Mehrdad Ghadiri

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Employment History

MIT — September 2023 - Present
Postdoctoral Associate — Host: Swati Gupta

Adobe - Real-time Experiences and Algorithms Lab — May 2022 - August 2022
Research Scientist Intern — Hosts: Anup Rao, Tung Mai, David Arbour

Google - Algorithms and Optimization Team — Aug 2021 - May 2022
Student Researcher — Hosts: Matthew Fahrbach, Thomas Fu

Google - Algorithms and Optimization Team — May 2021 - Aug 2021
Research Intern — Hosts: Matthew Fahrbach, Thomas Fu

Education

Georgia Institute of Technology — 2019 - 2023
Ph.D. in Algorithms, Combinatorics and Optimization / Computer Science — Advisor: Santosh Vempala
Thesis title: "Scalable, Efficient, and Fair Algorithms for Structured Convex Optimization Problems."

University of British Columbia — 2017 - 2019
M.Sc. in Computer Science — Advisors: Bruce Shepherd and Mark Schmidt
Thesis title: "Beyond Submodular Maximization: One-Sided Smoothness and Meta-Submodularity."

Sharif University of Technology — 2011 - 2016
B.Sc. in Information Technology Engineering. Thesis title: "Discrete Voronoi Games."

Research Interests

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

Honers and Awards

- **Georgia Tech's Sigma Xi Best Ph.D. Thesis Award** — 2024
  This is awarded to **only 10 dissertations per year** (1-2% of all dissertations awarded annually by Georgia Tech across all disciplines).
- **Georgia Tech's College of Computing Outstanding Doctoral Dissertation Award** — 2024
- **ARC-TRIAD Student Fellowship** — 2022
- **ML@GT Fellowship** — 2021
- **IDEaS-TRIAD Research Scholarship for Ph.D. Students and Postdocs** — 2020
- **Borealis AI Global Fellowship Award** — 2018
  This fellowship is awarded to **only 10 students per year** 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 **only M.Sc. student** who won this award that year.
- **Silver Medal in Iranian National Mathematical Olympiad** — 2010

Journal Publications

The authors are listed alphabetically for papers denoted by (α-β). Equal Contribution is denoted by *.

- *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.

Conference Publications (Peer-Reviewed)

- *The Bit Complexity of Dynamic Algebraic Formulas and their Determinants*, E. Anand, J. Brand, M. Ghadiri, D. Zhang, **ICALP** 2024.
- *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. (α-β)
- *A Parameterized Family of Meta-Submodular Functions*, M. Ghadiri, R. Santiago, B. Shepherd. **SODA** 2024. (α-β)
- *Finite Population Regression Adjustment and Non-asymptotic Guarantees for Treatment Effect Estimation*, M. Ghadiri, D. Arbour, T. Mai, C. Musco, A. Rao. **NeurIPS** 2023.
- *The Bit Complexity of Efficient Continuous Optimization*, M. Ghadiri, R. Peng, S. Vempala. **FOCS** 2023. (α-β)
- *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.
- *Approximately Optimal Core Shapes for Tensor Decompositions*, M. Ghadiri*, M. Fahrbach*, G. Fu, V. Mirrokni. **ICML** 2023.

- *Subquadratic Kronecker Regression with Applications to Tensor Decomposition*, M. Fahrbach and G. Fu, M. Ghadiri. **NeurIPS** 2022. (α-β)
- *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.
- *Socially Fair k-Means Clustering*, M. Ghadiri, S. Samadi, S. Vempala. **FAccT** 2021.
- *Beyond Submodular Maximization via One-Sided Smoothness*, M. Ghadiri, R. Santiago, B. Shepherd. **SODA** 2021. (α-β)
- *Distributed Maximization of Submodular Plus Diversity Functions for Multi-label Feature Selection on Huge Datasets*, M. Ghadiri, M. Schmidt. **AISTATS** 2019.
- *Scalable Feature Selection via Distributed Diversity Maximization*, S. Abbasi Zadeh[*], M. Ghadiri[*], V. Mirrokni and M. Zadimoghaddam. **AAAI** 2017. [**Oral Presentation**]
- *Linear Relaxations for Finding Diverse Elements in Metric Spaces*, A. Bhaskara, M. Ghadiri, V. Mirrokni, O. Svensson. **NeurIPS** 2016. (α-β)
- *Minimizing the Total Movement for Movement to Independence Problem on a Line*, M. Ghadiri, S. Yazdanbod. **CCCG** 2016. (α-β)
- *Active Distance-Based Clustering using K-medoids*, A. Aghaee[*], M. Ghadiri[*], M. S. Baghshah. **PAKDD** 2016.

Preprints

- *Constant-Factor Approximation Algorithms for Socially Fair k-Clustering*, M. Ghadiri, M. Singh, S. Vempala, arXiv preprint: 2206.11210.

Talks

- *Fast and Approximately Optimal Tucker Decompositions*, at **Tensor Network Reading Group, Mila - Quebec AI Institute**, Virtual, March 2024.
- *Finite Population Regression Adjustment and Non-asymptotic Guarantees for Treatment Effect Estimation*, at **LIDS Student Conference**, 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**), Virtual, May 2021.
- *Beyond Submodular Maximization via One-Sided Smoothness and Meta-Submodularity*, at **Google Research**, Virtual, 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.

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.

Professional Service

- **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, and Mathematical Programming.
- **Reviewed** for the following **conferences**: NeurIPS (2016, 2019, 2020, 2022, 2023), APPROX 2019, SODA (2020, 2023), AAAI 2021, ICLR 2021, STOC (2021, 2022, 2024), FORC 2021, ICALP (2022, 2024), ICML 2022, FAccT 2023, FOCS 2023, STACS 2024, IPCO 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.

References

- 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, Morteza Zadimoghaddam, Matthew Fahrbach