

# Andrew Lenharth

## EDUCATION

- 2010 **Doctor of Philosophy in Computer Science**  
*University of Illinois at Urbana Champaign*  
**Advisor:** Prof. Vikram Adve  
**Thesis:** Automatic Recovery For Request Oriented Systems
- 2004 **Master of Science in Computer Science**  
*Ohio University*  
**Advisor:** Prof. Lonnie Welch  
**Thesis:** Algorithms for Stable Allocations in Distributed Real-Time Resource Management Systems
- 2001 **Bachelor of Engineering with Distinction in Computer Engineering**  
*University of Washington*  
**Advisor:** Prof. Richard Ladner  
Magna Cum Laude, Minors in Math and Philosophy, Department Honors, Dean's List all quarters, Annual Dean's List all years

## PUBLICATIONS

- [28] Schuyler Eldridge, Prithayan Barua, Aliaksei Chapyzhenka, Adam Izraelevitz, Jack Koenig, Chris Lattner, Andrew Lenharth, George Leontiev, Fabian Schuiki, Ram Sunder, Andrew Young, and Richard Xia. Mlir as hardware compiler infrastructure. In *WOSET: Workshop on Open-Source EDA Technology*, volume 3, 2021.
- [27] Hoang-Vu Dang, Roshan Dathathri, Gurbinder Gill, Alex Brooks, Nikoli Dryden, Andrew Lenharth, Loc Hoang, Keshav Pingali, and Marc Snir. A lightweight communication runtime for distributed graph analytics. In *2018 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pages 980–989, 2018.
- [26] Gurbinder Gill, Roshan Dathathri, Loc Hoang, Andrew Lenharth, and Keshav Pingali. Abelian: A compiler for graph analytics on distributed, heterogeneous platforms. In Marco Aldinucci, Luca Padovani, and Massimo Torquati, editors, *Euro-Par 2018: Parallel Processing*, pages 249–264, Cham, 2018. Springer International Publishing.
- [25] Marcin M. Łoś, Maciej Woźniak, Maciej Paszyński, Andrew Lenharth, Muhamm Amber Hassaan, and Keshav Pingali. Iga-ads: Isogeometric analysis fem using ads solver. *Computer Physics Communications*, 217:99–116, 2017.
- [24] Andrew Lenharth, Donald Nguyen, and Keshav Pingali. Parallel graph analytics. *Communications of the ACM*, 59(5):78–87, April 2016. **Cover Article.**
- [23] Xin Sui, Andrew Lenharth, Donald S. Fussell, and Keshav Pingali. Proactive control of approximate programs. *SIGPLAN Not.*, 51(4):607–621, March 2016.

## PUBLICATIONS (CONTINUED)

- [22] Saeed Maleki, Donald Nguyen, Andrew Lenharth, María Garzarán, David Padua, and Keshav Pingali. Dsmr: A parallel algorithm for single-source shortest path problem. In *Proceedings of the 2016 International Conference on Supercomputing*, ICS '16, New York, NY, USA, 2016. Association for Computing Machinery.
- [21] Anna Paszyńska, Maciej Woźniak, Andrew Lenharth, Donald Nguyen, and Keshav Pingali. Hypergraph grammars in non-stationary hp-adaptive finite element method. *Procedia Computer Science*, 80:875–886, 2016. International Conference on Computational Science 2016, ICCS 2016, 6-8 June 2016, San Diego, California, USA.
- [20] Xin Sui, Andrew Lenharth, Donald S. Fussell, and Keshav Pingali. Proactive control of approximate programs. In *Proceedings of the Twenty-First International Conference on Architectural Support for Programming Languages and Operating Systems*, ASPLOS '16, page 607–621, New York, NY, USA, 2016. Association for Computing Machinery.
- [19] Akshatha Bhat, Andrew Lenharth, Donald Nguyen, Qing Yi, and Keshav Pingali. Automatic tuning of task scheduling policies on multicore architectures. In Gerhard R. Joubert, Hugh Leather, Mark Parsons, Frans J. Peters, and Mark Sawyer, editors, *Parallel Computing: On the Road to Exascale, Proceedings of the International Conference on Parallel Computing, ParCo 2015, 1-4 September 2015, Edinburgh, Scotland, UK*, volume 27 of *Advances in Parallel Computing*, pages 11–21. IOS Press, 2015.
- [18] Damian Goik, Konrad Jopek, Maciej Paszynski, Andrew Lenharth, Donald Nguyen, and Keshav Pingali. Graph grammar based multi-thread multi-frontal direct solver with galois scheduler. In *ICCS 2015: Proceedings of the International Conference on Computational Science*. Elsevier, 2015.
- [17] Andrew Lenharth, Donald Nguyen, and Keshav Pingali. Priority queues are not good concurrent priority schedulers. In *Euro-Par 2015: Parallel Processing - 21st International Conference on Parallel and Distributed Computing*. Springer, 2015.
- [16] Andrew Lenharth and Keshav Pingali. Scaling runtimes for irregular algorithms to large-scale NUMA systems. *IEEE Computer*, 48(8):35–44, 2015.
- [15] Anna Paszynska, Maciej Paszynski, Konrad Jopek, Maciej Wozniak, Damian Goik, Piotr Gurgul, Hassan AbouEisha, Mikhail Moshkov, Victor Manuel Calo, Andrew Lenharth, Donald Nguyen, and Keshav Pingali. Quasi-optimal elimination trees for 2d grids with singularities. *Scientific Programming*, 2015:303024:1–303024:18, 2015.
- [14] Joyce Jiyoung Whang, Andrew Lenharth, Inderjit S. Dhillon, and Keshav Pingali. Scalable data-driven pagerank: Algorithms, system issues, and lessons learned. In *Euro-Par 2015: Parallel Processing - 21st International Conference on Parallel and Distributed Computing*. Springer, 2015.
- [13] Damian Goik, Konrad Jopek, Maciej Paszynski, Andrew Lenharth, Donald Nguyen, and Keshav Pingali. Graph grammar based multi-thread multi-frontal direct solver with galois scheduler. In *ICCS 2014: Proceedings of the International Conference on Computational Science*, volume 29 of *Procedia Computer Science*, pages 960–969. Elsevier, 2014.
- [12] Konstantinos I. Karantasis, Andrew Lenharth, Donald Nguyen, María J. Garzarán, and Keshav Pingali. Parallelization of reordering algorithms for bandwidth and wavefront reduction. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '14, pages 921–932, Piscataway, NJ, USA, 2014. IEEE Press.
- [11] Donald Nguyen, Andrew Lenharth, and Keshav Pingali. A lightweight infrastructure for graph analytics. In *SOSP 2013: The 24th ACM Symposium on Operating System Principles*. ACM, 2014.
- [10] Donald Nguyen, Andrew Lenharth, and Keshav Pingali. Deterministic galois: On-demand, parameterless and portable. In *ASPLOS 2014: The 19th International Conference on Architectural Support for Programming Languages and Operating Systems*. ACM, 2013.

## PUBLICATIONS (CONTINUED)

- [9] Keshav Pingali, Donald Nguyen, Milind Kulkarni, Martin Burtscher, Muhammad Amber Hassaan, Rashid Kaleem, Tsung-Hsien Lee, Andrew Lenharth, Roman Manevich, Mario Méndez-Lojo, Dimitrios Proutzos, and Xin Sui. The tao of parallelism in algorithms. In *PLDI 2011: Proceedings of the 32nd ACM SIGPLAN Conference on Programming Language Design and Implementation*, pages 12–25, New York, NY, USA, 2011. ACM.
- [8] Andrew Lenharth. *Automatic Recovery For Request Oriented Systems*. PhD thesis, University of Illinois at Urbana-Champaign, 2010.
- [7] Andrew Lenharth, Vikram Adve, and Samuel King. Recovery domains: an organizing principle for recoverable operating systems. In *ASPLOS '09: Proceeding of the 14th International Conference on Architectural Support for Programming Languages and Operating Systems*, pages 49–60, New York, NY, USA, 2009. ACM.
- [6] John Criswell, Andrew Lenharth, Dinakar Dhurjati, and Vikram Adve. Secure virtual architecture: A safe execution environment for commodity operating systems. In *SOSP '07: Proceedings of 21st ACM SIGOPS Symposium on Operating Systems Principles*, pages 351–366, New York, NY, USA, 2007. ACM. **SOSP 2007 Audience Choice Award**.
- [5] Chris Lattner, Andrew Lenharth, and Vikram Adve. Making context-sensitive points-to analysis with heap cloning practical for the real world. In *PLDI '07: Proceedings of the 2007 ACM SIGPLAN Conference on Programming Language Design and Implementation*, pages 278–289, New York, NY, USA, 2007. ACM.
- [4] Eric Aber, Frank Drews, Dazhang Gu, David Juedes, Andrew Lenharth, David Parrott, Lonnie Welch, Hang Zhao, and David Fleeman. Experimental comparison of heuristic and optimal resource allocation algorithms for maximizing allowable workload in dynamic, distributed real-time systems. In *The 6th Brazilian Workshop on Real-Time Systems*, 2004.
- [3] David Fleeman, Matthew Gillen, Andrew Lenharth, M. Delaney, Lonnie R. Welch, David W. Juedes, and Chang Liu. Quality-based adaptive resource management architecture (qarma): A corba resource management service. In *18th International Parallel and Distributed Processing Symposium*. IEEE Computer Society, 2004.
- [2] Andrew Lenharth. Algorithms for stable allocations in distributed real-time resource management systems. Master's thesis, Ohio University, 2004.
- [1] Andrew Lenharth, Richard E. Ladner, Scott Hauck, Eve A. Riskin, and Agnieszka Miguel. Wavelet compression of modis satellite images. In *NASA Earth Science and Technology Conference*, 2001.

## GRANTS

- 2015 (Proposed) Co-PI, “Proteus: Controlling Resource-Adaptive Embedded Software”, DoD
- 2014 PI, “Heterogeneous execution of irregular programs”, NVIDIA
- 2013 Co-PI, “XPS: FP: Collaborative Research: Parallel Irregular Programs: From High-Level Specifications to Run-time Optimizations”, NSF
- 2012 PI, “Scaling Irregular Algorithms using the Galois Framework To Large NUMA Systems”, Extreme Science and Engineering Discovery Environment (XSEDE), May 2012 – May 2013
- 2010 PI, “Scaling Parallel Programming Frameworks to Large Systems”, Extreme Science and Engineering Discovery Environment (XSEDE), Dec 2010 – June 2012

## TALKS AND TUTORIALS

- 2022 Conference Tutorial, "Circuit IR for Compilers and Tools", Hot Chips 34, August 2022

## TALKS AND TUTORIALS (CONTINUED)

- Workshop Presentation, "MLIR and Cirt", MLIR Workshop at LLVM Developer's Meeting, San Jose, CA, October 2022
- 2021 Keynote Talk, "CIRCT: Lifting Hardware Development Out Of The 20th Century", LLVM Developer's Meeting, San Jose, CA, November 2021
- 2020 Invited Talk and Panelist, "FPGA Programmability", The Future of FPGA-Acceleration in Cloud and Datacenters workshop, co-located with The IEEE Symposium on Field-Programmable Custom Computing Machines (FCCM), New York, New York, October 2020
- 2015 Invited Talk, "Parallel Programming with the Galois System", PELGA 2015: 1st Workshop on Performance Engineering for Large Scale Graph Analytics, co-located with Euro-Par 2015, Vienna, Austria, August 2015
- Conference Presentation, "Priority Queues Are Not Good Concurrent Priority Schedulers", European Conference on Parallel and Distributed Computing (Euro-Par), Vienna, Austria, August 2015
- Conference Presentation, "Scalable Data-Driven PageRank: Algorithms, System Issues, and Lessons Learned", European Conference on Parallel and Distributed Computing (Euro-Par), Vienna, Austria, August 2015
- 2014 Invited Talk, "Graph Analytics with the Galois System", Dagstuhl Seminar 14462, Dagstuhl, Germany, November 2014
- Tutorial, "High-Performance Parallel Graph Analytics", European Conference on Parallel and Distributed Computing (Euro-Par), Porto, Portugal, August 2014
- Invited Talk, "Parallel Programming in the Age of Ubiquitous Parallelism", Microsoft Research Symposium, Redmond, WA, July 2014
- Tutorial, "Solving Graph Problems in Parallel Using the Galois System", Symposium on Principles and Practice of Parallel Programming (PPoPP), Orlando, FL, February 2014
- 2013 Invited Panelist, Third Workshop on Irregular Applications: Architectures and Algorithms, co-located with Super Computing (SC), Denver, Colorado, November 2013
- Invited Lecture, "Amorphous Data-Parallelism and the Galois System", Tsinghua University, January 2013
- 2012 Tutorial, "Parallelizing Irregular Applications through the Exploitation of Amorphous Data-Parallelism", Symposium on Principles and Practice of Parallel Programming (PPoPP), February 2012
- 2010 Invited Talk, "Automated Recovery for Operating Systems", Department of Computer Science, Notre Dame, May 2010
- 2009 Conference Presentation, "Recovery Domains: An Organizing Principle for Recoverable Operating Systems", Fourteenth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), Washington DC, March 2009
- 2007 Conference Presentation, "Making Context-Sensitive Points-to Analysis with Heap Cloning Practical For The Real World", ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), San Diego, California, June 2007
- 2005 Workshop Presentation, "Software Controlled Microarchitectures", SRC Annual Symposium, September 2005
- 2001 Workshop Presentation, "Wavelet Compression of MODIS Satellite Images", Earth Science Technology Conference (ESTC), August 2001

## PROFESSIONAL POSITIONS

- present    **Senior Staff Compiler Engineer** – 2020 - present  
*Sifive*
- 2020       **Senior Hardware Engineer** – 2017 - 2020  
*Microsoft*
- 2017       **Research Associate** – 2013 - 2017  
*University of Texas At Austin*
- 2014       **Lecturer** – 2013 - 2014  
*University of Texas At Austin*
- 2012       **Post-Doctoral Fellow** – 2010 - 2012  
*University of Texas at Austin*
- 2010       **Research Assistant** – 2004 - 2010  
*University of Illinois at Urbana-Champaign*
- 2009       **Debian GNU/Linux Developer (Volunteer)** – 1999 - 2009  
*Software in the Public Interest*
- 2004       **Research Assistant** – 2003 - 2004  
*Ohio University*
- 2003       **Teaching Assistant** – 2002 - 2003  
*Ohio University*
- 2002       **Information Technology Systems Specialist** – 1998 - 2002  
*Division of Child Support, Everett WA*
- 2001       **Research Programmer** – 2001 - 2001  
*University of Washington*
- 2000       **Grading Assistant** – 2000 - 2000  
*University of Washington*
- Network Administrator** – 1994 - 2000  
*Holy Cross High School, Everett WA*

## TEACHING EXPERIENCE

- Fall 2014    **Instructor** – CS 378 Programming for Performance  
*University of Texas at Austin*
- Fall 2013    **Instructor** – CS 378 Programming for Performance  
*University of Texas at Austin*
- Fall 2012    **Assistant Instructor** – CS 378 / CSE 392 Programming For Performance  
*University of Texas at Austin*
- Spring 2003 **Teaching Assistant** – CS 361 Data Structures  
*Ohio University*
- Fall 2003    **Teaching Assistant** – CS 240 Introduction to Computer Science  
*Ohio University*
- Spring 2000 **Grading Assistant** – CSE 341 Programming Languages  
*University of Washington*

## AWARDS AND HONORS

- 2007       SOSP 2007 Audience Choice Award
- 2003       First Place Local ACM programming competition, Ohio University
- 2001       Governor's Award for Excellence in State Government, State of Washington