
Michael Laurenzano, Ph.D.

Curriculum Vitae

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Research Fellow, University of Michigan
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Introduction

My work focuses on researching, designing and building cutting-edge intelligent software applications and the scalable systems and platforms that deliver them to the world. My research in support of these activities is diverse, covering a spectrum of topics in the areas of machine learning, conversational systems, compilers, computer architecture, programming languages, runtime systems and warehouse scale computing. In 2015 I co-founded Clinc, an Ann Arbor, MI based company focused on building intelligent conversational technology, where I have the pleasure of serving as the Chief Technology Officer. In 2009 I co-founded EP Analytics, a successful HPC consulting firm that continues to operate today in San Diego, CA.

Education

- 2013-2016 **Ph.D., Computer Science and Engineering.** University of Michigan, Ann Arbor
Advisors: Jason Mars and Lingjia Tang
Dissertation: Low-overhead Online Code Transformations
- 2004-2007 **M.S., Computer Science and Engineering.** University of California, San Diego
Advisor: Allan Snaveley
- 1999-2004 **B.A., Mathematics and B.A., Computer Science.** University of San Diego

Awards and Honors

- MICRO '17 **DeftNN paper nominated for Best Paper award at MICRO '17**
DeftNN: Addressing Bottlenecks for DNN Execution on GPUs via Synapse Vector Elimination and Near-compute Data Fission
- Top Picks '16 **Sirius (ASPLOS '15) paper selected for IEEE Micro Top Picks as one of the top computer architecture publications of 2015**
- TOCS '15 **Sirius (ASPLOS '15) paper selected for fast-track publication at Transactions on Computer Systems (TOCS)**
Sirius: An Open End-to-end Voice and Vision Personal Assistant and Its Implications for Future Warehouse Scale Computers
- Euro-par '14 **One of five papers selected as research highlight and invited to submit to a special issue of Concurrency and Computation: Practice and Experience**
Modeling the Impact of Reduced Memory Bandwidth on HPC Applications
- UMich '13 **University of Michigan CSE Fellowship**
Full tuition and stipend support; 1 year award (2013-2014)
- SC '08 **Finalist for the ACM Gordon Bell Prize (top 3) for outstanding achievement in high performance computing**
High-Frequency Simulations of Global Seismic Wave Propagations using SPECFEM3D_GLOBE

Appointments

- 2015-present **Chief Technology Officer**, clinc. Ann Arbor, MI.
 - Direct research and development of intelligent virtual assistant technology
 - Design and manage internal IT and user-facing web services infrastructure
- 2016-present **Research Fellow**, University of Michigan. Ann Arbor, MI
 - Research focused on compilers, comp. architecture prog. languages and emerging applications
- 2013-2016 **Research Assistant**, University of Michigan. Ann Arbor, MI.
 - Research on compilers, runtime systems, computer architecture and emerging applications
- 2009-2015 **Director of Systems and Architecture**, EP Analytics, Inc. San Diego, CA.
 - Direct research efforts investigating cutting edge HPC applications, platforms and architectures
 - Responsible for the design and procurement of all computing infrastructure
- 2012-2013 **Board of Directors**, EP Analytics, Inc. Ann Arbor, MI.
 - Oversee all aspects of business, operations and R&D
- 2007-2013 **Senior Computational Scientist**, San Diego Supercomputer Center
 - Research focused on techniques for modeling and improving HPC system energy efficiency
 - Software development and research focused on developing performance models
- 2005-2007 **Research Assistant**, University of California, San Diego
 - Research focused on developing efficient binary and assembly code instrumentation systems
- 2002-2005 **Teaching Assistant**, Dept. of Math and Computer Science, University of San Diego
 - Organize assignments and grade for multivariable Calculus
 - Tutor students in all lower division undergraduate mathematics courses

Conference Publications

- MICRO '17 Parker Hill, Animesh Jain, Mason Hill, Babak Zamirai, Chang-hong Hsu, [Michael A. Laurenzano](#), Scott Mahlke, Lingjia Tang, Jason Mars. *DeftNN: Addressing Bottlenecks for DNN Execution on GPUs via Synapse Vector Elimination and Near-compute Data Fission*. International Symposium on Microarchitecture. October, 2017.
 - MICRO '17 Best Paper nominee
- MICRO '16 Animesh Jain, Parker Hill, Shih-Chieh Lin, Muneeb Khan, Md E. Haque, Scott Mahlke, Jason Mars, Lingjia Tang and [Michael A. Laurenzano](#). *Concise Loads and Stores: The Case for an Asymmetric Compute-memory Architecture for Approximation*. International Symposium on Microarchitecture. December, 2016.
- MICRO '16 Steve Zekany, Daniel Rings, Nathan Harada, Lingjia Tang, [Michael A. Laurenzano](#) and Jason Mars. *CrystalBall: Statically Analyzing Runtime Behavior via Deep Sequence Learning*. International Symposium on Microarchitecture. December, 2016.
- MICRO '16 Animesh Jain, [Michael A. Laurenzano](#), Jason Mars and Lingjia Tang. *Continuous Shape Shifting: Enabling Loop Co-optimization via Near-free Dynamic Code Rewriting*. International Symposium on Microarchitecture. December, 2016.
- ICER '16 Soohyun Nam, Daniel Zingaro, [Michael A. Laurenzano](#), William Griswold, and Leonard Porter. *Lightweight, Early Identification of At-risk CS1 Students*. International Computing Education Research Conference (ICER). September, 2016.
- ISCA '16 [Michael A. Laurenzano](#), Yunqi Zhang, Jiang Chen, Lingjia Tang, Jason Mars. *PowerChop: Identifying and Managing Non-critical Units in Hybrid Processor Architectures*. International Symposium on Computer Architecture. June, 2016.
- PLDI '16 [Michael A. Laurenzano](#), Parker Hill, Mehrzad Samadi, Scott Mahlke, Jason Mars, Lingjia Tang. *Input Responsiveness: Using Canary Inputs to Dynamically Steer Software Approximation*. Programming Language Design and Implementation. June, 2016.

- ISPASS '16 [Michael A. Laurenzano](#), Ananta Tiwari, Allyson Cauble-Chantrenne, William A. Ward, Roy Campbell, Laura Carrington. *Characterization and Bottleneck Analysis of a 64-bit ARMv8 Platform*. Performance Analysis of Systems and Software. April, 2016.
- PACT '15 Muneeb Khan, [Michael A. Laurenzano](#), Jason Mars, Erik Hagersten and David Black-Schaffer. *A-REP: Adaptive Resource Resource Efficient Prefetching for Maximizing Multicore Performance*. Parallel Architectures and Compilation Techniques. October, 2015.
- ISCA '15 Johann Hauswald, Yiping Kang, [Michael A. Laurenzano](#), Quan Chen, Cheng Li, Trevor Mudge, Ronald G. Dreslinski, Jason Mars and Lingjia Tang. *DjiNN and Tonic: DNN as a Service and its Implications for Future Warehouse Scale Computers*. International Symposium on Computer Architecture. June, 2015.
- ASPLOS '15 Johann Hauswald, [Michael A. Laurenzano](#), Yunqi Zhang, Cheng Li, Austin Rovinski, Arjun Khurana, Ronald G. Dreslinski, Trevor Mudge, Vinicius Petrucci, Lingjia Tang and Jason Mars. *Sirius: An Open End-to-end Voice and Vision Personal Assistant and Its Implications for Future Warehouse Scale Computers*. Architectural Support for Programming Languages and Operating Systems. March, 2015.
□ [Invited for fast-track submission to Transactions on Computer Systems \(TOCS\)](#)
□ [Selected as one of the IEEE Micro Top Picks from computer architecture in 2015](#)
- HPCA '15 Vinicius Petrucci, [Michael A. Laurenzano](#), Yunqi Zhang, John Doherty, Daniel Mosse, Lingjia Tang and Jason Mars. *Octopus-Man: QoS-Driven Task Management for Multicores in Warehouse Scale Computers*. High Performance Computer Architecture. February, 2015.
- HPCA '15 Chang-Hong Hsu, Yunqi Zhang, [Michael A. Laurenzano](#), David Meisner, Thomas Wenisch, Jason Mars, Lingjia Tang and Ronald G. Dreslinski. *Adrenaline: Pinpointing and Reining in Tail Queries with Quick Voltage Boosting*. High Performance Computer Architecture. February, 2015.
- MICRO '14 [Michael A. Laurenzano](#), Yunqi Zhang, Lingjia Tang and Jason Mars. *Protean Code: Achieving Near-free Online Code Transformations for Warehouse Scale Computers*. International Symposium on Microarchitecture. December, 2014.
- MICRO '14 Yunqi Zhang, [Michael A. Laurenzano](#), Jason Mars and Lingjia Tang. *SMiTe: Precise QoS Prediction on Real-System SMT Processors to Improve Utilization in Warehouse Scale Computers*. International Symposium on Microarchitecture. December, 2014.
- Euro-par '14 [Michael A. Laurenzano](#), Ananta Tiwari, Adam Jundt, Joshua Peraza, William A. Ward, Roy Campbell and Laura Carrington. *Characterizing the Performance-Energy Tradeoff of Small ARM Cores in HPC Computation*. European Conf. on Parallel Processing. August, 2014.
- Euro-par '14 Ananta Tiwari, Anthony Gamst, [Michael A. Laurenzano](#), Martin Schulz and Laura Carrington. *Modeling the Impact of Reduced Memory Bandwidth on HPC Applications*. European Conf. on Parallel Processing. August, 2014.
- Euro-par '11 [Michael A. Laurenzano](#), Mitesh Meswani, Laura Carrington, Allan Snavely, Mustafa M. Tikir and Stephen Poole. *Reducing Energy Usage with Memory and Computation-Aware Dynamic Frequency Scaling*. August, 2011.
- ICS '11 Laura Carrington, Mustafa M. Tikir, Catherine Olschanowsky, [Michael A. Laurenzano](#), Joshua Peraza, Allan Snavely and Stephen Poole. *An Idiom-finding Tool for Increasing Productivity of Accelerators*. International Conference on Supercomputing. May, 2011.

- ISPASS '10 [Michael A. Laurenzano](#), Mustafa M. Tikir, Laura Carrington and Allan Snavely. *PEBIL: Efficient Static Binary Instrumentation for Linux*. International Symposium on the Performance Analysis of Systems and Software. March, 2010.
- Euro-par '09 Mustafa M. Tikir, [Michael A. Laurenzano](#), Laura Carrington and Allan Snavely. *PSiNS: An Open Source Event Tracer and Execution Simulator for MPI Applications*. European Conf. on Parallel Processing. August, 2009.
- SC '08 Laura Carrington, Dimitri Komatitsch, [Michael A. Laurenzano](#), Mustafa M. Tikir, David Michea, Nicholas Le Goff, Allan Snavely and Jeroen Tromp. *High-Frequency Simulations of Global Seismic Wave Propogations using SPECFEM3D_GLOBE*. International Conf. on HPC, Networking, Storage and Analysis. November, 2008.
 □ [ACM Gordon Bell Prize finalist](#)
- SC '05 Laura Carrington, [Michael A. Laurenzano](#), Allan Snavely, Roy Campbell and Larry Davis. *How Well Can Simple Metrics Represent the Performance of HPC Applications?* International Conf. on HPC, Networking, Storage and Analysis. November, 2005.
- IISWC '05 Xiaofeng Gao, [Michael A. Laurenzano](#), Beth Simon and Allan Snavely. *Reducing Overheads for Acquiring Dynamic Traces*. International Symposium on Workload Characterization. September, 2005.

Journal Publications

- TOCS '17 Chang-hong Hsu, Yunqi Zhang, [Michael A. Laurenzano](#), David Meisner, Thomas Wenisch, Ronald G. Dreslinski, Jason Mars, Lingjia Tang. *Reining in Long Tails in Warehouse-Scale Computers with QuickVoltage Boosting Using Adrenaline*. Transactions on Computer Systems. 2017.
- Top Picks '16 Johann Hauswald, [Michael A. Laurenzano](#), Yunqi Zhang, Cheng Li, Austin Rovinski, Arjun Khurana, Ronald G. Dreslinski, Trevor Mudge, Vinicius Petrucci, Lingjia Tang and Jason Mars. *Sirius Implications for Future Warehouse-scale Computers*. IEEE Micro Top Picks. 2016.
- TOCS '15 Johann Hauswald, [Michael A. Laurenzano](#), Yunqi Zhang, Hailong Yang, Yiping Kang, Cheng Li, Austin Rovinski, Arjun Khurana, Ronald G. Dreslinski, Trevor Mudge, Vinicius Petrucci, Lingjia Tang and Jason Mars. *Bridging the Scalability Gap for Sirius: Accelerating Future Warehouse Scale Computers for an End-to-End Intelligent Voice and Vision Assistant*. Transactions on Computer Systems. 2015.
- TACO '15 Leonard Porter, [Michael A. Laurenzano](#), Ananta Tiwari, Adam Jundt, William A. Ward, Roy Campbell and Laura Carrington. *Making the Most of SMT in HPC: System and Application Level Perspectives*. Transactions on Architecture and Code Optimization. 2015.
- PPL '13 Laura Carrington, [Michael A. Laurenzano](#) and Ananta Tiwari. *Characterizing Large-scale HPC Applications through Trace Extrapolation*. Parallel Processing Letters. 2013.
- CC '13 [Michael A. Laurenzano](#), Joshua Peraza, Laura Carrington, Ananta Tiwari, William A. Ward and Roy Campbell. *PEBIL: Binary Instrumentation for Practical Data-Intensive Program Analysis*. Cluster Computing Journal. 2013.
- CCPE '13 Joshua Peraza, Ananta Tiwari, [Michael A. Laurenzano](#), Laura Carrington and Allan Snavely. *PMAC's Green Queue: A Framework for Selecting Energy Optimal DVFS Configurations in Large Scale MPI Applications*. Concurrency and Computation: Practice and Experience. 2013.

CCPE '13 Alex Breslow, Leonard Porter, Ananta Tiwari, Michael A. Laurenzano, Dean Tullsen, Laura Carrington and Allan Snaveley. *The Case for Colocation of HPC Workloads*. Concurrency and Computation: Practice and Experience. 2013.

Workshop Publications

- E2SC '15 Adam Jundt, Allyson Cauble-Chantrenne, Ananta Tiwari, Joshua Peraza, Michael A. Laurenzano, Laura Carrington. *Compute Bottlenecks on the new 64-bit ARM*. Energy Efficient Supercomputing. November, 2015.
- Co-HPC '15 Ananta Tiwari, Kristopher Keipert, Adam Jundt, Sarom S. Leang, Michael A. Laurenzano, Mark S. Gordon, Laura Carrington. *Performance and Energy Efficiency Analysis of 64-bit ARM using GAMESS*. Hardware-software Co-design for High Performance Computing. November, 2015.
- MODSIM '14 Ananta Tiwari, Michael A. Laurenzano, Adam Jundt, Willam A. Ward, Jr., Roy Campbell and Laura Carrington. *Adaptive Model-driven Facility-wide Management of Energy Efficiency and Reliability*. Modeling and Simulation of Exascale Systems and Applications. August, 2014.
- MODSIM '13 Michael A. Laurenzano, Laura Carrington, Adam Jundt, Ananta Tiwari, Joshua Peraza, William A. Ward, Jr. and Roy Campbell. *Viewing Application/Machine Interactions through Computational Idioms*. Modeling and Simulation of Exascale Systems and Applications. September, 2013.
- LSPP '13 Laura Carrington, Michael A. Laurenzano and Ananta Tiwari. *Inferring Large-scale Computation Behavior via Trace Extrapolation*. Large Scale Parallel Processing. May, 2013.
- CGC '12 Ananta Tiwari, Michael A. Laurenzano, Joshua Peraza, Laura Carrington and Allan Snaveley. *Green Queue: Customized Large Scale Clock Frequency Scaling*. International Conference on Cloud and Green Computing. November, 2012.
- DISCS '12 Michael A. Laurenzano, Joshua Peraza, Laura Carrington, Ananta Tiwari, William A. Ward, Jr. and Roy Campbell. *A Static Binary Instrumentation Threading Model for Fast Memory Trace Collection*. Data-Intensive Scalable Computing Systems. November, 2012.
- DISCS '12 Kayla Seager, Ananta Tiwari, Michael A. Laurenzano, Joshua Peraza, Pietro Cicotti and Laura Carrington. *Efficient HPC Data Motion via Scratchpad Memory*. Data-Intensive Scalable Computing Systems. November, 2012.
- HPPAC '12 Ananta Tiwari, Michael A. Laurenzano, Laura Carrington and Allan Snaveley. *Modeling Power and Energy Usage of HPC Kernels*. High-Performance, Power-Aware Computing. May, 2012.
- PROPER '11 Ananta Tiwari, Michael A. Laurenzano, Laura Carrington and Allan Snaveley. *Auto-tuning for Energy Usage in Scientific Applications*. Productivity and Performance. August, 2011.
- WBIA '08 Mustafa M. Tikir, Michael A. Laurenzano, Laura Carrington and Allan Snaveley. *The PMAc Binary Instrumentation Library for PowerPC*. Binary Instrumentation and Applications. October, 2008.
- WBIA '05 Michael A. Laurenzano, Beth Simon, Allan Snaveley and Meghan Gunn. *Low Cost Trace-driven Memory Simulation using SimPoint*. Binary Instrumentation and Applications. September, 2005.

Professional Activities and Service

Technical
Paper
Referee

Program Committee

- Performance Analysis of Systems and Software (ISPASS) 2018
- Code Generation and Optimization (CGO) 2017

External Reviewer

- International Symposium on Computer Architecture (ISCA) 2016
- Arch. Support for Programming Languages and Operating Systems (ASPLOS) 2015, 2016
- International Symposium on Microarchitecture (MICRO) 2015, 2016, 2017
- Programming Language Design and Implementation (PLDI) 2015
- High Performance Computer Architecture (HPCA) 2014, 2015, 2018
- Supercomputing (SC) 2005, 2014
- International Conference on Supercomputing (ICS) 2005, 2014
- Performance Analysis of Systems and Software (ISPASS) 2015
- Computing Frontiers (CF) 2014
- European Research Council (ERC) grant review, 2017

Journal Invited Reviewer

- Public Library of Science (PLOS) ONE 2017
- IEEE Transactions on Circuits and Systems for Video Technology (TCSVT) 2017
- Wireless Networks (WiNe) 2016
- Transactions on Parallel and Distributed Systems (TPDS) 2016
- Journal of Parallel and Distributed Computing (JPDC) 2015
- Software: Practice and Experience (SPE) 2015
- Computer Languages, Systems and Structures (COMLAN) 2014
- Energies 2014

Conference
Organization

Submissions Chair

- Code Generation and Optimization (CGO) 2015
- International Symposium on Workload Characterization (IISWC) 2014

Technical Artifact Evaluation Committee

- Code Generation and Optimization (CGO) 2015, 2016
- Principles and Practice of Parallel Programming (PPoPP) 2015, 2016

Professional
Organizations

Member, Association for Computing Machinery (ACM)
Member, Institute of Electrical and Electronics Engineers (IEEE)

Tutorials

- HPCA '16 *Sirius and Djinn: Infrastructures to Study Emerging Intelligent Web Services.* With Johann Hauswald, Yiping Kang, Yunqi Zhang, Lingjia Tang and Jason Mars. March 12, 2016. Barcelona, Spain.
- ASPLOS '15 *Sirius: An Open End-to-End Voice and Vision Personal Assistant like Apple's Siri, Google Now, Microsoft's Cortana, and Amazon's Echo.* With Johann Hauswald, Yiping Kang, Yunqi Zhang, Lingjia Tang and Jason Mars. March 14, 2015. Istanbul, Turkey.

Grants and Funding Awards

- 2017-2019 **Principal Investigator**, National Science Foundation Small Business Innovation Research (NSF SBIR Phase II) program award #1738441 titled *Pushing the Boundaries of Intelligent Assistants for Financial Services* (\$750k)
- 2017-2019 **Principal Investigator**, Michigan Emerging Technologies Fund (MI ETF) supplement to NSF SBIR Phase II award #1738441 (\$125k)
- 2016-2017 **Principal Investigator**, National Science Foundation Small Business Innovation Research (NSF SBIR Phase I) program award #1622049 titled *An Open Source Platform for Intelligent Personal Assistants* (\$225k)

2013-2014 **Principal Investigator**, Department of Energy Small Business Innovation Research program (DoE SBIR Phase I) award #DE-SC0009497 titled *Performance Optimization and Porting Tools for Energy-Efficient High Performance Computing Architectures* (\$150k)

Patents

2016 Co-inventor on United States Patent Application 20160170727, *Runtime Compiler Environment With Dynamic Co-Located Code Execution*. With Jason Mars and Lingjia Tang.