

Vivek Bharadwaj

Machine Learning Engineer, Apple Platform Architecture

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EDUCATION

University of California, Berkeley

2020 — 2025

PhD in Computer Science

Advisers: James Demmel and Aydın Buluç

Focus: Geometric Deep Learning, Sparse Tensors, Graph Problems

Funding: DOE National Computational Science Graduate Fellowship

California Institute of Technology (Caltech)

2016 — 2020

BS, Computer Science and Mathematics

Cumulative GPA: 3.9/4.3

RESEARCH INTERESTS AND SKILLS

| | |
|------------------------|--|
| Interests | Graph Neural Networks, GPU Kernel Engineering, Randomized Algorithms, Sparsity in Machine Learning, Tensor Decomposition |
| Languages | C, C++, Python, Java, OCaml |
| Parallel Computing | MPI, CUDA, OpenMP |
| Libraries / Frameworks | Pybind11, Pytorch |

PUBLICATIONS

Conference Papers

- **V. Bharadwaj***, A. Glover*, A. Buluç, J. Demmel. An Efficient Sparse Kernel Generator for $O(3)$ -Equivariant Deep Networks. *Proceedings of the Conference on Applied and Computational Discrete Algorithms (ACDA)*, Jul 2025.
- B. Rakhshan*, **V. Bharadwaj***, O. Malik, G. Rabusseau. Efficient Leverage Score Sampling for Tensor Train Decomposition. *Advances in Neural Information Processing Systems*, Dec 2024.
- **V. Bharadwaj**, O. Malik, R. Murray, A. Buluç, J. Demmel. Distributed-Memory Randomized Algorithms for Sparse Tensor CP Decomposition. *Proceedings of the 36th ACM Symposium on Parallelism in Algorithms and Architectures*, Jun 2024.
- **V. Bharadwaj**, O. Malik, R. Murray, L. Grigori, A. Buluç, J. Demmel. Fast Exact Leverage Score Sampling from Khatri-Rao Products with Applications to Tensor Decomposition. *Advances in Neural Information Processing Systems*, Dec 2023.
- **V. Bharadwaj**, A. Buluç, J. Demmel. Distributed-Memory Sparse Kernels for Machine Learning. *2022 IEEE International Parallel and Distributed Processing Symposium*, Jun 2022.

Journal Papers

- P. Ramesh, S. Hwang, H. Davis, A. Lee-Gosselin, **V. Bharadwaj**, M. English, J. Sheng, V. Iyer, M. Shapiro. Ultraparamagnetic Cells Formed through Intracellular Oxidation and Chelation of Paramagnetic Iron. *Angewandte Chemie International Edition*, 2018.

* denotes equal contribution.

EXPERIENCE

Apple

September 2025-Present

Machine Learning Engineer

- Mapping machine learning workloads to hardware on the platform architecture team.
- Work spans performance modeling, kernel engineering, and algorithm exploration.

NVIDIA Math Libraries Team

Summer 2024

Sparse Linear Algebra Intern

- Rewrote large parts of cuSPARSELt, a library for structured sparse-dense matrix multiplication in machine learning, for new Blackwell generation GPUs.
- Investigated custom semiring support with JIT linking for sparse matrix-vector multiplication.

Lawrence Berkeley National Laboratory

Summers 2023, 2021, 2020

Graduate Student Researcher

- Focused on high-performance algorithms for randomized sparse problems.

- Research blended theoretical and applied work, from new randomized algorithms to optimized software kernels for high performance.

National Renewable Energy Laboratory Summer 2022

Visiting Graduate Student Researcher

- Focused on Krylov subspace methods for ill-conditioned linear systems.
- Wrote CUDA kernels for randomized butterfly transformations and incomplete LDL preconditioners.

Jane Street Capital Summer 2019

Software Engineering Intern

- Wrote protocols to relay market data from exchanges to traders.
- Improved Iron, an in-house fork of the Mercurial version control system.

Anandkumar Lab, Caltech Summer 2018

Summer Undergraduate Research Fellowship (SURF) Intern

- Focused on tensor decompositions and Gaussian process modeling.
- Mentored by Rose Yu (now UCSD).

Shapiro Lab, Caltech Summer 2017

Summer Undergraduate Research Fellowship (SURF) Intern

- Focused on GPU-based MRI simulations of diffusing water molecule spins.
- Work published in a journal of the German Chemical Society (code on GitHub).

SELECTED TALKS

SIAM Computational Science and Engineering (CSE25) March 4 2025, Fort Worth, TX

Engineering Fast Kernels for Rotation-Equivariant Deep Networks

SIAM Conference on Applied Linear Algebra (LA24) May 13 2024, Paris, France

Leverage-Based Sampling at Scale for Sparse Tensor CP Decomposition

SIAM Conference on Parallel Processing (PP24) Mar. 5 2024, Baltimore, MD

Distributed and Randomized Sparse Tensor Decomposition

SIAM Computational Science and Engineering (CSE23) Mar. 1, 2023, Amsterdam, Netherlands

New Leverage-Based Sampling Algorithms for Khatri-Rao Products

AWARDS

Berkeley Teaching Effectiveness Award 2024

Awarded to fifteen selected graduate TAs who identified and fixed a particular teaching problem.

Berkeley Outstanding Graduate Student Instructor 2022

Awarded for teaching work in CS267 (Parallel Computing).

Department of Energy Computational Science Graduate Fellowship 2021

Awarded to 32 selected graduate students nationwide. Fellowship covers full PhD tuition and stipend for four years.

Honorable Mention, National Science Foundation GRFP 2020

Caltech Thomas A. Tisch Prize for Undergraduate Teaching 2020

Awarded for three years of teaching work in Caltech CS38 (Algorithms).

Best Educational Hack, Hacktech 2019

Awarded for Presentr, a prototype of a blackboard image-to-text decoder.

Ph11 Scholar 2017

Funded summer research position awarded for solving hurdle problems at Caltech.

National Merit Scholar 2016

TEACHING

- SLMATH 1064: Mathematics of Big Data and Sketching** Summer 2023
TA for a two-week graduate summer program held by the Simons Laufer Mathematical Institute at IBM Research, Almaden.
- CS267: Applications of Parallel Computers** Spring 2022
Berkeley graduate course on parallelism and high-performance computing.
- CS38 / 138: Algorithms** Spring 2020, 2019, 2018
Caltech undergraduate / graduate proof-based algorithms class.
- CS21: Decidability and Tractability** Winter 2018
Caltech undergraduate complexity theory class.

PROFESSIONAL SERVICE

Peer Review for Journals / Conferences

- SIAM Journal on Scientific Computing 2026
- ACM Transactions on Mathematical Software 2025
- ACM SPAA Junior PC 2025
- GrAPL IPDPS Workshop 2025
- Neural Information Processing Systems (NeurIPS) 2024
- Supercomputing (SC) Artifact Evaluation 2024
- Numerical Linear Algebra with Applications, Wiley 2023
- IEEE Signal Processing Letters 2021

Reviewer, Berkeley SURF Research Applications March 2022

Caltech Board of Control 2019-2020
Served on the student panel adjudicating cases of academic dishonesty.

Student Chair, Caltech CS Student-Faculty Conference 2018

SELECTED COURSEWORK

Graduate Courses

- CS281A: Statistical Learning Theory
- CS262A: Advanced Topics in Computer Systems
- CS270: Combinatorial Algorithms and Data Structures
- ELENG C227C: Convex Optimization and Approximation

Undergraduate Courses

- Ma109ABC: Introduction to Geometry and Topology
- EE126A: Information Theory
- MA140: Probability
- CS150: Probability and Algorithms
- CS151: Complexity Theory

VOLUNTEERING

Middle / High School Competition Judge

- Alameda County Science Fair (2023, 2022)
- USA Young Physicists' Tournament (2021)
- Blair Middle School Science Fair (2020)

CRS Science Ambassador Oct-Dec 2021
Presented science talks virtually for students at Washington Elementary, Richmond.

Virtual Be a Scientist Mentor Jan-Mar 2021
Coached Berkeley students through science projects weekly.

Caltech RISE Tutor Jan-April 2020
Volunteer tutor for high school students in need of assistance from Pasadena Unified School District.