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".

Experience

Jan 2019 to July 2025 **Graduate Researcher** *with the UCD-PLSE Research Group*, UC Davis
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 below.*

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.

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. 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 performant mixed-precision kernels. 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. Resulted in a first-author publication at the 2020 International Symposium on Software Testing and Analysis (ISSTA) with an accompanying **"Distinguished Artifact" award**.

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 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**