Adam Ryan McDaniel

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Ph.D. student at the University of Tennessee (graduating Fall 2027) and research intern at Oak Ridge National Laboratory, working on GPU energy efficiency. First-author ISC 2026 paper on attributing millisecond-level GPU power to source code on Frontier; built a phase-aware GPU autotuner at AMD.

EDUCATION

University of Tennessee, Knoxville

Ph.D. in Computer Science GPA 3.93. Proposal: Jan 2027. — May 2024–Fall 2027 (expected)

M.S. in Computer Science GPA 3.90. — Dec 2022–May 2024

B.S. in Computer Science GPA 3.95. Completed in five semesters. — Aug 2020–Dec 2022

RESEARCH EXPERIENCE

Graduate Research Intern, *Oak Ridge National Laboratory* — May 2025–Present

- Built a profiler that samples GPU power at millisecond resolution on the Frontier and Portage supercomputers and attributes energy use to source code (first-author paper at ISC 2026).
- Contributed changes upstream to AMD's `rocm-smi-lib` that expose GPU energy counters to PAPI.
- Characterized HPL and HPG benchmarks on up to 512 MI250X GPUs and 480 MI300A APUs with HPE and AMD; showed mixed precision cuts Frontier node energy by up to 79%.
- Led a multi-institution study of how scientific software libraries affect GPU energy efficiency.

Research Associate, *Advanced Micro Devices (AMD)* — Jun 2026–Sep 2026

- Built a tool that improves GPU energy efficiency by classifying application phase behavior at runtime and adapting power-management settings to each phase.
- Designed an autotuning workflow that combines LLM-guided search with Bayesian optimization, and evaluated it against traditional optimization techniques on compute- and memory-bound HPC workloads.

Graduate Research Intern, *Oak Ridge National Laboratory* — May 2024–Aug 2024

- Built a process-monitoring system for anomaly detection in automated nuclear materials processing, using auto-encoder models to flag anomalies and LLMs to help diagnose them.

Graduate Research Assistant, *University of Tennessee* — May 2023–Present

- Runtime-systems research under Dr. Michael Jantz on CPU memory efficiency and performance.
- Wrote memory profilers in C++ that identify cold, compressible RAM regions while an application runs.

PUBLICATIONS

- **McDaniel, A.**, Jantz, M., Sharma, A., Abbott, S., Martin, S., Khandekar, S., Neth, B., Villasenor Alvarez, B., Kashi, A., Elwasif, W., and Hernandez, O. "Fine-Grained Power and Energy Attribution on AMD GPU/APU-Based Exascale Nodes." *ISC High Performance*, 2026.
- Hernandez, O., Sharma, A., Martin, S., Jajja, S. A., Park, W. Y., **McDaniel, A.**, Elwasif, W. R., and Nawaz, K. "Next-Generation Data Centers: Count Every Watt and Let Every Watt Count." *The Bridge* (National Academy of Engineering), 2026.
- Jahanshahi, M., Reid, D., **McDaniel, A.**, and Mockus, A. "OSS License Identification at Scale: A Comprehensive Dataset Using World of Code." *22nd International Conference on Mining Software Repositories (MSR)*, 2025.

PROJECTS

- **Ampere** (2026): Python tool for analyzing single runs or ensembles of exascale Score-P/OTF2 traces. Attributes GPU energy and power to functions, call paths, and MPI ranks, using Arkouda to process traces too large for one node's memory. Outputs flamegraphs, node timelines, and heatmaps.
- **Sage Programming Language & OS** (2022–2024): Statically typed, compiled language with structural typing, parametric polymorphism, algebraic datatypes, and pattern matching. Compact zero-address-code IR with x86-64, C, and interpreter backends; genetic-algorithm optimization cut generated code size by up to 20%. Used it to write the userspace of a custom RISC-V operating system. YouTube deep-dive has 300,000+ views.
- **Dune Shell** (2021–2024): Cross-platform shell with Lisp-like scripting and line completion (1.1k GitHub stars).

TECHNICAL SKILLS

- **Languages:** C++, C, Rust, Python, Bash, Lisp, x86-64 and RISC-V Assembly
- **GPU, HPC, and compilers:** ROCm, HIP, OpenMP, Arkouda, LLVM
- **Performance and power tools:** PAPI, Score-P, OTF2, `rocm-smi`, `amd-smi`

ACADEMIC SERVICE

- Program Committee Member, *MSR Data and Tool Showcase Track*, 2027
- Program Committee Member, *gem5 Workshop*, 2026
- Peer Reviewer, *Mining Software Repositories (MSR)*, 2026