Swati Gupta

Fouts Family Early Career Professor and Assistant Professor
April 7, 2022

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Swati Gupta
Fouts Family Early Career Professor and Assistant Professor
H. Milton Stewart School of Industrial and Systems Engineering
https://www.swatigupta.tech
swatig@gatech.edu
April 7, 2022

I. Earned Degrees

Ph.D.	2017	Massachusetts Institute of Technology *Advisors:* Prof. Michel Goemans and Prof. Patrick Jaillet	*Operations Research*
B.Tech and M.Tech.	2011	Indian Institute of Technology Delhi *Project advisor:* Prof. Naveen Garg	*Computer Science & Engg.*

II. Employment History

Georgia Institute of Technology
H. Milton Stewart School of Industrial and Systems Engineering

Lead of Ethical AI, NSF AI Institute, AI4OPT	*08/2021–Present*
School of Computer Science (by Courtesy)	*08/2020–Present*
Fouts Family Early Career Professor	*08/2020–Present*
Assistant Professor	*07/2018–Present*

Visiting Scientist, Simons Institute, UC Berkeley

Summer Cluster on Fairness	*05/2019–07/2019*

Research Fellow, Simons Institute, UC Berkeley

Real Time Decision Making	*01/2018–05/2018*
Bridging Discrete and Continuous Optimization	*08/2017–12/2017*

IBM Research Labs, Zurich

Intern Scientist	*06/2013–08/2013*

Massachusetts Institute of Technology

Research/Teaching Assistant	*08/2011–07/2017*

III. Honors and Awards

A. International or National Awards

- * **JP Morgan Chase Early Career Faculty Award**, 2021
- * One of two institute nominees for **Packard Fellowship**, Georgia Institute of Technology, 2021
- * Finalist for **New Voices in Science, Engineering and Medicine Program 2021-2023**, an initiative of the National Academies of Sciences, Engineering and Medicine, 2021
- * **NSF Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII) Award** 2019

- * **Spotlight Paper**, *Limited Memory Kelley's Method Converges for Composite Convex and Submodular Objectives*, at Neural Information Processing Systems (NeurIPS) 2018
- * Honorable Mention in **INFORMS Undergraduate Research Award** to student Song Zhou for *Limited Memory Kelley's Method Converges for Composite Convex and Submodular Objectives*, joint work with Madeleine Udell and Song Zhou
- * 5th place at the **ISSIP-IBM-CBA student paper award** for the **Best Industry Studies Paper 2019**, for *Robust Look-ahead Three-phase Balancing of Uncertain Distribution Loads* at HICSS 52, joint work with Xinbo Geng and Le Xie
- **Simons-Berkeley Research Fellowship** for Real-Time Decision Making, subsequently funded as a **Microsoft Research Fellowship**, Spring 2018
- **Simons-Berkeley Research Fellowship** for Bridging Continuous and Discrete Optimization, Fall 2017.
- Special Recognition by the **INFORMS Computing Society** for *What Works Best When? A Framework for Systematic Heuristic Evaluation*, joint work with Iain Dunning and John Silberholz, 2016
- Finalist for **INFORMS Service Science Section Student Paper Competition** for *An Efficient Algorithm for Dynamic Pricing using a Graphical Representation*, joint work with Maxime C. Cohen, Jeremy J. Kalas and Georgia Perakis, 2016
- **Google India Women in Engineering Award**, 2011

B. Institute or School Awards

- * Student Recognition of **Excellence in Teaching**: Class of 1934 CIOS Honor Roll 2021 *and* in 2022.
- * **Fouts Family Early Career Professorship** in ISyE, 2020-2023.
- * **Class of 1969 Teaching Fellow**, Center for the Enhancement of Teaching and Learning (CETL), 2019-2020.

IV. Research, Scholarship, and Creative Activities

Publications from work done at Georgia Tech are indicated by '*', and the student authors at Georgia Tech advised/mentored by Dr. Gupta are indicated in **bold**, and other student authors mentored by Dr. Gupta are indicated in *italics*. Publications where senior authors are listed in alphabetical order are indicated by †, those where all authors are listed in alphabetical order are indicated by ‡, and other author orders are explained with a footnote.

A. Published Books, Book Chapters, and Edited Volumes

A.1. Refereed Book Chapters

[1] Book Chapter: *Computational Comparison of Metaheuristics* by John Silberholz, Bruce Golden, Swati Gupta, Xingyin Wang, Handbook of Metaheuristics, Springer 2018.

B. Refereed Publications and Submitted Articles

B.1. Published and Accepted Journal Articles

[1] *‡ Swati Gupta, Vijay Kamble, "Individual Fairness in Hindsight", *Journal of Machine Learning Research*, 2021. Preliminary version appeared in EC 2019 as an extended abstract.
Best Paper Candidate in EC 2019,
Spotlight Talk at NeurIPS Workshop on Ethical, Social and Governance Issues in AI, 2018.

[2] *‡ Swati Gupta, *Ali Khodabakhsh*, **Hassan Mortagy**, Evdokia Nikolova, "Electric Flows over Spanning Trees", *Mathematical Programming (Series B)*, Special Issue on Global Solution of Integer, Stochastic and Nonconvex Optimization Problems, 2020.

[3] ‡ Maxime Cohen, Jeremy J. Kalas, Swati Gupta and Georgia Perakis, "An Efficient Algorithm for Dynamic Pricing using a Graphical Representation", *Production and Operations Management*, 2020.
INFORMS Service Science Section Student Paper Competition Finalist, 2016.

[4] ‡ Iain Dunning, Swati Gupta, John Silberholz, "What Works Best When? A Systematic Evaluation of Heuristics for Max-Cut and QUBO", *INFORMS Journal on Computing*, 2018.
** Finalist in Michigan Institute for Data Science's (MIDAS) Reproducibility Challenge 2020.*
Special Recognition in INFORMS Computing Society Student Paper Competition, 2016.

[5] ‡ Nishita Agarwal, Naveen Garg, Swati Gupta, "A 4/3 approximation for TSP on cubic 3-edge connected graphs", *Operations Research Letters*, 2018.

[6] ‡ Swati Gupta, Thulasi J. Rangan and Amitabha Tripathi, "The two-color Rado number for ax + by = (a + b)z", *Annals of Combinatorics*, 2015.

B.2. Conference Presentations with Proceedings (Refereed)

[1] *† **Jad Salem**, Deven R. Desai, Swati Gupta, "Don't let Ricci v. DeStefano Hold You Back: A Bias-aware Legal Solution to the Hiring Paradox". Preprint available at arXiv:2201.13367. To appear in ACM Conference on Fairness, Accountability and Transparency, FAccT 2022.

[2] *† **Hassan Mortagy**, **Jai Moondra**, Swati Gupta, "Reusing Combinatorial Structure: Faster Iterative Projections over Submodular Base Polytopes", *35th Conference on Neural Information Processing Systems*, NeurIPS 2021. Preprint available at arXiv:2106.11943.

[3] *† **Cyrus Hettle**, **Shixiang Zhu**, Swati Gupta, Yao Xie, "Balanced Districting with Provable Compactness and Contiguity", (non-archival) Foundations of Responsible Computing (FORC) 2021.

[4] *† **Hassan Mortagy**, Swati Gupta, Sebastian Pokutta, "Walking in the Shadow: A New Perspective on Descent Directions for Constrained Minimization", *34th Conference on Neural Information Processing Systems*, NeurIPS 2020.

[5] *[1] Semih Cayci, Swati Gupta, Atilla Ermilyaz, "Online Learning for Fair Resource Allocation", *34th Conference on Neural Information Processing Systems*, NeurIPS 2020.

[6] *† **Jad Salem**, Swati Gupta, "Closing the Gap: Mitigating Bias in Online Resume-Filtering", extended abstract appeared in the *16th Conference on Web and Internet Economics*, WINE 2020.

[7] * ‡ Swati Gupta, *Akhil Jalan*, Gireeja Ranade, *Helen Yang*, *Simon Zhuang*, "Too many fairness metrics: Is there a solution?", *Ethics of Data Science Conference*, EDSC 2020.

[1] Senior authors are listed by the order of seniority.

[8] * ‡ Swati Gupta, Vijay Kamble, "Individual Fairness in Hindsight", extended abstract appeared in *20th ACM Conference on Economics and Computation*, EC 2019.

[9] * ‡ Xinbo Geng, Swati Gupta, Le Xie, "Robust Look-ahead Three-phase Balancing of Uncertain Distribution Loads", *Hawaii International Conference on System Sciences*, HICSS 2019.
5th place at the ISSIP-IBM-CBA student paper award for the Best Industry Studies Paper 2019.

[10] * † *Song Zhou*, Swati Gupta, Madeleine Udell, "Limited Memory Kelley's Method Converges for Composite Convex and Submodular Objectives", *32nd Conference on Neural Information and Processing Systems*, NeurIPS 2018.
Spotlight presentation at the main conference ($\sim 3.5\%$ of total submissions),
Honorable mention in the INFORMS UG Research Prize 2018.

[11] ‡ Michel Goemans, Swati Gupta, Patrick Jaillet, "Newton's Method for Parametric Submodular Function Minimization", *Integer Programming and Combinatorial Optimization*, IPCO 2017, pp. 212-227. Springer, Cham.

[12] ‡ Swati Gupta, Kristin LeFevre, Atul Prakash, "SPAN: A Unified Framework and toolkit for Querying Heterogenous Access Policies", *Proceedings of 4th Usenix Conference on Hot Topics in Security*, 2009.

B.3. Submitted Journal Articles and Preprints

[1] *[2] **Reuben Tate**, **Majid Farhadi**, Creston Herold, Greg Mohler, Swati Gupta, "Bridging Classical and Quantum using SDP initialized warm-starts for QAOA", *under minor revision* at ACM Transactions in Quantum Computing. Preprint available at arXiv:2010.14021.

[2] *† **Jad Salem**, Swati Gupta, "Closing the Gap: Online Selections of Candidates with Biased Evaluations", under major revision at *Management Science* 2020. Preprint available at ssrn: 3444283. Preliminary version appeared in WINE 2020 as an extended abstract. Media Coverage: *Resoundingly Human (INFORMS OR/MS Magazine), GT College of Engineering News, Diginomica*

[3] *† *Joel Rajakumar*, **Jai Moondra**, Swati Gupta, Creston Herold, "Generating Target Graph Couplings for QAOA from Native Quantum Hardware Couplings", under major revision at *Physics Review A*. Preprint available at arXiv:2011.08165.

[4] * **Hassan Mortagy**, Swati Gupta, Sebastian Pokutta, "Walking in the Shadow: A New Perspective on Feasible Descent Directions". Preprint available at arXiv: 2006.08426. Under submission to Mathematical Programming, 2021. Preliminary version appeared in NeurIPS 2021.

[5] * ‡ Swati Gupta, *Akhil Jalan*, Gireeja Ranade, *Helen Yang*, *Simon Zhuang*, "Too many fairness metrics: Is there a solution? Equity across Demographic Groups for the Facility Location Problem", *under submission* to the Fields Institute Communication Series, 2021. A preliminary version of this work was accepted to the *Ethics of Data Science Conference*, EDSC 2020 (cancelled due to COVID). Preprint available at ssrn:3554829.

[6] * ‡ **Majid Farhadi**, Swati Gupta, **Shengding Sun**, Prasad Tetali, **Michael Wigal**, "Hardness and Approximations for Linear Ordering Problems". Preprint available at arXiv:2108.00914. Under submission to Mathematical Programming.

[2] Students alphabetical. Lead PI last

[7] *† **Cyrus Hettle**, Swati Gupta, Daniel Molzahn, "Fair and Reliable Reconnections for Temporary Disruptions in Electric Distribution Networks using Submodularity". Preprint available at arXiv:2104.07631. Under submission to Operations Research.

[8] *[3] **Reuben Tate**, Bryan Gard, Greg Mohler, Swati Gupta, "Classically-inspired Mixers for QAOA beat Goemans-Williamson for Max-Cut at Low Circuit Depths". Preprint available at arXiv: 2112.11354. In preparation for PNAS 2022.

[9] *‡ Yuri Faenza, Swati Gupta, Xuan Zhang, "Reducing the Feeder Effect in Public School Admissions: A Bias-aware Analysis for Targeted Interventions". Preprint available at arXiv:2004.10846. In preparation for submission to M&SOM.

[10] *† **Jad Salem**, Swati Gupta, Vijay Kamble, "Taming Wild Price Fluctuations: Regret Bounds for Monotone Stochastic Convex Optimization". Preprint available at arXiv:2103.09287. In preparation for submission to Management Science.

[11] *† **Cyrus Hettle**, *Shixiang Zhu*, Swati Gupta, Yao Xie, "Balanced Districting with Provable Compactness and Contiguity". Preprint available at arXiv:2102.05028. In preparation for submission to Operations Research.

[12] *† **Hassan Mortagy**, **Jai Moondra**, Swati Gupta, "Reusing Combinatorial Structure: Faster Iterative Projections over Submodular Base Polytopes". Preprint available at arXiv:2106.11943. Preliminary version appeared in NeurIPS 2021. In preparation for submission to Mathematical Programming.

[13] *‡ Yuri Faenza, Swati Gupta, *Xuan Zhang*, "Discovering Opportunities in New York City's Discovery Program: an Analysis of Affirmative Action Mechanisms". Preprint available at arXiv:2203.00544. In preparation for submission to Management Science.

[14] *‡ *Mehak Arora*, **Nathan Dwarshuis**, Swati Gupta, Andre Holder, Rishi Kamaleswaran, **Hassan Mortagy**, "Projections and high-dimensional projections of clinical data for novel sepsis phenotype detection". In preparation for submission to clinical journals.

[15] *‡ *Alessia Benevento*, Swati Gupta, Massimo Pacella, Kamran Paynabar, "Interval-Based Sequential Design for the Exploration and Estimation of a Response Surface". Preprint available at here. In preparation for submission to IISE TASE.

[16] † Swati Gupta, Michel Goemans, Patrick Jaillet, "Solving Combinatorial Games using Products, Projections and Lexicographically Optimal Bases", preprint on arXiv:1603.00522. In preparation for submission to Mathematical Programming.

[17] ‡ Dimitris Bertsimas, Swati Gupta, Joel Tay, "A Scalable Robust and Adaptive Optimization Approach to Inventory Routing", preprint on optimization online. In preparation for submission to European Journal of Operations Research.

B.4. Submitted Conference Articles

1. *† **Jad Salem**, Swati Gupta, Vijay Kamble, "Taming Wild Price Fluctuations: Regret Bounds for Monotone Stochastic Convex Optimization". Preprint available at arXiv:2103.09287. Under submission to ACM EC 2022.

2. ‡ Yuri Faenza, Swati Gupta, *Xuan Zhang*, "Discovering Opportunities in New York City's Discovery Program: an Analysis of Affirmative Action Mechanisms". Preprint available at arXiv:2203.00544. Under submission to ACM EC 2022.

[3] Students alphabetical. Lead PI last.

3. *† *Zhanzhan Zhao*, **Cyrus Hettle**[4], Swati Gupta, Jonathan Mattingly, Dana Randall, Greg Herschlag, "Mathematically Quantifying Gerrymandering and Non-Responsiveness of the 2021 Georgia Congressional Districting Plan". Preprint available at 2203.06552, 2022. To be submitted to ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization, EAAMO 2022.

B.5. Other Peer-Reviewed Material

[1] *† **Jad Salem**, Swati Gupta, Vijay Kamble, "Taming Wild Price Fluctuations: Regret Bounds for Monotone Stochastic Convex Optimization", *Revenue Management and Pricing Conference*, 2021.

[2] *† **Jad Salem**, Swati Gupta, Vijay Kamble, "Taming Wild Price Fluctuations: Regret Bounds for Monotone Stochastic Convex Optimization", *Manufacturing and Service Operations Management (MSOM) Conference*, 2021.

[3] *† **Cyrus Hettle**, Louis Faugere, Simon Kwon, Swati Gupta, and Benoit Montreuil, "Generating clusters for urban logistics in hyperconnected networks", *8th International Physical Internet Conference,* June 2021.

[4] *† **Jad Salem**, Deven R. Desai, Swati Gupta, "Hiring Practices: Biased Data, Fairer Algorithms, and Discrimination Law", *Privacy Law Scholars Conference*, June 2021.

[5] *† **Jad Salem**, Deven R. Desai, Swati Gupta, "Hiring Practices: Biased Data, Fairer Algorithms, and Discrimination Law", *Data Law and Ethics Research Workshop*, April 2021.

[6] *† **Michael Wang**, Swati Gupta, "Fairness in the Face of Uncertainty", *NeurIPS Workshop on Ethical, Social and Governance Issues in AI*, 2018.

[7] *‡ Swati Gupta, Vijay Kamble, "Temporal Aspects of Individual Fairness", *NeurIPS Workshop on Ethical, Social and Governance Issues in AI*, 2018.
Spotlight presentation at the workshop 2018.

[8] † Swati Gupta, Michel Goemans, Patrick Jaillet, "Bregman Projections over Submodular Base Polytopes", *NeurIPS Optimization for Machine Learning Workshop*, 2016.

[9] † Swati Gupta, Michel Goemans, Patrick Jaillet, "Games People (could not) Play", *Grace Hopper Conference*, October 2015.

[10] ‡ Maxime Cohen, Jeremy Kalas, Swati Gupta, Georgia Perakis, "An Efficient Algorithm for Dynamic Pricing using a Graphical Representation", *Revenue Management and Pricing Conference*, 2015.

[11] ‡ Maxime Cohen, Jeremy Kalas, Swati Gupta, Georgia Perakis, "When Dynamic Pricing Meets Graph Theory", *Manufacturing and Service Operations Management (MSOM) Conference*, 2015.

C. News Articles and Podcasts

[1] *OR/MS Education and Quantum Computing*, by Giacomo Nannicini, Swati Gupta, Sven Leyffer, Jim Ostrowski, Luis F. Zuluaga, August 2021 (here).

[2] *NSF partnerships expand National AI Research Institutes to 40 states*, NSF, July 2021.

[3] *Teaching in the Time of Covid-19*, Georgia Tech College of Engineering News, November 2020.

[4] Second first author

[4] *VOICES podcast for Social Justice Episode 5: How Do Algorithms Impact Behavior Over Time? Plus, Data Privacy, Social Media Addiction, and the Election*, Constellations Center for Equity in Computing, Georgia Tech, October 2020

[5] *Swati Gupta Appointed to Fouts Family Early Career Professorship*, Georgia Tech ISyE News, August 2020.

[6] *Keeping Bias Out of Job Applications and School Admissions*, Resoundingly Human, INFORMS OR/MS Magazine, June 2020

[7] *DARPA Awards $9.2M Grant to Inter-agency Team Researching Quantum Computing*, Georgia Tech ISyE News, June 2020

[8] *Bias in Algorithms* with Swati Gupta, Uncommon Engineer Podcast with Georgia Tech CoE Dean Steve McLaughlin, December 2019

[9] *GT Experts Bring Diverse Perspectives on the Challenges and Importance of Algorithmic Fairness*, Center of Machine Learning at Georgia Tech, November 2019

[10] *Can we create better algorithms for screening candidates - and reduce hiring bias?*, by Neil Raden, Diginomica, August 2019

[11] *Meet Your Newest Job Recruiter, the Algorithm*, by Georgia Parmelee, Georgia Tech College of Engineering News, August 2019 (Also, GT ISyE News in September 2019)

[12] *FPF Research Coordination Network Helps Academic Stars Connect with Private Sector Privacy Pros at IAPP*, Future of Privacy Forum, May 2019

[13] *Research Vignette: Real-Time Decision Making in Energy (RTDM-E)*, by Xinbo Geng, Swati Gupta, Tong Huang, and Le Xie, Simons Institute News Stories, April 2019

[14] *Looking at All the Angles*, MIT's Lab of Information and Decision Systems Magazine, 2016

D. Other Publications and Creative Products

D.1. Software

[1] *__CI-QuBe__: Combinatorial Instances for Quantum Benchmarking (CI-QuBe, 'see-cube') is a library of interesting instances to test and benchmark quantum algorithms for combinatorial problems. Instances are available for use on Github.

[2] *__Walking in the Shadow__: This code is available for use on Github. It contains an implementation of our algorithms Shadow-Walk and Shadow-CG and benchmarking experiments for a comparison with Away-step FW, Decomposition Invariant Conditional Gradient, Pairwise FW and Projected Gradient Descent. Details of the experiments can be found in the following paper: Hassan Mortagy, Swati Gupta, and Sebastian Pokutta. "Walking in the Shadow: A New Perspective on Descent Directions for Constrained Minimization." arXiv:2006.08426 (2020).

[3] *__Fairness in Facility Location__: This code is available for use on Github. It contains an implementation of our analysis of the closure of the Alta Bates Emergency Room in Berkeley and its impact on nearby populations based on current census data. Details of the experiments can be found in the following paper: Swati Gupta, Akhil Jalan, Gireeja Ranade, Helen Yang, Simon Zhuang, "Too many fairness metrics: Is there a solution?", *Ethics of Data Science Conference*, 2020, Sydney.

[4] **MQLib**: This code is open-source and available for use on Github. It contains an implementation of dozens of heuristics for the Max-cut and QUBO combinatorial optimization problems, a machine learning-based hyper-heuristic that tries to select the best heuristic for a given instance, and scripts to evaluate heuristics on Amazon EC2 and to analyze the results. This library and the related systematic heuristic evaluation strategy are described in the paper: "Dunning, Iain, Swati Gupta, and John Silberholz. *What works best when? A systematic evaluation of heuristics for Max-Cut and QUBO.* INFORMS Journal on Computing 30.3 (2018): 608-624."

D.2. Peer-reviewed Posters

[1] *† **Jai Moondra, Hassan Mortagy**, Swati Gupta, "Reusing Combinatorial Structure for Projections over Submodular Polytopes", *Mixed Integer Programming Workshop*, 2022.

[2] *‡ Swati Gupta, *Akhil Jalan*, Gireeja Ranade, *Helen Yang*, *Simon Zhuang*, "Too many fairness metrics: Is there a solution?", *Mechanism Design for Social Good Workshop*, 2020.

[3] *† **Jad Salem**, Swati Gupta, "Closing the Gap: Online Selections of Candidates with Biased Evaluations", *Mechanism Design for Social Good Workshop*, 2020.

[4] *‡ Swati Gupta, **Ali Khodabakhsh**, **Hassan Mortagy**, Evdokia Nikolova, "Electric Flows over Spanning Trees", *Mixed Integer Programming Workshop*, 2020.

D.3. Dissertations

[1] Swati Gupta, "'Combinatorial Structure in Online and Convex Optimization", Ph.D. Dissertation, Operations Research Center, Massachusetts Institute of Technology, 05/2017.

[2] Swati Gupta, "Towards a 4/3-approximation for the Metric Traveling Salesman Problem", Master's Thesis, Computer Science and Engineering, Indian Institute of Technology Delhi, 05/2011.

D.4. Other Creative Products

[1] "*Panoramia*": An experimental self-portrait studio at the MIT Museum, along with a 9-feet tall photographic display, in display from September 2015 - August 2017.

[2] "*Jiyo Re Laado*": An interactive art exhibit for creating dialogue about roles women play in the society, New Delhi, December 2014.

[3] "*Crossword project*": designed and initiated a wall art project with a crossword of yearly interns at the IBM Research Labs, Zurich, 2013.

E. Presentations

E.1. Selected Invited Conference and Workshop Presentations

[1] AI for Privacy Professionals, Invited Talk at IAPP Global Privacy Summit 2022,Washington DC, April 2022

[2] NSF-FET Workshop on Ising Machines, Frontiers in Emerging Technologies within NSF's CISE (Computer and Information Science and Engineering) Directorate, April 2022

[3] NSF Tripods-X Workshop on ML & Supply Chain Management, Lehigh University, Dec 2021

[4] Theory of Computing for Fairness, a Simons Collaboration Project, December 2021

[5] Opportunities for Classical Optimization for Quantum Algorithms, Core speaker, NSF-FET Workshop on Ising Machines, Frontiers in Emerging Technologies within NSF's CISE (Computer and Information Science and Engineering) Directorate, April 2022

[6] Developing the Quantum Approximate Optimization Algorithm, IEEE Quantum Week 2021 Workshop, October 2021

[7] Fairness in Operations Research, Auctions and Market Design Cluster, INFORMS Annual Meeting, November 2021

[8] Machine Learning for Industry Forum 2021 (ML4I 2021), Lawrence Livermore National Laboratory, August 2021

[9] Crossing Disciplines: Studying Fairness, Bias, and Inequality in Management and Decision Sciences Research, at Harvard Business School, May 2021

[10] Mathematics of Bias and Fairness, Georgia Tech Library's Symposium on the Interaction of Privacy and Autonomy, August 2020

[11] Impact of Bias on Hiring, Classification Society Annual Meeting, San Diego, July 2020 (postponed due to COVID)

[12] Electrical Flows over Spanning Trees, INFORMS Optimization Society Conference, Greenville, Mar 2020 (cancelled due to COVID)

[13] AI for Public Health Workshop, Center for Disease Control, Mar 2020 (postponed due to COVID)

[14] Impact of Bias on Hiring, Information Theory and Applications Workshop, San Diego, Feb 2020

[15] Impact of Bias on Hiring Decisions, Optimization for ML Workshop, Vancouver, Dec 2019

[16] Electrical Flows over Spanning Trees, Conference on Optimization, Fields Institute, Toronto, November 2019

[17] Impact of Bias on Hiring and School Matchings, Conference on Data Science and Optimization, Fields Institute, Toronto, November 2019

[18] Panelist, Optimization in Power Systems, Power & Energy Systems Annual Meeting, August 2019

[19] Non-convex optimization over Spanning Trees, Mixed Integer Programming Workshop (MIP) 2019, Sloan School of Management, MIT, July 2019

[20] Limited Memory Kelley's Method Converges for Composite Convex and Submodular Objectives, AMS Sectional Meeting, University of Hawaii at Manoa, March 2019

[21] Individual Fairness in Hindsight, Information Theory and Applications Workshop, UC San Diego, February 2019

[22] Panelist, Profiling, micro-targeting and a right to reasonable algorithmic inferences, at the International Conference on Computers, Privacy and Data Protection, in Brussels, February, 2019

[23] Learning What Works Best When, Workshop on Mathematical and Computational Challenges in Real-time Decision Making, Simons Institute, UC Berkeley, May 2018

[24] Learning Combinatorial Structure, Workshop on Algorithms and Optimization, International Centre for Theoretical Sciences (ICTS), Bangalore, January 2018

E.2. Selected Invited Seminar Presentations

[1] University of British Columbia, Sauder School of Business, March 2022

[2] Indian Institute of Science - Microsoft Research India Joint Theory Seminar, March 2022

[3] MIT Sloan School of Management, February 2022

[4] Mathematics of Bias and Fairness for Hiring, Georgia Tech Research Institute, February 2022

[5] Bridging Classical and Quantum Optimization, Department of ISE, Lehigh University, April 2021

[6] Electrical Flows over Spanning Trees, Department of Industrial and Systems Engineering, Virginia Tech, March 2021

[7] Mitigating the Impact of Bias in Selection Algorithms, Institute of Operations Research and Analytics, National University of Singapore, March 2021

[8] Electrical Flows over Spanning Trees, Algorithms and Randomness Center, Georgia Tech, February 2021

[9] Mitigating the Impact of Bias in Selection Algorithms, MIT Operations Research Center, IAP Seminar on Policymaking in OR, January 2021

[10] Mathematics of Fairness and Bias, Amazon Research, Seattle, January 2021

[11] Mathematics of Bias and Fairness, Guest Lecture in Virginia Tech Course, December 2020

[12] Bridging Classical and Quantum Computing with Warm-starts and Coupling Graphs, IBM Research Zurich, November 2020

[13] Mathematics of Fairness and Bias, LIONS Seminar, Arizona State University, October 2020

[14] Mathematics of Fairness and Bias, Oracle Research Group, October 2020

[15] Fairness and Bias in Tooling, Zillow Group, August 2020

[16] Convex Minimization over Submodular Polytopes, Center for Operations Research and Econometrics (CORE), Belgium, February, 2019

[17] Learning Combinatorial Structures, Stanford Theory Seminar, Stanford University, April 2018

[18] Learning Combinatorial Structures, Google Research, Mountain View, February 2018

[19] Solving Games Using Products, Projections and Lex. Optimal Bases, Visa Research, November 2017

[20] Learning Combinatorial Structures, Tepper School of Business, CMU, February 2017

[21] Learning Combinatorial Structures, UCLA Anderson School of Management, February 2017

[22] Learning Combinatorial Structures, Cornell University, ORIE, February 2017

[23] Learning Combinatorial Structures, Yale School of Management, February 2017

[24] Learning Combinatorial Structures, Booth School of Business, Chicago, January 2017

[25] Learning Combinatorial Structures, ISyE, Georgia Tech, January 2017

[26] Learning Combinatorial Structures, Northwestern University, IEMS, January 2017

[27] Solving Games using Products, Projections and Lexicographically Optimal Bases, Google Research, NYC 2016

[28] Learning Combinatorial Structures, Database Lab (CSE), Boston University, March 2016

F. Grants and Contracts

- **Quantum Computing and Operations Research Workshop**, Agency: Fields Institute and National Science Foundation, Overall funding: $14,500 CAD, Role: co-PI, Collaborators: Giacomo Nannicini (IBM Research), Sven Leyffer (Argonne National Laboratory), Luis Zuluaga (Lehigh University), James Ostrowski (University of Tennessee), Merve Bodur (University of Toronto) and Ashley Montanaro (University of Bristol), Duration: May 2022.
- **NSF AI Institute on Advances in Optimization (AI4OPT)**, Agency: National Science Foundation, Overall funding: $\sim$ $20 million, Role: *Lead of the Ethical AI Thrust*, Collaborator(s): Pascal Van Hentenryck (Georgia Tech, PI), Justin Romberg (Georgia Tech, co-PI), George Lan (Georgia Tech, co-PI), Bistra Dilkina (USC, co-PI), Alper Atamturk (UC Berkeley, co-PI), Dorit Hochbaum (UC Berkeley, co-PI), Charles Pierre (Clark Atlanta University, co-PI), Period of Contract: July 2021 - 2026.
- **Optimization with Trapped Ion Qubits (OPTIQ)**, Agency: DARPA, Overall funding: $9.2 million, Role: Georgia Tech PI, Collaborators: Creston Herold (Georgia Tech Research Institute (lead institute)), John Bollinger (National Institute of Standards and Technology), Travis Humble (Oak Ridge National Laboratory), Duration: January 2020 - January 2024.
- **Disparate Impact on Access to Service and Mitigation Strategies under Pandemic**, Agency: Thos and Clair Muller Research Endowment Fund, Georgia Tech, Overall Amount: $10,000, Role: co-PI, Collaborators: Deven R. Desai (Scheller College of Business, Georgia Tech), Duration: May 2020 - December 2020
- **CRII: AF: Faster Iterative Decisions within First-order Optimization Methods**, Agency: National Science Foundation, Overall Funding: $175,000, Role: Principal Investigator, Collaborators: none, Duration: June 1 2019 - May 31 2021.
- **Focused Program on Data Science and Optimization**, Agency: Fields Institute, Overall Funding: $100,000 CAD, Role: co-PI, Collaborators: Sanjeena Dang (Binghamton University), Antoine Deza (McMaster University), Paul McNicholas (McMaster University), Sebastian Pokutta (TU Berlin) and Masashi Sugiyama, Duration: November 2019

V. Education

A. Courses Taught

Semester, Year	Course Number	Course Title	No. of Students
Fall 2021	ISyE 4803-GUP	Online Learning and Decision Making	82
Spring 2021	ISyE 7686	Advanced Combinatorial Optimization	17
Fall 2020	ISyE 4803-GUP	Online Learning and Decision Making	72
Spring 2020	ISyE 7686	Advanced Combinatorial Optimization	6
Fall 2019	ISyE 4803-GUP	Online Learning and Decision Making	63

Semester, Year	Course Number	Course Title	No. of Students
Spring 2019	ISyE 7686	Advanced Combinatorial Optimization	28
Fall 2018	ISyE 4803-GUP	Online Learning and Decision Making	6

B. Individual Student Guidance

B.1. Ph.D. Students

B.1.a Graduated PhD Students

No data

B.1.b. In Process PhD Students

1. Name: Hassan Mortagy
   Tentative Thesis Title: First-Order Optimization Methods for Combinatorial Structures
   Advising Start Date: August 2018.
   Passed OR Comprehensive Exam in: 2019.
   Awards: ARC TRIAD Research Fellowship for Spring 2021.
   Invited Talks: INFORMS Annual meeting, Oct 2021.
   INFORMS Annual meeting, Oct 2020, National Harbor, MD.
   Refereed Poster at Mixed Integer Programming Workshop 2020.
   Lightening Talk at Fields Institute Workshop on Optimization, November 2019.
2. Name: Cyrus Hettle
   Tentative Thesis Title: Fairness in Combinatorial Optimization
   Advising Start Date: November 2018.
   Passed Oral Qualifying Exam: Spring 2020.
   Invited Talks: INFORMS Annual meeting 2021, MOPTA, 2021.
   8th International Physical Internet Conference (IPIC) 2021.
   INFORMS Annual meeting, Oct 2020, National Harbor, MD.
   Lightening Talk at Fields Institute Workshop on Optimization, November 2019.
3. Name: Jad Salem
   Tentative Thesis Title: Fairness in Online Learning
   Advising Start Date: Spring 2019.
   Passed Oral Qualifying Exam: Spring 2020.
   Invited Talks: INFORMS Annual meeting 2021.
   Revenue Management and Pricing Conference, June 2021.
   Manufacturing and Service Operations Management Conference, June 2021.
   Privacy Law Scholars Conference, June 2021.
   Data, Law and Ethics Research Workshop, April 2021.
   INFORMS Annual meeting, Oct 2020, National Harbor, MD.
   Lightening Talk at Fields Institute Workshop on Optimization, November 2019.
4. Name: Reuben Tate
   Tentative Thesis Title: Optimization and Machine Learning for Quantum Algorithms.
   Advising Start Date: Spring 2020.
   Passed Oral Qualifying Exam: Fall 2020.
   Invited Talks: MOPTA 2021.
   INFORMS Annual meeting, Oct 2020, National Harbor, MD.
5. Name: Jai Moondra
   Advising Start Data: January 2021.

B.2. Undergraduate Students

1. Name: Michael Wang
   Advised: Fall 2018
   Awards: ISyE Alpha PI Mu Academic Excellence Award
   First Position: Currently a PhD candidate at UC Berkeley

2. Name: Song (Sam) Zhou, Undergraduate Research Assistant, Tsinghua University,
   Advised: March 2017 - Dec 2018
   Awards: Honorable mention in the INFORMS Undergraduate Research Competition 2018
   First Position: Currently a PhD candidate at Cornell University

B.3. Service on Thesis or Dissertation Committees

B.4.a Internal

Student Name	School	Advisor	Committee	Date
Cyrille Combettes	ISyE	S. Pokutta	ML Comps: PhD Proposal: PhD Defense:	Spring 2019 Fall 2020 Spring 2021
Alejandro Agustin Carderera De Diego	ISyE	S. Pokutta	ML Comps: PhD Proposal: PhD Defense:	Fall 2019 Spring 2021 Fall 2021
Matthew O'Shaughnessy	ECE	Christopher J. Rozell, M. Davenport	PhD Proposal: PhD Defense:	Fall 2020 Fall 2021
Michael Wigal	Math	Xingxing Yu	ACO Research Proposal Committee:	Spring 2021
Li Chen	CS	Richard Peng	PhD Proposal:	Fall 2021
Majid Ahmadi	Public Policy	Marilyn A. Brown	PhD Proposal:	Spring 2022
Majid Farhadi (GT)	Math	Prasad Tetali (CMU)	PhD Defense:	Spring 2022

B.4.b External

Student Name	University	Dept	Advisor	Date
Philippe Olivier	École Polytechnique de Montréal	Math & IE	Andrea Lodi	Thesis Defense: May 2021
Ali Khodabhakhsh	UT Austin	ECE	Evdokia Nikolova	Thesis Proposal: Spring 2019, Defense: February 2021

B.4. Mentorship of Postdoctoral Fellows or Visiting Scholars

B.5.a Visiting Scholars

1. Ali Khodabhakhsh, visiting scholar, August 2018, July-August 2019
   Research Topic: Reconfiguration of Electricity Distribution Networks

C. Educational Innovations and Other Contributions

- **ISYE 4803-GUP** *Online Learning and Decision Making:* Dr. Gupta has developed a new undergraduate course on online machine learning algorithms. This course covers fundamental theoretical tools for analyzing online methods, algorithmic techniques for developing computationally efficient methods, applications to real-world problems, and discussions around ethical and legal issues that might arise due to a perceived bias or discrimination in the decisions. The technical content of this course is fairly recent and cutting-edge. The course has both theoretical assignments and practical coding exercises with real-world data sets.

VI. Service

A. Professional Contributions

A.1. Editorial Board Memberships

1. Guest Editor, Health Care Management Science, Special Issue on *Analytical Fairness in Healthcare*, July 2021- present.
2. Associate Editor, *Open Journal of Mathematical Optimization*, July 2020 - present.
3. Guest Editor for Fields Institute Communications Series on *Data Science and Optimization*, July 2020 - present.

A.2. Society Officers, Activities, and Membership

- Leadership Roles:
  1. ICS Quantum Computing Working Group 2020, along with Sven Leyffer, Giacomo Nannicini, Jim Ostrowski and Luis Zuluaga, 2020 - present.
  2. Ethical AI Lead, NSF AI Institute on AI for Optimization, 2021 - present.
- Award Committees:
  1. INFORMS Doing Good with OR Student Paper Competition, 2021
- Membership:
  1. IEEE Member (2021 - present)
  2. MOS: Mathematical Optimization Society (2012 - present). Co-editor of their biannual newsletter OPTIMA (2020 - present).
  3. INFORMS: Institute for Operations Research and Management Science (2012 - present)
     - Societies: Analytics Society, Computing Society, Junior Faculty Interest Group, MSOM, Optimization Society, Revenue Management and Pricing, Service Science
  4. ACM: Association for Computing Machinery (2019 - present)
  5. IISE: Institute of Industrial and Systems Engineers

A.3. Organization and Chairmanship of Technical Sessions, Workshops and Conferences

- Member of Organizing Committee for Conferences and Workshops:
  1. Organizing Committee Member, ICERM Workshop on Trends in Computational Discrete Optimization, 2023 (jointly with Antoine Deza and Volker Kaibel, as a part of a semester on Discrete Optimization organized by Jesús De Loera, Antoine Deza, Marcia Fampa, Volker Kaibel, Jon Lee, and Laura Sanità).
  2. Organizing Committee Member, Integer Programming and Combinatorial Optimization (IPCO) 2021 (jointly with Mohit Singh, Santanu Dey and Alejandro Toriello).
  3. Co-organizer, "Focused Program on Data Science and Optimization" at the Fields Institute, Toronto, from November 2019-2020 (jointly with Sebastian Pokutta, Sanjeena Dang, Antoine Deza, Paul McNicholas, Masashi Sugiyama).
  4. Co-organizer, "Optimization and Fairness" mini-symposium, Simons Institute, November 2017 (jointly with David Williamson).
- Member of Technical Program Committees for Conferences: ACM Conference on Fairness, Accountability and Transparency **FAccT 2022** (area chair), International Symposium on Combinatorial Optimization ISCO 2022 (declined[5]), Web and Internet Economics **WINE 2021**, Workshop on Operations of People-Centric Systems **EC workshop 2021**, Foundations of Responsible Computing **FORC 2021** (and publications co-chair), The Web Conference **WWW 2021**, **AAAI** Conference on Artificial Intelligence 2020, **AAAI-20** AI for Social Impact Track 2020, Approximation Algorithms for Combinatorial Optimization Problems **APPROX 2019**

A.4. Technical Journal or Conference Referee Activities

- Technical Journal Referee: ACM Transactions on Algorithms, Quantum, INFORMS Journal on Optimization, Nature (Human Behavior), Management Science, Manufacturing and Service Operations (M&SOM), Mathematical Programming, SIAM Journal of Optimization, Operations Research, Networks, Naval Research Logistics, Discrete Optimization, Theory of Computing
- Conference Referee: International Conference on Learning Representations (ICLR) 2020, Neural Information Processing Systems (NeurIPS) 2020 and 2021, ACM-SIAM Symposium on Discrete Algorithms (SODA) 2021 and 2016, ACM-Symposium on Theory of Computing (STOC) 2018

A.5. Proposal Panels and Reviews

- Panelist, CISE, National Science Foundation, 2021-22
- Reviewer for Office of Naval Research, 2020
- Panelist, Robust Intelligence, CISE, National Science Foundation, 2019-20
- Panelist, Algorithmic Foundations, CISE, National Science Foundation, 2018-19
- Panelist, Robust Intelligence, CISE, National Science Foundation, 2018-19

[5]Declined due to unexpected medical reasons.

VII. Societal and Policy Impacts

A. Outreach to Law Professionals and Policy Makers

[1] Presented our work on "Discovering Opportunities in New York City's Discovery Program: an Analysis of Affirmative Action Mechanisms" to the Department of Education in New York, 2022, with Yuri Faenza and Xuan Zhang. We analyzed that current implementation of the discovery program creates incentives to underperform, and provided a new mechanism which with minimal changes to the status-quo can align incentives.

[2] Featured academic speaker at IAPP Global Privacy Summer, Washington DC, April 2022. Together with Brenda Leong (Former Future of Privacy Forum) and Kat Robinson (NIKE), we gave a 4-hour workshop on *AI for Privacy Professionals*.

[3] Featured academic speaker invited by FPF to present recent work on "Individual Fairness in Hindsight" at the "Little Big Stage", International Association of Privacy Professionals (IAPP), Washington DC, May 2, 2019. Presented our work on individual fairness in hindsight to law and policy makers, as a way of incorporating fairness in online learning models.

[4] Panelist, "Profiling, micro-targeting and a right to reasonable algorithmic inferences", organized by Microsoft at the *International Conference on Computers, Privacy and Data Protection*, in Brussels, January 30 - Feb 1, 2019.

[5] Tutorial on "Bias and Fairness in ML/AI", Swati Gupta in collaboration with the Future of Privacy Forum, Official side-event at the International Conference of Data Protection (ICDPPC), 2018 and the first lecture in the *Digital Data Flows Masterclass* lecture series organized by the Future of Privacy Forum.

B. K-12 and Diversity, Inclusion and Equity Outreach Activities

[1] Advisory Board of GoSTEM (collaborative partnership at Georgia Tech between the Center for Education Integrating Science, Mathematics and Computing (CEISMC) and Institute Diversity, Equity and Inclusion (IDEI))

[2] Two Invited Talks on "Impact of Algorithms on Society" to high schools students at the Tapia Summer Camps, Tapia Center for Excellence and Equity in Education, Rice University, Texas, June 2021.

[3] Invited seminar on "Fairness and Bias in Algorithms" to upper class level students at the Mount Vernon School, Sandy Springs, Georgia, September 2020.

[4] Seminar on "Fairness and Bias in Algorithms" to fifth graders at the Peeples Elementary School, Fayette County, Georgia, October 2019. *Dr. Gupta subsequently received $\sim$30 handwritten letters by elementary school students thanking her and discussing ideas on fairness in their day-to-day lives.*

[5] Seminar on "Prediction, Algorithms and Subsets" to second graders at the Midvale Elementary School, Dekalb County, Atlanta Science Festival, March 2019

[6] "Fairness in Applied OR", Ford FOCUS Scholars Event, January 2019

[7] "Predictability and Learning" for high school students (36% females and 17% students on scholarship), at the Mission Possible Summer Camp, Georgia Tech, June 2018

[8] Instructor, Beginners I-II Sections, Class 5-6, module on "Growth and Decay of Exponentials", *Berkeley Math Circle, UC Berkeley*, a weekly Mathematics program for over 500 San Francisco Bay Area elementary, middle and high school students, January 2018

[9] “Power of Exponential”, *BLOSSOMS educational video*, created with Nataly Youssef and John Silberholz. This video has been dubbed in Urdu and Mandarin. It is a part of the Florida High School Math Curriculum (CPALMS: resource 28034)