

Vivek Sarkar

Curriculum Vitae

Summary

Twenty-five years of pioneering research, technology and educational leadership in the area of software for parallel and high-performance computing. My research and technology accomplishments include 1) Leading the research and development of ASTI during 1991–1996, IBM’s first product compiler component for optimizing locality, parallelism, and the (then) new FORTRAN 90 array language (ASTI has been shipped as a key component of IBM’s XL Fortran product compilers since 1996, and was also used as the foundation for IBM’s High Performance Fortran product); 2) Leading the research and development of the open source Jikes Research Virtual Machine during 1998–2001, a first-of-a-kind JVM implemented in Java that delivered superior parallel performance and scalability to existing commercial JVMs in 2000 (Jikes RVM has been used by over a hundred universities worldwide for research and teaching, and received the 2012 ACM SIGPLAN Programming Languages Software Award); 3) Co-leading the creation of the new X10 programming language and its open source release for future parallel systems during 2004–2007 (the X10 project is now in its eleventh year, with contributions to both scientific and commercial applications at IBM, and extensive use in universities); 4) Co-leading the creation of the Open Community Runtime (OCR) system since 2010, based on ideas developed in the Habanero Extreme Scale Software Research group that I lead at Rice (OCR is used by members of the exascale software research community in the DOE X-Stack program); 5) Creation of a unique sophomore-level course on parallel programming (COMP 322) that has been offered at Rice since 2009 (material from this course has been taught at other universities including Harvey-Mudd College and BYU); and, 6) Extensive contributions to the engineering literature with 170+ publications, 10 patents, 11,000+ citations, and an h-index of 50.

At IBM, my contributions were recognized by major awards, induction into the IBM Academy of Technology in 1995, and my appointment as Senior Manager of Programming Technologies in IBM Research during 2000–2007. I have been at Rice since 2007, where I hold the E.D. Butcher Chair in Engineering, and have been Chair of the Department of Computer Science since 2013. I was inducted as a Fellow of the Association for Computing Machinery (ACM) in 2008, and as a member of DOE’s Advanced Scientific Computing Advisory Committee (ASCAC) in 2009.

Education

- 1987 Ph.D., Computer Systems Laboratory, Dept. of Electrical Engineering, Stanford University.
Thesis: “Partitioning and Scheduling Parallel Programs for Execution on Multiprocessors”.
Advisor: Professor John L. Hennessy.
- 1982 M.S., Computer Science, University of Wisconsin-Madison.
- 1981 B.Tech., Electrical Engineering, Indian Institute of Technology, Kanpur, India.
Project title: “Command Language Processor Generator” (Best B.Tech. project award).

Professional Experience

2013-present: Chair, Department of Computer Science, Rice University

The Rice CS department is unique in many ways. It is a small department with under 20 faculty members, and is also a relatively young department created in 1984. We continue to lead in our historical areas of strengths, which include programming languages and parallel computing (an area that I contribute to and in which our department is rank 12th nationwide), while also growing in other research areas such as data analytics and networking. In addition, Rice CS faculty have showed tremendous initiative in on-line education; our introductory course on interactive programming in Python is a top-rated course in Coursera with over 100,000 students registered in its third offering, that has now been followed by a three-course online certificate sequence. Finally, we have recently undertaken a major reform of our undergraduate curriculum which has contributed to a significant increase in the number of CS undergraduate majors at Rice, and, more importantly, to an increase in the percentage of women CS undergraduate majors to over 30% (the highest in our department’s history).

2007-present: Professor of Computer Science, Professor of Electrical and Computer Engineering (joint appointment), E.D. Butcher Chair in Engineering, Rice University

Responsible for creating and leading the Habanero Extreme Scale Software research project that aims to unify elements of high-end computing, multicore, and embedded software stacks so as to produce portable software that can run unchanged on a range of homogeneous and heterogeneous extreme scale platforms (<http://habanero.rice.edu>). The research agenda for the Habanero project includes the creation of new parallel language, compiler, runtime, and verification technologies with a common execution model foundation. This Habanero execution model integrates elements of 1) deterministic parallelism with async tasks, future tasks, data-driven tasks, phasers, accumulators, and asynchronous data transfers; 2) nondeterministic concurrency with global/object-based isolation, and integration of task parallelism with actors; 3) task and data distribution with hierarchical

places, heterogeneous parallelism, distributed data-driven tasks, distributed data-driven futures, and distributed arrays. The model has been implemented in the Habanero-Java, Habanero-C, and Concurrent Collections programming languages, with new research on analysis, verification, and optimization of programs compiled to the Habanero execution model. The current Habanero group at Rice includes five research scientists, one research programmer, one postdoctoral researcher, eleven graduate students, and three undergraduate students.

Created undergraduate class, COMP 322 (Fundamentals of Parallel Programming) targeted at sophomores; COMP 322 is now a required course for all CS undergraduate majors at Rice. Thus far, the full semester version of COMP 322 has been taught at Rice in Fall 2009, Spring 2011, Spring 2012, Spring 2013, and Spring 2014, and part semester versions at Harvey-Mudd College and Brigham Young University.

Instructor for COMP 515 (Advanced Compilation for Vector and Parallel Processors, formerly taught by Prof. Ken Kennedy) in Spring 2009 and Fall 2012, COMP 422 (Introduction to Parallel Computing) in Spring 2008, and COMP 635 (Seminar on Heterogeneous Processors) in Fall 2007. Co-instructor (with Prof. Corky Cartwright) for freshman-level programming class with Scheme and Java languages (COMP 211) in Spring 2010.

PI or co-PI of multiple research projects funded by DOE, DARPA, DOD, MARCO, and NSF. Co-PI and Associate Associate Director of NSF Expeditions Center for Domain-Specific Computing started in 2009 (PI is Prof. Jason Cong at UCLA). Recipient of funding from multiple industry sponsors and partners including AMD, BHP Billiton, Halliburton Services, IBM Research, IBM Toronto laboratory, Intel, Microsoft, and Samsung. Recipient of equipment donation from AMD, IBM, NVIDIA, Samsung, Texas Instruments, Samsung, and Sun Microsystems.

Adjunct faculty positions: IIT Kanpur, India and Waseda University, Japan.

2011-2013: Consultant, University Technical Services

University Technical Services is a contractor for the National Security Agency (NSA). Through this consulting agreement, I visited NSA for a month in August 2011.

2002-2007: Team Lead, PERCS Programming Models, Tools, and Productivity, IBM Research

Responsible for creating and leading the programming models, tools, and productivity research agenda in the DARPA-funded IBM PERCS project, and representing this area in all DARPA milestone reviews until June 2007. I was listed as one of six key personnel for the project and contributed to IBM's proposals being selected for funding in Phase 1 (\$3M), Phase 2 (\$53M) and Phase 3 (\$244M) of the DARPA HPCS program. Two major outcomes of this effort have been the

creation of the X10 language for future parallel systems which I co-lead with Vijay Saraswat during 2004–2007, and the creation of the Eclipse Parallel Tools Platform open source project with LANL and other partners. In Phase 2, my role also included funding and coordinating work performed by multiple university partners – UC Berkeley (Ras Bodik), MIT (Saman Amarasinghe), U Delaware (Guang Gao), UT Austin (Jim Browne), U Illinois (Ralph Johnson), Purdue University (Jan Vitek). I received an IBM Outstanding Technical Achievement Award at IBM for my work on PERCS.

2000-2007: Senior Manager, Programming Technologies Department, IBM Research

Responsible for initiating and overseeing research projects carried out by a department with approximately forty permanent researchers, additional temporary researchers, and an annual budget of over \$12 million. These research projects spanned the areas of Programming Models (X10, XJ, Collage), Tools (Eclipse Parallel Tools Platform, Advanced Refactorings in Eclipse, Scalable And Flexible Error detection, Security analysis, Scripting analysis), and Optimized Execution Environments (Jikes RVM, Metronome, Progressive Deployment Systems). During this period, I personally led the open-source release of the Jikes Research Virtual Machine (RVM), and initiated multiple new projects including PERCS, X10, XJ, and DOMO/WALA. I received an IBM Outstanding Technical Achievement Award at IBM for my work on Jikes RVM, which included the leadership of the design and implementation of the Jikes RVM dynamic optimizing compiler. Jikes RVM has been used by over a hundred universities worldwide for research and teaching, and received the 2012 ACM SIGPLAN Programming Languages Software Award. As IBM's Research Relationship Manager for Aerospace and Defense, I interacted with multiple customers in that industry to discuss their future strategic needs and synergies with IBM's solutions to help them achieve their strategic goals. My Senior Manager responsibilities also included defining and coordinating IBM Research strategy around the open source Eclipse framework for programming tools (www.eclipse.org) and the Eclipse Innovation Grants program.

1998-2000: Manager, Dynamic Compilation Group, IBM Research

Conducted research in and led the group in the design and implementation of a new dynamic optimizing compiler for the Java language, as part of the Jalapeno project which resulted in the Jikes Research Virtual Machine. The design built on my personal research in the areas of Linear Scan register allocation, load/store elimination of heap references using Array SSA form, BURS-based register-sensitive instruction selection, and Array Bounds Check elimination on Demand (ABCD). The dynamic optimizing compiler also provided the foundation for research on adaptive optimization.

1996-1998: Visiting Associate Professor, MIT EECS department (on leave from IBM)

Restructured and taught MIT's main compilers class (6.035) in Fall 1996 and 1997. Co-invented

the Array SSA form and Linear Scan register allocation analyses and optimizations. Founding member of the RAW project. Supervised PhD, Masters, and undergraduate students.

1995-2007: Member, IBM Academy of Technology

The IBM Academy is the top technical advisory group in the company. Academy membership is permanent and is a recognition of sustained technical contributions. Academy membership is limited to 300 people, less than 1% of IBM employees, who are recognized as the top technical leaders from IBM in areas that span software, hardware, manufacturing, applications, and services.

1994-1996: Manager, Application Development Technology Institute (ADTI), IBM Software Group

Founding manager of a technology-transfer department with the mission of working with multiple research groups to invent, harvest, and transfer high priority technologies to IBM's programming language products. I personally led the design and implementation of automatic and OpenMP parallelization in IBM's XL Fortran product compilers and runtime systems for SMP systems, which built on the ASTI optimizer.

1991-1993: Project Leader, ASTI Optimizer, IBM Santa Teresa Laboratory

Conducted research in and led a 10-person team in the design and implementation of the ASTI optimizer, IBM's first high-level optimizer for performing loop and data transformations for cache locality, and for efficient scalarization of Fortran 90 array language. The ASTI optimizer was also used as the foundation for IBM's High Performance Fortran (HPF) product compiler, and is still shipped as a key component of IBM's XL Fortran product compilers. I received an Outstanding Innovation Award at IBM for my work on ASTI.

1987-1990: Research Staff Member, PTRAN project, IBM Research

Conducted research on automatic partitioning of program dependence graphs into parallel tasks, and on new representations and uses of the control dependence relation, leading to a new foundation for selecting useful parallelism in program dependence graphs. Also contributed to the design and implementation of the PTRAN research system led by Fran Allen (recipient of 2006 ACM Turing Award).

1982-87: Research Assistant, Computer Systems Laboratory, Stanford University

Basic research on automatic partitioning and scheduling of parallel programs, with a prototype implementation for the single-assignment programming language, SISAL.

1986-87: Part-time consultant, Lawrence Livermore National Laboratory

Parallelization and optimization of the single-assignment programming language, SISAL.

1985: Part-time consultant, American Supercomputers Incorporated

Vectorization and other optimizations for a Cray-like mini-supercomputer.

1981-82: Teaching Assistant, University of Wisconsin-Madison

Lecturer for introductory programming course in Pascal and Fortran.

Advisory and Steering Committees

2015-present: Member, CRA Board of Directors

CRA's mission is to strengthen research and advanced education in computing, and includes membership of Computer Science departments in the USA and Canada.

2015-present: Member, UCSB Computer Engineering Advisory Board

The UCSB Computer Engineering Advisory Board (CEAB) advises the ECE and CS departments at UCSB on future directions for their Computer Engineering Program.

2014-present: Member, Advisory Board for Distributed Computing Lab, Huawei Technologies

The role of this advisory board is to guide Huawei's Distributed Computing Lab in conducting more open research, and increasing its connections with the external community.

2013-present: Member, ASPLOS Steering Committee

After serving as General Chair of the ASPLOS 2013 conference (Architectural Support for Programming Languages and Operating Systems) in Houston, I became a member of the ASPLOS Steering Committee, and am currently the chair.

2013-present: Member, PACT Steering Committee

After serving as Program Chair of the PACT 2011 conference (Parallel Architectures and Compilation Techniques) in Houston, I became a member of the PACT Steering Committee.

2011-present: Member, DFM Steering Committee

After serving as a founding Program Committee member of the DFM workshop (Data-Flow execution Models for extreme scale computing) in 2011, I became a member of the DFM Steering Committee.

2009-present: Member, Advanced Scientific Computing Advisory Committee (ASCAC), US Department of Energy

The Advanced Scientific Computing Advisory Committee (ASCAC) provides advice to the Department

of Energy on a variety of scientific and technical issues related to its Advanced Scientific Computing Research program. ASCAC's recommendations include advice on long-range plans, priorities, and strategies to address more effectively the scientific aspects of advanced scientific computing including the relationship of advanced scientific computing to other scientific disciplines, and maintaining appropriate balance among elements of the program. The Committee, which formally reports to the Director, Office of Science, primarily includes representatives of universities, national laboratories, and industries involved in advanced computing research. I have participated in multiple ASCAC subcommittees including one on exascale computing in 2010. More recently, I chaired an ASCAC subcommittee formed in September 2012 in response to a charge by Dr. William F. Brinkman, Director of the Office of Science, Department of Energy, asking ASCAC to examine the potential synergies between the challenges of data-intensive science and exascale. The report for this subcommittee was submitted in March 2013.

Awards

2012	ACM SIGPLAN Programming Languages Software Award for Jikes RVM
2010	Best paper award, Runtime Verification conference (RV 2010)
2010	First Decade High Impact Paper, CASCON conference
2010	Outstanding Faculty Associate, Wiess College, Rice University
2008	ACM Fellow
2008	IBM Outstanding Technical Achievement Award, PERCS project (Phase 3)
2006	ACM Distinguished Scientist
2006	IBM Research Division Award, PERCS project (Phase 2)
2006	Honorable Mention, HPC Challenge Class 2 Award, Supercomputing 2006
2005	IBM Outstanding Technical Achievement Award, Jikes Research Virtual Machine
2003	IBM Research Division Award, PERCS project (Phase 1)
2001	IBM Research Division Award, Jikes Research Virtual Machine
1998	Third Invention Achievement Award, IBM
1998	Best paper, LCPC workshop (one of three best papers)
1998	Second Invention Achievement Award, IBM
1997	IBM Outstanding Innovation Award, ASTI optimizer
1997	Best paper, International Conference on Parallel Processing
1996	First Invention Achievement Award, IBM
1994	Best IBM paper, CASCON '94
1985	First place, ACM International Collegiate Programming Contest
1981	Best B.Tech. project, IIT Kanpur

Research Contracts

- DARPA MUSE award, September 2014 – November 2018, “Pliny: An End-to-End Framework for Big Code Analytics”. PI: Vivek Sarkar, co-PIs: Swarat Chaudhuri, Keith Cooper, Chris Jermaine, Moshe Vardi (Rice University), Ben Liblit, Tom Reps (U. Wisconsin – Madison), Isil Dillig, Thomas Dillig (UT Austin), Dave Melski (GramaTech). Total Award Amount: \$11,142,361 (shared among 11 co-PIs at four institutions)
- Co-PI in NSF InTrans award for “Accelerator-Rich Architectures with Applications to Healthcare”, PI: Jason Cong (UCLA), July 2015 – June 2017. Total Award Amount: \$75,000.
- Industry contract from Samsung Electronics Co., Ltd for “JavaScript: Ahead-of-Time Compilation with LLVM”, August 2013 – March 2015. PI: Vivek Sarkar. Total Award Amount: \$300,000.
- NSF award CCF-1302570, April 2013 – April 2017, “Collaborative Research: A Static and Dynamic Verification Framework for Parallel Programming”, PI: Ganesh Gopalakrishnan (U. Utah), co-PIs: Eric Mercer (BYU), Vivek Sarkar (Rice). Amount awarded to Vivek Sarkar for first two years: \$200,000 (additional \$200,000 for Years 3 and 4 is pending).
- Department of Defense contract for “Advanced Computing Runtime”, April 2013 – April 2015, PI: Vivek Sarkar. Total amount: \$1,994,965 (\$1,049,292 for Prof. Sarkar’s group at Rice, and \$945,673 for a subcontract to Intel, co-PI: Tim Mattson.)
- Industry contract from Halliburton Corporation for “Optimization of Lattice Boltzmann (LB) Simulations on Multicore CUP and Manycore GPU Processors”, April 2013 – December 2013. PI: Vivek Sarkar. Total amount: \$250,000.
- Industry contract from Samsung Advanced Institutes of Technology for “Rice Tizen Analysis for Security (RTAS)”, October 2012 – October 2013. PI: Vivek Sarkar. Total amount: \$259,999
- DOE X-stack contract DE-SC0008883 for “DEGAS : Dynamic, Exascale Global Address Space”, September 2012 – August 2015. Overall PI: Kathy Yelick (LBL). PI for Rice subcontract: Vivek Sarkar. Co-PI for Rice subcontract: John M Mellor-Crummey. Award amount for Rice: \$450,000/year.
- Intel DOE Traleika Glacier X-Stack subcontract, September 2012 – August 2015, PI: Vivek Sarkar. Amount awarded to Vivek Sarkar: \$705,000.

- DOE X-stack contract DE-SC0008882 for “Domain Specific Language Support for Exascale (D-TEC)”, September 2012 – August 2015. Overall PI: Dan Quinlan (LLNL). PI for Rice subcontract: John M Mellor-Crummey. Co-PI for Rice subcontract: Vivek Sarkar. Award amount for Rice: \$575,000/year.
- Intel UHPC subcontract for “Scalable Runtimes and CnC Implementations for Extreme Scale Systems”, October 2011 – June 2012, PI: Vivek Sarkar. Amount awarded to Vivek Sarkar: \$180,000.
- DOE/LLNS contract for “Data Abstractions for Portable HPC Performance”, October 2011 – September 2013, PI: Vivek Sarkar. Total amount: \$200,000.
- DOE/LLNS contract for “Program Analyses for Rose”, September 2011 – June 2013, PI: Vivek Sarkar. Total amount: \$150,000 (Phase 1), \$100,000 (Phase 2).
- DOE/LLNS contract for “ROSE Extensions for Java”, July 2011 – September 2014, PI: Vivek Sarkar. Total amount: \$150,000 (Phase 1), \$165,548 (Phase 3).
- NSF award CCF-0964520, June 2010 – May 2013, “Collaborative Research: Chorus:Dynamic Isolation in Shared- Memory Parallelism”, PI: Swarat Chaudhuri (PSU), co-PI: Vivek Sarkar (Rice). Amount awarded to Vivek Sarkar: \$653,918.
- NSF Expeditions award CCF-0926127, September 2009 – August 2014, “Customizable Domain-Specific Computing”. This research is conducted by the multi-institute Center for Domain-Specific Computing (Center Director: Jason Cong, UCLA, Center Associate Director: Vivek Sarkar, Rice.) Total amount: \$9,999,997. Amount awarded to Vivek Sarkar: \$1,610,000.
- MARCO award for Multiscale Systems Center, September 2009 – August 2012, “Automated Modeling and Management of Energy in Managed Runtime Systems”, PI: Jan Rabaey (UC Berkeley). Amount awarded to Vivek Sarkar (Rice): \$184,134.
- Intel contract, December 2009 – December 2010, “Scheduling Policies and Patterns for Intel’s Concurrent Collections Parallel Programming Model”, PI: Vivek Sarkar (Rice). Total amount: \$75,000.
- NSF award CCF-0938018, September 2009 – August 2012, “Collaborative Research: Programming Models and Storage System for High Performance Computation with Many- Core Processors”, PI: Vivek Sarkar (Rice), co-PIs: Jack Dennis (MIT), Guang Gao (U. Delaware). Amount awarded to Vivek Sarkar: \$300,000.
- DARPA AACE award, AFRL Contract FA8650-09-C-7915, March 2009 – September 2013, “Platform-Aware Compilation Environment (PACE)”, PI: Keith Cooper (Rice), co-PIs: John

Mellor-Crummey (Rice), Krishna Palem (Rice), Vivek Sarkar (Rice), Linda Torczon (Rice).
Total amount: \$16,000,000.

- NSF award, CCF-0833166, September 2008 – August 2011, “Collaborative Research: Programming Models, Compilers, and Runtimes for High-End Computing on Manycore Processors”, PI: Vivek Sarkar (Rice), co-PI: Guang Gao (U. Delaware). Amount awarded to Vivek Sarkar: \$405,999.
- AMD contract, September 2007 – September 2008, “Integration and Evaluation of Lightweight Profiling (LWP) in Java Runtime Environments for Multicore Processors”, PI: Vivek Sarkar (Rice). Total amount: \$125,000.
- DARPA HPCS program, IBM PERCS project, 2003 – 2010. Contributed to IBM’s proposals being selected for funding in Phase 1 (\$3M), Phase 2 (\$53M) and Phase 3 (\$244M) of the DARPA HPCS program, as one of six key personnel in the proposals. *This was the only external funding that I applied for while at IBM during 1987–2007.*

Industry Gifts

- IBM CAS Fellowship for research on “XL Compiler and Runtime Extensions for GPU Platforms” by PhD student, Deepak Majeti, 2015, \$28,000.
- IBM CAS Fellowship for research on “GPU Enablement of Java Applications ” by Postdoctoral Researcher, Akihiro Hayashi, 2015, \$28,000.
- IBM CAS Fellowship for research on “XL Compiler and Runtime Extensions for GPU Platforms” by PhD student, Deepak Majeti, 2014, \$28,000.
- IBM CAS Fellowship for research on “GPU Enablement of Java Applications ” by Postdoctoral Researcher, Akihiro Hayashi, 2014, \$28,000.
- IBM CAS Fellowship for research on “OpenMP and PGAS Enhancements for Manycore Processor (continuation)” by PhD student, Sanjay Chatterjee, 2013, \$28,000.
- IBM CAS Fellowship for research on “OpenMP and PGAS Enhancements for Manycore Processor (continuation)” by PhD student, Sanjay Chatterjee, 2012, \$28,000.
- IBM CAS Fellowship for research on “OpenMP and PGAS Enhancements for Manycore Processors” by PhD student, Sanjay Chatterjee, 2011, \$28,000.
- Intel grant, December 2010, for research on “CnC-Python”, \$75,000.

- Co-PI for IBM SUR donation of 18-node POWER7 system at Rice, valued at \$9M including hardware, software, and services (March 2010).
- IBM X10 Innovation grant, March 2010, \$20,000.
- IBM CAS Fellowship for research on “Scalable and Efficient Scheduling of OpenMP Tasks (continuation)” by PhD student, Yi Guo, 2010, \$28,000.
- IBM Open Collaboration Research grant for Multicore Software, January 2009, \$200,000.
- IBM CAS Fellowship for research on “Scalable and Efficient Scheduling of OpenMP Tasks” by PhD student, Yi Guo, 2009, \$28,000.
- BHP Billiton gift for Numerical Optimization of Java Codes in Seismic Applications, June 2008, \$100,000.
- IBM Open Collaboration Research grant for Multicore Software, January 2008, \$200,000.

Research Supervision of Graduate Students

- Currently supervising eleven graduate students at Rice University. All graduate supervision prior to 2007 was performed when I was at IBM.
- Supervised Kamal Sharma (Rice PhD, 2014) on his PhD research related to locality transformations of computation and data.
- Supervised Sanjay Chatterjee (Rice PhD, 2013) on his PhD research related to runtime systems for extreme scale platforms.
- Supervised Raghavan Raman (Rice PhD, 2012) on his PhD research related to dynamic data race detection in parallel programs.
- Supervised Yi Guo (Rice PhD, 2010) on his PhD research related to runtime systems for multicore processors.
- Supervised Rajkishore Barik (Rice PhD, 2009) on his PhD research related to register allocation and analysis and optimization of explicitly parallel programs.
- Supervised Mackale Joyner (Rice PhD, 2008) on his PhD research related to optimization of array accesses in high-productivity languages (Chapel, Fortress, X10).
- Supervised Igor Peshansky (NYU PhD, 2003) on his PhD research on optimistic program optimization.

- Co-supervised Massimiliano Poletto (MIT PhD, 1999) on his PhD research related to Linear Scan register allocation.
- Co-supervised Kourosh Gharachorloo (Stanford PhD, 1995) on his graduate research related to implementation of Sisal programs, prior to his PhD research.
- In addition to the above, I co-supervised the following graduate students while they were at IBM, and have co-authored papers with each of them: Radhika Thekkath (U.Washington PhD, 1995), Ras Bodik (U.Pittsburgh PhD, 1999), Chandra Krintz (UCSB PhD, 2001), Jan-Willem Maessen (MIT PhD, 2002), Matthew Arnold (Rutgers PhD, 2002), Keunwoo Lee (U.Washington PhD, 2006), Alexey Loginov (U.Wisconsin PhD, 2006), John Whaley (Stanford PhD, 2006), Matthew Harren (PhD, UC Berkeley, 2007), Vincent Cave (MS, INRIA, 2007), Kartik Agaram (PhD, UT Austin, 2008), Yuan Zhang (PhD, U.Delaware, 2008), Shivali Agarwal (PhD,TIFR, India, 2009).
- I also co-supervised the following graduate students while I was on sabbatical at MIT during 1996–1998: Rajeev Barua, Jacob Harris, Kathleen Knobe, Walter Lee, Devabhaktuni Srikrishna, Michael Taylor, Eliot Waingold.

Ph.D. Thesis Committees

- Kamal Sharma, Rice University, 2014 (advisor).
- Sanjay Chatterjee, Rice University, 2013 (advisor).
- Raghavan Raman, Rice University, 2012 (advisor).
- David Peixotto, Rice University, 2012.
- Yi Guo, Rice University, 2010 (advisor).
- Nathan Tallent, Rice University, 2010.
- Rajkishore Barik, Rice University, 2009 (advisor).
- Ryan Zhang, Rice University, 2009.
- Mackale Joyner, Rice University, 2008 (co-advisor).
- Raj Bandyopadhyay, Rice University, 2008.
- Guilherme Ottoni, Princeton University, 2008.
- Fernando Pereira, UCLA, 2008.

- Kit Barton, University of Alberta, 2008.
- Igor Peshansky, NYU, 2003 (co-advisor).
- Massimiliano Poletto, MIT, 1999 (co-advisor).
- Alex Caro, MIT, 1998.
- Dattatraya Kulkarni, University of Toronto, 1997.
- Douglas Pase, Oregon Graduate Institute, 1989.

Program Committees

- Plenary Speaker Chair, ACM Federated Computing Research Conference (FCRC), June 2015.
- Program Co-chair, 29th International Conference on Supercomputing (ICS), June 2015.
- Program Vice-chair (Software), 29th IEEE International Parallel and Distributed Processing Symposium (IPDPS), May, 2015.
- Program Committee Member, IA³ Workshop on Irregular Applications: Architectures and Algorithms, co-located with Supercomputing 2014, November 2014.
- Program Committee Member, International Conference on Principles and Practice of Programming on the Java platform: virtual machines, languages, and tools (PPPJ), September 2014.
- General Chair, Eighteenth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), March 2013.
- External Review Committee member, OOPSLA conference, October 2012.
- Program Committee member, Third International Conference on Runtime Verification (RV), September 2012.
- Program Committee member, 25th Workshop on Languages and Compilers for Parallel Computing (LCPC), September 2012.
- Program Committee member, 2012 IEEE International Parallel & Distributed Processing Symposium (Software Track), May 2012.
- Program Committee member, CC 2012: Twenty-first International Conference on Compiler Construction, March 2012.
- Program Co-chair, Systems Software area, Supercomputing 2011, November 2011.

- Program Chair, PACT 2011: Twentieth International Conference on Parallel Architectures and Compilation Techniques (PACT), October 2011.
- General Co-chair, Partitioned Global Address Space (PGAS) conference, October 2011.
- Program Committee member, IEEE International Parallel and Distributed Processing Symposium (IPDPS), April 2011.
- Program Co-chair, Fourth workshop on Programming Language Approaches to Concurrency and Communication-cEntric Software (PLACES), April 2011.
- Program Committee member, 2nd Workshop on Determinism and Correctness in Parallel Programming (WoDet), March 2011.
- External Review Committee member, Sixteenth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2011), March 2011.
- General Co-chair, 7th International Conference on Distributed Computing and Internet Technologies (ICDCIT), February 2011.
- External Review Committee member, 2011 ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP), February 2011.
- Workshop Co-chair, 23rd Workshop on Languages and Compilers for Parallel Computing (LCPC), October 2010.
- Program Committee member, PACT 2010: Nineteenth International Conference on Parallel Architectures and Compilation Techniques (PACT), September 2010.
- Program Committee member, TOOLS EUROPE 2010: International Conference on Objects, Models, Components, Patterns, June 2010.
- Program Committee member, ACM SIGPLAN '10 Conference on Programming Language Design and Implementation (PLDI), June 2010.
- Program Committee member, 2nd USENIX Workshop on Hot Topics in Parallelism (HotPar '10), June 2010.
- Program Committee member, ACM International Conference on Computing Frontiers (CF), May 2010.
- Program Committee member, 2010 International Symposium on Code Generation and Optimization (CGO), April 2010.

- Program Committee member, CC 2010: Nineteenth International Conference on Compiler Construction, March 2010.
- Program Committee member, 3rd workshop on Programming Language Approaches to Concurrency and communication-centric Software (PLACES 2010)
- Program Committee member, 6th International Conference on Distributed Computing and Internet Technologies (ICDCIT), February 2010.
- Program Committee member, Supercomputing 2009 (SC09), November 2009.
- Program Committee member, 22nd Workshop on Languages and Compilers for Parallel Computing (LCPC), October 2009.
- Vice Chair, Programming Models, Languages and Compilers track, International Conference on Parallel Processing (ICPP), September 2009.
- Program Committee Member, Second International Workshop on Parallel Programming Models and Systems Software for High-End Computing (P2S2), co-located with ICPP 2009, September 2009.
- Program Committee Member, IFIP Working Conference on Domain Specific Languages (DSL WC), July 2009.
- External Review Committee member, ACM SIGPLAN '09 Conference on Programming Language Design and Implementation (PLDI), June 2009.
- Program Committee Member, ACM SIGOPS Operating System Review Special Issue on the Interaction among the OS, Compilers, and Multicore Processors, April 2009.
- Program Chair, 2009 ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP), February 2009.
- Program Committee Member, DAMP 2009 Workshop (Declarative Aspects of Multicore Programming), co-located with POPL, January 2009.
- Member of Editorial Board, Encyclopedia of Parallel Computing, Springer, 2009.
- Program Committee Member, First International Workshop on Parallel Programming Models and Systems Software for High-End Computing (P2S2), co-located with ICPP 2008, September 2008.
- Program Committee Member, 20th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), June 2008.

- Program Committee Member, 2008 Workshop on Software and Hardware Challenges of Manycore Platforms (SHCMP'08), co-located with ISCA'08, June 2008.
- Program Committee Member, Workshop on Software Tools for Manycore Systems (STMS08), June 2008.
- Program Committee Member, International Workshop on Multi-Core Computing System (MuCoCoS'08), March 2008.
- Program Committee Member, Workshop on Parallel Programming on Accelerator-Based Systems (PPABS), co-located with PPOPP 2008, February 2008.
- Program Committee Member, ICDCIT 2007: Fourth International Conference on Distributed Computing and Internet Technology, December 2007.
- Program Committee Member, PACT 2007: Sixteenth International Conference on Parallel Architectures and Compilation Techniques, September 2007.
- Conference Co-chair, IBM Academy Conference on Software Engineering for Tomorrow (SWEFT), October 2006.
- Program Committee Member, Workshop on Programming Models for Ubiquitous Parallelism (PMUP), September 2006 (co-located with PACT 2006).
- Program Committee Member, 2006 International Conference on High Performance Computing and Communications (HPCC), September 2006.
- Program Committee Member, IBM Academy Conference on Software Engineering for Tomorrow (SWEFT), November 2005.
- General Chair, ACM SIGPLAN '05 Conference on Programming Language Design and Implementation (PLDI), June 2005.
- Guest Editor, IBM Systems Journal special issue on Open Source Software, Volume 44, Number 2, June 2005.
- Program Committee Member, ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming 2005 (PPOPP), June 2005.
- Program Committee Member, PODC Workshop on Concurrency and Synchronization in Java Programs, July 2004.
- Program Co-chair, PACT 2003: Twelfth International Conference on Parallel Architectures and Compilation Techniques, September 2003.

- Program Committee Member, CC 2003: Twelfth International Conference on Compiler Construction, April 2003.
- General Chair, PLAN-X: First Workshop on Programming Language Technologies for XML, October 2002 (co-located with ACM PLI 2002).
- Conference Chair, IBM Academy Conf. on Best Practices in Multi-Site Software Development, May 2002.
- Program Committee Member, ACM International Conference on Supercomputing, June 2001.
- Program Committee Member, ACM Java Grande Conference, June 2000.
- Program Committee Member, Second Workshop on Java for High-Performance Computing, June 2000.
- Program Committee Member, International Conference on Parallel Processing (ICPP), August 1996.
- Program Committee Member, 28th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO), November 1995.
- Program Committee Member, PACT 1994: Parallel Architectures and Compilation Techniques, August 1994.
- Program Chair, ACM SIGPLAN '94 Conference on Programming Language Design and Implementation (PLDI), June 1994.
- Program Committee Member, Twenty-first ACM Symposium on Principles of Programming Languages (POPL), January 1994.
- Program Committee Member, ACM SIGPLAN '93 Conference on Programming Language Design and Implementation (PLDI), June 1993.
- Program Committee Member, ACM SIGPLAN '91 Conference on Programming Language Design and Implementation (PLDI), June 1991.

Selected Invited Talks and Panels

- Keynote speaker, International Conference on Principles and Practice of Programming on the Java platform: virtual machines, languages, and tools (PPPJ), “Beyond Multicores: Parallel Computing on GPUs and clusters with Java 8”, September 2014.

- Distinguished lecturer, “Hybrid Programming Challenges for Extreme Scale Software”, Department of Computer Science and Engineering, Texas A&M University, September 2014.
- Invited speaker, “Test-Driven Detection and Repair of Data Races in Structured Parallel Programs”, Indian Institute of Science (IISc), Bangalore, India, August 2014.
- Invited speaker, “Test-Driven Detection and Repair of Data Races in Structured Parallel Programs”, Tata Institute of Fundamental Research (TIFR), Mumbai, India, August 2014.
- Invited speaker, “Leveraging Structured Parallelism for Improved Programmability and Scalability”, U. Alberta, July 2014.
- Invited speaker, “Software Challenges for Extreme Scale Systems”, Princeton University, May 2014.
- Keynote speaker, “Hybrid Programming Challenges for Extreme Scale Software”, 12th Annual Workshop on Charm++ and Application, University of Illinois at Urbana-Champaign, April 2014.
- Invited speaker, “Why Runtime Systems and System Software Must Work Together for Future HPC Applications”, 2014 DOE Salishan Conference on High Speed Computing, Gleneden Beach, Oregon, April 2014.
- Invited speaker, “Software Challenges for Extreme Scale Systems”, Intel Labs, Santa Clara, April 2014.
- Keynote speaker, “Hybrid Programming Challenges for Extreme Scale Software”, First OpenSHMEM Workshop: Experiences, Implementations and Tools, Annapolis, Maryland, March 2014.
- , Panelist, “Exascale Runtime Systems”, SC13, Denver, Colorado, November, 2013.
- Keynote speaker, “The Role of OpenMP in Extreme Scale Software”, International Workshop on OpenMP (IWOMP) 2013, Canberra, Australia, September 2013.
- Invited lecture, “Analysis and Transformation of Programs with Explicit Parallelism”, Seoul National University, August 2013.
- Invited colloquium speaker, “Software Challenges for Extreme Scale Systems”, U. Utah School of Computing, July 2013.
- Invited lecture, “Analysis and Transformation of Programs with Explicit Parallelism”, ENS Lyon, June 2013.

- Invited Lecture, “Synergistic Challenges in Data-Intensive Science and Extreme Scale Computing”, ISI Kolkata and TIFR Mumbai, May 2013.
- Organizer and presenter, SC12 Birds of a Feather Session on “Open Community Runtime (OCR)”, November 2012.
- Invited colloquium speaker, Harvey Mudd College, “Determinacy and Data Races in Task-Parallel Programs”, September 2012.
- Distinguished Lecture, “Programming Challenges for Multicore Processors”, UC Riverside, February 2012.
- Invited lecture, “Towards a Portable Execution Model for Extreme Scale Multicore Systems”, CSIRO, Perth, Australia, December 2011.
- Panelist, PGAS 2011 conference, October 2011.
- Panelist, DFM 2011 workshop, October 2011.
- Keynote speaker, APPT Conference, “Software Challenges for Extreme Scale Systems”, Shanghai, China, September 2011.
- Panelist, Supercomputing 2010, “Advanced HPC Execution Models: Innovation or Disruption”, November 2010.
- Panelist, IEEE International Parallel and Distributed Processing Symposium (IPDPS) 2010, “Unconventional Wisdom in Multicore Computing”, April 2010.
- Invited speaker, ACM SIGPLAN/SIGBED Conference on Languages, Compilers and Tools for Embedded Systems (LCTES), “Towards a Unified Execution Model for Mainstream and Embedded Multicore Systems”, April 2010.
- Invited speaker, 4th Joint Symposium on Radiotherapy Research, “High Performance Computing in Biomedical Research”, April 2010.
- UT San Antonio Distinguished Lecture Series in Computer Science, “Multicore Programming Models and their Implementation Challenges”, March 2010.
- U. Michigan Distinguished Lecture Series in Computer Science and Engineering, “Multicore Programming Models and their Implementation Challenges”, January 2010.
- Panelist, HPCA 2010 and PPOPP 2010 conferences, “Extreme Scale Computing: Challenges and Opportunities”, January 2010.

- Panelist, Disruptive Technologies Panel, Supercomputing 2009 (SC09) conference, “Software Challenges in Extreme Scale Systems”, November 2009.
- Invited speaker, 3rd workshop on Virtual Machines and Intermediate Languages (VMIL) co-located with OOPSLA 2009, “Virtual Machine and Intermediate Language Challenges for Parallelism”, October 2009.
- Keynote speaker, 2009 European Joint Conferences on Theory and Practice of Software (ETAPS), “Challenges in Code Optimization of Parallel Programs”, March 2009.
- ISTec Distinguished Lecturer, Colorado State University, “Multicore Programming Models and their Implementation Challenges” and “A Quick Tour of Modern Multicore Programming Models”, December 2008.
- Panelist, “Can Developing Applications for Massively Parallel Systems with Heterogeneous Processors Be Made Easy(er)?”, Supercomputing 2008.
- Invited talk, Supercomputing 2008 Workshop on Bridging Multicore’s Programmability Gap, “Multicore Programming Models and their Implementation Challenges”.
- Keynote speaker, U. Washington and Microsoft Research 2008 Summer Institute on The Concurrency Challenge, Multicore Programming Models and their Implementation Challenges, August 2008.
- Invited speaker, IBM Austin Research Lab Distinguished Seminar Series, Multicore Programming Models and their Implementation Challenges, July 2008.
- Invited speaker, GCOE Ambient SoC Symposium, Waseda University, Japan, Programming Challenges for Multicore Parallel Systems, July 2008.
- Invited talk, 2008 Workshop on Exploiting Concurrency Efficiently and Correctly (co-located with CAV 2008), “Static and Dynamic Analysis of Parallel Programs”, July 2008.
- Invited colloquium speaker, U. Maryland ECE department, “Programming Challenges for Multicore Parallel Systems”, May 2008.
- Keynote speaker, 2008 International Symposium on Code Generation and Optimization (CGO), “Code Optimization of Parallel Programs”, April 2008.
- Panelist, IEEE International Parallel and Distributed Processing Symposium (IPDPS), “How to avoid making the same Mistakes all over again — what the parallel-processing Community has (failed) to offer the multi/many-core Generation?”, April 2008.

- Invited colloquium speaker, UT Austin CS Department, “Programming Challenges for Multicore Parallel Systems”, April 2008.
- Invited talk, Workshop on Architectures and Compilers for Multithreading, “Compiler Challenges for Multicore Parallel Systems”, December 2007, IIT Kanpur, India.
- Keynote speaker, High Performance Computation Conference (HPCC), “Programming Challenges for Petascale and Multicore Parallel Systems”, September 2007.
- Plenary speaker, Third International Conference on Distributed Computing and Internet Technology, “The Role of Programming Languages in Future Data-Centric and Net-Centric Applications”, December 2006.
- Panelist, ”Wish List: Architectural Support and Tool Infrastructure for Improving Software Dependability”, Workshop on Architectural and System Support for Improving Software Dependability (ASID) co-located with ASPLOS, October 2006.
- Panelist, “Opportunities and Challenges in Partitioned Global Address Space Languages”, Los Alamos Computer Science Institute (LACSI) Symposium, October 2006.
- Keynote speaker, Workshop on Software Challenges for Multicore Architectures, “X10: A High-Productivity Approach to Programming Multi-Core Systems”, September 2006.
- Panelist, ”High Productivity Languages for HPC: Compiler Challenges”, LCPC 2005 workshop, October 2005.
- Invited speaker, Ninth Annual Workshop on High Performance Embedded Computing (HPEC), “X10 Programming: Towards High Productivity High Performance Systems in the post-Moore’s Law Era”, September 2005.
- Panelist, panel discussion on ”Will Software Save Moore’s Law?”, HPEC 2005 workshop, September 2005.
- Invited speaker, AHPARC DARPA PGAS Programming Model Conference, “X10: An Object-Oriented Approach to PGAS Programming”, September 2005.
- Invited speaker, Workshop in programming models for HPCS ultra-scale applications (PMUA 2005), “X10 — a New Programming Model for Productive Scalable Parallel Programming”, June 2005.
- Invited speaker, Seventh Workshop on Languages, Compilers, and Run-time Support for Scalable Systems (LCR), “X10: Addressing Language, Compiler, and Runtime Challenges for Scalable Systems in 2010”, October 2004.

- Invited speaker, 2nd International Conference on the Principles and Practice of Programming in Java (PPPJ), “Java Innovation in Industry and Academia: Current Synergy and Future Challenges”, June 2003.
- Keynote speaker, High Performance Computing (HiPC) conference, “Scalable High-Performance Java Virtual Machines”, December 2001.
- Invited speaker, Workshop on Cutting Edge Computing, ”End-to-end Adaptive Optimization: Towards Autonomic Virtual Machines”, December 2001.
- Keynote speaker, 2nd Workshop on Java for High-Performance Computing (held in conjunction with ACM ICS 2000 conference), ”The Evolution of Optimization and Parallelization technologies for Java, or why Java for High-Performance Computing is not an oxymoron”, June 2000.
- Panelist, panel discussion on Dynamic Compilation at ACM Dynamo 2000 workshop held in conjunction with ACM POPL 2000 conference, Jan 2000.
- Invited speaker, ISCOPE conference, “Evolution of Optimization and Parallelization technologies from Fortran to Java — why High-Performance Object-Oriented Computing need not be an oxymoron”, December 1999.
- Invited speaker, Workshop on Scheduling Algorithms for Parallel/Distributed Computing, ”Static Scheduling with Communication Weights — Theory and Practice”, June 1999.
- Panelist, Workshop on Challenges for Parallel Processing (co-located with ICPP), “Issues in Distributed Memory Systems”, August 1995.
- Invited speaker, IXth Distinguished Lecture Series, University Video Communications, “Don’t Waste Those Cycles: An In-Depth Look at Scheduling Instructions in Basic Blocks and Loops”, August 1994 (with Barbara Simons).
- Lecturer, ACM Lectureship Series, “Program Optimization — a Quantitative Approach”, “Compiling for Parallelism”, and “A General Framework for Iteration-Reordering Loop Transformations”, 1992-93.
- Panelist, Third Workshop on Compilers for Parallel Computers, “How good are parallelizing compilers in practice?”, July 1992.
- Panelist, International Workshop on Multithreaded Computers (co-located with Supercomputing ’91 conference), “Programming, Compilation, and Resource Management Issues for Multithreading”, November 1991.

- Invited speaker, ACM International Conference on Supercomputing, “Compiling for Parallel Computers”, June 1989.
- Panelist, ACM International Conference on Supercomputing, “Delivering Supercomputer Performance to the User”, June 1989.
- Keynote speaker, Fourth Parallel Processing Circus, “The Programming Problem for General-purpose Multiprocessors”, December 1988.
- Panelist, International Conference on Supercomputing, “Future of Parallel Programming”, May 1988.

Conference Tutorials

- “Habanero-Java: Multicore Programming for the Masses” (with Shams Imam), given at PPOPP 2014.
- “Compiler Challenges for Task-Parallel Languages”, given at PLDI 2011.
- “The Concurrent Collections Parallel Programming Model - Foundations and Implementation Challenges” (with Kathleen Knobe), given at PLDI 2009.
- “Analysis and Optimization of Parallel Programs” (with Sam Midkiff), given at PLDI 2008.
- “Programming using the Partitioned Global Address Space (PGAS) Model” (with Tarek El-Ghazawi), given at Supercomputing 2007.
- “X10: Concurrent Object-Oriented Programming for Modern Architectures” (with Vijay Saraswat), given at OOPSLA 2006 and PPOPP 2007.
- “Programming Internet-Scale Distributed Applications in the 21st Century: BPEL and Beyond” (with John Field), given at ECOOP 2004 and OOPSLA 2003 conferences.
- “Optimized Compilation of Java Programs”, given at ACM PLDI 2000 and ACM Java Grande 2001 conferences.
- “Static and Dynamic Optimized Compilation of Java Programs”, given at the workshop on Java for High-Performance Computing, held in conjunction with ICS '99 (with Manish Gupta).
- “Code Optimization in Modern Compilers” given at the ASPLOS '96, HPCA '96, POPL '96, HiPC '95 conferences (with Krishna Palem).

- “Advanced Optimizations for Memory Hierarchies” given at the PLDI ’93 and CASCON ’94 conferences.
- “Instruction Scheduling” given at the SPDP ’93 conference (with Barbara Simons). This tutorial was extended into an invited video lecture in University Video Communications’ Distinguished Lecture Series.

Courses

- COMP 322 (Fundamentals of Parallel Programming), Rice University, Spring 2015.
- COMP 322 (Fundamentals of Parallel Programming), Rice University, Spring 2014.
- COMP 515 (Advanced Compilation for Vector and Parallel Processors), Rice University, Fall 2013.
- COMP 322 (Fundamentals of Parallel Programming), Rice University, Spring 2013.
- Co-instructor for CS 181E (Fundamentals of Parallel Programming), Harvey Mudd College, Fall 2012.
- COMP 322 (Fundamentals of Parallel Programming), Rice University, Spring 2012.
- Three-day course on “Introduction to Parallel Programming”, CSIRO, Perth, Australia, December 2011.
- COMP 515 (Advanced Compilation for Vector and Parallel Processors), Rice University, Fall 2011.
- COMP 322 (Fundamentals of Parallel Programming), Rice University, Spring 2011.
- Invited short course on Multicore Programming Models and their Compilation Challenges, ACACES 2010 Sixth International Summer School on Advanced Computer Architecture and Compilation for High-Performance and Embedded Systems, July 2010.
- COMP 211 (Principles of Program Design), Rice University, Spring 2010.
- COMP 322 (Fundamentals of Parallel Programming), Rice University, Fall 2009.
- COMP 515 (Advanced Compilation for Vector and Parallel Processors), Rice University, Spring 2009.
- Independent Study courses: COMP 590 (3 CAAM PhD students), COMP 490 (1 CS Undergraduate student), Fall 2008.

- Invited short course on Multicore Programming Models, Second International School on Trends in Concurrency, June 2008.
- COMP 422 (Introduction to Parallel Computing), Rice University, Spring 2008.
- COMP 635 (Seminar on Heterogeneous Processors), Rice University, Fall 2007.
- 6.035 (Computer Language Engineering), MIT, Fall '96 & Fall '97.
Sole instructor for the main compilers class at MIT. Restructured curriculum to use Java as the language foundation instead of CLU.
- Code Optimization in Modern Compilers, Western Institute for Computer Science (WICS), Stanford University, August '94, August '95, August '96.
This one-week overview class on code optimization was designed for industry professionals and overseas students (taught jointly with Prof. Krishna Palem from the NYU Courant Institute).
- Compiling for Parallelism, Indian Institute of Science, March 1990.
This intensive two-week course was sponsored by the United Nations Development Programme.
- CS 302, U. Wisconsin-Madison, Fall '81 & Spring '82.
Sole lecturer for introductory programming course in Pascal and Fortran,

Patents

1. Method and apparatus for efficient and precise datarace detection for multithreaded object-oriented programs. Jong-Deok Choi, Keunwoo Lee, Robert O'Callahan, Vivek Sarkar, and Manu Sridharan. *Filed June 2002, issued as US patent 7516446 in April 2009.*
2. Static detection of a datarace condition for multithreaded object-oriented applications. Jong-Deok Choi, Alexey Loginov, and Vivek Sarkar. *Filed January 2002, issued as US patent 7469403 in December 2008.*
3. Retargeting optimized code by matching tree patterns in directed acyclic graphs. Vivek Sarkar, Mauricio J. Serrano, and Barbara Simons. *IBM Docket ST996057, filed December 1998, issued as US patent 6292938 in September 2001.*
4. Method and system for generating compact code for the loop unrolling transformation Khoa Nguyen and Vivek Sarkar. *IBM Docket ST996069, filed July 1997, issued as US patent 6035125 in March 2000.*

5. A Method of, System for, and Computer Program Product for providing Quick Fusion in WHERE constructs. Dz-Ching Ju, John Ng, and Vivek Sarkar. *IBM Docket ST995058, filed July 1997, issued as US patent 6041181 in March 2000.*
6. Method of, System for, and Computer Program Product for performing Weighted Loop Fusion by an Optimizing Compiler. Nimrod Megiddo and Vivek Sarkar. *IBM Docket ST997073, filed June 1997, issued as US patent 6058266 in October 2000.*
7. System, method, and program product for loop instruction scheduling hardware lookahead. Barbara Simons and Vivek Sarkar. *IBM Docket ST995023, filed June 1997, issued as US patent 6044222 in March 2000.*
8. Method of, System for, and Computer Program Product for Minimizing Loop Execution Time by Optimizing Block/Tile Sizes. Nimrod Megiddo and Vivek Sarkar. *IBM Docket ST995008, filed July 1997, issued as US patent 05953531 in September 1999.*
9. System, method, and program product for instruction scheduling in the presence of hardware lookahead accomplished by the rescheduling of idles lots. Barbara Simons and Vivek Sarkar. *IBM Docket ST995022, filed June 1996, issued as US patent 5887174 in March 1999.*
10. Method and System for Efficient Identification of Private Variables in Program Loops by an Optimizing Compiler. Vivek Sarkar. *IBM Docket ST995060, filed December 1995, issued as US patent 5790859 in August 1998.*

Refereed Conference and Journal Publications

1. Oil and Water Can Mix: An Integration of Polyhedral and AST-based Transformations. Jun Shirako, Louis-Noel Pouchet, Vivek Sarkar. *The Conference on High Performance Computing, Networking, Storage and Analysis (SC'14), November 2014.*
2. HabaneroUPC++: a Compiler-free PGAS Library. Vivek Kumar, Yili Zheng, Vincent Cave, Zoran Budimlic, Vivek Sarkar. *8th International Conference on Partitioned Global Address Space Programming Models (PGAS14), October 2014.*
3. Habanero-Java Library: a Java 8 Framework for Multicore Programming. Shams Imam, Vivek Sarkar. *11th International Conference on the Principles and Practice of Programming on the Java platform: virtual machines, languages, and tools (PPPJ'14), September 2014.*
4. Bounded Memory Scheduling of Dynamic Task Graphs. Dragos Sbirlea, Zoran Budimlic, Vivek Sarkar. *International Conference on Parallel Architectures and Compilation Techniques (PACT), August 2014.*

5. Cooperative Scheduling of Parallel Tasks with General Synchronization Patterns. Shams Imam, Vivek Sarkar. *28th European Conference on Object-Oriented Programming (ECOOP)*, July 2014.
6. Test-Driven Repair of Data Races in Structured Parallel Programs. Rishi Surendran, Raghavan Raman, Swarat Chaudhuri, John Mellor-Crummey, Vivek Sarkar. *35th ACM Conference on Programming Language Design and Implementation (PLDI)*, June 2014.
7. Inter-iteration Scalar Replacement Using Array SSA Form. Rishi Surendran, Rajkishore Barik, Jisheng Zhao, Vivek Sarkar. *The 23rd International Conference on Compiler Construction (CC 2014)*, April 2014.
8. A Decoupled non-SSA Global Register Allocation using Bipartite Liveness Graphs. Rajkishore barik, Jisheng Zhao and Vivek Sarkar. *ACM Transactions on Architecture and Code Optimization (TACO)*, Volume 10 Issue 4, December 2013.
9. Automatic Detection of Inter-application Permission Leaks in Android Applications. Dragos Sbirlea, Michael G. Burke, Salvatore Guarnieri, Marco Pistoia, Vivek Sarkar. *IBM Journal of Research and Development (Volume:57 , Issue: 6)*, November–December 2013.
10. Isolation for Nested Task Parallelism. Jisheng Zhao, Roberto Lubliner, Zoran Budimlic, Swarat Chaudhuri, Vivek Sarkar. *The 29th International Conference on the Object-Oriented Programming, System, Languages and Application (OOPSLA)*, October 2013.
11. Interprocedural Strength Reduction of Critical Sections in Explicitly-Parallel Programs. Raj Barik, Jisheng Zhao, Vivek Sarkar. *Proceedings of the 22nd International Conference on Parallel Architectures and Compilation Techniques (PACT)*, September 2013.
12. Accelerating Habanero-Java Programs with OpenCL Generation. Akihiro Hayashi, Max Grossman, Jisheng Zhao, Jun Shirako, Vivek Sarkar. *10th International Conference on the Principles and Practice of Programming in Java (PPPJ)*, September 2013.
13. A Transformation Framework for Optimizing Task-Parallel Programs. Krishna Nandivada, Jun Shirako, Jisheng Zhao, Vivek Sarkar. *ACM Transactions on Programming Languages and Systems (TOPLAS)*, Volume 35 Issue 1, April 2013.
14. Integrating Asynchronous Task Parallelism with MPI. Sanjay Chatterjee, Sagnak Tasirlar, Zoran Budimlic, Vincent Cave, Milind Chabbi, Max Grossman, Vivek Sarkar. *27th IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, April 2013.
15. Integrating Task Parallelism with Actors. Shams Imam, Vivek Sarkar. *SPLASH Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA)*, October 2012.

16. Folding of Tagged Single Assignment Values for Memory-Efficient Parallelism. Dragos Sbirlea, Kathleen Knobe, Vivek Sarkar. *International European Conference on Parallel and Distributed Computing (Euro-Par), August 2012.*
17. A Practical Approach to DOACROSS Parallelization. Priya Unnikrishnan, Jun Shirako, Kit Barton, Sanjay Chatterjee, Raul Silvera, Vivek Sarkar. *International European Conference on Parallel and Distributed Computing (Euro-Par), August 2012.*
18. Design, Verification and Applications of a New Read-Write Lock Algorithm. Jun Shirako, Nick Vrvilo, Eric G. Mercer, Vivek Sarkar. *24th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), June 2012.*
19. Scalable and Precise Dynamic Datarace Detection for Structured Parallelism. Raghavan Raman, Jisheng Zhao, Vivek Sarkar, Martin Vechev, Eran Yahav. *Proceedings of 2012 ACM Conference on Programming Language Design and Implementation (PLDI), June 2012.*
20. Mapping a Data-Flow Programming Model onto Heterogeneous Platforms. Alina Sbirlea, Yi Zou, Zoran Budimlic, Jason Cong, Vivek Sarkar. *Conference on Languages, Compilers, Tools and Theory for Embedded Systems (LCTES), June 2012.*
21. Practical Permissions for Race-Free Parallelism. Edwin Westbrook, Jisheng Zhao, Zoran Budimlic, Vivek Sarkar. *26th European Conference on Object-Oriented Programming (ECOOP), June 2012.*
22. Analytical Bounds for Optimal Tile Size Selection. Jun Shirako, Kamal Sharma, Naznin Fauzia, Louis-Noel Pouchet, J. Ramanujam, P. Sadayappan, Vivek Sarkar. *Proceedings of the 2012 International Conference on Compiler Construction (CC 2012), April 2012.*
23. Delegated Isolation. Roberto Lublinerman, Jisheng Zhao, Zoran Budimlic, Swarat Chaudhuri, Vivek Sarkar. *Proceedings of OOPSLA 2011, October 2011.*
24. Interfacing Chapel with Traditional HPC Programming Languages. Adrian Prantl, Thomas Epperly, Shams Imam, Vivek Sarkar. *PGAS11 Conference, October 2011.*
25. Permission Regions for Race-Free Parallelism. Edwin Westbrook, Jisheng Zhao, Zoran Budimlic, Vivek Sarkar. *Proceedings of the 2nd International Conference on Runtime Verification (RV '11), September 2011.*
26. Data-Driven Tasks and their Implementation. Sagnak Tasirlar, Vivek Sarkar. *Proceedings of the International Conference on Parallel Processing (ICPP) 2011, September 2011.*

27. Habanero-Java: the New Adventures of Old X10. Vincent Cave, Jisheng Zhao, Jun Shirako, Vivek Sarkar. *9th International Conference on the Principles and Practice of Programming in Java (PPPJ), August 2011.*
28. DrHJ — a lightweight pedagogic IDE for Habanero Java. Jarred Payne, Vincent Cave, Raghavan Raman, Mathias Ricken, Robert Cartwright, Vivek Sarkar. *Tool Demonstration paper, 9th International Conference on the Principles and Practice of Programming in Java (PPPJ), August 2011.*
29. Hardware and Software Tradeoffs for Task Synchronization on Manycore Architectures. Yonghong Yan, Sanjay Chatterjee, Daniel Orozco, Elkin Garcia, Zoran Budimlic, Jun Shirako, Robert Pavel, Guang R. Gao, and Vivek Sarkar. *Proceedings of Euro-Par 2011, August 2011.*
30. Optimizations for Distributed-Memory X10 Programs. Rajkishore Barik, Jisheng Zhao, David Grove, Igor Peshansky, Zoran Budimli, Vivek Sarkar. *25th IEEE International Parallel and Distributed Processing Symposium (IPDPS), April 2011.*
31. Subregion Analysis and Bounds Check Elimination for High Level Arrays. Mackale Joyner, Zoran Budimli, Vivek Sarkar. *Proceedings of the 2011 International Conference on Compiler Construction (CC 2011), April 2011.*
32. Customizable Domain-Specific Computing. Jason Cong, Vivek Sarkar, Glenn Reinman, and Alex Bui. *IEEE Design & Test, 2:28, pp. 6–15, March 2011.*
33. Efficient Selection of Vector Instructions using Dynamic Programming. Rajkishore Barik, Jisheng Zhao, Vivek Sarkar. *MICRO-43, December 2010.*
34. Efficient Data Race Detection for Async-Finish Parallelism. Raghavan Raman, Jisheng Zhao, Vivek Sarkar, Martin Vechev, Eran Yahav. *Proceedings of the 1st International Conference on Runtime Verification (RV 10), November 2010. Recipient of Best Paper Award.*
35. Reducing Task Creation and Termination Overhead in Explicitly Parallel Programs. Jisheng Zhao, Jun Shirako, Krishna V. Nandivada, Vivek Sarkar. *Proceedings of the Nineteenth International Conference on Parallel Architectures and Compilation Techniques (PACT), September 2010.*
36. Verifying Determinism of Structured Parallel Programs. Martin Vechev, Eran Yahav, Raghavan Raman, Jisheng Zhao, Vivek Sarkar. *Proceedings of the 2010 Static Analysis Symposium (SAS '10), September 2010.*
37. Concurrent Collections. Zoran Budimlić, Michael Burke, Vincent Cavé, Kathleen Knobe, Geoff Lowney, Ryan Newton, Jens Palsberg, David Peixotto, Vivek Sarkar, Frank Schlimbach, Saĝnak Taşirlar. *Scientific Programming, 18:3–4, pp. 203–217, August 2010.*

38. A Study of a Software Cache Implementation of the OpenMP Memory Model for Multicore and Manycore Architectures. Chen Chen, Joseph B. Manzano, Ge Gan, Guang R. Gao, and Vivek Sarkar. *Proceedings of Euro-Par 2010, August 2010*.
39. SLAW: a Scalable Locality-aware Adaptive Work-stealing Scheduler. Yi Guo, Jisheng Zhao, Vincent Cav, Vivek Sarkar. *24th IEEE International Parallel and Distributed Processing Symposium (IPDPS), April 2010*.
40. Hierarchical Phasers for Scalable Synchronization and Reduction. Jun Shirako, Vivek Sarkar. *24th IEEE International Parallel and Distributed Processing Symposium (IPDPS), April 2010*.
41. Software Challenges in Extreme Scale Systems. V. Sarkar, W. Harrod, A.E. Snively. *SciDAC Review Special Issue on Advanced Computing: The Roadmap to Exascale, pp. 60-65, 2010 (revised version of reference [46] below)*.
42. Programmability Issues. Barbara Chapman, Jess Labarta, Vivek Sarkar, Mitsuhsa Sato. *International Journal of High Performance Computing Applications (IJHPCA), November 2009, volume 23, number 4, pp 328-331*.
43. Interprocedural Load Elimination for Dynamic Optimization of Parallel Programs. Rajkishore Barik, Vivek Sarkar. *The Eighteenth International Conference on Parallel Architectures and Compilation Techniques (PACT), September 2009*.
44. JCUDA: a Programmer-Friendly Interface for Accelerating Java Programs with CUDA. Yonghong Yan, Max Grossman, Vivek Sarkar. *Proceedings of Euro-Par 2009, August 2009*.
45. Chunking Parallel Loops in the Presence of Synchronization. Jun Shirako, Jisheng Zhao, V. Krishna Nandivada, Vivek Sarkar. *Proceedings of the 2009 ACM International Conference on Supercomputing (ICS), June 2009*.
46. Software Challenges in Extreme Scale Systems. V. Sarkar, W. Harrod, A.E. Snively. *2009 Conference on Scientific Discovery through Advanced Computing Program (SciDAC), June 2009*.
47. Work-First and Help-First Scheduling Policies for Terminally Strict Parallel Programs. Yi Guo, Rajkishore Barik, Raghavan Raman, Vivek Sarkar. *23rd IEEE International Parallel and Distributed Processing Symposium (IPDPS), May 2009*.
48. Phaser Accumulators: a New Reduction Construct for Dynamic Parallelism. Jun Shirako, David Peixotto, Vivek Sarkar, William Scherer. *23rd IEEE International Parallel and Distributed Processing Symposium (IPDPS), May 2009*.

49. Phasers: a Unied Deadlock-Free Construct for Collective and Point-to-point Synchronization. Jun Shirako, David Peixotto, Vivek Sarkar, William Scherer. *Proceedings of the 2008 ACM International Conference on Supercomputing (ICS)*, June 2008.
50. Type Inference for Locality Analysis of Distributed Data Structures. Satish Chandra, Vijay Saraswat, Vivek Sarkar, Ras Bodik. *Proceedings of the 2008 ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*, February 2008.
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Selected Software Artifacts

- Co-led releases of Habanero-C and Open Computing Runtime (OCR) starting 2012.
- Led Habanero-Java (HJ) releases starting October 2009 (<http://habanero.rice.edu/hj>). HJ is used by multiple institutions for research and teaching. At Rice, this software is used for laboratory and programming assignments in COMP 322, and for research in the Habanero Extreme Scale Software research project.
- Co-led first open source release of X10 in December 2006 (<http://x10-lang.org>).
- Led first open source of Jikes Research Virtual Machine in October 2001 (<http://jikesrvm.org/>).
- Led development of ASTI optimizer component, which has been shipping as part of IBM's XL Fortran product compilers since 1996.
- Contributed to development of PTRAN research prototype compiler (led by Fran Allen).

Personal Information

- US citizen, and Overseas Citizen of India.
- Married with two children.
- Extra-curricular interests: theatre, hiking, horseback riding, classical music (violin).
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