

# NATHAN R. TALLENT, PH.D.

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## 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* 26<sup>x5</sup>, 25<sup>x2</sup>, 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<sup>x2</sup>, 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:
  - [MassiveGNN](#), for scaling graph neural network training to new levels with communication-efficient training for massive (distributed) GNNs within the state-of-the-art Amazon DistDGL (distributed Deep Graph Library).
  - PowerTrip & PowerMorph, 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) for performance optimization of scientific HPC workflows

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:
  - [MemGaze/MemFriend](#), a memory analysis toolset that combines low-overhead measurement; sophisticated, high-resolution trace analysis; and emulation of memory-placement policies.
  - [OCEAN](#) (Open-source CXL Emulation at Hyperscale Architecture and Networking), an emerging tool for emulating CXL-extended distributed memory systems.
  - [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**

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- ◊ 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**

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- ◊ 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)