Nathan R. Tallent

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Executive Summary

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

◇ Currently, Dr. Tallent is a distinguished computer scientist in PNNL's Future Computing Technologies Group, with expertise in performance analysis, hardware-software co-design, distributed systems, scientific workflows, AI & machine learning, and data management.

◇ Dr. Tallent has over 70 peer-reviewed publications, a DOE Early Career award, and has made notable contributions in performance measurement, modeling, bottleneck diagnosis, and optimization.

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

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

◇ US DOE Early Career (2021)

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

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

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

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.

Software Contributions

- **Efficient AI systems**. Leading design of distributed AI systems such as MassiveGNN, performant and productive training for massively connected (distributed) GNNs within the state-of-the-art Amazon DistDGL (distributed Deep Graph Library); and PowerTrip, for exploiting federated heterogeneous datacenter power during distributed ML training.
- **Optimization of Distributed Workflows**. Project lead for DataFlowDrs, a new comprehensive suite of tools (DataLife, DaYu, FastFlow, FlowForecaster) for performance optimization of scientific HPC workflows that especially focuses on data flow and storage.
- **Application Performance Analysis**. Original designer and developer of HPCToolkit, a widely used suite of performance tools for high performance computing.
- **Hardware-Software-System Co-design**. Project lead for efforts in performance modeling and prediction to enable co-design of advanced computing systems.
  - MemGaze/MemFriend, a memory analysis toolset that combines high-resolution trace analysis and low overhead measurement, sophisticated trace analysis, and an emulator-optimizer for CXL memory allocation.
  - 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.

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)