

Neil Vachharajani

Curriculum Vitae

CONTACT INFORMATION

Department of Computer Science
Princeton University
35 Olden Street
Princeton, NJ 08540

Office Phone: (609) 258-0254
Home Phone: (609) 635-9533
nvachhar@princeton.edu
<http://www.cs.princeton.edu/~nvachhar>

EDUCATION

Princeton University, Princeton, NJ
Ph.D. in Computer Science, Expected June 2008
M.A. in Computer Science, November 2004
Advisor: David I. August

Princeton University, Princeton, NJ
B.S.E. in Electrical Engineering, High Honors, June 2002
Certificate in Applications of Computing

EXPERIENCE

Graduate Intern Technical, June 2004 to September 2004

Intel Corporation

Strategic Cad Labs, Hillsboro, OR

Studied multiprocessor modeling methodology.

Assistant in Research, September 2002 to present

Undergraduate Assistant in Research, February 2001 to August 2001

Princeton University

Liberty Research Group, Department of Computer Science, Princeton, NJ

Intern, June 2000 to August 2000

International Business Machines, Poughkeepsie, NY

Developed Linux system monitoring tools.

Undergraduate Assistant in Research, June 1999 to August 1999

Princeton University

Professor James C. Sturm's Group, Department of Electrical Engineering, Princeton, NJ

Studied low-cost fabrication techniques for organic semiconductors.

TEACHING

ELE375/COS471 - Computer Architecture and Organization (2 semesters)

Assistant in Instruction

Introductory course in Computer Architecture. Graded assignments and assisted in a lab where students design and synthesize to an FPGA an ARM Thumb-like processor.

RECOGNITION

Best Paper Award for “SWIFT: Software Implemented Fault Tolerance” at the Third Annual ACM/IEEE International Symposium on Code Generation and Optimization (CGO), March 2005.

Best Paper Award for “Compiler Optimization-Space Exploration” at the First Annual ACM/IEEE International Symposium on Code Generation and Optimization (CGO), March 2003.

National Science Foundation Graduate Research Fellowship, 2003

Best Student Paper Award for “Microarchitectural Exploration with Liberty” at the 35th Annual ACM/IEEE International Symposium on Microarchitecture (MICRO), November 2002.

Calvin Dodd MacCracken Senior Thesis/Project Award, Princeton University, 2002

Intel Student Research Contest Finalist for the project “Hardware Support for Speculative Thread Execution,” 2001

President’s Award for Academic Achievement, Princeton University, 1999

Memberships: ACM, Tau Beta Pi, Eta Kappa Nu

TALKS

CONFERENCE AND WORKSHOP TALKS

“Speculative Decoupled Software Pipelining,” presented at the 16th International Conference on Parallel Architectures and Compilation Techniques, Brasov, Romania, September 2007.

Invited response to “Deconstructing Hardware Architectures for Security,” presented at the 2006 Workshop on Duplicating, Deconstructing, and Debunking, Boston, MA, June 2006.

“Chip Multi-Processor Scalability for Single-Threaded Applications,” presented at the 2005 Workshop on Design, Architecture and Simulation of Chip Multi-Processors, Barcelona, Spain, November 2005.

“RIFLE: An Architectural Framework for User-Centric Information-Flow Security,” presented at the 37th International Symposium on Microarchitecture, Portland, OR, December 2004.

INVITED TALKS

“RIFLE: An Architectural Framework for User-Centric Information-Flow Security,” presented at the University of Colorado at Boulder Computer Science Colloquium, February 2005.

“Architectural Exploration with Liberty,” presented at IBM T. J. Watson Research Center, July 2002.

TUTORIALS

“Structural Simulation,” presented at the HiPEAC Compilation and Architecture Summer School in L’Aquila, Italy, June 2005.

“Using The Liberty Simulation Environment with emphasis on validated OS-level simulation,” presented at the 11th International Conference on Architectural Support for Programming Languages and Operating Systems in Boston, MA, October 2004.

“The Liberty Simulation Environment, Version 1.0,” presented at the 36th International Symposium on Microarchitecture in San Diego, CA, December 2003.

“Architectural Exploration with Liberty,” presented at the International Symposium on Microarchitecture in Austin, TX, December 2001.

PROFESSIONAL ACTIVITIES

REVIEWS

Journals: ACM Transaction on Architecture and Code Optimization

Conferences: CGO, HiPEAC, ICCAD, ISCA, ISPASS, MICRO, MoBS, PLDI

GRANTS

Assisted Professor David I. August with the \$120,000 grant “User-centric Information Flow Security,” from Intel Corporation for August 2005 to July 2008.

ADVISING

Assisted Professor David I. August in advising Christopher Wynnyk’s undergraduate independent research project “Exploration of vulnerabilities in Smart Codes” (Spring 2006).

Assisted Professor David I. August in advising Ryan Wells’ undergraduate independent research project “Hardware/Software Hybrid Processor Simulation” (Spring 2004, Fall 2004, and Spring 2005). He is now at Intel Corporation.

Assisted Professor David I. August in advising Ryan Peterson’s undergraduate independent research project “Information Flow Security in Java” (Fall 2004). He is now a Ph.D. student at Cornell University.

PUBLICATIONS

BOOK CHAPTERS

- [1] Neil Vachharajani and David I. August, “Speculation,” to appear in *Encyclopedia of Computer Science and Engineering* edited by Benjamin W. Wah, Wiley.

JOURNAL PUBLICATIONS

- [1] Matthew J. Bridges, Neil Vachharajani, Yun Zhang, Thomas Jablin, and David I. August, “Revisiting the Sequential Programming Model for the Multicore Era,” in *IEEE Micro*, January 2008.
IEEE Micro’s “Top Picks” special issue for papers “most relevant to industry and significant in contribution to the field of computer architecture” in 2007.
- [2] David I. August, Jonathan Chang, Sylvain Girbal, Daniel Gracia-Perez, Gilles Mouchard, David Penry, Olivier Temam, and Neil Vachharajani, “UNISIM: An Open Simulation Environment and Library for Complex Architecture Design and Collaborative Development,” in *IEEE Computer Architecture Letters (CAL)*, September 2007.
- [3] Manish Vachharajani, Neil Vachharajani, David A. Penry, Jason A. Blome, Sharad Malik, and David I. August, “The Liberty Simulation Environment: A Deliberate Approach to High-Level System Modeling,” in *ACM Transactions on Computer Systems (TOCS)*, August 2006.
- [4] George A. Reis, Jonathan Chang, Neil Vachharajani, Ram Rangan, David I. August, and Shubhendu S. Mukherjee, “Software-Controlled Fault Tolerance,” in *ACM Transactions on Architecture and Code Optimization (TACO)*, December 2005.
- [5] Manish Vachharajani, Neil Vachharajani, David A. Penry, Jason Blome, and David I. August, “The Liberty Simulation Environment, Version 1.0,” in *Performance Evaluation Review: Special Issue on Tools for Architecture Research (PER)*, March 2004.

CONFERENCE PUBLICATIONS

- [1] Neil Vachharajani, Matthew J. Bridges, Ram Rangan, and David I. August, “Multi-Threaded Transactions,” submitted to the *Proceedings of the 35th International Symposium on Computer Architecture (ISCA)*, June 2008.
- [2] Easwaran Raman, Neil Vachharajani, Ram Rangan, and David I. August, “Spice: Speculative Parallel Iteration Chunk Execution,” to appear in *Proceedings of the 2008 International Symposium on Code Generation and Optimization (CGO)*, April 2008.
- [3] Matthew J. Bridges, Neil Vachharajani, Yun Zhang, Thomas Jablin, and David I. August, “Revisiting the Sequential Programming Model for Multi-Core,” in *Proceedings of the 40th IEEE/ACM International Symposium on Microarchitecture (MICRO)*, December 2007.
Selected for IEEE Micro’s ”Top Picks” special issue for papers ”most relevant to industry and significant in contribution to the field of computer architecture” in 2007.
- [4] Neil Vachharajani, Ram Rangan, Easwaran Raman, Matthew J. Bridges, Guilherme Ottoni, and David I. August, “Speculative Decoupled Software Pipelining,” in *Proceedings of the 16th International Conference on Parallel Architectures and Compilation Techniques (PACT)*, September 2007.
- [5] Bolei Guo, Neil Vachharajani, and David I. August, “Shape Analysis with Inductive Recursion Synthesis,” in *Proceedings of the ACM SIGPLAN 2007 Conference on Programming Language Design and Implementation (PLDI)*, June 2007.

- [6] Ram Rangan, Neil Vachharajani, Adam Stoler, Guilherme Ottoni, David I. August, and George Z. N. Cai, "Support for High-Frequency Streaming in CMPs," in *Proceedings of the 39th IEEE/ACM International Symposium on Microarchitecture (MICRO)*, December 2006.
- [7] Matthew J. Bridges, Neil Vachharajani, Guilherme Ottoni, and David I. August, "Automatic Instruction Scheduler Retargeting by Reverse-Engineering," in *Proceedings of the 2006 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)*, June 2006.
- [8] Bolei Guo, Youfeng Wu, Cheng Wang, Matthew J. Bridges, Guilherme Ottoni, Neil Vachharajani, Jonathan Chang, and David I. August, "Selective Runtime Memory Disambiguation in a Dynamic Binary Translator," in *Proceedings of the 15th International Conference on Compiler Construction (CC)*, March 2006.
- [9] George A. Reis, Jonathan Chang, Neil Vachharajani, Ram Rangan, David I. August, and Shubhendu S. Mukherjee, "Design and Evaluation of Hybrid Fault-Detection Systems," in *Proceedings of the 32nd International Symposium on Computer Architecture (ISCA)*, June 2005.
- [10] George A. Reis, Jonathan Chang, Neil Vachharajani, Ram Rangan, and David I. August, "SWIFT: Software Implemented Fault Tolerance," in *Proceedings of the Third International Symposium on Code Generation and Optimization (CGO)*, March 2005.
Winner Best Paper Award.
- [11] Neil Vachharajani, Matthew J. Bridges, Jonathan Chang, Ram Rangan, Guilherme Ottoni, Jason A. Blome, George A. Reis, Manish Vachharajani, and David I. August, "RIFLE: An Architectural Framework for User-Centric Information-Flow Security," in *Proceedings of the 37th International Symposium on Microarchitecture (MICRO)*, December 2004.
- [12] Manish Vachharajani, Neil Vachharajani, Sharad Malik, and David I. August, "Facilitating Reuse in Hardware Models with Enhanced Type Inference," in *The IEEE/ACM/IFIP Second International Conference on Hardware/Software Codesign and System Synthesis (ISSS)*, September 2004.
- [13] Ram Rangan, Neil Vachharajani, Manish Vachharajani, and David I. August, "Decoupled Software Pipelining with the Synchronization Array," in *Proceedings of the 13th International Conference on Parallel Architectures and Compilation Techniques (PACT)*, September 2004.
Highest ranked paper by the anonymous reviewers.
- [14] Manish Vachharajani, Neil Vachharajani, and David I. August, "The Liberty Structural Specification Language: A High-Level Modeling Language for Component Reuse," in *Proceedings of the 2004 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)*, June 2004.
- [15] Spyridon Triantafyllis, Manish Vachharajani, Neil Vachharajani, and David I. August, "Compiler Optimization-Space Exploration," in *Proceedings of the 2003 International Symposium on Code Generation and Optimization (CGO)*, March 2003.
Winner Best Paper Award.
- [16] Manish Vachharajani, Neil Vachharajani, David A. Penry, Jason A. Blome, and David I. August, "Microarchitectural Exploration with Liberty," in *Proceedings of the 35th International Symposium on Microarchitecture (MICRO)*, November 2002.
Winner Best Student Paper Award.

REFEREED WORKSHOP PUBLICATIONS

- [1] Neil Vachharajani, Matthew Iyer, Chinmay Ashok, Manish Vachharajani, David I. August, and Daniel A. Connors, “Chip Multi-Processor Scalability for Single-Threaded Applications,” in *Proceedings of the 2005 Workshop on Design, Architecture and Simulation of Chip Multi-Processors (dasCMP)*, November 2005.
- [2] Guilherme Ottoni, Ram Rangan, Neil Vachharajani, and David I. August, “Decoupled Software Pipelining: A Promising Technique to Exploit Thread-Level Parallelism,” in *Proceedings of the Fourth Workshop on Explicitly Parallel Instruction Computer Architectures and Compiler Technology (EPIC)*, March 2005.
- [3] Matthew Iyer, Chinmay Ashok, Joshua Stone, Neil Vachharajani, Daniel A. Connors, and Manish Vachharajani, “Finding Parallelism for Future EPIC Machines,” in *Proceedings of the Fourth Workshop on Explicitly Parallel Instruction Computer Architectures and Compiler Technology (EPIC)*, March 2005.
- [4] Jason Blome, Manish Vachharajani, Neil Vachharajani, and David I. August, “The Liberty Simulation Environment as a Pedagogical Tool,” in *Proceedings of the Workshop on Computer Architecture Education (WCAE)*, June 2003.

TECHNICAL REPORTS

- [1] Manish Vachharajani, Neil Vachharajani, David A. Penry, Jason A. Blome, Sharad Malik, and David I. August, “The Liberty Simulation Environment: A Deliberate Approach to High-Level System Modeling,” *Liberty Research Group Technical Report 04-02*, March 2004.
- [2] Manish Vachharajani, Neil Vachharajani, and David I. August, “A Comparison of Reuse in Object-oriented Programming and Structural Modeling Systems,” *Liberty Research Group Technical Report 03-01*, October 2003.

RELEASED SOFTWARE

- [1] Manish Vachharajani, David A. Penry, Neil Vachharajani, Jason A. Blome, and David I. August, “Liberty Simulation Environment, Version 1.0, Version ,” Released in December 2003, available at <http://liberty.princeton.edu/Software/LSE>.

REFERENCES

Professor David I. August

Department of Computer Science
Princeton University
35 Olden Street
Princeton, NJ 08540
(609) 258-2085
august@cs.princeton.edu

Professor Sharad Malik

Department of Electrical Engineering
Princeton University
Engineering Quad, Room B224
Princeton, NJ 08544-5263
(609) 258-4625
sharad@princeton.edu

Professor Scott Mahlke
Department of
Electrical Engineering and
Computer Science
University of Michigan
4633 CSE Building
2660 Hayward Street
Ann Arbor, MI 48109
(734) 936-1602
mahlke@umich.edu

Professor Andrew Appel
Department of Computer Science
Princeton University
35 Olden Street
Princeton, NJ 08540
(609) 258-4627
appel@princeton.edu