Samuel D. Pollard

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

Overview

I am a senior member of technical staff researching formal verification at Sandia National Laboratories. I have a Ph.D. in computer science, an M.S. in computer science, and a B.S. in mathematics. My research focuses on the application of formal methods to high performance computing, binary analysis, floating-point arithmetic, and program verification.

Education

Ph.D. computer science, *University of Oregon*: September 2016–June 2021
Research supported by Boyana Norris and Sandia National Laboratories. 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 four quarters of a teaching assistantship and three quarters of a research assistantship. 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. Acceptance Rate: 43% (10/23).

[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. Acceptance rate: 24% (68/288).

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] 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.

[5] 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

[6] 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.

[7] 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)

[8] 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.

[9] 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 Member of Technical Staff, R&D S&E Cybersecurity, Sandia National Laboratories: July 2021–Present

Responsibilities include formal verification of high-consequence systems.

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),

Formal Methods R&D S&E Intern, Sandia National Laboratories: Summer 2018–Present

Mentored by Geoff Hulette and Philip Johnson-Freyd.

Developed a Haskell-based tool for binary analysis of legacy architecture [5], writing and verifying formal specifications of software systems.

Full-time during the summer, part time year-round.

Computation Student Intern, Lawrence Livermore National Laboratory: Summer 2017

Summer internship mentored by Abhinav Bhatele and Nikhil Jain studying topology-aware job scheduling. Implemented a fat-tree job scheduling framework which completely eliminates inter-job interference [2].

Contributed to Flux, an open-source resource management framework.

Software Engineering Intern, EMC Isilon: Summer 2015

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

Teaching Assistant, Western Washington University: September 2014–December 2015

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

Service

Peer Review

Program Committee: Supercomputing Correctness Workshop 2022, 2023.

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

Mentoring

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

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

ACM Mentor (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: November 2018

Awarded a travel grant to attend the Supercomputing conference.

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: March 2022

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

General University Scholarship: March 2019 & March 2020

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

Applied for and awarded two separate years.

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: June 2017

A scholarship awarded by nomination from the departmental committee at the University of Oregon. Awarded to students who show exceptional promise for achievement as evidence by GPA, originality of research or other applicable criteria.

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

A 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: December 2013

Worked in a three-person group to develop a model and report to rank college sports coaches using statistical methods. Received meritorious (among the top 9%).

Mathematics Memorial Scholarship, Western Washington University: May 2013

Tuition waiver in honor of all former faculty in the Mathematics Department. Awarded based on grade point averages in the Department of Mathematics.

Washington State Opportunity Scholarship, College Success Foundation: June 2012 and June 2013

Scholarship offered to low-income students studying in the STEM fields with sufficient academic merit. Renewed once for a total of two years.

Presidential Scholarship, Western Washington University: September 2010

Two year scholarship awarded to the top 1% of applicants to Western Washington University.

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

Hobbies

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