Aditya Devarakonda

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▬ Education

2012–2018	**University of California, Berkeley**, *Ph.D.*, *Computer Science.*
	Ph.D. minor in Computational and Data Science and Engineering
	Thesis: *Avoiding Communication in First Order Methods for Optimization*
	Thesis Committee: James Demmel, Michael W. Mahoney, and Adityanand Guntuboyina.
2012–2016	**University of California, Berkeley**, *M.S.*, *Computer Science.*
2008–2012	**Rutgers University, New Brunswick**, *B.S.*, *Computer Engineering.*
	Double major in Computer Science.

▬ Skills

- Theoretical analysis of computation and communication costs of parallel algorithms.
- Redesign of algorithms to avoid communication.
- Code optimization for Cray XC30, XC40, and IBM BlueGene/Q systems.

Programming Languages	C/C++, Python, MATLAB, Charm++, UPC.
Parallel Libraries	Message Passing Interface (MPI), OpenMP, CUDA.
Software	PyTorch, Math Kernel Library, BLAS.
Parallel Frameworks	Hadoop MapReduce, MapReduce-MPI, Spark.
Tools	Git, Perforce, SVN, Make, CMake, LaTeX.

▬ Work Experience

Apr 2019 – Present	**Assistant Research Scientist**, Johns Hopkins University.
	Developing the theory and practice of efficient machine learning algorithms and systems. Interested in automating the derivation and generation of fast algorithms for heterogeneous parallel environments. Applying deep learning methods to astrophysics applications and, more generally, to the natural sciences.
Oct 2018 – Mar 2019	**Data Scientist**, Johns Hopkins University Applied Physics Laboratory.
	Developing high performance code for data science problems faced by APL sponsors. Contributing developer to Socrates (distributed graph analytics) and pGalileo (A Parallel MPI-Based Generalized Low-Entropy Mixture Model). Technical lead for a high-performance computing systems modernization and procurement project.
Aug 2012 – Aug 2018	**Graduate Research Assistant**, University of California, Berkeley.
	Designed a novel technique to avoid communication in parallel machine learning algorithms. Derived theoretical results to show the new algorithms are provably efficient and implemented the new algorithms in C++ and MPI to show speedups of up to 6.1× on a Cray XC30 supercomputer.
Aug 2017 – Nov 2017	**Research Intern**, NVIDIA Corporation.
	Derived an adaptive batch size technique which progressively increases the batch size during the training of deep neural networks. Implemented the technique in the PyTorch deep learning framework and experimentally showed speedups of up to 6.25× when using 4 NVIDIA P100 GPUs.
Sept 2010 – May 2012	**Undergraduate Research Assistant**, Rutgers University, New Brunswick.
	Developed a scheduling and communication framework for replica exchange molecular dynamics to be deployed on a heterogeneous environment comprised of Cloud, Supercomputing, and GRID computing resource.

May 2011 – Aug 2011	**Research Assistant**, University of Illinois, Urbana-Champaign. Developed a parallel Quicksort algorithm and topology-aware dynamic load balancing techniques for ChaNGa, an n-body cosmology application.

▬ Teaching Experience

Jan 2014 – May 2014 & May 2016 – Aug 2016 & Jan 2018 – May 2018	**Graduate Student Instructor - CS267 Applications of Parallel Computers**, University of California, Berkeley. Graded projects, assignments, and updated autograders for the course in 2014 and 2018. Published a paper in 2014 which describes the architecture of the autograder. Developed online courseware in Summer 2016 which was used to teach for-credit classes at several universities in the country through XSEDE. Served as the head graduate student instructor (GSI) in 2018 and worked with the instructors and other GSIs to offer three versions of the course concurrently.
July 2010 – Aug 2010 & Jun 2014 – Aug 2014	**Teaching Assistant - Intro. to Electrical Engineering**, Johns Hopkins University Center for Talented Youth. Led lab and study sessions, graded assignments,quizzes and reports. Designed and taught lessons on C++ programming and Arduino programming for audience of middle school students.
Jan 2010 – May 2010	**Teaching Assistant - CS111 Intro. to Computer Science**, Rutgers University, New Brunswick. Led several recitation sections and designed lessons to reinforce lecture material, prepare for exams and complete assignments.

▬ Thesis

○ A. Devarakonda, Avoiding Communication in First Order Methods for Optimization, Ph.D. Thesis, University of California, Berkeley, 2018.

▬ Manuscripts in Progress

○ A. Devarakonda, and J. Demmel, Avoiding communication in logistic regression.

○ A. Devarakonda, K. Fountoulakis, J. Demmel and M. W. Mahoney, Avoiding Communication in Kernel Methods.

▬ Publications and Technical Reports

○ A. Devarakonda, K. Fountoulakis, J. Demmel and M. W. Mahoney, Avoiding communication in primal and dual block coordinate descent methods, SIAM Journal of Scientific Computing (SISC), 41(1), pp. C1-C27, 2019.

○ A. Devarakonda, K. Fountoulakis, J. Demmel and M. W. Mahoney, Avoiding Synchronization in First-Order Methods for Sparse Convex Optimization, 2018 In Proceedings of the IEEE International Parallel and Distributed Processing Symposium (IPDPS 2018), Vancouver, British Columbia, Canada, 2018, pp. 409-418.

○ S. Soori, A. Devarakonda, Z. Blanco, J. Demmel, M. Gurbuzbalaban, and M. M. Dehnavi. Reducing Communication in Proximal Newton Methods for Sparse Least Squares Problems. In Proceedings of the 47th ACM International Conference on Parallel Processing (ICPP 2018), New York, NY, USA.

○ A. Devarakonda, M. Naumov, and M. Garland, AdaBatch: Adaptive Batch Sizes for Training Deep Neural Networks, arXiv cs.LG 1712.02029, 2017.

○ S. Soori, A. Devarakonda, J. Demmel, M. Gurbuzbalaban, M. M. Dehnavi, Avoiding communication in proximal methods for convex optimization problems, arXiv cs.DC 1710.08883, 2017

○ A. Gittens, A. Devarakonda, E. Racah, M. Ringenburg, L. Gerhardt, J. Kottalam, J. Liu, K. Maschhoff, S. Canon, J. Chhugani, P. Sharma, J. Yang, J. Demmel, J. Harrell, V. Krishnamurthy, M. W. Mahoney, Prabhat, Matrix factorizations at scale: A comparison of scientific data analytics in spark and C+MPI using three case studies, 2016 IEEE International Conference on Big Data (Big Data 2016), Washington, DC, 2016, pp. 204-213.

○ R. Carbunescu, A. Devarakonda, J. Demmel, S. Gordon, J. Alameda, and S. Mehringer. 2014. Architecting an autograder for parallel code. In Proceedings of the 2014 Annual Conference on Extreme Science and Engineering Discovery Environment (XSEDE 2014). ACM, New York, NY, USA.

- M. Parashar, M. AbdelBaky, I. Rodero and A. Devarakonda, Cloud Paradigms and Practices for Computational and Data-Enabled Science and Engineering, in Computing in Science & Engineering, vol. 15, no. 4, pp. 10-18, 2013.
- D. Villegas, N. Bobroff, I. Rodero, J. Delgado, Y. Liu, A. Devarakonda, L. Fong, S. M. Sadjadi, M. Parashar, Cloud federation in a layered service model, Journal of Computer and System Sciences, Volume 78, Issue 5, pp. 1330-1344, 2012.
- A. Devarakonda, I. Rodero, M. AbdelBaky, B. Claus, M. Parashar, Scalable Asynchronous Molecular Dynamics on Federated Cyberinfrastructure, Poster in XSEDE Conference, July 2012.

Presentations

- Unsupervised Learning, Guest Lecturer, AS.171.205 Beautiful Data: Introduction to Practical Data Science, Johns Hopkins University, April 2019.
- An Introduction to Deep Learning, Guest Lecturer, AS.171.205 Beautiful Data: Introduction to Practical Data Science, Johns Hopkins University, April 2019.
- Avoiding Communication in Machine Learning, CS Seminar, Lawrence Berkeley National Lab, Berkeley, CA, January 2019.
- Avoiding Communication in First-Order Methods for Optimization, Dissertation Talk, Berkeley, CA, May 2018.
- s-step Methods in Machine Learning, SIAM Parallel Processing, Tokyo, Japan, March 2018.
- Avoiding Synchronization in Sparse Convex Optimization, UC Berkeley Scientific Computing and Matrix Computations Seminar, Berkeley, CA, February 2018.
- Avoiding Communication in Machine Learning, Johns Hopkins University Applied Physics Lab, Laurel, MD, January 2018.
- Communication-Avoiding Krylov Subspace Methods, NASA Langley Research Center, Hampton, VA, December 2017.
- Communication-Avoiding Algorithms, NASA Langley Research Center, Hampton, VA, December 2017.
- AdaBatch: Adaptive Batch Sizes for Training Deep Neural Networks, NVIDIA, Santa Clara, CA, November 2017.
- Communication-Avoiding Methods for Regularized Least-Squares, SIAM Annual 2017, Pittsburgh, PA, July 2017.
- Communication-Avoiding Machine Learning, Householder Symposium XX, Blacksburg, VA, June 2017.
- Communication-Avoiding Machine Learning, ASPIRE Summer Retreat 2017, Santa Cruz, CA, June 2017.
- Communication Avoiding Primal and Dual Block Coordinate Descent Methods, SIAM Optimization 2017, Vancouver, Canada, May, 2017.
- A Generalized Framework for Communication-Avoiding Regularized Least Squares, Berkeley Statistics Annual Research Symposium (BSTARS), Berkeley, CA, 2017.
- Matrix factorizations at scale: A comparison of scientific data analytics in Spark and C+ MPI using three case studies, IEEE Big Data, Washington D.C., December, 2016.
- Avoiding Communication in Machine Learning, Berkeley Statistics Annual Research Symposium (BSTARS), Berkeley, CA, 2016.
- Communication-Avoiding Coordinate Descent Methods for Linear Systems, UC Berkeley Scientific Computing and Matrix Computations Seminar, Berkeley, CA, 2016
- Scalable Asynchronous Molecular Dynamics on Federated Cyberinfrastructure, SCALE Challenge 2012, Ottawa, Canada, May, 2012.
- Parallel Quicksort, Passionate on Parallel Research Experience for Undergraduates, Urbana, IL, August, 2011.
- Molecular Dynamics on Federated Cyberinfrastructure, Demo for Life Sciences and Pharmaceuticals Industrial Advisory Board, New Brunswick, NJ 2011.

Professional Service

Reviewer, *ACM Transactions on Parallel Computing (2018).*

Reviewer, *ACM Symposium on Parallelism in Algorithms and Architecture (2017)*.
Reviewer, *SIAM Journal of Scientific Computing (2017)*.

Outreach

Aug 2016 – Aug 2018 **Computer Science Coordinator**, EECS Peers.

Aug 2017 – Aug 2018 **Workshop Presenter**, Bias Busters.

Aug 2016 – Aug 2017 **EECS Delegate**, UC Berkeley Graduate Assembly.

Aug 2016 – Aug 2017 **Committee Member**, Information Risk Governance Committee.

Aug 2016 – Aug 2017 **Committee Member**, Campus Information Security and Privacy.

Selected Awards

- The NSF Graduate Research Fellowship
- UC Berkeley EECS Department Fellowship
- Rutgers School of Engineering James J. Slade Scholar
- James L. Potter Award in Research
- Kuhl Memorial Engineering Fellowship
- Charles V. Longo Memorial Scholarship
- Rutgers Academic Excellence Award
- Hannah Sands Endowed Scholarship in Engineering
- Rutgers School of Engineering Dean's List
- Edward J. Bloustein Distinguished Scholars Award
- Rutgers Scarlet Scholarship