


Samuel D. Pollard

Sandia National Laboratories, Livermore, California
spolla at sandia dot gov  <https://sampollard.github.io>

Overview

I am a senior R&D scientist researching formal verification at Sandia National Laboratories. My research focuses on the application of formal methods to high performance computing, embedded system verification, and floating-point arithmetic.

Education

Ph.D. computer science, *University of Oregon*: September 2016–June 2021

Advisor: Boyana Norris. GPA: 4.07.

Dissertation: *When Does a Bit Matter? Techniques for Verifying the Correctness of Assembly Languages and Floating-Point Programs*. [PDF]

M.S. computer science, *Western Washington University*: September 2014–August 2016

Supported by teaching and research assistantships. GPA: 3.95.

B.S. mathematics, *Western Washington University*: September 2010–June 2014

Graduated with university honors and a computer science minor. GPA: 3.60.

Publications *Conferences*

- [1] Samuel D. Pollard, Sudharshan Srinivasan, and Boyana Norris. A performance and recommendation system for parallel graph processing implementations: Work-in-progress. In *Companion of the 10th ACM/SPEC International Conference on Performance Engineering*, ICPE '19, pages 25–28, Mumbai, India, April 2019. ACM.
- [2] Samuel D. Pollard, Nikhil Jain, Stephen Herbein, and Abhinav Bhatele. Evaluation of an interference-free node allocation policy on fat-tree clusters. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage, and Analysis*, SC '18, pages 26:1–26:13, Dallas, TX, USA, November 2018. IEEE Press.

Journals

- [3] Sriram Srinivasan, Samuel D. Pollard, Sajal K. Das, Boyana Norris, and Sanjukta Bhowmick. A shared-memory algorithm for updating tree-based properties of large dynamic networks. *IEEE Transactions on Big Data*, pages 1–15, September 2018.

Workshops

- [4] Anthony Dario and Samuel D. Pollard. A step-function abstract domain for granular floating-point error analysis. In *Proceedings of the 10th ACM SIGPLAN International Workshop on Numerical and Symbolic Abstract Domains*, NSAD '24, New York, NY, USA, October 2024. ACM.
- [5] Zachary Sullivan and Samuel D. Pollard. A formal model for portable, heterogeneous accelerator programming. In *Vivek Sarkar Festschrift Symposium*, VIVEKFEST, October 2024.
- [6] Samuel D. Pollard, Robert C. Armstrong, John Bender, Geoffrey C. Hulette, Raheel S. Mahmood, Karla Morris, Blake C. Rawlings, and Jon M. Aytac. Q: A sound verification framework for statecharts and their implementations. In *8th International Workshop on Formal Techniques for Safety-Critical Systems (FTSCS)*, pages 16–26, New York, USA, December 2022. ACM.
- [7] Samuel D. Pollard and Boyana Norris. A statistical analysis of error in MPI reduction operations. In *Fourth International Workshop on Software Correctness for HPC Applications*, Correctness, pages 49–57. IEEE, November 2020.
- [8] Samuel D. Pollard, Philip Johnson-Freyd, Jon Aytac, Tristan Duckworth, Michael J. Carson, Geoffrey C. Hulette, and Christopher B. Harrison. Quameleon: A lifter and

intermediate language for binary analysis. In *Workshop on Instruction Set Architecture Specification, SpISA '19*, pages 1–4, Portland, OR, USA, September 2019.

Posters

- [9] Vivek Kale, Shyamali Mukherjee, Samuel D. Pollard, Richard Rutledge, and Jackson Mayo. Automated analysis of heterogeneous parallel kokkos applications guided by example programs. Poster in 1st Annual Conference of the US Research Software Engineer Association (US-RSE'23), October 2023.
- [10] Samuel D. Pollard and Boyana Norris. A comparison of parallel graph processing implementations. In *IEEE International Conference on Cluster Computing, CLUSTER*, pages 657–658, Honolulu, HI, USA, September 2017. IEEE Computer Society.

Technical Reports and Position Papers (non-refereed)

- [11] Samuel D. Pollard, Jon M. Aytac, Ariel Kellison, Ignacio Laguna, Srinivas Nedunuri, Sabrina Reis, Matthew J. Sottile, and Heidi K. Thornquist. The first tri-lab workshop on formal verification: Capabilities, challenges, research opportunities, and exemplars. Technical report, Sandia National Laboratories, February 2024.
- [12] Ariel Kellison, Geoff C. Hulette, John Bender, Samuel D. Pollard, and Heidi K. Thornquist. Formal methods-based certification frameworks for scientific computing applications. Technical report, ASCR Workshop on Cybersecurity and Privacy for Scientific Computing Ecosystems, U.S. Department of Energy, Office of Advanced Scientific Computing Research, November 2021.
- [13] Noah Evans, Robert Armstrong, Samuel D. Pollard, and Jacob Hobbs. AI-based formal specification for scientific security. Technical report, ASCR Workshop on Cybersecurity and Privacy for Scientific Computing Ecosystems, U.S. Department of Energy, Office of Advanced Scientific Computing Research, November 2021.

Employment *Senior R&D scientist, cybersecurity, Sandia National Laboratories: 2021–Present*

Roles include: researcher, technical lead, subject matter expert, and software developer, all with a focus on formal verification of high-consequence systems.

Principal Investigatory roles include three Laboratory-Directed Research & Development Projects (LDRD) and a sub-element role for Advanced Simulation and Computing.

Intern mentoring: Haoda “Harry” Wang (Columbia), John Jacobson III (U. of Utah), Kaden Hart (Utah State U.), Sabrina Reis (U. Oregon), Anthony Dario (U. Oregon), Laine Rumreich (The Ohio State U.), Ariel Kellison (Cornell), Jarom Christiansen (The Ohio State U.)

Formal Methods R&D Intern, Sandia National Laboratories: 2018–2021

Year-round intern mentored by Geoff Hulette and Philip Johnson-Freyd.

Developed a Haskell-based tool for binary analysis of legacy architecture [8].

Computation Student Intern, Lawrence Livermore National Laboratory: 2017

Summer internship mentored by Abhinav Bhatele and Nikhil Jain researching topology-aware job scheduling [2].

Software Engineering Intern, EMC Isilon: 2015

Development of internal testing utilities to ensure system stability at and beyond published operating system limits.

Teaching Assistant, Western Washington University: 2014–2015

Responsible for instructing and grading four lab sections (approximately 20 students each) of 100 and 200-level computer science courses.

Service

Peer Review

Committee Member: Halpewattage Akila Nuwantha Peiris, *Dungones and Dragons Fantasy Adventure Generation*, M.S. Thesis, University of Moratuwa, 2024.

Alliance Strategy Team: Predictive Science Academic Alliance Program IV (2024).

Program Committee: Supercomputing Correctness Workshop (2022, 2023, 2024), Vivek Sarkar Festschrift Symposium (2024)

Reviewer: Supercomputing Correctness Workshop 2018–2021, ACM Transactions on Mathematical Software 2019.

Mentoring

Panelist, ACM PLMW@SPLASH Career Paths, Pasadena, CA, 2024.

ACM SIPLAN-M long-term mentoring, 2023–2024.

Early Career Professional Mentor (NSF Grant #1742110), Western Washington University: 2018–2020.

ACM tutor, Western Washington University, 2013–2014.

Graduate Student Union Steward: 2019–2021

Point of contact between computer science graduate students and union leadership.

Supercomputing Student Volunteer, ACM/IEEE: 2018

Student Representative, Graduate Education Committee, Computer and Information Sciences, University of Oregon: 2017–2019

One of two student representatives providing student feedback on department department policies.

Radio Station DJ: 2010–2011

Disc jockeyed for KUGS, Western Washington University's radio station.

Honors & Awards

Sandia National Labs Employee Recognition Award: 2022

For work on formally-verified compilation. Awards given to approximately 10% of staff.

General University Scholarship: 2019 & 2020

A scholarship at the University of Oregon awarded based on scholastic achievement and service to the university.

ICPE 2019 Travel Grant: April 2019

A travel grant to attend the 10th ACM/SPEC International Conference on Performance Engineering.

IEEE Student Mentor Program: September 2017

A travel grant to attend IEEE Cluster '17 funded both by NSF and IEEE.

Erwin & Gertrude Juilfs Scholarship in Computer and Information Science, John Juilfs: 2017

Scholarship awarded by nomination from the departmental committee at the University of Oregon.

Kaiser-Borsari Scholarship, Kaiser-Borsari Educational Foundation: 2015

Scholarship awarded to students who demonstrate high academic potential combined with creativity and leadership qualities and financial need.

COMAP Mathematical Contest in Modeling, Western Washington University: 2013

Group project in statistical modeling. Received meritorious (among the top 9%).

Mathematics Memorial Scholarship, Western Washington University: 2013

Tuition waiver awarded based on grade point averages in the Department of Mathematics.

Washington State Opportunity Scholarship, College Success Foundation: 2012 & 2013
Merit-based scholarship for low-income STEM students in Washington State.

Presidential Scholarship, Western Washington University: 2010
Two year scholarship awarded to the top 1% of applicants to WWU.

Washington State PTA Scholarship, Washington Congress of Parents and Teachers: 2010
Merit-based scholarship awarded to seniors from WA State public high schools.

Federal Pell Grant, U.S. Department of Education: 2010–2014
Awarded to undergraduate students who display exceptional financial need.

Hobbies

My hobbies include homebrewing, jewelry, cycling, computer generated art, painting, and video gaming (mostly Dota 2).