Vivek Bharadwaj

https://vivek-bharadwaj.com

Education

PhD in Computer Science
University of California, Berkeley, 2020-2025 (expected)
Advisors: James Demmel and Aydın Buluç
Focus: Randomized Sketching Algorithms for Tensor Problems
Funding: DOE National Computational Science Graduate Fellowship (2021-2025)

BS in Computer Science and Mathematics
California Institute of Technology, 2016-2020
Cumulative GPA: 3.9/4.3

Interests

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

Skills

Languages	C, C++, Python, Java, OCaml
Parallel Computing	OpenMP, MPI, CUDA, UPC++
Libraries / Frameworks	Pybind11, Pytorch

Publications & Preprints

1. **Vivek Bharadwaj**, Osman Asif Malik, Riley Murray, Aydın Buluç, and James Demmel. Distributed-memory randomized algorithms for sparse tensor CP decomposition. *ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)*, 2024.
2. **Vivek Bharadwaj**, Osman Asif Malik, Riley Murray, Laura Grigori, Aydın Buluç, and James Demmel. Fast exact leverage score sampling from Khatri-Rao products with applications to tensor decomposition. *Neural Information Processing Sytems (NeurIPS) Main Conference*, 2023.
3. **Vivek Bharadwaj**, Aydın Buluç, and James Demmel. Distributed-memory sparse kernels for machine learning. In *2022 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pages 47–58. IEEE Computer Society, June 2022.
4. Pradeep Ramesh, Son-Jong Hwang, Hunter C Davis, Audrey Lee-Gosselin, **Vivek Bharadwaj**, Max A English, Jenny Sheng, Vasant Iyer, and Mikhail G Shapiro. Ultraparamagnetic cells formed through intracellular oxidation and chelation of paramagnetic iron. *Angewandte Chemie (International ed. in English)*, September 2018.

Selected Talks

1. Distributed-Memory Randomized Algorithms for Sparse Tensor CP Decomposition. SIAM Conference on Parallel Processing, March 5 2024, Baltimore MD.
2. Faster Leverage-Based Algorithms for ALS CP and Tensor-Train Decomposition. Workshop on Sparse Tensor Computations, October 18 2023, Chicago IL.
3. Fast Parallel Algorithms for Massive Sparse Tensor Decomposition. Sparsitute Annual Meeting, October 17 2023, Chicago IL.
4. Algorithms for Approximate Tensor-Train Decomposition. High Dimensional Scientific Computing Seminar, September 19 & 26, 2023, Berkeley CA.

5. New Leverage-Based Sampling Algorithms for CP Decomposition. Sparsity Minisymposium, SIAM Computational Science and Engineering, March 1 2023, Amsterdam, The Netherlands.

Experience

Lawrence Berkeley National Laboratory Summer 2023, 2021, 2020
Graduate Student Researcher
- Focus: randomized algorithms for sparse matrix and tensor factorization.
- Research is a blend of theoretical and applied work, with an emphasis on high-performance implementation of randomized methods.

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 factorization, both used as 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 VCS.

Anandkumar Lab, Caltech Summer 2018
Caltech SURF Intern
- Focus: Continuous analogues of tensor decomposition and Gaussian process modeling, mentored by Rose Yu (now UCSD).

Shapiro Lab, Caltech Summer 2017
Ph11 Research Scholar
- Focus: GPU-based MRI simulations of diffusing water molecule spins in strong magnetic fields.
- Work published in a Journal of the German Chemical Society (code available on Github).

Teaching

Mathematics of Big Data and Sketching Summer 2023
TA, two-week summer graduate school 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.

Professional Service

Peer review for journals / conferences:
1. *Numerical Linear Algebra with Applications, Wiley.* 2023

Reviewer, Berkeley SURF Research Applications March 2022

Graduate Visit Day Co-organizer, Scientific Computing 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

Awards

Berkeley Outstanding Graduate Student Instructor 2023

Honorable Mention, National Science Foundation GRFP 2020

Thomas A. Tisch Prize for Undergraduate Teaching 2020

Ph11 Scholar 2017
Funded research position awarded for solving "hurdle" problems at Caltech.

National Merit Scholar 2016

Volunteering

Middle / High School Science 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
Virtual science presenter for students at Washington Elementary, Richmond.

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

Caltech RISE Tutor Winter 2020
Volunteer tutor for high school students from Pasadena Unified School district.