

Kishen N Gowda

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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 and practical implementations that power large-scale vector and multi-vector retrieval and related applications.

Education

- 🎓 **University of Maryland, College Park, MD, USA** AUG '21 – MAY '27
M.S. and Ph.D. in Computer Science
Advisors: *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

Industry and Research Experience

- 🧰 **Intern Technical (PhD), eBay Inc.** SUMMER '26
Manager: Viswa Vutharkar, Cloud Data Technologies (CDT)
We developed an adaptive cost-based query planner for MonstorDB, eBay's distributed document database, using online cost learning and joint cardinality estimation to adapt index selection as data distributions change. We achieved up to $65.5\times$ speedups in end-to-end latency. We are currently working on implementing the new planner into production.
- 🧰 **Student Researcher, Google LLC** FALL & WINTER '24
Manager: Rajesh Jayaram, Graph Mining Team
We introduced and studied the problem of multi-vector clustering with Chamfer distance, a dissimilarity measure widely used in the area of multi-vector retrieval. We developed a practical Lloyd-style iterative approach, *MV-Lloyd*, for clustering point clouds and building high-quality multi-vector cluster centers. We leverage this to design *MV-IVF*, an IVF-based method for highly-scalable multi-vector retrieval.
- 🧰 **Visiting Research Fellow, Brown University** SUMMER '24
Advisor: Prof. D. Ellis Hershkowitz
We worked on designing parallel algorithms for Hierarchical Agglomerative Clustering (HAC) under non-reducible linkage functions such as Ward's and centroid. We also studied the parallel complexity of computing envy-free allocations for indivisible items.
- 🧰 **Research Intern, Indian Institute of Science, Bangalore** SPRING & SUMMER '21
Advisors: Prof. Anand Louis & Amit Deshpande (Microsoft Research India)
We developed a general framework for socially-fair clustering of points using points as well as linear subspaces as cluster representatives. We prove theoretical fairness and efficiency guarantees, as well as show strong empirical performance.
- 🧰 **Research Intern, University of Bergen, Norway** SUMMER '20
Advisors: Prof. Saket Saurabh & Prof. Fahad Panolan
We designed faster randomized FPT algorithms for a family of vertex deletion 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
We studied the two-dimensional strip packing problem and developed heuristics to improve the worst-case performance of the popular Steinberg's and Schiermeyer's algorithms.

Publications

Journal Articles

- 1 **Improved Bi-point Rounding Algorithms and a Golden Barrier for k -Median** TOPML '26
Kishen N Gowda, Thomas Pensyl, Aravind Srinivasan, and Khoa Trinh
- 2 **Improved FPT Algorithms for Deletion to Forest-Like Structures** ALGORITHMICA '24
Kishen N Gowda, Aditya Lonkar, Fahad Panolan, Vraj Patel, and Saket Saurabh

Conference Proceedings

- 1 **Faster Parallel Batch-Dynamic Algorithms for Low Out-Degree Orientation** SODA '27
Guy Blelloch, Andrew Brady, Laxman Dhulipala, Jeremy Fineman, *Kishen N Gowda*, and Chase Hutton
- 2 **UFO Trees: Practical and Provably-Efficient Parallel Batch-Dynamic Trees** PPoPP '26
Quinten De Man, Atharva Sharma, *Kishen N Gowda*, and Laxman Dhulipala
Best Paper Nominee
- 3 **MV-IVF: Multi-Vector Retrieval via Multi-Vector Clustering** VECDB '26
Kishen N Gowda, Laxman Dhulipala, Lars Gottlieb, and Rajesh Jayaram
- 4 **Improved Parallel Algorithms for EF1 Allocations** WINE '26
Kishen N Gowda, D Ellis Hershkowitz, Richard Z Huang, and Gregory Kehne
- 5 **Fully-Dynamic Parallel Algorithms for Single-Linkage Clustering** SPAA '25
Quinten De Man, Laxman Dhulipala, and *Kishen N Gowda*
- 6 **Efficient Centroid-Linkage Clustering** NEURIPS '24
MohammadHossein Bateni, Laxman Dhulipala, Willem Fletcher, *Kishen N Gowda*, D Ellis Hershkowitz, Rajesh Jayaram, and Jakub Łącki
- 7 **It's Hard to HAC Average Linkage!** ICALP '24
MohammadHossein Bateni, Laxman Dhulipala, *Kishen N Gowda*, D Ellis Hershkowitz, Rajesh Jayaram, and Jakub Łącki
- 8 **Optimal Parallel Algorithms for Dendrogram Computation and Single-Linkage Clustering** SPAA '24
Laxman Dhulipala, Xiaojun Dong, *Kishen N Gowda*, and Yan Gu
- 9 **Socially Fair Center-Based and Linear Subspace Clustering** ECML PKDD '23
Sruthi Gorantla, *Kishen N Gowda*, Amit Deshpande, and Anand Louis
- 10 **Improved Bi-point Rounding Algorithms and a Golden Barrier for k -Median** SODA '23
Kishen N Gowda, Thomas Pensyl, Aravind Srinivasan, and Khoa Trinh
- 11 **Improved FPT Algorithms for Deletion to Forest-Like Structures** ISAAC '20
Kishen N Gowda, Aditya Lonkar, Fahad Panolan, Vraj Patel, and Saket Saurabh
- 12 **A Parameterized Perspective on Attacking and Defending Elections** IWOC '20
Kishen N Gowda, Neeldhara Misra, and Vraj Patel

Manuscripts

- 1 **UltraKMeans: Fully Scalable and High Quality k -means** UNDER SUBMISSION
Xiaojun Dong, *Kishen N Gowda*, Jessica Shi, MohammadHossein Bateni, Laxman Dhulipala, Xiaoju Ju, and Jakub Łącki
- 2 **Parallel Hierarchical Agglomerative Clustering in Low Dimensions** PREPRINT ON ARXIV
MohammadHossein Bateni, Laxman Dhulipala, Willem Fletcher, *Kishen N Gowda*, D Ellis Hershkowitz, Rajesh Jayaram, and Jakub Łącki
- 3 **Chamfer-Linkage for Hierarchical Agglomerative Clustering** PREPRINT ON ARXIV
Kishen N Gowda, Willem Fletcher, MohammadHossein Bateni, Laxman Dhulipala, D Ellis Hershkowitz, Rajesh Jayaram, and Jakub Łącki

Research Visits

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

Teaching Experience

 Tutorial Organizer and Presenter , SPAA '25, Portland, OR Tutorial on Parallel Clustering.	2025
 Graduate Teaching Assistant , University of Maryland, College Park Courses: Algorithms (CMSC 351), Analysis of Algorithms (CMSC 451), Scalable Parallel Algorithms and Data Structures (CMSC 858N)	2021 – PRESENT
 Teaching Assistant , IIT Gandhinagar Course: Data Structures and Algorithms I (ES 242)	2020
 Tutorial Organizer and Presenter at GRASP and METIS, IIT Gandhinagar Organized various workshops and tutorials on competitive programming, C++, and web scraping.	2018 – 2020

Invited Talks

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

Professional Service

 SPAA 2027 Shadow Program Committee	2026
 VecDB 2026 Program Committee	2026
 SPAA 2026 Shadow Program Committee	2026
 SPAA 2026 Junior Program Committee	2025
 Organizer, Capital Area Theory Seminar (CATS) Organized the UMD CS Theory weekly seminar and hosted external speakers.	2023 – 2024
 President and Co-founder, GRASP The competitive programming group at IIT Gandhinagar.	2019 – 2021
 Reviewer SODA '27, SPAA {'27, '26, '25}, SIGMOD '27, VecDB '26, NeurIPS '26, KDD '26, ICML '26, ALENEX '26, FOCS '25, ESA {'25, '21}, AISTATS '25, ICLR '23.	

Honors and Awards

🏆	Best Paper Nominee at PPOPP '26	2026
🏆	NSF Student Travel Grant , SPAA '25	2025
🏆	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.	
🏆	Selected for the Mitacs Globalink Research Internship	2020
	Program cancelled due to the COVID-19 pandemic.	
🏆	Honorable Mention , ACM ICPC Amritapuri and Kanpur Regionals	2019
🏆	Narendra Summer Research Internship , IISc Bangalore, India	2019

Technical Skills

Programming & Tools	🔧 C++, Python, C; PyTorch, Bazel, Eigen, Mathematica, $\text{\LaTeX}$.
Algorithms & Retrieval	🔧 Parallel and dynamic algorithms, graph algorithms and data structures, clustering and hierarchical clustering, nearest-neighbor search, vector and multi-vector retrieval.