# Jackson Vanover

*Leveraging static and dynamic analyses to maximize the performance and correctness of numerical code in the field of HPC*

## Education

Target 2025 **PhD Candidate in Computer Science** *at University of California, Davis*

2018 to 2020 **MS in Computer Science** *at University of California, Davis*, GPA: 4.0

2012 to 2016 **BA in Mathematics** *at University of California, Santa Cruz*, Major GPA: 3.92

## Experience

Jan 2019 to Present **Graduate Researcher** *with the UCD-PLSE Research Group*, UC Davis
Focus on designing strategies and developing tools for numerical software with an emphasis on the correctness and performance of floating-point computation in high-performance computing applications.

Summer '21,'22 **Graduate Student Computing Researcher**, Lawrence Livermore National Laboratory
Researching novel techniques for the analysis of numerical software to facilitate the optimization of high-performance computing applications via approximation.

## Selected Projects

**EXCVATE: Testing Exception Handling in Foundational Linear Algebra Libraries**
Collaboration with the Principal Investigators of the LAPACK and BLAS linear algebra libraries to devise a tool combining binary instrumentation and SMT solvers to test library exception handling. Culminated in a first-author publication at the 2025 International Symposium on Computer Arithmetic.

**Prose: Optimizing the Performance of Large-Scale Climate Modeling Software**
Collaboration with the Climate & Global Dynamics Laboratory at the National Center for Atmospheric Research to research automated precision tuning optimizations for weather/climate code. Culminated 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 focused on improving the robustness of numerical software that resulted in the FPDiff tool. Culminated in a first-author publication at the 2020 International Symposium on Software Testing and Analysis with an accompanying "Distinguished Artifact" award.

## Areas of Interest

- Input-Aware Performance Optimization
- Handling of Floating-Point Exceptions
- Mixed-Precision Floating-Point
- Formal Verification of Low-Level Software

## Skills

**Languages** Fortran, C++, x86 Assembly, Python, Bash

**Techniques** Binary Instrumentation/Analysis, Search-Based Optimization, SMT Solvers, Automated Program Transformation

## References

**Dr. Cindy Rubio-González** *Advisor at UCD // (530) 752-7069 // crubio@ucdavis.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 listed on following page

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## Publications

**Vanover, Jackson**, James Demmel, Xiaoye Sherry Li, and Cindy Rubio-González. "EXCVATE: Spoofing Exceptions and Solving Constraints to Test Exception Handling in Numerical Libraries." *Proceedings of the 32nd IEEE International Symposium on Computer Arithmetic.* Accepted, expected May 2025.

**Vanover, Jackson**, Alper Altuntas, and Cindy Rubio-González. "Toward Automated Precision Tuning of Weather and Climate Models: A Case Study." *2024 IEEE/ACM 8th International Workshop on Software Correctness for HPC Applications (Correctness).* 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.* 2022.

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