

# Mehrdad Ghadiri

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## EMPLOYMENT HISTORY

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<b>MIT</b> Postdoctoral Associate	September 2023 - Present LIDS/IDSS, Host: Ali Jadbabaie
<b>Adobe - Real-time Experiences and Algorithms Lab</b> Research Scientist Intern	May 2022 - August 2022 Hosts: Anup Rao, Tung Mai, David Arbour
<b>Google - Algorithms and Optimization Team</b> Student Researcher	Aug 2021 - May 2022 Hosts: Matthew Fahrback, Thomas Fu
<b>Google - Algorithms and Optimization Team</b> Research Intern	May 2021 - Aug 2021 Hosts: Matthew Fahrback, Thomas Fu

## EDUCATION

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<b>Georgia Institute of Technology</b> Ph.D. in Algorithms, Combinatorics and Optimization / Computer Science Thesis title: “Scalable, Efficient, and Fair Algorithms for Structured Convex Optimization Problems.” Minor: Algebraic and Enumerative Combinatorics.	2019 - 2023 Advisor: Santosh Vempala
<b>University of British Columbia</b> M.Sc. in Computer Science Thesis title: “Beyond Submodular Maximization: One-Sided Smoothness and Meta-Submodularity.”	2017 - 2019 Advisors: Bruce Shepherd and Mark Schmidt
<b>Sharif University of Technology</b> B.Sc. in Information Technology Engineering. Thesis title: “Discrete Voronoi Games.”	2011 - 2016

## RESEARCH INTERESTS

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- Continuous and discrete optimization, numerical linear algebra and their applications in machine learning, statistics, and causal inference.
- Societal aspects of operations research and algorithms such as fairness and differential privacy.

## HONORS AND AWARDS

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• <b>INFORMS George B. Dantzig Dissertation Award (Honorable Mention)</b>	2024
• <b>Sigma Xi Best Ph.D. Thesis Award</b> This is awarded to <b>only 10 Ph.D. dissertations per year</b> (1-2% of all Ph.D. dissertations awarded annually by Georgia Tech across all disciplines).	2024
• <b>Georgia Tech’s College of Computing Outstanding Doctoral Dissertation Award</b>	2024
• <b>ARC-TRIAD Student Fellowship</b>	2022
• <b>ML@GT Fellowship</b>	2021
• <b>IDEaS-TRIAD Research Scholarship for Ph.D. Students and Postdocs</b>	2020
• <b>Borealis AI Global Fellowship Award</b> This fellowship is awarded to <b>only 10 students per year</b> who pursue graduate degrees (M.Sc. or Ph.D.) at Canadian universities in computer science and related fields with a focus on machine learning or artificial intelligence. I was the <b>only M.Sc. student</b> who won this award that year.	2018
• <b>Silver Medal in Iranian National Mathematical Olympiad</b>	2010

## JOURNAL PUBLICATIONS

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The authors are listed alphabetically for papers denoted by  $(\alpha-\beta)$ . Equal Contribution is denoted by \*.

- [J5] *Beyond Submodular Maximization via One-Sided Smoothness*, M. Ghadiri, R. Santiago, B. Shepherd. *Minor revision* at **Mathematical Programming Series A**.
- [J4] *On Symmetric Factorizations of Hankel Matrices*, M. Ghadiri. *Major revision* at Algorithmica.
- [J3] *A Multiscale Agent-Based Framework Integrated with a Constraint-Based Metabolic Network Model of Cancer for Simulating Tumor Growth*, M. Ghadiri\*, M. Heidari\*, S. A. Marashi and S. H. Mousavi, **Molecular BioSystems**, 13(9): 1888-1897, 2017.

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### Under review/submitted journal papers

- [J2] *A Parameterized Family of Meta-Submodular Functions*, M. Ghadiri, R. Santiago, B. Shepherd. Under review at Mathematics of Operations Research.
- [J1] *A Note on the Stability of the Sherman-Morrison-Woodbury Formula*, L. Ma, C. Boutsikas, M. Ghadiri, P. Drineas. Under review at SIAM Journal on Matrix Analysis and Applications.

## CONFERENCE PUBLICATIONS (PEER-REVIEWED)

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- [C17] *Fast Tensor Completion via Approximate Richardson Iteration*, M. Ghadiri, M. Fahrbach, Y. Kook, A. Jadbabaie. **ICML** 2025.
- [C16] *The Bit Complexity of Dynamic Algebraic Formulas and their Determinants*, E. Anand, J. Brand, M. Ghadiri, D. Zhang, **ICALP** 2024. ( $\alpha$ - $\beta$ )
- [C15] *Improving the Bit Complexity of Communication for Distributed Convex Optimization*, M. Ghadiri, Y. T. Lee, S. Padmanabhan, W. Swartworth, D. P. Woodruff, G. Ye. **STOC** 2024. ( $\alpha$ - $\beta$ )
- [C14] *A Parameterized Family of Meta-Submodular Functions*, M. Ghadiri, R. Santiago, B. Shepherd. **SODA** 2024. ( $\alpha$ - $\beta$ )
- [C13] *Finite Population Regression Adjustment and Non-asymptotic Guarantees for Treatment Effect Estimation*, M. Ghadiri, D. Arbour, T. Mai, C. Musco, A. Rao. **NeurIPS** 2023.
- [C12] *The Bit Complexity of Efficient Continuous Optimization*, M. Ghadiri, R. Peng, S. Vempala. **FOCS** 2023. ( $\alpha$ - $\beta$ )
- [C11] *On Symmetric Factorizations of Hankel Matrices*, M. Ghadiri. **FOCS** 2023.  
— This is one of the **only two papers** (out of about 30) accepted in the conjecture track at FOCS.
- [C10] *Approximately Optimal Core Shapes for Tensor Decompositions*, M. Ghadiri\*, M. Fahrbach\*, G. Fu, V. Mirrokni. **ICML** 2023.
- [C9] *Subquadratic Kronecker Regression with Applications to Tensor Decomposition*, M. Fahrbach and G. Fu, M. Ghadiri. **NeurIPS** 2022. ( $\alpha$ - $\beta$ )
- [C8] *Amortized Rejection Sampling in Universal Probabilistic Programming*, S. Naderiparizi, A. Scibior, A. Munk, M. Ghadiri, A. G. Baydin, B. G. Hansen, C. S. de Witt, R. Zinkov, P. Torr, T. Rainforth, Y. W. Teh, F. Wood. **AISTATS** 2022. [**Oral Presentation**]  
— A preliminary version appeared in PROBPROG 2020.
- [C7] *Socially Fair k-Means Clustering*, M. Ghadiri, S. Samadi, S. Vempala. **FAccT** 2021.
- [C6] *Beyond Submodular Maximization via One-Sided Smoothness*, M. Ghadiri, R. Santiago, B. Shepherd. **SODA** 2021. ( $\alpha$ - $\beta$ )
- [C5] *Distributed Maximization of Submodular Plus Diversity Functions for Multi-label Feature Selection on Huge Datasets*, M. Ghadiri, M. Schmidt. **AISTATS** 2019.
- [C4] *Scalable Feature Selection via Distributed Diversity Maximization*, S. Abbasi Zadeh\*, M. Ghadiri\*, V. Mirrokni and M. Zadimoghaddam. **AAAI** 2017. [**Oral Presentation**]
- [C3] *Linear Relaxations for Finding Diverse Elements in Metric Spaces*, A. Bhaskara, M. Ghadiri, V. Mirrokni, O. Svensson. **NeurIPS** 2016. ( $\alpha$ - $\beta$ )
- [C2] *Minimizing the Total Movement for Movement to Independence Problem on a Line*, M. Ghadiri, S. Yazdanbod. **CCCG** 2016. ( $\alpha$ - $\beta$ )
- [C1] *Active Distance-Based Clustering using K-medoids*, A. Aghae\*, M. Ghadiri\*, M. S. Baghshah. **PAKDD** 2016.

## PREPRINTS

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- *Entrywise Approximate Matrix Inversion*, M. Ghadiri, J. Yang. In submission. arXiv preprint: 2504.19054. ( $\alpha$ - $\beta$ )
- *Constant-Factor Approximation Algorithms for Socially Fair k-Clustering*, M. Ghadiri, M. Singh, S. Vempala, arXiv preprint: 2206.11210. ( $\alpha$ - $\beta$ )

## TALKS

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- *Non-Asymptotic Guarantees for Treatment Effect Estimation Using Regression Adjustment*, at **CMU Theory Lunch**, Pittsburgh, PA, January 2025.
- *Approximately Optimal Core Shapes for Tensor Decompositions*, at **JTL Urban Mobility Lab at MIT**, Cambridge, MA, November 2024.
- *Non-Asymptotic Guarantees for Treatment Effect Estimation Using Regression Adjustment*, at **Google Research**, Online, September 2024.
- *Fast and Approximately Optimal Tucker Decompositions*, at **Global Technology Applied Research Center at JP Morgan Chase**, Online, August 2024.
- *Fast and Approximately Optimal Tucker Decompositions*, at **Tensor Network Reading Group, Mila - Quebec AI Institute**, Online, March 2024.
- *Finite Population Regression Adjustment and Non-asymptotic Guarantees for Treatment Effect Estimation*, at **LIDS Student Conference at MIT**, Cambridge, MA, February 2024.
- *Scalable Constant-Factor Approximation Algorithms for Socially Fair k-Clustering*, at **INFORMS Session on Fairness in Operations Research**, Phoenix, AZ, October 2023.
- *On Symmetric Factorizations of Hankel Matrices*, at **Carnegie Mellon University (CMU)**, Pittsburgh, PA, May 2023.
- *Bit Complexity of Efficient Optimization*, at **University of British Columbia (UBC)**, Vancouver, BC, April 2023.
- *On Symmetric Factorizations of Hankel Matrices*, at **American Mathematical Society (AMS) Special Session on Algebraic Methods in Algorithms, II**, Atlanta, GA, March 2023.
- *Bit Complexity of Efficient Optimization*, at **Canadian Mathematical Society (CMS) Special Session on Algorithms and Complexity aspects of Optimization**, Toronto, ON, December 2022.

- *Socially Fair  $k$ -Clustering*, at **INFORMS Special Session on Ethical AI and Optimization - Part II**, Indianapolis, IN, October 2022.
- *Faster  $p$ -Norm Regression Using Sparsity*, at **University of Washington (UW)**, Seattle, WA, May 2022.
- *Socially Fair  $k$ -Means Clustering*, at the 8th Biennial Canadian Discrete and Algorithmic Mathematics Conference (**CanaDAM**), Online, May 2021.
- *Beyond Submodular Maximization via One-Sided Smoothness and Meta-Submodularity*, at **Google Research**, Online, January 2021.
- *In Search of Tractable Supermodular Maximization Problems*, at the 7th Biennial Canadian Discrete and Algorithmic Mathematics Conference (**CanaDAM**), Vancouver, BC, May 2019.
- *Beyond Submodular Maximization*, at the **Bellairs Workshop on Discrete Optimization**, Barbados, April 2019.
- *Scalable Feature Selection via Distributed Submodular and Diversity Maximization*, at the **Element AI Research Workshop**, Vancouver, BC, August 2018.

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## TEACHING ASSISTANTSHIPS

- Georgia Institute of Technology: Computation and the Brain (Graduate Course), Dynamic Algebraic Algorithms (Graduate Course).
- University of British Columbia: Combinatorial Optimization (Graduate Course), Intermediate Algorithm Design and Analysis, Advanced Algorithm Design and Analysis.
- Sharif University of Technology: Discrete Structures (3 times), Fundamentals Of Programming, Engineering Probability and Statistics, Signals and Systems, Technical and Scientific Presentation.

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## PROFESSIONAL SERVICE AND ACTIVITIES

- **Founding member** and student/faculty affairs chair of School of Computer Science **Graduate Student Association** (SCS-GSA) at Georgia Institute of Technology (May 2021- April 2022).
- **Reviewed** for the following **journals**: INFORMS Journal on Computing, Operations Research Letters, Journal of Machine Learning Research, Journal of Combinatorial Optimization, SIAM Journal on Discrete Mathematics, Algorithmica, Mathematical Programming, IEEE Signal Processing Letters.
- **Reviewed** for the following **conferences**: NeurIPS (2016, 2019, 2020, 2022, 2023, 2024), APPROX 2019, SODA (2020, 2023, 2025), AAAI 2021, ICLR 2021, STOC (2021, 2022, 2024), FORC 2021, ICALP (2022, 2024), ICML (2022, 2025), FAccT 2023, FOCS (2023, 2024), STACS 2024, IPCO 2024, ESA 2024.
- Co-organized a special session on **algebraic methods in algorithms** at 2023 spring southeastern sectional meeting of **American Mathematical Society (AMS)**, Atlanta, GA.
- Organized a **reading group on differential privacy** in Spring 2022 at Georgia Institute of Technology.
- Co-organized the UBC **machine learning reading group** in Fall 2018, Spring 2019, and Summer 2019.

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## REFERENCES

- Massachusetts Institute of Technology: Ali Jadbabaie, Alberto Abadie
- Georgia Institute of Technology: Santosh Vempala (Ph.D advisor), Mohit Singh
- Carnegie Mellon University: Richard Peng
- University of British Columbia: Bruce Shepherd (M.Sc. advisor), Mark Schmidt (M.Sc. advisor)
- Google: Vahab Mirrokni, Matthew Fahrback, Morteza Zadimoghaddam