

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 Roderio

Selected Awards

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

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

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

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

- Selahattin Akkas, Aditya Devarakonda, and Ariful Azad. DistShap: Scalable GNN explanations with distributed shapley values. *arXiv:2506.22668*, 2025. **Accepted, VLDB'26.**
- 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. **Accepted**.
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 Dehnavi. 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 Ringenbun, 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 Roder, 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 Roder, 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

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

ACM/IEEE SC26
Algorithms Track

ACM Conference on Web Search and Data Mining (WSDM 2026)
Demo Track

SIAM Conference on Parallel Processing for Scientific Computing (PP 2026)

ISC High Performance 2025, 2026
Machine Learning and AI Track

IPDPSW GRAPL 2025: Workshop on Graphs, Architectures, Programming, and Learning

International Conference on High Performance Computing in Asia-Pacific Region (HPCAsia 2025)
Machine Learning, AI, and Emerging Technologies Track

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
Scalable Algorithms and Analytics Track

International Conference on High Performance Computing in Asia-Pacific Region (HPCAsia 2024)
Application and Algorithm Track

ACM/IEEE International Conference on Utility and Cloud Computing (UCC 2023)

IPDPS PhD Forum 2023

ACM/IEEE SC21, SC22, and SC23

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