEEE Symposium on Foundations of Computer Science (**FOCS23**), Santa Cruz, USA. November, 2023.
- [7] Anupam Gupta, Amit Kumar, Debmalya Panigrahi. *Efficient Algorithms and Hardness Results for the Weighted  $k$ -server Problem*. Proceedings of the 26<sup>th</sup> International Conference on Approximation Algorithms for Combinatorial Optimization Problems (**APPROX23**), Atlanta, USA. September 2023.
- [8] Ilan Rueven Cohen, Debmalya Panigrahi. *A Universal Approach to Learning-Augmented Online Allocation*. Proceedings of the 50<sup>th</sup> International Colloquium on Automata, Languages, and Programming (**ICALP23**), Paderborn, Germany, July, 2023.
- [9] Marek Chrobak, Samuel Haney, Mehraneh Liaee, Debmalya Panigrahi, Rajmohan Rajaraman, Ravi Sundaram, Neal Young. *Online Paging with Heterogeneous Cache Slots*. Proceedings of the 40<sup>th</sup> International Symposium on Theoretical Aspects of Computer Science (**STACS23**), Hamburg, Germany, March, 2023.
- [10] Jason Li, Danupon Nanongkai, Debmalya Panigrahi, Thatchaphol Saranurak. *Fair Cuts, Approximate Isolating Cuts, and Approximate Gomory-Hu Trees in Near-Linear Time*. Proceedings of the 34<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA23**), Florence, Italy. January, 2023.
- [11] Ruoxu Cen, William He, Jason Li, Debmalya Panigrahi. *Steiner Connectivity Augmentation and Splitting-Off in Poly-logarithmic Maximum Flows*. Proceedings of the 34<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA23**), Florence, Italy. January, 2023.
- [12] Anupam Gupta, Debmalya Panigrahi, Bernardo Subercaseaux, Kevin Sun. *Augmenting Online Algorithms with  $\epsilon$ -Accurate Predictions*. Proceedings of the 36<sup>th</sup> Conference on Neural Information Processing Systems (**NeurIPS22**), New Orleans, USA. November/December, 2022.
- [13] MohammadTaghi Hajiaghayi, MohammadReza Khani, Debmalya Panigrahi, Max Springer. *Online Algorithms for the Santa Claus Problem*. Proceedings of the 36<sup>th</sup> Conference on Neural Information Processing Systems (**NeurIPS22**), New Orleans, USA. November/December, 2022.
- [14] Sreenivas Gollapudi, Kostas Kollias, Debmalya Panigrahi. *The Pit Stop Problem: How to Plan Your Next Road Trip*. Proceedings of the 30<sup>th</sup> ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (**SIGSPATIAL22**), Seattle, USA. November, 2022.
- [15] Amir Abboud, Robert Krauthgamer, Jason Li, Debmalya Panigrahi, Thatchaphol Saranurak, Ohad Trabelsi. *Breaking the Cubic Barrier for All-Pairs Max-Flow: Gomory-Hu Tree in Nearly Quadratic Time*. Proceedings of the 63<sup>rd</sup> Annual IEEE Symposium on Foundations of Computer Science (**FOCS22**), Denver, USA. October/November, 2022.  
★ **Invited to the special issue of SIAM Journal on Computing for FOCS 2022.** (Invitation declined.)
- [16] Keerti Anand, Rong Ge, Amit Kumar, Debmalya Panigrahi. *Online Algorithms with Multiple Predictions*. Proceedings of the 39<sup>th</sup> International Conference on Machine Learning (**ICML22**), Baltimore, USA. July, 2022.

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- [17] Ruoxu Cen, Jason Li, Debmalya Panigrahi. *Edge Connectivity Augmentation in Near-Linear Time*. Proceedings of the 54<sup>th</sup> Annual ACM Symposium on Theory of Computing (STOC22), Rome, Italy. June, 2022.
- [18] Xiao Hu, Yuxi Liu, Haibo Xiu, Pankaj Agarwal, Debmalya Panigrahi, Sudeepa Roy, Jun Yang. *Selectivity Functions of Range Queries are Learnable*. Proceedings of the 48<sup>th</sup> Annual ACM SIGMOD Conference (SIGMOD22), Philadelphia, USA. June, 2022.
- [19] Vincent Conitzer, Debmalya Panigrahi, Hanrui Zhang. *Learning Influence Adoption in Heterogeneous Networks*. Proceedings of the 36<sup>th</sup> AAAI Conference on Artificial Intelligence (AAAI22) (conference held online). February/March, 2022.
- [20] Jason Li, Debmalya Panigrahi, Thatchaphol Saranurak. *A Nearly Optimal All Pairs Minimum Cuts Algorithm in Simple Graphs*. Proceedings of the 62<sup>nd</sup> Annual IEEE Symposium on Foundations of Computer Science (FOCS21) (conference held online). February, 2022.<sup>1</sup>
- [21] Anupam Gupta, Amit Kumar, Debmalya Panigrahi. *A Hitting Set Relaxation for  $k$ -Server and an Extension to Time-Windows*. Proceedings of the 62<sup>nd</sup> Annual IEEE Symposium on Foundations of Computer Science (FOCS21) (conference held online). February, 2022.<sup>1</sup>
- [22] Ruoxu Cen, Jason Li, Danupon Nanongkai, Debmalya Panigrahi, Kent Quanrud, Thatchaphol Saranurak. *Minimum Cuts in Directed Graphs via Partial Sparsification*. Proceedings of the 62<sup>nd</sup> Annual IEEE Symposium on Foundations of Computer Science (FOCS21) (conference held online). February, 2022.<sup>1</sup>
- [23] Ruoxu Cen, Jason Li, Debmalya Panigrahi. *Augmenting Edge Connectivity via Isolating Cuts*. Proceedings of the 33<sup>rd</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA22) (conference held online). January, 2022.
- [24] Yossi Azar, Debmalya Panigrahi, Noam Touitou. *Online Graph Algorithms with Predictions*. Proceedings of the 33<sup>rd</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA22) (conference held online). January, 2022.
- [25] Keerti Anand, Rong Ge, Amit Kumar, Debmalya Panigrahi. *A Regression Approach to Learning-Augmented Online Algorithms*. Proceedings of the 35<sup>th</sup> Conference on Neural Information Processing Systems (NeurIPS21) (conference held online). December, 2021.
- [26] Xiao Hu, Shouzhuo Sun, Shweta Patwa, Debmalya Panigrahi, Sudeepa Roy. *Aggregated Deletion Propagation for Counting Conjunctive Query Answers*. Proceedings of the 47<sup>th</sup> International Conference on Very Large Databases (VLDB21), Copenhagen, Denmark. August, 2021.
- [27] Ruoxu Cen, Yu Cheng, Debmalya Panigrahi, Kevin Sun. *Sparsification of Directed Graphs via Cut Balance*. Proceedings of the 48<sup>th</sup> International Colloquium on Automata, Languages, and Programming (ICALP21) (conference held online). July, 2021.
- [28] Arun Ganesh, Bruce Maggs, Debmalya Panigrahi. *Universal Algorithms for Clustering Problems*. Proceedings of the 48<sup>th</sup> International Colloquium on Automata, Languages, and Programming (ICALP21) (conference held online). July, 2021.
- [29] Jason Li, Debmalya Panigrahi. *Approximate Gomory-Hu tree is Faster than  $n - 1$  Maxflows*. Proceedings of the 53<sup>rd</sup> Annual ACM Symposium on Theory of Computing (STOC21) (conference held online). June, 2021.
- [30] Jason Li, Danupon Nanongkai, Debmalya Panigrahi, Thatchaphol Saranurak, Sorrachai Yingchareonthawornchai. *Vertex Connectivity in Poly-logarithmic Max-flows*. Proceedings of the 53<sup>rd</sup> Annual ACM Symposium on Theory of Computing (STOC21) (conference held online). June, 2021.  
 \* **Invited to the special issue of SIAM Journal on Computing for STOC 2021.** (Invitation declined.)
- [31] Yuan Deng, Debmalya Panigrahi, Hanrui Zhang. *Online Combinatorial Auctions*. Proceedings of the 32<sup>nd</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA21) (conference held online). January, 2021.
- [32] Jason Li, Debmalya Panigrahi. *Deterministic Min-cut in Poly-logarithmic Max-flows*. Proceedings of the 61<sup>st</sup> Annual IEEE Symposium on Foundations of Computer Science (FOCS20) (conference held online). November, 2020.  
 \* **Invited to the special issue of SIAM Journal on Computing for FOCS 2020.** (Invitation declined.)
- [33] Keerti Anand, Rong Ge, Debmalya Panigrahi. *Customizing ML Predictions for Online Algorithms*. Proceedings of the 37<sup>th</sup> International Conference on Machine Learning (ICML20) (conference held online). July, 2020.
- [34] Vincent Conitzer, Debmalya Panigrahi, Hanrui Zhang. *Learning Opinion in Social Networks*. Proceedings of the 37<sup>th</sup> International Conference on Machine Learning (ICML20) (conference held online). July, 2020. A preliminary version of this paper also appeared in the 15<sup>th</sup> Workshop on the Economics of Networks, Systems and Computation (NetEcon20). July, 2020.

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<sup>1</sup>The FOCS 2021 conference was delayed to February 2022 because of the COVID-19 pandemic.

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- [35] Arun Ganesh, Bruce Maggs, Debmalya Panigrahi. *Robust Algorithms for NP-hard Problems: TSP and Steiner Tree*. Proceedings of the 47<sup>th</sup> International Colloquium on Automata, Languages, and Programming (ICALP20) (conference held online). July, 2020.
- [36] Zhihao Jiang, Debmalya Panigrahi, Kevin Sun. *Online Algorithms for Weighted Paging with Predictions*. Proceedings of the 47<sup>th</sup> International Colloquium on Automata, Languages, and Programming (ICALP20) (conference held online). July, 2020.
- [37] Ilan Cohen, Sungjin Im, Debmalya Panigrahi. *Online Algorithms for Two-dimensional Load Balancing*. Proceedings of the 47<sup>th</sup> International Colloquium on Automata, Languages, and Programming (ICALP20) (conference held online). July, 2020.
- [38] Anupam Gupta, Amit Kumar, Debmalya Panigrahi. *Caching with Time Windows*. Proceedings of the 52<sup>nd</sup> Annual ACM Symposium on Theory of Computing (STOC20) (conference held online). June, 2020.
- [39] Samuel Haney, Mehraneh Liaee, Bruce Maggs, Debmalya Panigrahi, Ravi Sundaram, Rajmohan Rajaraman. *Retracting Graphs to Cycles*. Proceedings of the 46<sup>th</sup> International Colloquium on Automata, Languages, and Programming (ICALP19), Patras, Greece. July, 2019.
- [40] Amir Abboud, Raghavendra Addanki, Fabrizio Grandoni, Debmalya Panigrahi, Barna Saha. *Dynamic Set Cover: Improved Algorithms and Lower Bounds*. Proceedings of the 51<sup>st</sup> Annual ACM Symposium on Theory of Computing (STOC19), Phoenix, USA. June, 2019.
- [41] Vincent Conitzer, Christian Kroer, Debmalya Panigrahi, Okke Srijvers, Eric Sodomka, Nicolas Stier-Moses, Christopher Wilkens. *Pacing Equilibrium in First-Price Auction Markets*. Proceedings of the 20<sup>th</sup> ACM Conference on Economics and Computation (EC19), Phoenix, USA. June, 2019.
- [42] Sreenivas Gollapudi, Debmalya Panigrahi. *Online Algorithms for Rent-or-Buy with Expert Advice*. Proceedings of the 36<sup>th</sup> International Conference on Machine Learning (ICML19), Long Beach, USA. June, 2019.
- [43] Sreenivas Gollapudi, Kostas Kollias, Debmalya Panigrahi. *You Get What You Share: Incentives for a Sharing Economy*. Proceedings of the 33<sup>rd</sup> AAAI Conference on Artificial Intelligence (AAAI19), Honolulu, USA. January, 2019.
- [44] Yuan Deng, Debmalya Panigrahi. *Multi-unit Supply-monotone Auctions with Bayesian valuations*. Proceedings of the 30<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA19), San Diego, USA. January, 2019.
- [45] Kyle Fox, Debmalya Panigrahi, Fred Zhang. *Minimum Cut and Minimum k-Cut in Hypergraphs via Branching Contractions*. Proceedings of the 30<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA19), San Diego, USA. January, 2019.
- [46] Anupam Gupta, Ravishankar Krishnaswamy, Amit Kumar, Debmalya Panigrahi. *Elastic Caching*. Proceedings of the 30<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA19), San Diego, USA. January, 2019.
- [47] Shuchi Chawla, Joseph (Seffi) Naor, Debmalya Panigrahi, Mohit Singh, Seeun William Umboh. *Timing Matters: Online Dynamics in Broadcast Games*. Proceedings of the 14<sup>th</sup> Conference on Web and Internet Economics (WINE18), Oxford, UK. December, 2018.  
★ **Invited to the special issue of ACM Transactions on Economics and Computation for WINE 2018.**
- [48] Sungjin Im, Nathaniel Kell, Debmalya Panigrahi, Maryam Shadloo. *Online Load Balancing for Related Machines*. Proceedings of the 50<sup>th</sup> Annual ACM Symposium on Theory of Computing (STOC18), Los Angeles, USA. June, 2018.
- [49] Abhimanyu Das, Sreenivas Gollapudi, Anthony Kim, Debmalya Panigrahi, Chaitanya Swamy. *Minimizing Latency in Online Ride and Delivery Services*. Proceedings of the 27<sup>th</sup> The Web Conference (WWW18), Lyon, France. April, 2018.  
★ **Honorable mention for best paper award**
- [50] Yossi Azar, Ilan Cohen, Debmalya Panigrahi. *Randomized Algorithms for Online Vector Load Balancing*. Proceedings of the 29<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA18), New Orleans, USA. January, 2018.
- [51] Sreenivas Gollapudi, Ravi Kumar, Debmalya Panigrahi, Rina Panigrahy. *Order Management in Online Shopping Services*. Proceedings of the 27<sup>th</sup> ACM International Conference on Information and Knowledge Management (CIKM17), Singapore. November, 2017.
- [52] Sreenivas Gollapudi, Kostas Kollias, Debmalya Panigrahi, Venetia Pliatsika. *Profit Sharing and Efficiency in Utility Games*. Proceedings of the 24<sup>th</sup> Annual European Symposium on Algorithms (ESA17), Vienna, Austria. September, 2017.
- [53] Samuel Haney, Bruce Maggs, Biswaroop Maiti, Debmalya Panigrahi, Rajmohan Rajaraman, Ravi Sundaram. *Symmetric Interdiction for Matching Problems*. Proceedings of the 20<sup>th</sup> International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX17), Berkeley, USA. August, 2017.

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- [54] Pankaj K. Agarwal, Kyle Fox, Debmalya Panigrahi, Kasturi Varadarajan, Allen Xiao. *Faster Algorithms for the Geometric Transportation Problem*. Proceedings of the 33<sup>rd</sup> *International Symposium on Computational Geometry (SoCG17)*, Brisbane, Australia. July, 2017.
- [55] Anupam Gupta, Ravishankar Krishnaswamy, Amit Kumar, Debmalya Panigrahi. *Online and Dynamic Algorithms for Set Cover*. Proceedings of the 49<sup>th</sup> *Annual ACM Symposium on Theory of Computing (STOC17)*, Montreal, Canada. June, 2017.
- [56] Yossi Azar, Arun Ganesh, Rong Ge, Debmalya Panigrahi. *Online Service with Delay*. Proceedings of the 49<sup>th</sup> *Annual ACM Symposium on Theory of Computing (STOC17)*, Montreal, Canada. June, 2017.
- [57] Yuan Deng, Debmalya Panigrahi, Bo Waggoner. *The Complexity of Stable Matchings under Substitutable Preferences*. Proceedings of the 31<sup>st</sup> *AAAI Conference on Artificial Intelligence (AAAI17)*, San Francisco, USA. February, 2017.
- [58] Mohsen Ghaffari, David R. Karger, Debmalya Panigrahi. *Random Contractions and Sampling for Hypergraph and Hedge Connectivity*. Proceedings of the 28<sup>th</sup> *Annual ACM-SIAM Symposium on Discrete Algorithms (SODA17)*, Barcelona, Spain. January, 2017.
- [59] Rupert Freeman, Samuel Haney, Debmalya Panigrahi. *On the Price of Stability of Undirected Multicast Games*. Proceedings of the 12<sup>th</sup> *Conference on Web and Internet Economics (WINE16)*, Montreal, Canada. December, 2016.
- [60] Yossi Azar, Niv Buchbinder, T.-H. Hubert Chan, Shahar Chen, Ilan Cohen, Anupam Gupta, Zhiyi Huang, Ning Kang, Viswanath Nagarajan, Joseph (Seffi) Naor, Debmalya Panigrahi. *Online Algorithms for Packing and Covering Problems with Convex Objectives*.<sup>2</sup> Proceedings of the 57<sup>th</sup> *Annual IEEE Symposium on Foundations of Computer Science (FOCS16)*, New Brunswick, USA. October, 2016.
- [61] Nathaniel Kell, Debmalya Panigrahi. *Online Budgeted Allocation with General Budgets*. Proceedings of the 17<sup>th</sup> *ACM Conference on Economics and Computation (EC16)*, Maastricht, The Netherlands. July, 2016.
- [62] Sungjin Im, Nathaniel Kell, Janardhan Kulkarni, Debmalya Panigrahi. *Tight Bounds for Online Vector Scheduling*. Proceedings of the 56<sup>th</sup> *Annual IEEE Symposium on Foundations of Computer Science (FOCS15)*, Berkeley, USA. October, 2015.
- [63] Deeparnab Chakrabarty, Alina Ene, Ravishankar Krishnaswamy, Debmalya Panigrahi. *Online Algorithms for Multi-commodity Buy-at-Bulk Network Design*. Proceedings of the 56<sup>th</sup> *Annual IEEE Symposium on Foundations of Computer Science (FOCS15)*, Berkeley, USA. October, 2015.
- [64] Yossi Azar, Nikhil Devanur, Zhiyi Huang, Debmalya Panigrahi. *Non-Clairvoyant Online Scheduling to Minimize Energy*. Proceedings of the 27<sup>th</sup> *ACM Symposium on Parallelism in Algorithms and Architectures (SPAA15)*, Portland, USA. June, 2015.
- ★ **Best paper award**
- [65] Sreenivas Gollapudi, Debmalya Panigrahi. *Fair Allocation in Online Markets*. Proceedings of the 23<sup>rd</sup> *ACM International Conference on Information and Knowledge Management (CIKM14)*, Shanghai, China. November, 2014.
- [66] Kshipra Bhawalkar, Sreenivas Gollapudi, Debmalya Panigrahi. *Online Set Cover with Set Requests*. Proceedings of the 17<sup>th</sup> *International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX14)*, Barcelona, Spain. September, 2014.
- [67] MohammadTaghi Hajiaghayi, Vahid Liaghat, Debmalya Panigrahi. *Near-optimal Online Algorithms for Prize-collecting Steiner Problems*. Proceedings of the 41<sup>st</sup> *International Colloquium on Automata, Languages, and Programming (ICALP14)*, Copenhagen, Denmark. August, 2014.
- [68] Konstantin Makarychev, Debmalya Panigrahi. *Precedence-constrained Scheduling of Malleable Jobs with Preemption*. Proceedings of the 41<sup>st</sup> *International Colloquium on Automata, Languages, and Programming (ICALP14)*, Copenhagen, Denmark. August, 2014.
- [69] MohammadTaghi Hajiaghayi, Vahid Liaghat, Debmalya Panigrahi. *Online Node-weighted Steiner Forest and Extensions via Disk Paintings*. Proceedings of the 54<sup>th</sup> *Annual IEEE Symposium on Foundations of Computer Science (FOCS13)*, Berkeley, USA. October, 2013.
- [70] Debmalya Panigrahi, Sreenivas Gollapudi. *Document Selection for Tiered Indexing in Commerce Search*. Proceedings of the 6<sup>th</sup> *Annual ACM International Conference on Web Search and Data Mining (WSDM13)*, Rome, Italy. February, 2013.

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<sup>2</sup>This paper was a merger of three manuscripts on similar results obtained independently, one of them by Azar, Cohen, and Panigrahi.

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- [71] Yossi Azar, Umang Bhaskar, Lisa Fleischer, Debmalya Panigrahi. *Online Mixed Packing and Covering*.<sup>3</sup> Proceedings of the 24<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA13), New Orleans, USA. January, 2013.
- [72] Aranyak Mehta, Debmalya Panigrahi. *Online Matching with Stochastic Rewards*. Proceedings of the 53<sup>rd</sup> Annual IEEE Symposium on Foundations of Computer Science (FOCS12), New Brunswick, USA. October, 2012.
- [73] Debmalya Panigrahi, Atish Das Sarma, Gagan Aggarwal, Andrew Tomkins. *Online Selection of Diverse Results*. Proceedings of the 5<sup>th</sup> Annual ACM International Conference on Web Search and Data Mining (WSDM12), Seattle, USA. February, 2012.
- [74] Aleksander Madry, Debmalya Panigrahi. *The Semi-stochastic Ski-rental Problem*. Proceedings of the 31<sup>st</sup> Annual IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS11), Mumbai, India. December, 2011.
- [75] Joseph (Seffi) Naor, Debmalya Panigrahi, Mohit Singh. *Online Node-weighted Steiner Tree and Related Problems*. Proceedings of the 51<sup>st</sup> Annual IEEE Symposium on Foundations of Computer Science (FOCS11), Palm Springs, USA. October, 2011.
- [76] Wai Shing Fung, Ramesh Hariharan, Nicholas J. A. Harvey, Debmalya Panigrahi. *A General Framework for Graph Sparsification*.<sup>4</sup> Proceedings of the 43<sup>rd</sup> Annual ACM Symposium on Theory of Computing (STOC11), San Jose, USA. June, 2011.
- [77] Susan B. Davidson, Sanjeev Khanna, Tova Milo, Debmalya Panigrahi, Sudeepa Roy. *Provenance Views for Module Privacy*. Proceedings of the 30<sup>th</sup> Annual ACM Symposium on Principles of Database Systems (PODS11), Athens, Greece. June, 2011.
- [78] Debmalya Panigrahi, Sreenivas Gollapudi. *Result Enrichment in Commerce Search using Browse Trails*. Proceedings of the 4<sup>th</sup> Annual ACM International Conference on Web Search and Data Mining (WSDM11), Hong Kong, PRC. February, 2011.
- [79] Debmalya Panigrahi. *Survivable Network Design Problems in Wireless Networks*. Proceedings of the 22<sup>nd</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA11), San Francisco, USA. January, 2011.
- [80] John R. Douceur, James Mickens, Thomas Moscibroda, Debmalya Panigrahi. *Collaborative Measurements of Upload Speeds in P2P Systems*. Proceedings of the 29<sup>th</sup> Annual IEEE Conference on Computer Communications (INFOCOM10), San Diego, USA. March, 2010. Preliminary version appeared as a brief announcement at the 28<sup>th</sup> Annual ACM Symposium on Principles of Distributed Computing (PODC09), Calgary, Canada. August, 2009.
- [81] Partha Dutta, Vivek Mhatre, Debmalya Panigrahi, Rajeev Rastogi. *Joint Routing and Scheduling in Wireless Mesh Networks with Directional Antennas*. Proceedings of the 29<sup>th</sup> IEEE Conference on Computer Communications (INFOCOM10) (short paper), San Diego, USA. March, 2010.
- [82] John R. Douceur, James Mickens, Thomas Moscibroda, Debmalya Panigrahi. *ThunderDome: Discovering Upload Constraints Using Decentralized Bandwidth Tournaments*. Proceedings of the 5<sup>th</sup> Annual ACM International Conference on Emerging Networking Experiments and Technologies (coNEXT09), Rome, Italy. December, 2009.
- [83] Yossi Azar, Aleksander Madry, Thomas Moscibroda, Debmalya Panigrahi, Aravind Srinivasan. *Maximum Bipartite Flow in Networks with Adaptive Channel Width*. Proceedings of the 36<sup>th</sup> Annual International Colloquium on Automata, Languages and Programming (ICALP09), Rhodes, Greece. July, 2009.  
 ★ Invited to the special issue of Theoretical Computer Science for ICALP 2009.
- [84] Debmalya Panigrahi, Bhaskaran Raman. *TDMA Scheduling in Long-Distance WiFi Networks*. Proceedings of the 28<sup>th</sup> Annual IEEE Conference on Computer Communications (INFOCOM09) (short paper), Rio de Janeiro, Brazil. April, 2009.
- [85] David R. Karger, Debmalya Panigrahi. *A Near-Linear Time Algorithm for Constructing a Cactus Representation of Minimum Cuts*. Proceedings of the 20<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (SODA09), New York, USA. January, 2009.
- [86] Debmalya Panigrahi, Partha Dutta, Sharad Jaiswal, K V M Naidu, Rajeev Rastogi. *Minimum Cost Topology Construction for Rural Wireless Mesh Networks*. Proceedings of the 27<sup>th</sup> Annual IEEE Conference on Computer Communications (INFOCOM08), Phoenix, USA. April, 2008.

<sup>3</sup>This paper was a merger of two manuscripts on similar results obtained independently, one of them by Azar and Panigrahi.

<sup>4</sup>This paper was a merger of two manuscripts on similar results obtained independently, one of them by Hariharan and Panigrahi.



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- [87] K.V.M. Naidu, Debmalaya Panigrahi, Rajeev Rastogi. *Detecting Anomalies Using End-to-End Path Measurements*. Proceedings of the 27<sup>th</sup> Annual IEEE Conference on Computer Communications (**INFOCOM08**) mini-symposium, Phoenix, USA. April, 2008.
- [88] Partha Dutta, Sharad Jaiswal, Debmalaya Panigrahi, Rajeev Rastogi. *A New Channel Assignment Mechanism for Rural Wireless Mesh Networks*. Proceedings of the 27<sup>th</sup> Annual IEEE Conference on Computer Communications (**INFOCOM08**) mini-symposium, Phoenix, USA. April, 2008.
- [89] Anand Bhalgat, Ramesh Hariharan, Telikepalli Kavitha, Debmalaya Panigrahi. *Fast Edge Splitting and Edmonds' Arborescence Construction for Unweighted Graphs*. Proceedings of the 19<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA08**), San Francisco, USA. January, 2008.
- [90] Anand Bhalgat, Ramesh Hariharan, Telikepalli Kavitha, Debmalaya Panigrahi. *An  $\tilde{O}(mn)$  Gomory-Hu Tree Construction Algorithm for Unweighted Graphs*. Proceedings of the 39<sup>th</sup> Annual ACM Symposium on Theory of Computing (**STOC07**), San Diego, USA. June, 2007.  
 ★ **Invited to the special issue of SIAM Journal on Computing for STOC 2007.** (Invitation declined.)
- [91] Ramesh Hariharan, Telikepalli Kavitha, Debmalaya Panigrahi. *Efficient Algorithms for Computing All Low  $s - t$  Edge Connectivities and Related Problems*. Proceedings of the 18<sup>th</sup> Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA07**), New Orleans, USA. January, 2007.
- [92] Partha Dutta, Sharad Jaiswal, K V M Naidu, Debmalaya Panigrahi, Rajeev Rastogi, Ajay Todimala. *VillageNet: A low-cost, 802.11-based mesh network for rural regions*. Proceedings of the 1<sup>st</sup> Workshop on Wireless Systems: Advanced Research and Development (**WISARD07**), Bangalore, India. January, 2007.  
 ★ **Best paper award**

#### Book chapters

- [1] Debmalaya Panigrahi. *Online Node-weighted Problems*. In *Encyclopedia of Algorithms*, 2016.
- [2] Debmalaya Panigrahi. *Gomory-Hu trees*. In *Encyclopedia of Algorithms*, 2008; revised in 2016.

#### Theses

- [1] Debmalaya Panigrahi. *Optimization Problems in Network Connectivity*. Ph.D. dissertation, advisor: Prof. David R. Karger. *Massachusetts Institute of Technology*.
- [2] Debmalaya Panigrahi. *Fast Algorithms in Graph Connectivity*. M.Eng. dissertation, advisor: Prof. Ramesh Hariharan. *Indian Institute of Science*.

#### PATENTS

- [1] Nikhil Devanur, Zhiyi Huang, Debmalaya Panigrahi (Microsoft Corp.) *Energy Efficient Job Scheduling*. US Patent 9766932.
- [2] John Douceur, James Mickens, Thomas Moscibroda, Debmalaya Panigrahi (Microsoft Corp.) *Collaborative speed determination in distributed systems*. US Patents 8019862, 8307077.
- [3] Partha Dutta, Sharad Jaiswal, Debmalaya Panigrahi, Rajeev Rastogi (Lucent Technologies Inc.) *A method and system for channel assignment in rural wireless mesh networks*. International Patent WO/2009/107144.

#### RESEARCH FUNDING

- [1] **NSF CCF 2329230** 2023 – 2026  
 SMALL: *Algorithms for Graph Cuts*.  
 Panigrahi (PI): \$300,000.
- [2] **NSF CCF 2239610** 2022  
 Conference: *Workshop on Learning-Augmented Algorithms*.  
 Panigrahi (PI): \$25,000.
- [3] **ARO W911NF2110230** 2021 – 2022  
 Information Networks: *RESUME: Artificial Intelligence, Algorithms, and Optimization for Responsible Reopening*.  
 Conitzer (PI) + Panigrahi (co-PI): \$100,000.

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- [4] **NSF CCF 1955703** 2020 – 2025  
MEDIUM: *Collaborative Research: Algorithms Meet Machine Learning: Mitigating Uncertainty in Optimization*.  
Panigrahi (PI): \$600,000.
- [5] **NSF CCF 1934964** 2019 – 2022  
HDR TRIPODS: *Innovations in Data Science: Integrating Stochastic Modeling, Data Representations, and Algorithms*.  
Panigrahi (SP): \$0.
- [6] **NSF CCF 1750140 (Faculty Early Career Development Award)** 2018 – 2024  
CAREER: *New Directions in Graph Algorithms*.  
Panigrahi (PI): \$500,000.
- [7] **Indo-U.S. Science and Technology Forum (IUSSTF) Virtual Networked Center** 2018 – 2020  
*Indo-US Joint Center for Algorithms under Uncertainty*.  
Panigrahi (co-PI) + several others: (approx.) ₹5,000,000 ≈ \$60,000.
- [8] **NSF CCF 1527084** 2015 – 2019  
SMALL: *Algorithmic Foundations Core Small: Allocation Algorithms in Online Systems*.  
Panigrahi (PI): \$400,000.
- [9] **NSF CCF 1535972** 2015 – 2020  
Algorithms in the Field: *Collaborative Research: Optimizing Networked Systems with Limited Information*.  
Maggs (PI) + Panigrahi (co-PI): \$360,000.
- [10] **Yahoo Faculty Research and Engagement Program (FREP) Award** 2015  
*Budget-Aware Online Auctions in Internet Advertising*.  
Panigrahi (PI): \$20,000.
- [11] **Google Faculty Research Award** 2014  
*Multi-objective Optimization in Internet Advertising*.  
Panigrahi (PI): \$53,833.

## INVITED TALKS

### Workshops and Meetings

- [1] “Learning-augmented Assignment: Santa Claus does Load Balancing.” Workshop on Learning-augmented Algorithms, TTI, Chicago, IL. *August 2024*.
- [2] “Network Unreliability in Sub-Quadratic Time.” Workshop on Algorithms and Data Structures Today: New Techniques, New Problems, New Challenges, NUS, Singapore. *July 2024*.
- [3] “Network Unreliability in Sub-Quadratic Time.” Simons Institute Workshop on Optimization and Algorithm Design, Berkeley, CA. *December 2023*.
- [4] “Tutorial: The Isolating Cuts Lemma and its Applications”. DIMACS Workshop on Modern Techniques in Graph Algorithms, Piscataway, NJ. *June 2023*.
- [5] “Learning-augmented Assignment: Santa Claus does Load Balancing”. Dagstuhl Workshop on Scheduling, Schloss Dagstuhl - Leibniz Center for Informatics, Germany. *February 2023*.
- [6] “Online Algorithms with Multiple Predictions”. Workshop on Algorithms with Predictions, ACM Symposium on Theory of Computing (STOC), Rome, Italy. *June 2022*.
- [7] “Online Algorithms with Multiple Predictions”. Workshop on Algorithms with Predictions, Bernoulli Center, EPFL, Lausanne, Switzerland. *May 2022*.
- [8] “Recent Trends in Minimum Cut Algorithms”. Workshop on Recent Trends in Algorithms, IMSc, Chennai, India. *March 2022*.
- [9] “Isolating Cuts: A New Tool for Solving Minimum Cut Problems”. Workshop on Continuous Approaches to Discrete Optimization, Hausdorff Center for Mathematics, Bonn, Germany. *October 2021*.
- [10] “Learning-Augmented Algorithms: The Case of Multiple Experts”. Workshop on Learning Based Algorithms, TTI, Chicago, IL. *August 2019*.

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- [11] “Random Sampling and Contraction for Hypergraph and Hedge Connectivity”. INFORMS Annual Conference, Phoenix, AZ. *November 2018*.
- [12] “Online Vector Scheduling”. Workshop on Data Center Scheduling: From Theory to Practice, TTI, Chicago, IL. *July 2018*.
- [13] “Random Sampling and Contraction for Hypergraph and Hedge Connectivity”. Workshop on Flexible Network Design, College Park, MD. *June 2018*.
- [14] “Online Vector Scheduling”. Simons Institute Workshop on Discrete Optimization via Continuous Relaxation, Berkeley, CA. *September 2017*.
- [15] “Online Vector Scheduling”. DIMACS Workshop on Data Center Networks, Piscataway, NJ. *June 2017*.
- [16] “Online Service with Delay”. Workshop on Algorithms and Optimization under Uncertainty, NII Shonan, Japan. *May 2017*.
- [17] “Online Algorithms for Multicommodity Network Design”. Workshop on Flexible Network Design, Amsterdam, The Netherlands. *July 2016*.
- [18] “Tutorial: Routing in Cost-shared Networks: Equilibria and Dynamics”. Workshop on Games, Epidemics, and Behavior, ICTS, Bangalore, India. *June 2016*.
- [19] “Routing in Cost-shared Networks: Equilibria and Dynamics”. DIMACS Workshop on Algorithms for Software Defined Networking, Piscataway, NJ. *June 2016*.
- [20] “Online Algorithms for Multicommodity Network Design”. Workshop on Current Trends in Combinatorial Optimization, NII Shonan, Japan. *April 2016*.
- [21] “A General Framework for Graph Sparsification”. Workshop on Large-scale Graph Algorithms, NII Shonan, Japan. *October 2014*.
- [22] “Online Algorithms for Node-weighted Network Design”. Workshop on Flexible Network Design, Lugano, Switzerland. *July 2014*.
- [23] “Online Algorithms for Node-weighted Network Design”. SIAM Conference on Optimization, San Diego, CA. *May 2014*.
- [24] “Online Algorithms for Node-weighted Network Design”. Workshop on Electrical Flows, Graph Laplacians, and Algorithms: Spectral Graph Theory and Beyond, ICERM, Brown University, Providence, RI. *April 2014*.
- [25] “A General Framework for Graph Sparsification”. Workshop on Theoretical Aspects of Big Data, CUHK, Hong Kong, China. *July 2013*.

#### **Universities and Research Labs**

- [26] “Learning-augmented Assignment: Santa Claus does Load Balancing.” University of Chile, Santiago, Chile. *June 2024*.
- [27] “The Isolating Cuts Lemma and its Applications”. Max Planck Institute for Software Systems, Saarbrücken, Germany. *July 2023*.
- [28] “All-Pairs Minimum Cuts in Nearly Quadratic Time”. Indian Institute of Technology, Delhi, India. *January 2023*.
- [29] “All-Pairs Minimum Cuts in Nearly Quadratic Time”. Shiv Nadar University, Delhi, India. *January 2023*.
- [30] “All-Pairs Minimum Cuts in Nearly Quadratic Time”. Indian Institute of Science, Bangalore, India. *December 2022*.
- [31] “Online Algorithms with Multiple Predictions”. University of Massachusetts, Amherst, MA, USA. *December 2022*.
- [32] “All-Pairs Minimum Cuts in Nearly Quadratic Time”. University of Pennsylvania, Philadelphia, PA, USA. *October 2022*.
- [33] “All-Pairs Minimum Cuts in Nearly Quadratic Time”. Georgia Institute of Technology, Atlanta, GA, USA. *October 2022*.
- [34] “Recent Results in Minimum Cut Algorithms”. University of Texas, Austin. *April 2022*.
- [35] “Recent Trends in Minimum Cut Algorithms”. University of North Carolina, Greensboro (STAMPS colloquium). *February 2022*.
- [36] “Deterministic Min-cut in Poly-logarithmic Max-flows”. Georgia Institute of Technology. *August 2020*.
- [37] “Learning-Augmented Algorithms”. Georgia Institute of Technology. *January 2020*.

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- [38] “Randomized Algorithms in Graph Connectivity: New Takes on Old Ideas”. Indian Institute of Technology, Delhi, India. *December 2019*.
- [39] “Random Contractions in Hypergraph Connectivity”. Indian Statistical Institute, Kolkata, India. *May 2019*.
- [40] “Vector Scheduling & other stories”. Rice University, Houston, TX, USA. *September 2018*.
- [41] “Online Budgeted Allocation with General Budgets”. Google Research, Mountain View. *October 2016*.
- [42] “Online Budgeted Allocation with General Budgets”. University of Maryland, College Park, MD. *March 2016*.
- [43] “Network Algorithms in the Internet Era”. Indian Institute of Technology, Gandhinagar, India. *January 2016*.
- [44] “Network Algorithms in the Internet Era”. Texas A & M University, College Station, TX. *April 2015*.
- [45] “Network Algorithms in the Internet Era”. University of Houston, Houston, TX. *April 2015*.
- [46] “Network Algorithms in the Internet Era”. Microsoft Research, Redmond, WA. *April 2015*.
- [47] “Network Algorithms in the Internet Era”. University of California, Irvine, CA. *March 2015*.
- [48] “Network Algorithms in the Internet Era”. Georgia Institute of Technology, Atlanta, GA. *March 2015*.
- [49] “Network Algorithms in the Internet Era”. Purdue University, West Lafayette, IN. *March 2015*.
- [50] “Energy-efficient Scheduling in the Non-clairvoyant Model”. Microsoft Research, Redmond, WA. *June 2015*.
- [51] “Precedence-constrained Scheduling of Malleable Jobs”. Microsoft Research, Redmond, WA. *June 2014*.
- [52] “Online Algorithms for Node-weighted Network Design”. IBM T. J. Watson Research Center, Yorktown Heights, NY. *April 2014*.
- [53] “Online Algorithms for Node-weighted Network Design”. Tata Institute of Fundamental Research, Mumbai, India. *February 2014*.
- [54] “Online Algorithms for Node-weighted Network Design”. Microsoft Research, Bangalore, India. *January 2014*.
- [55] “Online Algorithms for Node-weighted Network Design”. Indian Institute of Science, Bangalore, India. *January 2014*.
- [56] “Energy-efficient Scheduling in the Non-clairvoyant Model”. Georgia Institute of Technology, Atlanta, GA. *April 2013*.
- [57] “Energy-efficient Scheduling in the Non-clairvoyant Model”. Georgia Institute of Technology, Atlanta, GA. *February 2013*.
- [58] “Energy-efficient Scheduling in the Non-clairvoyant Model”. Duke University, Durham, NC. *February 2013*.
- [59] “Online Matching with Stochastic Rewards”. Georgia Institute of Technology, Atlanta, GA. *February 2013*.
- [60] “Online Matching with Stochastic Rewards”. University of Washington, Seattle, WA. *October 2012*.
- [61] “Online Matching with Stochastic Rewards”. Duke University, Durham, NC. *September 2012*.
- [62] “Optimization Problems in Network Connectivity”. Stony Brook University, Stony Brook, NY. *April 2012*.
- [63] “Optimization Problems in Network Connectivity”. IBM T. J. Watson Research Center, Yorktown Heights, NY. *March 2012*.
- [64] “Optimization Problems in Network Connectivity”. Duke University, Durham, NC. *March 2012*.
- [65] “Optimization Problems in Network Connectivity”. Microsoft Research, Redmond, WA. *February 2012*.
- [66] “Survivable Network Design with Node and Edge Costs”. University of Maryland, College Park, MD. *April 2012*.
- [67] “Survivable Network Design with Node and Edge Costs”. AT&T Labs, Florham Park, NJ. *November 2011*.
- [68] “Survivable Network Design with Node and Edge Costs”. Brown University, Providence, RI. *November 2011*.
- [69] “Survivable Network Design with Node and Edge Costs”. University of Michigan, Ann Arbor, MI. *November 2011*.
- [70] “Survivable Network Design with Node and Edge Costs”. University of Texas, Austin, TX. *October 2011*.
- [71] “Survivable Network Design with Node and Edge Costs”. Carnegie Mellon University, Pittsburgh, PA. *September 2011*.
- [72] “Survivable Network Design with Node and Edge Costs”. Duke University, Durham, NC. *September 2011*.

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- [73] “Survivable Network Design with Node and Edge Costs”. Georgia Institute of Technology, Atlanta, GA. *August 2011*.
- [74] “Survivable Network Design with Node and Edge Costs”. Google Research, Mountain View, CA. *August 2011*.
- [75] “Survivable Network Design with Node and Edge Costs”. IBM Almaden Research Center, San Jose, CA. *August 2011*.
- [76] “A General Framework for Graph Sparsification”. Carnegie Mellon University, Pittsburgh, PA. *March 2012*.
- [77] “A General Framework for Graph Sparsification”. Yahoo Research, Santa Clara, CA. *May 2011*.
- [78] “A General Framework for Graph Sparsification”. Stanford University, Palo Alto, CA. *January 2011*.
- [79] “A General Framework for Graph Sparsification”. Microsoft Research, Mountain View, CA. *January 2011*.
- [80] “A General Framework for Graph Sparsification”. Microsoft Research, Bangalore, India. *December 2010*.
- [81] “A General Framework for Graph Sparsification”. Microsoft Research, Cambridge, MA. *September 2010*.
- [82] “A General Framework for Graph Sparsification”. IBM T. J. Watson Research Center, Yorktown Heights, NY. *June 2010*.
- [83] “Survivable Network Design for Wireless Networks”. Indian Institute of Science, Bangalore, India. *December 2010*.
- [84] “Online Non-metric Facility Location and Related Problems”. Microsoft Research, Redmond, WA. *September 2010*.
- [85] “Result Enrichment and Ranking in Commerce Search”. Microsoft Research, Mountain View, CA. *August 2009*.
- [86] “Maximum Bipartite Flow in Networks with Adaptive Channel Width”. Microsoft Research, Mountain View, CA. *June 2009*.
- [87] “Efficient Algorithms for Computing All Low s-t Edge Connectivities and Related Problems”. Bell Labs, Murray Hill, NJ. *January 2007*.
- [88] “Efficient Algorithms for Computing All Low s-t Edge Connectivities and Related Problems”. Georgia Institute of Technology, Atlanta, GA. *January 2007*.

### Miscellaneous

- [89] Panel: “Ask Me Anything”, TCS For All Workshop, ACM Symposium on Theory of Computing (STOC), Vancouver, Canada. *June 2024*.
- [90] Panel: “Where Is the Area of Learning with Predictions Going?”, Workshop on Algorithms with Predictions, ACM Symposium on Theory of Computing (STOC), Rome, Italy. *June 2022*.
- [91] Panel: “Research Directions in Data Structures and Optimization”, Workshop on Continuous Approaches to Discrete Optimization, Hausdorff Center for Mathematics, Bonn, Germany. *October 2021*.
- [92] Popular Science Talk: “Is Computer Science a (Basic) Science? Some Puzzles, Paradoxes, and Problems”. Jagadis Bose National Science Talent Search Professional Development Forum. *November 2020*.

## ACADEMIC ADVISING

### Postdoctoral students:

- |  |           |
|--|-----------|
| [1] Yu Cheng   | 2017 – 19 |
| <i>First employment:</i> Assistant Professor, University of Illinois, Chicago. |           |
| [2] Kyle Fox   | 2016 – 17 |
| <i>First employment:</i> Assistant Professor, University of Texas, Dallas.     |           |

### Graduate students:

- |  |           |
|--|-----------|
| [3] Nathaniel Kell, PhD. Defended on July 23, 2018.                    | 2013 – 18 |
| Thesis: <i>Algorithms for Allocation Problems in Online Settings</i> . |           |
| <i>Outstanding Ph.D. Award.</i>  |           |
| <i>Outstanding Ph.D. Preliminary Exam Award.</i>                       |           |
| <i>Outstanding Ph.D. Research Initiation Project Award.</i>            |           |
| <i>First employment:</i> Assistant Professor, Denison University.      |           |

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- [4] Samuel Haney, PhD. Defended on January 18, 2019. 2013 – 19  
 Thesis: *Algorithms for Networks with Uncertainty*.  
 First employment: Scientist, Tumult Labs.
- [5] Kevin Sun, PhD. Defended on July 10, 2022. 2017 – 22  
 Thesis: *Online Algorithms with Predictions*.  
 First employment: Teaching Assistant Professor, UNC Chapel Hill.
- [6] Keerti Anand, PhD (co-advised with Prof. Rong Ge). Defended on July 18, 2022. 2017 – 22  
 Thesis: *Online Algorithms with Learned Predictions*.  
 First employment: Associate, Goldman Sachs.
- [7] Ruoxu Cen 2021 –  
 Outstanding Ph.D. Preliminary Exam Award.  
 Outstanding Ph.D. Research Initiation Project Award.
- [8] Lu Wang, MS. 2021 – 2024
- [9] Anish Hebbar 2023 –

#### Undergraduate students:

- [10] William He 2020 – 2022 (CS+/NSF REU 2021)  
*Alex Vasilos Award for Excellence in Computer Science Research*  
 Topic: Graph Algorithms (see **SODA '23**, **SODA '24** papers)  
 First employment: Graduate student, Carnegie Mellon University
- [11] Haofeng (Fred) Zhang 2016 – 2018 (Dean's Summer Research Fellowship 2017)  
 Graduated with BS, *summa-cum-laude*  
 Topics: Online Algorithms, Graph Algorithms (see **SODA '19** paper)  
 First employment: Graduate student, Harvard University (transferred to University of California, Berkeley)
- [12] Arun Ganesh 2015 – 2017 (NSF REU 2016)  
*Alex Vasilos Award for Excellence in Computer Science Research*  
 Graduated with BS, *summa-cum-laude*  
 Topic: Online Algorithms (see **STOC '17** paper)  
 First employment: Graduate student, University of California, Berkeley
- [13] Annie Wang CS+/NSF REU 2021  
 Topic: Graph Algorithms
- [14] Grace Tian CS+/NSF REU 2021  
 Topic: Graph Algorithms
- [15] Feng Cong CS+ 2021  
 Topic: Graph Algorithms
- [16] Davidson Zhu Dean's Summer Research Fellowship 2023  
 Topic: Online Algorithms

#### High school students:

- [17] Vibhu Gomatam (NC School of Science & Math) 2022 – 2023  
 Topic: Online Algorithms

#### Other Student Mentoring:

- **Visiting Students and Interns:**

- Vahid Liaghat, *University of Maryland, College Park*
- Seeun William Umboh, *University of Wisconsin, Madison*
- Jatin Batra, *Indian Institute of Technology, Delhi*

- 
- Jai Moondra, *Indian Institute of Technology, Delhi*
  - Zhihao Jiang, *Tsinghua University, China*

- **Examination Committees:**

- Ruomin Huang (Research Initiation Project committee)
- Mo Zhou (PhD thesis defense, Preliminary examination committees)
- Keegan Yao (Preliminary examination, Research Initiation Project committees)
- Govind Shankar (Preliminary examination, Research Initiation Project committees )
- Rahul Raychaudhury (Research Initiation Project committee)
- Yiheng Shen (Preliminary examination, Research Initiation Project committees)
- Chenwei Wu (PhD thesis defense, Preliminary examination committees)
- Muthuraman Chidambaram (PhD thesis defense, Preliminary Examination, Research Initiation Project committees)
- Caspar Oesterheld (Research Initiation Project committee)
- Hanrui Zhang (Preliminary examination, Research Initiation Project committee)
- Alexander Steiger (PhD thesis defense, Preliminary examination, Research Initiation Project committees)
- Xiang Wang (PhD thesis defense, Preliminary examination, Research Initiation Project committee)
- Kangning Wang (PhD thesis defense, Preliminary examination, Research Initiation Project committees)
- Abraham Frandsen (PhD thesis defense, Preliminary examination, Research Initiation Project committees)
- Allen Xiao (PhD thesis defense, Preliminary examination, Research Initiation Project committees)
- Yuan Deng (PhD thesis defense, Preliminary examination, Research Initiation Project committees)
- Reza Alijani (PhD thesis defense, Preliminary examination, Research Initiation Project committees)
- Abhinandan Nath (Preliminary examination, Research Initiation Project committees)
- Ilker Nadi Bozkurt (Research Initiation Project committee)
- Alan Grayson York (MS thesis committee)
- Akbota Anuarbek (MS thesis committee)
- Zhiyu Zhang (MS thesis committee)
- Jupiter Zhu (BS Graduation with Distinction committee)
- Weiyao Wang (BS Graduation with Distinction committee)
- Will Victor (BS Graduation with Distinction committee)

## TEACHING

(all at Duke University)

- Fall 2024. Approximation Algorithms (graduate).
- Spring 2023. Graph Algorithms (graduate).
- Fall 2022. Introduction to the Design & Analysis of Algorithms (undergraduate).
- Fall 2021. Great Ideas in Computer Science (undergraduate). **(This is a new undergraduate course that I created.)**
- Spring 2021. Machine Learning Algorithms (co-taught with Prof. Rong Ge) (graduate). **(This is a new graduate course that I created with Prof. Rong Ge.)**
- Spring 2021. Introduction to the Design & Analysis of Algorithms (co-taught with Prof. Rong Ge) (undergraduate).

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- Fall 2020. Introduction to the Design & Analysis of Algorithms (co-taught with Prof. Rong Ge) (undergraduate).
  - Spring 2020. Discrete Mathematics (undergraduate).
  - Fall 2019. Graph Algorithms (graduate).
  - Spring 2019. Discrete Mathematics (undergraduate).
  - Spring 2018. Introduction to the Design & Analysis of Algorithms (undergraduate).
  - Fall 2017. Approximation Algorithms (graduate).
  - Spring 2017. Graph Algorithms (graduate).
  - Spring 2017. Introduction to the Design & Analysis of Algorithms (undergraduate).
  - Spring 2016. Introduction to the Design & Analysis of Algorithms (undergraduate).
  - Fall 2015. Design & Analysis of Algorithms (graduate).
  - Spring 2015. Graph Algorithms (graduate). **(This is a new graduate course that I created.)**
  - Fall 2014. Introduction to the Design & Analysis of Algorithms (undergraduate).
  - Fall 2013. Design & Analysis of Algorithms (graduate).

## PROFESSIONAL SERVICE

### Organizer

- Dagstuhl Seminar on “Online Algorithms Beyond Competitive Analysis”. November 2025 (upcoming).
- Dagstuhl Seminar on “Graph Algorithms: Cuts, Flows, and Network Design”. October 2023.
- Workshop on “Algorithms under Uncertainty”, IIT Madras, Chennai, India. December 2022.
- Local Organization co-chair, 61st Annual IEEE Symposium on Foundations of Computer Science (FOCS), online, November 2020.
- NII Shonan Workshop on “Algorithms and Optimization under Uncertainty”, *National Institute of Informatics, Japan*. May 2017.
- “Algorithms and Uncertainty” seminar series, *Simons Institute for the Theory of Computing, Berkeley, CA*. Fall 2016.

### Jury member

- ACM India Doctoral Dissertation Award, 2017 – 2019.

### Journal editor

- Guest editor for SIAM Journal on Computing special issue for FOCS 2019.
- Guest editor for SIAM Journal on Computing special issue for STOC 2016.
- Guest editor for ACM Transactions on Algorithms special issue for SODA 2015.

### Program Committees

- **(Area chair)** The 34th Web Conference (WWW), 2025.
- **(PC co-chair)** 36th ACM-SIAM Symposium on Discrete Algorithms (SODA), 2025.
- **(Area chair)** The 33rd Web Conference (WWW), 2024.
- 64th Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2023.
- 42nd Foundations of Software Technology and Theoretical Computer Science Conference (FSTTCS), 2022.
- 26th International Conference on Randomization and Computation (RANDOM), 2022.
- 23rd ACM Conference on Economics and Computation (EC), 2022.



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- 49th International Colloquium on Automata, Languages, and Programming (ICALP), 2022.
  - 5th SIAM Symposium on Simplicity of Algorithms (SOSA), 2022.
  - 23rd International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX), 2021.
  - 12th Innovations in Theoretical Computer Science (ITCS), 2021.
  - 32nd ACM-SIAM Symposium on Discrete Algorithms (SODA), 2021.
  - 60th Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2019.
  - 19th ACM Conference on Economics and Computation (EC), 2018.
  - 25th European Symposium on Algorithms (ESA), 2018.
  - 18th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX), 2016.
  - 48th ACM Symposium on Theory of Computing (STOC), 2016.
  - 35th Foundations of Software Technology and Theoretical Computer Science Conference (FSTTCS), 2015.
  - 1st Conference on Topics in Theoretical Computer Science (TTCS), 2015.
  - 26th ACM-SIAM Symposium on Discrete Algorithms (SODA), 2015.
  - 16th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX), 2014.
  - 11th Workshop on Approximation and Online Algorithms (WAOA), 2013.

#### **Other External Committees**

- Golden Jubilee: Alumni Advisory Committee, *Department of Computer Science and Automation, Indian Institute of Science*

#### **Reviewer**

- **Research Proposals:**

- Member of *National Science Foundation* CCF-AF panels in 2016, 2018, 2020, 2021, 2023.
- Invited reviewer for *National Science Foundation, European Research Council, Israel Science Foundation, (US-Israel) Binational Science Foundation, Dutch Research Council, Swiss National Science Foundation, Vienna Science and Technology Fund, National Science Center of Poland.*

- **Journals:**

- Journal of the ACM
- SIAM Journal on Computing
- SIAM Journal on Discrete Mathematics
- ACM Transactions on Algorithms
- Algorithmica
- Combinatorica
- Mathematics of Operations Research
- Operations Research
- Discrete Applied Mathematics
- ACM Transactions on Spatial Algorithms and Systems
- ACM Transactions on Mobile Computing
- Computer Networks

- **Conferences:**

- IEEE Symposium on Foundations of Computer Science (FOCS)

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- ACM Symposium on Theory of Computing (STOC)
  - ACM-SIAM Symposium on Discrete Algorithms (SODA)
  - International Conference on Machine Learning (ICML)
  - Conference on Neural Information Processing Systems (NeurIPS)
  - International Colloquium on Automata, Languages and Programming (ICALP)
  - International Conference on Learning Representations (ICLR)
  - ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)
  - Conference on Integer Programming and Combinatorial Optimization (IPCO)
  - International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX)
  - European Symposium on Algorithms (ESA)
  - International Symposium on Theoretical Aspects of Computer Science (STACS)
  - Scandinavian Symposium and Workshops on Algorithm Theory (SWAT)
  - International Symposium on Algorithms and Computation (ISAAC)
  - Foundations of Software Technology and Theoretical Computer Science (FSTTCS)
  - ACM Symposium on Principles of Database Systems (PODS)
  - Very Large Databases Conference (VLDB)
  - ACM Special Interest Group on Management of Data Conference (SIGMOD)
  - IEEE International Conference on Data Mining (ICDM)
  - The Web Conference (WWW)
  - IEEE Conference on Computer Communications (INFOCOM)
  - IEEE International Conference on Mobile Ad hoc and Sensor Systems (MASS)

## UNIVERSITY SERVICE

### Duke University

- Visited IIT-Gandhinagar as part of Duke team led by Vice Provost for Research January 2016

### Computer Science Department

- Graduate admissions committee (chair, 2023) 2015 – 2017, 2019, 2023
- Communications committee (chair, 2019 – 2021) 2017 – 2021
- Taskforce for Broadening Participation in Computing 2020
- Undergraduate program committee 2017 – 2020
- Strategic planning committee 2017 – 2020, 2024 –
- Colloquium coordinator 2017 – 2019
- Course-only MS defense committee 2022, 2023
- Executive committee 2019 –
- Promotion, Renewal, and Tenure committees (various) 2019 –