Nathan R. Tallent, Ph.D.

Distinguished Computer Scientist
Future Computing Technologies Group
Pacific Northwest National Laboratory
Richland, WA • 509.372.4206

nathantallent.github.io
Performance Lab for EXtreme Computing and daTa
www.linkedin.com/in/nathan-tallent/
tallent@pnnl.gov • tallent@alumni.rice.edu

Executive Summary

◇ Dr. Nathan Tallent is an internationally recognized expert in extreme AI/HPC performance. He understands all levels of performance in massively scalable computing, including interconnects/networking, storage, memory, and processors; and workloads ranging from AI/ML, data analytics/graphs, and HPC.

◇ World-class expertise in performance analysis, hardware-software co-design, distributed systems, scientific workflows, AI & machine learning, and data management.

◇ Leads development of research software prototypes for distributed AI systems, scientific workflows, and performance analysis and prediction.

◇ Notable contributions in performance measurement, modeling, bottleneck diagnosis, and optimization through 70 peer-reviewed publications, a DOE Early Career award, and software projects.

Professional Experience

◇ Chief Computer Scientist, Pacific Northwest National Laboratory, Jan. 2022–present.

◇ Senior Computer Scientist, Pacific Northwest National Laboratory, Oct. 2011–2021.

◇ Research Scientist, Dept. of Computer Science, Rice University, Apr. 2010–Oct. 2011.

◇ Performance Tools Consultant (Samara Technology Group, SiCortex), Jan. 2007–Mar. 2011.

Selected Publications and Awards

◇ Top-tier publications: ***IPDPS*** 25, 25, 24, 23, 17, 16, 16 • ***SC*** 23, 21, 17, 15, 10, 09 • ***ICS*** 25, 14, 11 ***AAAI*** 26, ***ICDM*** 25 • ***BigData*** 20, 19 • ***IISWC*** 20, 18 • ***ISPASS*** 20 • ***PPoPP*** 15, 10, 09 • ***PLDI*** 09 ***CLUSTER*** 24, 24, 18, 22 • ***JPDC*** 23 • ***TPDS*** 21, 20 • ***C&C*** 10 • ***IEEE Computer*** 09

◇ US DOE Early Career (2021)

◇ Best paper nominees: SSDBM '25, ICS '25, IISWC '18, SC '15, PLDI '09.

◇ ACM/IEEE-CS George Michael Memorial HPC Fellowship (2009)

Education

Ph.D., Computer Science, *Rice University*, Houston, TX — May 2010

M.S., Computer Science, *Rice University*, Houston, TX — May 2007

M.Div., *Westminster Theological Seminary*, Philadelphia, PA — May 2002

B.A., Computer Science, *Rice University*, Houston, TX — May 1998

Software Contributions

◇ **Efficient AI systems**. Leading design of distributed AI systems such as
• MassiveGNN, for performant and productive training for massively connected (distributed) GNNs within the state-of-the-art Amazon DistDGL (distributed Deep Graph Library); and
• PowerTrip, for addressing the power constraints of large-scale training with federated heterogeneous datacenter power and intelligent adaptation of demand-response power.

◇ **Optimization of Distributed Workflows**. Project lead for DataFlowDrs, a new comprehensive suite of tools (DataLife, DaYu, FastFlow, FlowForecaster) that automates several previously difficult manual analyses and substantially reduces the impact of data flow bottlenecks.

- **Application Performance Analysis**. Original designer and developer of HPCToolkit, a widely used suite of performance tools for measurement and analysis of program performance on computers ranging from multicore desktop systems to GPU-accelerated supercomputers.
- **Hardware-Software-System Co-design**. Project lead for efforts in performance modeling and prediction to enable co-design of advanced computing systems, such as:
  • MemGaze/MemFriend, a memory analysis toolset that combines low-overhead measurement; sophisticated, high-resolution trace analysis; and emulation of memory-placement policies; and
  • OCEAN (Open-source CXL Emulation at Hyperscale Architecture and Networking), an emerging tool for emerging tool for emulating CXL-extended memory systems; and
  • Palm, a suite of performance modeling tools to assist performance analysis and predictive model generation.
- **Workload Benchmarking and Characterization**. Led efforts for
  - SEAK Suite, a collection of *constraining problems* for common embedded computing challenges.
  - PERFECT Suite, kernels and applications for evaluating tradeoffs between performance, power, and architecture within the domains of radar and image processing.

Professional Leadership

- Western Washington University, Dept. of Computer Science Advisory Board
- PI, DOE ASCR (Early Career) "Orchestration for Distributed and Data-Intensive Scientific Exploration," 2021-2026.
- Co-PI, AT SCALE (LDRD) "Data-Intensive Scientific Exploration", 2024-25.
- Chief Scientist, PNNL Agile investment "Cloud, HPC, and Edge for Science and Security" (CHESS), 2022-24.
- Co-PI, DMC (LDRD) "Fixing Amdahl's Law within the Limits of Accelerated Systems" (Fallacy), 2019-22.

Mentoring & Advising

- Mentoring for more than 30 Post Doctoral Researchers and Interns
- Served on Ph.D. Committee for Hasanur Rashid (University of Delaware), Yasodha Suriyakumar (Portland State University) and Oceane Bel (University of California, Santa Cruz)