

Vivek Bharadwaj

Graduate Student Researcher, UC Berkeley

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EDUCATION

University of California, Berkeley

2020 — 2025 (expected)

PhD in Computer Science

Advisers: James Demmel and Aydın Buluç

Focus: Exploiting Sparsity and Randomness to Accelerate Linear Algebra at Scale

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

Numerical Linear Algebra, Tensor Problems, Parallel Computing, Randomized Methods, Sparsity in Machine Learning

Languages

C, C++, Python, Java, OCaml

Parallel Computing

OpenMP, MPI, CUDA

Libraries / Frameworks

Pybind11, Pytorch

PUBLICATIONS

Conference Papers

- **V. Bharadwaj**, O. A. Malik, R. Murray, A. Buluç, J. Demmel. Distributed-Memory Randomized Algorithms for Sparse Tensor CP Decomposition. *ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)*, June 2024.
- **V. Bharadwaj**, O. A. Malik, R. Murray, L. Grigori, A. Buluç, J. Demmel. Fast Exact Leverage Score Sampling from Khatri-Rao Products with Applications to Tensor Decomposition. *Neural Information Processing Systems (NeurIPS) Main Conference*, December 2023.
- **V. Bharadwaj**, A. Buluç, J. Demmel. Distributed-Memory Sparse Kernels for Machine Learning. *IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, June 2022.

Journal Papers

- P. Ramesh, S.J. Hwang, H.C. Davis, A. Lee-Gosselin, **V. Bharadwaj**, M. A. English, J. Sheng, V. Iyer, M. G. Shapiro. Ultraparamagnetic Cells Formed Through Intracellular Oxidation and Chelation of Paramagnetic Iron. *Angewandte Chemie (International ed. in English)*, September 2018.

EXPERIENCE

NVIDIA Math Libraries Team

Summer 2024

Sparse Linear Algebra Intern

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

Lawrence Berkeley National Laboratory

Summers 2023, 2021, 2020

Graduate Student Researcher

- Focus: High Performance Algorithms for Randomized Sparse Problems
- Research was a blend of theoretical and applied work, ranging from development of new randomized algorithms to optimizing software kernels to achieve high performance.

National Renewable Energy Laboratory

Summer 2022

Visiting Graduate Student Researcher

- Focus: 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.
- Made improvements to Iron, an in-house fork of the Mercurial version control system.

Anandkumar Lab, Caltech

Summer 2018

Summer Undergraduate Research Fellowship (SURF) Intern

- Focus: tensor decompositions and Gaussian process modeling, mentored by Rose Yu (now UCSD).

Shapiro Lab, Caltech

Summer 2017

Summer Undergraduate Research Fellowship (SURF) Intern

- Focus: 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 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***Workshop on Sparse Tensor Computations**

Oct. 18, 2023, Chicago IL

*Faster Algorithms for ALS CP and Tensor Train Fitting***SIAM Computational Science and Engineering (CSE23)**

Mar. 1, 2023, Amsterdam, Netherlands

*New Leverage-Based Sampling Algorithms for Canonical Tensor Decomposition***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

TA, Berkeley graduate course on parallelism and high-performance computing.

CS38 / 138: Algorithms

Spring 2020, 2019, 2018

TA, Caltech undergraduate / graduate proof-based algorithms class.

CS21: Decidability and Tractability

Winter 2018

TA, Caltech undergraduate complexity theory class.

PROFESSIONAL SERVICE

Peer Review for Journals / Conferences

- 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
- ELEN 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.