

Jackson Vanover

Education

- 2020 to 2025 **Ph.D. in Computer Science** at University of California, Davis
2018 to 2020 **M.S. in Computer Science** at University of California, Davis
2012 to 2016 **B.A. in Mathematics** at University of California, Santa Cruz

Summary

2 internships at Lawrence Livermore National Laboratory, 3 first-author publications, 3 cross-institution collaborations, 7 conference talks, and 2 international conference awards: "Best Paper" and "Distinguished Artifact".

Selected Projects

EXCVATE: Testing Exception Handling in Foundational Linear Algebra Libraries

Led a collaboration with the Principal Investigators of the LAPACK and BLAS linear algebra libraries to develop a testing methodology for floating-point exception handling. Proposed and implemented a novel strategy combining binary instrumentation of x86 assembly and SMT solvers. Identified critical failures in multiple widely-used implementations of the BLAS. Resulted in a first-author publication at the 2025 International Symposium on Computer Arithmetic (ARITH) with an accompanying "[Best Paper](#)" award.

Prose: Optimizing the Performance of Large-Scale Climate Modeling Software

Collaborated with the Climate & Global Dynamics Laboratory at the National Center for Atmospheric Research to apply automated precision tuning optimizations for large weather and climate codes. Wrote automated AST transformations for the ROSE compiler to generate mixed-precision kernels achieving 2x speedup over uniform high-precision with less error than uniform low-precision. Resulted in a first-author publication at the 2024 International Workshop on Software Correctness for HPC Applications.

FPDiff: Automated Differential Testing for Bug-Finding in Numerical Libraries

Led a team to devise an automated correctness testing methodology to improve the robustness of numerical software. Identified over 100 bugs in widely-used numerical libraries. Resulted in a first-author publication at the 2020 International Symposium on Software Testing and Analysis (ISSTA) with an accompanying "[Distinguished Artifact](#)" award.

Experience

- Jan 2019 to **Graduate Researcher** with the UCD-PLSE Research Group, UC Davis
July 2025 Researched and developed practical tools and techniques for numerical software with an emphasis on the correctness and performance of floating-point computation in high-performance computing applications, resulting in 3 first-author publications, 7 conference talks, and 2 awards. See *Selected Projects* above.
- Summer '21-'22 **Graduate Student Computing Researcher**, Lawrence Livermore National Laboratory
Two research focuses: (1) the use of local and global sensitivity analysis (Feature Importance of Random Forests, Sobol Indices, Variograms, Automatic Differentiation/Morris Method) to identify kernels of high-performance computing applications to optimize via approximation (low-precision, loop perforation) or to replace with ML surrogates; (2) the use of random forests to interpolate the sensitivities of outputs from performance-critical kernels in high-performance computing applications (calculated via automatic differentiation for a set of sampled inputs) to yield a model predicting effective approximation parameters for unseen inputs.

References

- Dr. Cindy Rubio-González** Advisor at UCD // (530) 752-7069 // crubio@ucdavis.edu
Dr. James Demmel Collaborator at UCB // (510) 643-5386 // demmel@berkeley.edu
Dr. Harshita Menon Advisor at LLNL // (650) 741-4260 // harshitha@llnl.gov
Dr. Alper Altuntas Collaborator at NCAR // (919) 649-9980 // altuntas@ucar.edu

Publications

Awarded
"Best Paper"

Vanover, Jackson, James Demmel, Xiaoye Sherry Li, and Cindy Rubio-González. "EXCVATE: Spoofing Exceptions and Solving Constraints to Test Exception Handling in Numerical Libraries." In *2025 IEEE 32nd Symposium on Computer Arithmetic (ARITH)*, pp. 109-116. IEEE, 2025.

Vanover, Jackson, Alper Altuntas, and Cindy Rubio-González. "Toward Automated Precision Tuning of Weather and Climate Models: A Case Study." In *SC24-W: Workshops of the International Conference for High Performance Computing, Networking, Storage and Analysis*, pp. 148-159. IEEE, 2024.

Menon, Harshitha, James Diffenderfer, Giorgis Georgakoudis, Ignacio Laguna, Michael O. Lam, Daniel Osei-Kuffuor, Konstantinos Parasyris, and **Jackson Vanover**. "Approximate High-Performance Computing: A Fast and Energy-Efficient Computing Paradigm in the Post-Moore Era." *IT Professional* 25, no. 2 (2023): 7-15.

Parasyris, Konstantinos, James Diffenderfer, Harshitha Menon, Ignacio Laguna, **Jackson Vanover**, Ryan Vogt, and Daniel Osei-Kuffuor. "Approximate computing through the lens of uncertainty quantification." In *SC22: International Conference for High Performance Computing, Networking, Storage and Analysis*, pp. 1-14. IEEE, 2022.

Awarded
"Distinguished
Artifact"

Vanover, Jackson, Xuan Deng, and Cindy Rubio-González. "Discovering discrepancies in numerical libraries." In *Proceedings of the 29th ACM SIGSOFT International Symposium on Software Testing and Analysis*, pp. 488-501. 2020.

Talks

- Oct 2025 **Workshop on the Development of Modern Methods for Linear Algebra**, (DMML70)
- Sep 2025 **The 2025 BLIS Retreat**
- May 2025 **Symposium on Computer Arithmetic**, (ARITH25)
- Nov 2024 **Workshop on Software Correctness for HPC Applications at SC24**, (Correctness '24)
- Apr 2023 **Improving Scientific Software Conference**, (ISS23)
- Jul 2020 **Symposium on Software Testing and Analysis**, (ISSTA20)
- Jun 2020 **FPTalks 2020**