

Summary

Citations: 773

h-index: 8

Recognition: Outstanding Paper Award at HPCAsia 2025

Grants Awarded: 2 DOE (Co-PI), 1 ORNL (PI), 1 NSF (Travel, PI)

Graduate Students Advised: 8 M.S. and 10 undergraduates

Theses Advised: 1 M.S. and 1 undergraduate

Research Interests: High Performance Computing, Parallel Algorithms, Sparse Computations

Teaching Interests:

Core Courses: Undergraduate/Graduate-level Algorithms.

Elective Courses: Parallel Algorithms, Numerical Optimization, Scientific AI and Machine Learning.

Github/Gitlab: aditya08

Selected Open Source Software Contributions:

HybridSGD: <https://github.com/aditya08/hybridsgd>

TuckerMPI-HOOI: <https://zenodo.org/records/16752647>

DistSHAP: <https://zenodo.org/records/15272858>

AdaBatch: <https://github.com/NVLabs/AdaBatch>

Professional Appointments

Assistant Professor

2022 – current

Department of Computer Science, Wake Forest University

Assistant Research Scientist (Postdoctoral Position)

2019 – 2022

Institute for Data Intensive Engineering and Science, Johns Hopkins University

Industry and Lab Experience

Oak Ridge National Laboratory

2024 – 2025

Visiting Scientist

NVIDIA Research

2017

Research Internship

Education

Ph.D. in Computer Science, University of California, Berkeley

2018

Designated Emphasis in Computational and Data Science and Engineering

Thesis: *Avoiding Communication in First Order Methods for Optimization*

Advised by Jim Demmel and Michael W. Mahoney

M.S. in Computer Science, University of California, Berkeley

2016

B.S. in Electrical and Computer Engineering, Rutgers University

2012

Double major in Computer Science

Honors Thesis: *Scaling Replica Exchange Molecular Dynamics*
Advised by Manish Parashar and Ivan Rodero

Selected Awards

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| HPC-Asia 2025, Outstanding Paper Award | 2025 |
| NSF Graduate Research Fellowship | 2013 – 2018 |
| UC Berkeley EECS Department Fellowship | 2012 – 2013 |
| Rutgers School of Engineering James J. Slade Scholar | 2012 |
| James L. Potter Award in Research | 2012 |
| Edward J. Bloustein Distinguished Scholars Award | 2008 – 2012 |
| Rutgers Scarlet Scholarship | 2008 – 2012 |
| Kuhl Memorial Engineering Fellowship | 2011 |
| Charles V. Longo Memorial Scholarship | 2011 |
| Rutgers Academic Excellence Award | 2010 |
| Hannah Sands Endowed Scholarship in Engineering | 2010 |

Grants

Wake Forest University

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| PI, Oak Ridge National Laboratory: Subcontract | 2024 – 2025 |
| Co-PI, DOE ASCR: Data Reduction for Science | 2024 – 2027 |
| PI, NSF OAC: Travel: Student Travel Grant for ICPP 2023 | 2023 – 2024 |
| Co-PI, DOE ASCR: Mathematical Multifaceted Integrated Capability Centers | 2022 – 2027 |

Compute Time

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| Co-PI, An Exascale Co-Design Framework for Spiking Graph Neural Networks <i>ASCR ALCC</i> | 2025 – current |
| PI, Scalable Numerical Algorithms and Libraries for Sparse Computations <i>NERSC ERCAP</i> | 2024 – current |

Teaching

Wake Forest University

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| CSC 301: Algorithms Design and Analysis | Fa23, Sp24 |
| CSC 721: Theory of Algorithms | Sp24, Sp26 |
| CSC 393: Individual Study: <i>s-step and communication-avoiding algorithms</i> | Fa23 |
| CSC 790: Parallel Numerical Optimization | Sp23 |
| CSC 393: Individual Study: <i>sparse matrix computations</i> | Sp23 |
| CSC 201: Data Structures and Algorithms | Sp22 – Fa23 |

Johns Hopkins University

AS117.205: Beautiful Data
Guest Lecturer Sp19, Sp20

Johns Hopkins University Center for Talented Youth

Introduction to Deep Learning
Workshop Presenter 01/2020

Introduction to Electrical Engineering
Teaching Assistant Sum10, Sum14

University of California, Berkeley

CS267: Applications of Parallel Computers
Graduate Student Instructor Sp14, Sum16, Sp18

CS267: Applications of Parallel Computers
Guest Lecturer Sp17

ParLab Parallel Boot Camp: Short Course on Parallel Computing
Teaching Assistant Sum14

Rutgers University, New Brunswick

CS111: Introduction to Computer Science
Teaching Assistant Sp10

Mentorship

Graduate Students

Irene Simó (Ph.D. student at Cornell) Alan de Mersseman (M.Eng. student at Cornell)

Zishan Shao (Ph.D. student at Duke, former Wake Forest advisee) Yixiao Wang (Ph.D. student at Duke)

Ziyue Yang (now: Intel Shanghai) João Pinheiro (now: Ph.D. student at Purdue, co-advised with Grey Ballard)

Nikhil Rajkumar (now: Red Ventures) Xiaotian Liu (now: Ph.D. student at Dartmouth)

Qingjia Xu Alex Michon (now: Arista Networks)

Undergraduate Students

Ting (Justin) Jiang Mason Horne

Runhao Huang (now: Morgan Stanley) Richard Zhang (now: M.S. student at U. Penn)

Jiachen Liu (now: AppDev) Ziang Xu (now: M.S. student at Columbia)

Boyuan Pan Cecilia Liu (now: Microsoft)

Rachel Lin (now: Ph.D. student at Indiana University) Jieming Wei (now: Uber)

Publications

1. Selahattin Akkas, Aditya Devarakonda, and Ariful Azad. DistShap: Scalable GNN explanations with distributed shapley values. *arXiv:2506.22668*, 2025. Accepted, VLDB'26.
2. Julian Bellavita, Matthew Rubino, Nakul Iyer, Andrew Chang, Aditya Devarakonda, Flavio Vella, and Giulia Guidi. Communication-Avoiding Linear Algebraic Kernel K-Means on GPUs. *arXiv:2601.17136*, 2025. Accepted, IPDPS'26.

3. Aditya Devarakonda and Ramakrishnan Kannan. Communication-efficient, 2D parallel stochastic gradient descent for distributed-memory optimization. *arXiv:2501.07526*, 2025. **Under review**.
4. Ramkrishnan Kannan, Aditya Devarakonda, Prasanna Date, Ashish Gautam, Shruti Kulkarni, Hao Lu, Jakub Kurzak, Guojing Cong, Seung-Hwan Lim, Catherine Schuman, Robert Patton, Gina Adam, Yiran Chen, and Thomas Potok. HyperNeuro: A high performance simulator for neuromorphic computing. 2025. **Under review**.
5. Joao Pinheiro, Aditya Devarakonda, and Grey Ballard. Parallel rank-adaptive higher order orthogonal iteration. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '25, page 1800–1815, New York, NY, USA, 2025. Association for Computing Machinery.
6. Zishan Shao and Aditya Devarakonda. Scalable dual coordinate descent for kernel methods. In *Proceedings of the International Conference on High Performance Computing in Asia-Pacific Region*, HPCASIA '25, page 52–63, New York, NY, USA, 2025. Association for Computing Machinery. **Outstanding Paper Award**.
7. Yixiao Wang, Zishan Shao, Ting Jiang, and Aditya Devarakonda. Enhanced cyclic coordinate descent methods for elastic net penalized linear models. In *The Thirty-ninth Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2025.
8. Aditya Devarakonda and Grey Ballard. Sequential and shared-memory parallel algorithms for partitioned local depths. In *Proceedings of the 2024 SIAM Conference on Parallel Processing for Scientific Computing (PP)*, pages 53–64. SIAM, 2024.
9. Aditya Devarakonda and James Demmel. Avoiding communication in logistic regression. In *2020 IEEE 27th International Conference on High Performance Computing, Data, and Analytics (HiPC)*, pages 91–100, Los Alamitos, CA, USA, 2020. IEEE Computer Society.
10. Aditya Devarakonda, Kimon Fountoulakis, James Demmel, and Michael W Mahoney. Avoiding communication in primal and dual block coordinate descent methods. *SIAM Journal on Scientific Computing*, 41(1):C1–C27, 2019.
11. Aditya Devarakonda, Kimon Fountoulakis, James Demmel, and Michael W Mahoney. Avoiding synchronization in first-order methods for sparse convex optimization. In *2018 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pages 409–418. IEEE, 2018.
12. Saeed Soori, Aditya Devarakonda, Zachary Blanco, James Demmel, Mert Gurbuzbalaban, and Maryam Mehri Dehnvi. Reducing communication in proximal newton methods for sparse least squares problems. In *Proceedings of the 47th International Conference on Parallel Processing*, ICPP 2018, pages 22:1–22:10, New York, NY, USA, 2018. ACM.
13. Aditya Devarakonda, Maxim Naumov, and Michael Garland. Adabatch: adaptive batch sizes for training deep neural networks. *arXiv preprint arXiv:1712.02029*, 2017.
14. Alex Gittens, Aditya Devarakonda, Evan Racah, Michael Ringenburg, Lisa Gerhardt, Jey Kottalam, Jialin Liu, Kristyn Maschhoff, Shane Canon, Jatin Chhugani, et al. Matrix factorizations at scale: A comparison of scientific data analytics in spark and c+ mpi using three case studies. In *2016 IEEE International Conference on Big Data (Big Data)*, pages 204–213. IEEE, 2016.
15. Razvan Carbunescu, Aditya Devarakonda, James Demmel, Steven Gordon, Jay Alameda, and Susan Mehringer. Architecting an autograder for parallel code. In *Proceedings of the 2014 Annual Conference on Extreme Science and Engineering Discovery Environment*, XSEDE '14, New York, NY, USA, 2014. Association for Computing Machinery.
16. Manish Parashar, Moustafa AbdelBaky, Ivan Rodero, and Aditya Devarakonda. Cloud paradigms and practices for computational and data-enabled science and engineering. *Computing in Science & Engineering*, 15(4):10–18, 2013.
17. Nishant Totla and Aditya Devarakonda. Massive parallelization of sat solvers. Technical report, University of California, Berkeley, 2013.
18. David Villegas, Norman Bobroff, Ivan Rodero, Javier Delgado, Yanbin Liu, Aditya Devarakonda, Liana Fong, S Masoud Sadjadi, and Manish Parashar. Cloud federation in a layered service model. *Journal of Computer and System Sciences*, 78(5):1330–1344, 2012.

Talks

1. Hybrid s-step sgd and local sgd for large scale optimization. In *SIAM Conference on Mathematics of Data Science (MDS24)*, October 2024.
2. Scalable dual coordinate descent for kernel methods. In *SIAM Conference on Applied Linear Algebra (LA24)*, May 2024.
3. Sequential and shared-memory parallel algorithms for partitioned local depths. In *SIAM Conference on Parallel Processing (PP24)*, March 2024.
4. s-step dual coordinate descent methods for kernelized classification and regression. In *DOE ASCR PI Meeting*, January 2024.
5. Physics-informed neural networks and scalable optimization algorithms. In *Department of Physics Seminar, Wake Forest University*, November 2023.
6. Hybrid 2D s-step methods for machine learning. In *All-Members Meeting, Sparsitute*, October 2023.
7. Scalable algorithms and techniques for machine learning. In *Graduate Thesis Seminar, Wake Forest University*, October 2023.
8. Hybrid 2D s-step methods for machine learning. In *Mathematics in Computation Seminar, Oak Ridge National Laboratory*, July 2023.
9. 2D s-step methods for machine learning. In *SIAM Conference on Computational Science and Engineering (CSE23)*, February 2023.
10. s-step methods for machine learning and beyond. In *Sparsitute Bi-Weekly Seminar*, February 2023.
11. Scalable algorithms and techniques for machine learning. In *Graduate Thesis Seminar, Wake Forest University*, October 2022.
12. Avoiding communication in first-order methods for optimization. In *Invited talk, Reservoir Labs*, January 2021.
13. Avoiding communication in logistic regression. In *International Conference on High Performance Computing, Data, and Analytics*, December 2020.
14. Avoiding communication in logistic regression. In *CS Seminar, Lawrence Berkeley National Laboratory*, January 2019.
15. Avoiding synchronization in first-order methods for convex optimization. In *Dissertation Talk*, May 2018.
16. Avoiding synchronization in first-order methods for sparse convex optimization. In *International Parallel and Distributed Processing Symposium*, May 2018.
17. s-step methods in machine learning. In *SIAM Parallel Processing*, March 2018.
18. Avoiding synchronization in first-order methods for sparse convex optimization. In *UC Berkeley Scientific Computing and Matrix Computations Seminar*, February 2018.
19. Avoiding communication in machine learning. In *Johns Hopkins University Applied Physics Lab*, January 2018.
20. Communication-avoiding algorithms. In *NASA Langley Research Center*, December 2017.
21. Communication-avoiding krylov subspace methods. In *NASA Langley Research Center*, December 2017.
22. Adabatch: Adaptive batch sizes for training deep neural networks. In *NVIDIA*, November 2017.
23. Communication-avoiding machine learning. In *Householder Symposium XX*, July 2017.
24. Communication-avoiding methods for regularized least-squares. In *SIAM Annual*, July 2017.
25. Communication-avoiding machine learning. In *Householder Symposium XX*, June 2017.
26. Communication avoiding primal and dual block coordinate descent methods. In *SIAM Optimization*, May 2017.
27. A generalized framework for communication-avoiding regularized least squares. In *Berkeley Statistics Annual Research Symposium*, April 2017.

28. Matrix factorizations at scale: A comparison of scientific data analytics in spark and c+ mpi using three case studies. In *IEEE Big Data*, July 2016.
29. Avoiding communication in machine learning. In *Berkeley Statistics Annual Research Symposium*, April 2016.
30. Communication-avoiding coordinate descent methods for linear systems. In *UC Berkeley Scientific Computing and Matrix Computations Seminar*, March 2016.
31. Scalable asynchronous molecular dynamics on federated cyberinfrastructure. In *SCALE Challenge (CCGRID)*, May 2012.
32. Parallel quicksort. In *Passionate on Parallel Research Experience for Undergraduates*, August 2011.
33. Molecular dynamics on federated cyberinfrastructure. In *Life Sciences and Pharmaceuticals Industrial Advisory Board*, May 2011.

Service

External Leadership

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|---|---|
| Frontiers in High Performance Computing | Review Editor |
| SC22/SC23 Birds of a Feather: TCHPC Career Panel | Co-Organizer and Panel Moderator |
| International Conference on Parallel Processing (ICPP 2023) | Poster & Student Program Co-Chair |
| IEEE Technical Community on High Performance Computing | Co-Chair, Education and Outreach Initiative |

External Reviewing

Conferences and Workshops

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| ACM International Conference on Parallel Processing (ICPP 2026) <i>Algorithms Track</i> | |
| ACM/IEEE SC 2026 <i>Algorithms Track</i> | |
| ACM Conference on Web Search and Data Mining (WSDM 2026) <i>Demo Track</i> | |
| SIAM Conference on Parallel Processing for Scientific Computing (PP 2026) | |
| ISC High Performance 2025, 2026 <i>Machine Learning and AI Track</i> | |
| IPDPSW GRAPL 2025: Workshop on Graphs, Architectures, Programming, and Learning | |
| International Conference on High Performance Computing in Asia-Pacific Region (HPCAsia 2025) <i>Machine Learning, AI, and Emerging Technologies Track</i> | |
| ACM/IEEE International Conference on Utility and Cloud Computing (UCC 2024) | |
| IPDPSW GRAPL 2024: Workshop on Graphs, Architectures, Programming, and Learning | |
| SIAM Conference on Parallel Processing for Scientific Computing (PP 2024) | |
| IEEE International Conference on High Performance Computing, Data, and Analytics (HiPC) 2024 <i>Scalable Algorithms and Analytics Track</i> | |
| International Conference on High Performance Computing in Asia-Pacific Region (HPCAsia 2024) <i>Application and Algorithm Track</i> | |
| ACM/IEEE International Conference on Utility and Cloud Computing (UCC 2023) | |

IPDPS PhD Forum 2023

ACM/IEEE SC 2021, SC 2022, and SC 2023
Machine Learning and HPC Track

ACM/IEEE International Symposium on Cluster, Cloud and Internet Computing (CCGrid 2022)
AI, ML, and Deep Learning Track

IEEE International Conference on Cluster Computing Cluster 2022
Applications, Algorithms, and Libraries Track

Journals

SIAM Journal on Matrix Analysis and Applications (SIMAX)

Journal of Parallel and Distributed Computing (JPDC)

ACM Transactions on Mathematical Software (TOMS)

ACM Transactions on Parallel Computing (TOPC)

IEEE Transactions on Artificial Intelligence (TAI)

Journal of Astronomy and Computing

Proposals

Department of Defense (NDSEG Fellowship Reviewer) 2025

National Science Foundation (GRF Reviewer) 2024

Department of Energy 2023, 2025

Memberships

ACM and SIAM