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 – Present
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
[abc] Quinten De Man, Laxman Dhulipala, *Kishen N Gowda*, and Atharva Sharma

2   **Fully-Dynamic Parallel Algorithms for Single-Linkage Clustering**   SPAA '25
[abc] Quinten De Man, Laxman Dhulipala, and *Kishen N Gowda*

3   **Efficient Centroid-Linkage Clustering**   NeurIPS '24
[abc] 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

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)

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

- **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

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.