

# Kishen N Gowda

Ph.D. Student in Computer Science @ University of Maryland, College Park

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## Research Interests

My research focuses on designing efficient and scalable parallel algorithms for graph-theoretic and combinatorial optimization problems. I am particularly interested in clustering algorithms and their theoretical foundations, as well as fast, practical implementations that power large-scale vector and multi-vector retrieval and related applications.

## Education

- 🎓 **University of Maryland, College Park, MD, USA** AUG '21 – DEC '26  
M.S. and Ph.D. in Computer Science  
Advised by *Prof. Laxman Dhulipala* and *Prof. Aravind Srinivasan*
- 🎓 **Indian Institute of Technology, Gandhinagar, Gujarat, India** AUG '17 – DEC '20  
B.Tech. in Computer Science and Engineering

## Internships

- 🏢 **Student Researcher, Google LLC** FALL & WINTER '24  
Manager: Rajesh Jayaram, Graph Mining Team  
Working on efficient multi-vector clustering and retrieval algorithms, in theory and practice.
- 🏢 **Visiting Research Fellow, Brown University** SUMMER '24  
Advisor: Prof. D. Ellis Hershkowitz  
Developed parallel algorithms for Hierarchical Agglomerative Clustering (HAC) under non-reducible linkage functions, and studied the parallel complexity of computing envy-free allocations in fair-division problems.
- 🏢 **Research Intern, Indian Institute of Science, Bangalore** SPRING & SUMMER '21  
Advisors: Prof. Anand Louis & Amit Deshpande (Microsoft Research India)  
Worked on designing a general framework for fair clustering with theoretical guarantees and strong empirical performance.
- 🏢 **Research Intern, University of Bergen, Norway** SUMMER '20  
Advisors: Prof. Saket Saurabh & Prof. Fahad Panolan  
Designed and analyzed faster randomized FPT algorithms for problems including Almost Forest Deletion, Pseudo Forest Deletion, and their generalizations.
- 🏢 **Narendra Summer Research Intern, Indian Institute of Science, Bangalore** SUMMER '19  
Advisor: Prof. Arindam Khan  
Studied the two-dimensional strip packing problem and developed heuristics to improve the worst-case performance of Steinberg's and Schiermeyer's algorithms.

## Publications

### Conference Proceedings

- 1 **UFO Trees: Practical and Provably-Efficient Parallel Batch-Dynamic Trees** PPoPP '26  
Quinten De Man, Atharva Sharma, *Kishen N Gowda*, and Laxman Dhulipala
- 2 **Fully-Dynamic Parallel Algorithms for Single-Linkage Clustering** SPAA '25  
<sup>abc</sup> Quinten De Man, Laxman Dhulipala, and *Kishen N Gowda*
- 3 **Efficient Centroid-Linkage Clustering** NEURIPS '24  
<sup>abc</sup> MohammadHossein Bateni, Laxman Dhulipala, Willem Fletcher, *Kishen N Gowda*, D Ellis Hershkowitz, Rajesh Jayaram, and Jakub Łącki

- 4 **It's Hard to HAC Average Linkage!** ICALP '24  
*abc* MohammadHossein Bateni, Laxman Dhulipala, *Kishen N Gowda*, D Ellis Hershkowitz, Rajesh Jayaram, and Jakub Łącki
- 5 **Optimal Parallel Algorithms for Dendrogram Computation and Single-Linkage Clustering** SPAA '24  
*abc* Laxman Dhulipala, Xiaojun Dong, *Kishen N Gowda*, and Yan Gu
- 6 **Socially Fair Center-Based and Linear Subspace Clustering** ECML PKDD '23  
Sruthi Gorantla, *Kishen N Gowda*, Amit Deshpande, and Anand Louis
- 7 **Improved Bi-point Rounding Algorithms and a Golden Barrier for k-Median** SODA '23  
*abc* *Kishen N Gowda*, Thomas Pensyl, Aravind Srinivasan, and Khoa Trinh
- 8 **Improved FPT Algorithms for Deletion to Forest-Like Structures** ISAAC '20  
*abc* *Kishen N Gowda*, Aditya Lonkar, Fahad Panolan, Vraj Patel, and Saket Saurabh
- 9 **A Parameterized Perspective on Attacking and Defending Elections** IWOCA '20  
*abc* *Kishen N Gowda*, Neeldhara Misra, and Vraj Patel

## Journal Articles

- 1 **Improved FPT Algorithms for Deletion to Forest-Like Structures** ALGORITHMICA '24  
*abc* *Kishen N Gowda*, Aditya Lonkar, Fahad Panolan, Vraj Patel, and Saket Saurabh

## Manuscripts

- 1 **Parallel Hierarchical Agglomerative Clustering in Low Dimensions** PREPRINT ON ARXIV  
*abc* MohammadHossein Bateni, Laxman Dhulipala, Willem Fletcher, *Kishen N Gowda*, D Ellis Hershkowitz, Rajesh Jayaram, and Jakub Łącki







## Honors and Awards

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|--|-------------|
| 🏆 NSF Student Travel Grant, SPAA '24   | 2024        |
| 🏆 SIAM Travel Award, SODA '23  | 2023        |
| 🏆 Gold Medal, IIT Gandhinagar  | 2021        |
| Awarded for best performance in core courses of Physics, Chemistry and Life Sciences |             |
| 🏆 Dean's List, IIT Gandhinagar   | 2017 – 2020 |
| Awarded for outstanding academic performance in a graded semester                    |             |
| 🏆 Mitacs Globalink Research Internship (program called-off due to the pandemic)      | 2020        |
| 🏆 Honorable Mention at ACM ICPC Amritapuri and Kanpur Regionals                      | 2019        |
| 🏆 Narendra Summer Research Internship, IISc Bangalore, India                         | 2019        |

## Skills




- Programming 🦄 C++, Python, C; Mathematica,  $\LaTeX$ , Bazel, Eigen.
- ML & Retrieval 🦄 PyTorch; clustering, hierarchical clustering, nearest-neighbor search, multi-vector retrieval.
- Web Dev 🦄 HTML/CSS, JavaScript; Django, Flask.

## Selected Projects







-  **Parallel Batch-Dynamic and Phase-Concurrent Treaps** 2025  
*Advisor:* Prof. Laxman Dhulipala  
Designed work-optimal batch-parallel and phase-concurrent *join* and *split* algorithms for treaps. The resulting concurrent treap implementation achieves  $2-3\times$  speedups while using  $1.5\times$  less memory compared to the highly optimized phase-concurrent skip lists.
-  **Socially-Fair Correlation Clustering** 2023  
*Advisor:* Prof. Furong Huang  
Designed a PTAS for a natural *fairness*-constrained variant of correlation clustering under the maximizing agreements objective.
-  **Quantum Speed-ups for Dynamic Programming Algorithms: A Write-Up** 2021  
*Advisor:* Prof. Daniel Gottesman  
Surveyed the techniques introduced by Ambainis et al. [SODA '18] for achieving quantum speed-ups in dynamic programming based algorithms for NP-hard problems.
-  **A Survey on Matching in the Graph-Stream Model** 2020  
*Advisor:* Prof. Anirban Dasgupta  
Conducted a comprehensive survey and empirical evaluation of algorithms for maximum matching in the semi-streaming model.
-  **MiniNim** 2019  
*Advisor:* Prof. Bireswar Das  
Implemented a compiler for a concise subset of the Nim programming language in C, targeting MIPS assembly as the backend.
-  **Map Reduce Library** 2019  
*Advisor:* Prof. Nipun Batra  
Implemented and evaluated a reliable MapReduce library in C. Designed approximation-based scheduling strategies for mapper workloads and implemented an efficient external sorting routine.

## Miscellaneous Experience

### Invited Talks

-  **Optimal Parallel Algorithms for Dendrogram Computation and Single-Linkage Clustering** 2025  
Brown Theory Seminar, Brown University, Providence, RI.
-  **Improved Bi-point Rounding Algorithms and a Golden Barrier for k-Median** 2023  
Algorithms and Complexity Theory Seminar, Johns Hopkins University, Baltimore, MD.
-  **Improved Bi-point Rounding Algorithms and a Golden Barrier for k-Median** 2023  
Capital Area Theory Seminar (CATS) Series, University of Maryland, College Park, MD.

### Visits

-  **AlgoPARC Workshop on Parallel Algorithms and Data Structures** 2025  
University of Hawaii at Manoa, HI.
-  **Fusing Theory and Practice of Graph Algorithms** 2025  
ICERM, Brown University, Providence, RI.
-  **DIMACS Tutorial on Fine-Grained Complexity** 2024  
DIMACS, Rutgers University, Piscataway, NJ.
-  **DIMACS Workshop on Efficient Algorithms for High Dimensional Metrics: New Tools** 2024  
DIMACS, Rutgers University, Piscataway, NJ.
-  **DIMACS Workshop on Modern Techniques in Graph Algorithms** 2023  
DIMACS, Rutgers University, Piscataway, NJ.
-  **Parameterized Complexity 201**, IISER Pune, India. 2020

## Miscellaneous Experience (continued)

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### Professional Service

- 📖 **Tutorial Organizer and Presenter**, SPAA '25, Portland, Oregon, US. 2025  
*Topic:* Tutorial on Parallel Clustering
- 📖 **SPAA '25 Junior Program Committee** 2025
- 📖 **Organizer, Capital Area Theory Seminar (CATS)** 2023 – 2024  
Responsible for organizing the UMD CS Theory weekly seminar and hosting external speakers.
- 📖 **President and Co-founder, GRASP**, Competitive Programming Group at IIT Gandhinagar. 2019 – 2021
- 📖 **Organizer and Problem Setter, HackRush**, intra-college hackathon, IIT Gandhinagar. 2018 – 2021
- 📖 **Event Organizer, Amalthea**, IIT Gandhinagar's Annual Tech Summit. 2018
- 📖 **Reviewer**. FOCS '25, ESA '25, SPAA '25, AISTATS '25, ICLR '23, ESA '21

### Teaching Experience

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- 👤 **Graduate Teaching Assistant**, University of Maryland, College Park 2021 – PRESENT  
Courses: Algorithms (CMSC 351), Analysis of Algorithms (CMSC 451), Scalable Parallel Algorithms and Data Structures (CMSC 858N)
- 👤 **Teaching Assistant**, IIT Gandhinagar 2020  
Course: Data Structures and Algorithms I (ES 242)
- 👤 **Tutorial Organizer and Presenter** at GRASP and METIS, IIT Gandhinagar 2018 – 2020  
Organized various workshops and tutorials on competitive programming, C++, web scraping, etc.

### Key Courses

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- Graduate Level 📖 Advanced Algorithms, Computational Geometry, Convex Optimization, Randomized Algorithms, Shared Memory Algorithms, Quantum Information Processing.
- Data Science 📖 Advanced Numerical Optimization, Algorithms in Machine Learning: Guarantees and Analyses, Numerical Methods in Data Science and Machine Learning, Probabilistic Models.