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

1. **UltraKMeans: Fully Scalable and High Quality k-means**
   Xiaojun Dong, **Kishen N Gowda**, Jessica Shi, MohammadHossein Bateni, Laxman Dhulipala, Xiaoen Ju, Jakub Łącki
   PPoPP 2027 (to appear)
2. **Faster Parallel Batch-Dynamic Algorithms for Low Out-Degree Orientation**
   Guy Blelloch, Andrew Brady, Laxman Dhulipala, Jeremy Fineman, **Kishen N Gowda**, Chase Hutton
   SODA 2027 (to appear)
3. **Improved rounding algorithms for set cover via exponential clocks**
   Kishen N Gowda, Will Ma, Aravind Srinivasan, Renata Valieva
   Operations Research Letters 2027
4. **Chamfer-Linkage for Hierarchical Agglomerative Clustering**
   Kishen N Gowda, Willem Fletcher, MohammadHossein Bateni, Laxman Dhulipala, D Ellis Hershkowitz, Rajesh Jayaram, Jakub Łącki
   arXiv 2026
5. **Improved Bi-point Rounding Algorithms and a Golden Barrier for k-Median**
   Kishen N Gowda, Thomas Pensyl, Aravind Srinivasan, Khoa Trinh
   TOPML 2026
6. **Improved Parallel Algorithms for EF1 Allocations**
   Kishen N Gowda, D Ellis Hershkowitz, Richard Z Huang, Gregory Kehne
   WINE 2026 (to appear)
7. **UFO Trees: Practical and Provably-Efficient Parallel Batch-Dynamic Trees**
   Quinten De Man, Atharva Sharma, **Kishen N Gowda**, Laxman Dhulipala
   PPoPP 2026 **Best Paper Nominee**
8. **MV-IVF: Multi-Vector Retrieval via Multi-Vector Clustering**
   Kishen N Gowda, Laxman Dhulipala, Lars Gottesbüren, Rajesh Jayaram
   VecDB 2026
9. **Parallel Hierarchical Agglomerative Clustering in Low Dimensions**
   MohammadHossein Bateni, Laxman Dhulipala, Willem Fletcher, **Kishen N Gowda**, D Ellis Hershkowitz, Rajesh Jayaram, Jakub Łącki
   arXiv 2025 (Under Submission)
10. **Fully-Dynamic Parallel Algorithms for Single-Linkage Clustering**
    Quinten De Man, Laxman Dhulipala, **Kishen N Gowda**
    SPAA 2025
11. **Efficient Centroid-Linkage Clustering**
    MohammadHossein Bateni, Laxman Dhulipala, Willem Fletcher, **Kishen N Gowda**, D Ellis Hershkowitz, Rajesh Jayaram, Jakub Łącki
    NeurIPS 2024
12. **It's Hard to HAC with Average Linkage!**
    MohammadHossein Bateni, Laxman Dhulipala, **Kishen N Gowda**, D Ellis Hershkowitz, Rajesh Jayaram, Jakub Łącki
    ICALP 2024
13. **Optimal Parallel Algorithms for Dendrogram Computation and Single-Linkage Clustering**
    Laxman Dhulipala, Xiaojun Dong, **Kishen N Gowda**, Yan Gu
    SPAA 2024
14. **Improved FPT Algorithms for Deletion to Forest-like Structures**
    Kishen N Gowda, Aditya Lonkar, Fahad Panolan, Vraj Patel, Saket Saurabh
    Algorithmica 2024
15. **Socially Fair Center-based and Linear Subspace Clustering**
    Sruthi Gorantla, **Kishen N Gowda**, Amit Deshpande, Anand Louis
    ECML PKDD 2023
16. **Improved Bi-point Rounding Algorithms and a Golden Barrier for k-Median**
    Kishen N Gowda, Thomas Pensyl, Aravind Srinivasan, Khoa Trinh
    SODA 2023
17. **Improved FPT Algorithms for Deletion to Forest-like Structures**
    Kishen N Gowda, Aditya Lonkar, Fahad Panolan, Vraj Patel, Saket Saurabh
    ISAAC 2020

18. **A Parameterized Perspective on Attacking and Defending Elections**
Kishen N Gowda, Neeldhara Misra, Vraj Patel
IWOCA 2020

Research Visits

- **AlgoPARC Workshop on Parallel Algorithms and Data Structures** 2025
University of Hawai'i at Mānoa, 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** 2020
IISER Pune, India.

Teaching Experience

- **Tutorial Organizer and Presenter**, SPAA '25, Portland, OR 2025
Tutorial on Parallel Clustering.
- **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++, and web scraping.

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), University of Maryland, College Park, MD.

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)** 2023 – 2024
Organized the UMD CS Theory weekly seminar and hosted external speakers.
- **President and Co-founder, GRASP** 2019 – 2021
The competitive programming group at IIT Gandhinagar.

Professional Service (continued)

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, LaTeX.
Algorithms & Retrieval	Parallel and dynamic algorithms, graph algorithms and data structures, clustering and hierarchical clustering, nearest-neighbor search, vector and multi-vector retrieval.