

# Vivek Bharadwaj

Graduate Student Researcher, UC Berkeley

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## EDUCATION

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**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

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*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

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### 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. Ultrparamagnetic Cells Formed Through Intracellular Oxidation and Chelation of Paramagnetic Iron. *Angewandte Chemie (International ed. in English)*, September 2018.

## SELECTED TALKS

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**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*

## EXPERIENCE

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**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.

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|--|-------------|
| <b>National Renewable Energy Laboratory</b><br><i>Visiting Graduate Student Researcher</i>   | Summer 2022 |
| <ul style="list-style-type: none"> <li>• Focus: Krylov subspace methods for ill-conditioned linear systems</li> <li>• Wrote CUDA kernels for randomized butterfly transformations and incomplete LDL preconditioners.</li> </ul> |             |
| <b>Jane Street Capital</b><br><i>Software Engineering Intern</i>   | Summer 2019 |
| <ul style="list-style-type: none"> <li>• Wrote protocols to relay market data from exchanges to traders.</li> <li>• Made improvements to Iron, an in-house fork of the Mercurial version control system.</li> </ul>              |             |
| <b>Anandkumar Lab, Caltech</b><br><i>Summer Undergraduate Research Fellowship (SURF) Intern</i>  | Summer 2018 |
| <ul style="list-style-type: none"> <li>• Focus: tensor decompositions and Gaussian process modeling, mentored by Rose Yu (now UCSD).</li> </ul>  |             |
| <b>Shapiro Lab, Caltech</b><br><i>Summer Undergraduate Research Fellowship (SURF) Intern</i>   | Summer 2017 |
| <ul style="list-style-type: none"> <li>• Focus: GPU-based MRI simulations of diffusing water molecule spins.</li> <li>• Work published in a journal of the German Chemical Society (code on Github).</li> </ul>                  |             |

## AWARDS

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|---|------|
| <b>Berkeley Outstanding Graduate Student Instructor</b><br>Awarded for teaching work in Berkeley CS267 (Parallel Computing).  | 2022 |
| <b>Department of Energy Computational Science Graduate Fellowship</b><br>One of 32 selected graduate students in the award year. Fellowship covers full PhD tuition and stipend for four years. | 2021 |
| <b>Honorable Mention, National Science Foundation GRFP</b>  | 2020 |
| <b>Caltech Thomas A. Tisch Prize for Undergraduate Teaching</b><br>Awarded for three years of teaching work in Caltech CS38 (Algorithms).   | 2020 |
| <b>Best Educational Hack, Hacktech</b><br>Awarded for <i>Presentr</i> , a prototype of a blackboard image-to-text decoder.  | 2019 |
| <b>Ph11 Scholar</b><br>Funded summer research position awarded for solving “hurdle” problems at Caltech.  | 2017 |
| <b>National Merit Scholar</b>   | 2016 |

## TEACHING

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

## PROFESSIONAL SERVICE

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### Peer Review for Journals / Conferences

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| • 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

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### 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

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### 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.