

# 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. Ultraparamagnetic 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.

<b>National Renewable Energy Laboratory</b> <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> <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> <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> <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 Teaching Effectiveness Award</b> Awarded to fifteen selected graduate TAs who identified and fixed a particular teaching problem.	2024
<b>Berkeley Outstanding Graduate Student Instructor</b> Awarded for teaching work in CS267 (Parallel Computing).	2022
<b>Department of Energy Computational Science Graduate Fellowship</b> Awarded to 32 selected graduate students nationwide. 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> Awarded for three years of teaching work in Caltech CS38 (Algorithms).	2020
<b>Best Educational Hack, Hacktech</b> Awarded for <i>Presentr</i> , a prototype of a blackboard image-to-text decoder.	2019
<b>Ph11 Scholar</b> 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> 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> TA, Berkeley graduate course on parallelism and high-performance computing.	Spring 2022
<b>CS38 / 138: Algorithms</b> TA, Caltech undergraduate / graduate proof-based algorithms class.	Spring 2020, 2019, 2018
<b>CS21: Decidability and Tractability</b> TA, Caltech undergraduate complexity theory class.	Winter 2018

## PROFESSIONAL SERVICE

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<b>Peer Review for Journals / Conferences</b>	
<ul style="list-style-type: none"> <li>• Neural Information Processing Systems (NeurIPS)</li> </ul>	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

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### 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

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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.