MICHAEL J. WILKINS

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Research Interests

Parallel computing, high-performance computing, programming models/runtime systems, computer architecture, memory systems, emerging architectures such as reconfigurable and quantum computing

Education

Northwestern University, *Evanston, IL* *Expected: Late 2023*
Ph.D. Computer Engineering
GPA: 3.97
Co-Advised by Dr. Nikos Hardavellas and Dr. Peter Dinda

Rose-Hulman Institute of Technology, *Terre Haute, IN* *May 2019*
B.S. Computer Engineering
GPA: 3.92

Research Experience

MPI Collective Autotuning using Machine Learning *Ongoing*
Argonne National Laboratory
- Developing a machine-learning autotuner that automatically selects the optimal MPI collective algorithm
- Invented multiple optimizations to make ML-based MPI autotuning feasible on large-scale systems

Cache Coherence for High-Level Parallel Languages *Ongoing*
Northwestern University
- Examined the upper bound of efficiency improvements from disabling cache coherency in a distributed multiprocessor system
- Modified the ZSim architectural simulator and custom benchmarks to quantify coherency delays in false sharing and true sharing scenarios

Compiler and Runtime Memory Observation Tool (CARMOT) *Ongoing*
Northwestern University
- Developing a tool that presents allocation state information to the developer at the source-code level using compiler and runtime techniques
- Built a pintool using the Intel pin interface to report memory locations allocated and freed within statically compiled libraries

Developing Computational Architectures (DeCA) *2017-2019*
Rose-Hulman Institute of Technology
- Developed DeCA: a platform that enables application researchers to prototype FPGA accelerator designs through industry-standard tools and custom software
- Created a custom FPGA accelerator using DeCA for a neuroscience application to showcase the platform's capabilities; achieved 1.5x speedup

Publications

ACCLAiM: Advancing the Practicality of MPI Collective Communication Autotuning Using Machine Learning

CLUSTER'22
***Michael Wilkins**, Yanfei Guo, Rajeev Thakur, Peter Dinda, Nikos Hardavellas*

A FACT-Based Approach: Making Machine Learning Collective Autotuning Feasible on Exascale Systems
ExaMPI'21 Workshop
***Michael Wilkins**, Yanfei Guo, Rajeev Thakur, Nikos Hardavellas, Peter Dinda, Min Si*

WARDen: Specializing Cache Coherence for High-Level Parallel Languages
In Submission
***Michael Wilkins**, Sam Westrick, Vijay Kandiah, Alex Bernat, Brian Suchy, Enrico Armenio Deiana, Simone Campanoni, Umut Acar, Peter Dinda, Nikos Hardavellas,*

High-Level Parallel Languages Are a Better Fit for HPC Than You Think
In Submission (Workshop)
***Michael Wilkins**, Luke Arnold, Garrett Weil, Nikos Hardavellas, Peter Dinda*

CARMOT: Compiler and Runtime Memory Observation Tool
In Submission
*Enrico Deiana, Brian Suchy, **Michael Wilkins**, Brian Homerding, John McMichen, Nikos Hardavellas, Peter Dinda, Simone Campanoni*

Industry Experience

Argonne National Laboratory, Lemont, IL *2020-Present*
W.J. Cody Associate/Research Aide/Visiting Student
- Founded the MPI collective algorithm/machine learning project, initially under the supervision of Dr. Min Si and Dr. Pavan Balaji, now Dr. Yanfei Guo and Dr. Rajeev Thakur
- Earned external funding for the remainder of my Ph.D.

National Instruments, Austin, TX *2018 May-August*
Engineering Leadership Program (ELP) Intern
- Engaged with technical leaders through field presentations to multiple companies in the Seattle area
- Assisted customers to design and troubleshoot data-acquisition applications using NI platforms

Flexware Innovation, Fishers, IN *2017 June-August*
Trailblazer Intern
- Designed an innovative RFID tracking solution to repair a malfunctioning inventory locating system
- Produced a full-stack BI database solution analyzing internal employee and revenue data

Power Solutions International, Wood Dale, IL *2016 June-August*
Director of Tool Services
- Organized and managed the company's inventory of CNC machining tools, valued at more than $500,000
- Trained company technicians on new processes and managed tool services employees

Skills & Abilities

Simulators/Tools: ZSim, gem5, Xilinx Vivado, Xilinx ISE, Quartus II, Modelsim, Multisim
Software Languages: C, C++, Python, Standard/Parallel ML, C#, LabVIEW, Java, SQL, Bash
Hardware Description Languages: Chisel, VHDL, Verilog, SPICE

Leadership

Pi Kappa Alpha Fraternity Iota Delta Chapter *2017-2019*
Treasurer
- Drafted and managed a budget of over $400,000 across two school years while completing initiatives to increase payment collection and digitize fiduciary practices

Rose-Hulman Bowling Club *2016-2019*
President
- Restructured the club's leadership and daily operation; increased membership by 300%

Mooseheart Tutoring Program *2014-2016*
Founder and President
- Began program to tutor orphaned students at Mooseheart Child City; after 3 years of growth, had 45 students and 24 tutors meeting twice a week

Honors & Awards

Argonne National Laboratory Research Subcontract *2020-Present*
- Full funding for my Ph.D. from ANL

Cabell Fellowship *2019-2020*
- Awarded to the top 10 1st year Ph.D. students across all engineering majors

Department Choice Award *2019*
- Awarded to the best senior research project

Embedded Systems Design Competition Champion *2018*
Freshman ECE Design Competition Champion *2016*
Dean's List (All Semesters) *2016-2019*
Class of 1940 Endowed Scholarship *2016-2019*
National AP Scholar *2016*
Illinois State Scholar *2016*
36 ACT Certificate *2015*

Societies & Activities

Institute of Electrical and Electronics Engineers (IEEE) *2016-Present*
Eta Kappa Nu Honor Society *2017-2019*
Blue Key Honor Society *2017-2019*
Alpha Lambda Delta Honor Society *2017-2018*
Community Service Chapel Street Church of Geneva Nursery, Habitat for Humanity