

Jennifer B. Sartor

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Research Managed runtime environments, memory management, dynamic optimization, software-hardware co-design, memory system efficiency

Education **The University of Texas at Austin** Austin, TX, USA
Ph.D. in Computer Science August 2010
Advisors: Prof. Kathryn McKinley, Prof. Steve Blackburn (from Australian National University)
Title: Exploiting Language Abstraction to Optimize Memory Efficiency

M.S. in Computer Science December 2004
Computer Science Education study August 2002 - December 2003

The University of Arizona Tucson, AZ, USA
B.S. in honors Computer Science and Mathematics, minor in Spanish December 2001

Publications S. Akram, J.B. Sartor, and L. Eeckhout. **DEP+BURST: Online DVFS Performance Prediction for Energy-Efficient Managed Language Execution.** *IEEE Transactions on Computers*, 2017 (to appear).

C. González-Álvarez, J.B. Sartor, C. Álvarez, D. Jiménez-González, and L. Eeckhout. **MIInGLE: An Efficient Framework for Domain Acceleration using Low-Power Specialized Functional Units.** *ACM Transactions on Architecture and Code Optimization (TACO)*, Vol. 13, Issue 2. June 2016.

S. Akram, J.B. Sartor, and L. Eeckhout. **DVFS Performance Prediction for Managed Multithreaded Applications.** *IEEE Symposium on Performance Analysis of Systems and Software (ISPASS)*, Uppsala, Sweden, April 2016.
—Nominated for **ISPASS's Best Paper Award.**

S. Akram, J.B. Sartor, K. Van Craeynest, W. Heirman, and L. Eeckhout. **Boosting the Priority of Garbage: Scheduling Collection on Heterogeneous Multicore Processors.** *ACM Transactions on Architecture and Code Optimization (TACO)*, Vol. 13, Issue 1, April 2016.

M. De Wael, S. Marr, J. De Koster, J.B. Sartor, and W. De Meuter. **Just-in-Time Data Structures.** *Onward! 2015 as part of Conference on Systems, Programming, Languages and Applications: Software for Humanity (SPLASH)*, p. 61–75, Pittsburgh, October 2015.

C. González-Álvarez, J.B. Sartor, C. Álvarez, D. Jiménez-González, and L. Eeckhout. **Automatic Design of Domain-Specific Instructions for Low-Power Processors.** *International Conference on Application-specific Systems, Architectures and Processors (ASAP)*, p. 1–8, Toronto, Canada, July 2015.
—Won **Best Student Paper Award.**

J.B. Sartor, W. Heirman, S.M. Blackburn, L. Eeckhout, and K.S. McKinley. **Cooperative Cache Scrubbing.** *International Conference on Parallel Architectures and Compilation Techniques. (PACT)*, p. 15–26, Edmonton, Alberta, Canada, August 2014. Acceptance Rate = 26%.
—Nominated for **PACT's Best Paper Award.**

C. González-Álvarez, J.B. Sartor, C. Álvarez, D. Jiménez-González, and L. Eeckhout. **Accelerating an Application Domain with Specialized Functional Units.** *ACM Transactions on Architecture and Code Optimization (TACO)*, Vol 10, No 4, January 2014.

K. Du Bois, J.B. Sartor, S. Eyerman, and L. Eeckhout. **Bottle Graphs: Visualizing Scalability Bottlenecks in Multi-Threaded Applications.** *ACM SIGPLAN 2013 Conference on Object Oriented Programming, Systems, Languages and Applications (OOPSLA)*, p. 355–372, Indianapolis, Indiana, October 2013. Acceptance Rate = 26%.

- Publications cont.* K. Du Bois, S. Eyerman, J.B. Sartor, and L. Eeckhout. **Criticality Stacks: Identifying Critical Threads in Parallel Programs using Synchronization Behavior.** *International Symposium on Computer Architecture (ISCA)*, p. 511–522, Tel-Aviv, Israel, June 2013. Acceptance Rate = 19%.
—Received **HiPEAC Paper Award**.
- J.B. Sartor, and L. Eeckhout. **Exploring Multi-Threaded Java Application Performance on Multicore Hardware.** *ACM SIGPLAN 2012 Conference on Object Oriented Programming, Systems, Languages and Applications (OOPSLA)*, pp. 281–296, Tucson, Arizona, October 2012. Acceptance Rate = 25%.
- X. Yang, S.M Blackburn, D. Frampton, J.B. Sartor, and K.S. McKinley. **Why Nothing Matters: The Impact of Zeroing.** *ACM SIGPLAN 2011 Conference on Object Oriented Programming, Systems, Languages and Applications (OOPSLA)*, pp. 307–324, Portland, Oregon, October 2011. Acceptance Rate = 37%.
- J.B. Sartor, S.M. Blackburn, D. Frampton, M. Hirzel, and K.S. McKinley. **Z-Rays: Divide Arrays and Conquer Speed and Flexibility.** *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)*, pp. 471–482, Toronto, Canada, June 2010. Acceptance Rate = 20%.
- J.B. Sartor, M. Hirzel, and K.S. McKinley. **No Bit Left Behind: The Limits of Heap Data Compression.** In *The 2008 International Symposium on Memory Management (ISMM)*, pp. 111–120, Tucson, Arizona, June 2008.
—Received conference’s **Best Presentation Award**.
- Honors* Nominated for ISPASS’s Best Paper Award for *DVFS Performance Prediction* paper. April 2016
- Awarded a research project grant for 2 new PhD students by FWO (Flanders Research Fund) (13% acceptance rate). November 2015
- Won ASAP’s Best Student Paper Award for *Automatic Design* paper. July 2015
- Awarded inter-university VUB-UGent Alliance. June 2015
- Nominated for PACT’s Best Paper Award for *Cooperative Cache Scrubbing* paper. June 2014
- HiPEAC Paper Award for *Criticality Stacks* paper. June 2013
- First place in poster and presentation rounds in the graduate student category of ACM Student Research Competition at PLDI conference. June 2009
- Best student presentation at ISMM conference for *No Bit Left Behind* paper. June 2008
- USA’s National Science Foundation graduate student award for East Asia and Pacific Summer Institute, research collaboration with Australian National University. Summer 2008
- University of Texas at Austin Computer Science Teaching Assistant Excellence Award. Fall 2003
- Experience* **Vrije Universiteit Brussel - Software Languages Lab** Brussels, Belgium
Assistant Professor started September 2014
- Research on implementation technology, or how modern programming languages, especially those that run on top of a virtual machine or runtime environment, can be efficiently implemented in terms of performance and memory. Specifically specializing on the optimization of parallel programs running on multicore hardware.
—**Supervision** of 2 PhD, 2 Masters and 1 Bachelors student, and service on doctoral committee.
- Ghent University - Computer Systems Lab** Ghent, Belgium
Post-doctoral Researcher with Prof. Lieven Eeckhout October 2011-September 2016
- Research on managed language runtime environments running on top of modern, multicore hardware. Currently looking into software-hardware cooperative solutions to utilize and manage memory and processor resources more efficiently from applications, through system software, to cores, caches, and down to DRAM.
—**Supervision** of 4 PhD students and 2 Masters students, and service on doctoral committees.

Experience cont. **École Polytechnique Fédérale de Lausanne - Parallel Systems Architecture Lab** *Lausanne, Switzerland*
Post-doctoral Researcher with Prof. Babak Falsafi *October 2010 - October 2011*
 Helped with research on light-weight hardware to accelerate instruction-grain runtime monitoring of software to find bugs and security exploits. Also brought up a database workload in Simics.
 —**Supervision** of 1 PhD student.

UTexas Computer Science - Programming Languages/Compilers Group *Austin, TX, USA*
Graduate Research Assistant with Prof. Kathryn McKinley *January 2004 - October 2010*
 Research on improving performance with dynamic optimizations in a Java virtual machine, focusing on memory management, developed primarily in Jikes RVM. Changed the heap to have a discontinuous array layout with indirection to fixed-sized *arraylets*, dynamically compressing arraylets to save space and improve memory efficiency. Also explored communicating between virtual machine and caches to save bandwidth, traffic, and cache pollution.

IBM TJ Watson - Dynamic Optimization Group *Hawthorne, NY, USA*
Research Intern *June 2007 - December 2007*
 Optimized page faults in memory-constrained environments through cooperation of the garbage collector and operating system by changing how the collector traverses and organizes objects.

Intel - Managed Runtime Division *Hillsboro, OR, USA*
Research Intern *June 2005 - December 2005*
 Made a Java virtual machine cache-coherent non-uniform memory access (cc-NUMA) aware with dynamic profile-guided object migration. Used hardware performance monitors to inform migration of objects between threads with the garbage collector.

Sun Microsystems - Directory Server Group *Austin, TX, USA*
Intern *Summer 2003*
 Developed a system management prototype web application using Jato and Lockhart framework that was able to install and manage server software.

Teaching **Vrije Universiteit Brussel CS - Performance Analysis and Evaluation** *Brussels, Belgium*
Assistant Professor *Fall 2016*
 Teaching a course on how to evaluate and analyze performance at all layers of the software/system stack, including the compiler, the managed language runtime environment, the operating system, the processor, and the memory subsystem.

Vrije Universiteit Brussel Computer Science- Multicore Programming *Brussels, Belgium*
Assistant Professor *Spring 2015, 2016, 2017*
 Teaching a course on multicore programming to masters students, including the concepts of parallelism and concurrency, in the context of three different programming languages: Erlang, Clojure, and Java.

De Hogeschool West-Vlaanderen Industriële Wetenschappen - C++ Computer Programming *Kortrijk, Belgium*
Lecturer *Fall 2012, 2013, 2014*
 Organized and taught 18 hours of C++ to masters students as an introduction to the graphics programming course, including weekly programming assignments, labs with exercises, and a final exam.

UTexas Computer Science - Introduction to Computer Programming: C++ *TX, USA*
Assistant Instructor *Fall 2009, Spring 2010*
 Designed a course to introduce the C++ language to students who had prior programming experience in other languages. Taught the details of C++ in class, including weekly programming assignments and quizzes.

UTexas Computer Science - Honors Computer Organization *Austin, TX, USA*
Graduate Teaching Assistant with Prof. Steve Keckler *Spring 2004*
 Assisted the professor, by leading a separate weekly lab, in teaching the basic building blocks of computer systems, including high-level understanding of the compiler, operating system, assembler, instruction set, and hardware.

- Teaching cont.*
- UTexas Computer Science - Honors Computer Architecture** *Austin, TX, USA*
Graduate Teaching Assistant with Prof. Steve Keckler *Fall 2003*
 Assisted the professor in teaching computer architecture fundamentals: assembly language programming, hardware performance analysis, instruction set design, datapaths, pipelining, and memory systems including caches and virtual memory.
 —Received annual **Teaching Assistant Excellence Award** from Computer Science department.
- UTexas Computer Science - Computer Fluency** *Austin, TX, USA*
Graduate Teaching Assistant with Dr. Roger Priebe *Spring 2003*
 Assisted the professor in teaching high-level “what are computers” class for non-majors, in a cooperative learning style. This included computer organization, number representation and storage, algorithms, programming languages, and networking.
- UTexas Computer Science - Elements of Computing and Programming** *Austin, TX, USA*
Graduate Teaching Assistant with Dr. Rober Priebe *Fall 2002*
 Lead a separate weekly lab to assist in teaching introductory programming to Java, including object-orientation, variables and data types, classes, control structures, loops, methods, and arrays.
- UArizona Computer Science - Various Java programming and math classes** *AZ, USA*
Section Leader or Undergraduate Teaching Assistant *Spring 1999 - Fall 2001*
 Assisted the professors, by leading a separate weekly lab, in teaching courses in introductory Java programming and data structures; object-oriented programming and design including event-driven programming and graphical user interfaces in a large scale software system; and discrete math with focus on algorithm analysis and complexity, data structure analysis, and introductory combinatorics and probability.
- Professional Development*
- Organized 2-day workshop for the Alliance between UGent’s PerformanceLab and VUB’s Software Languages Lab. *Jan 2017*
- Invited to be SPLASH 2017 Student Research Competition (SRC) co-chair. *2017*
- Invited to be Poster and Student Research Competition Chair of <Programming>2017 conference. *2017*
- Served on the jury of a master’s student’s thesis from Australian National University. *2016*
- Serving on the VUB’s computer science bachelor’s students thesis committee. *2015-present*
- Invited to teach at Virtual Machines Summer School 2016 in Cumberland Lodge, UK. *May-June 2016*
- Served as Chair of CGO’s ACM Student Research Competition, and evaluator of Grand Finals. *2015*
- Invited to be the Students Chair for CGO. *2015*
- Invited to serve on the following Program Committees to review conference/journal papers:
- ICS (ACM International Conference on Supercomputing) External Review Committee (ERC) 2017
 - TOPLAS (Transactions on Programming Languages and Systems) journal manuscript review 2016
 - VMIL (Virtual Machines and Intermediate Language) Workshop 2016
 - TOSEM (ACM Transactions on Software Engineering and Methodology) manuscript review 2016
 - Micro (International Symposium on Microarchitecture) ERC 2016
 - ICPP (International Conference on Parallel Programming) 2016 Programming Models and Languages Area
 - ECOOP (European Conference on Object-Oriented Programming) 2016
 - TACO (ACM Transactions on Architecture and Code Optimization) manuscript review 2015, 2016
 - PLDI (ACM SIGPLAN Conference on Programming Language Design and Implementation) ERC 2015
 - ASPLOS (International Conference on Architectural Support for Programming Languages and Operating Systems) 2015

*Professional
Development
cont.*

Program Committees continued:

- HPCA (IEEE Symposium on High Performance Computer Architecture) ERC 2015, ERC 2016, ERC 2017
- ISCA (International Symposium on Computer Architecture) ERC 2015
- VEE (ACM SIGPLAN/SIGOPS Int'l Conference on Virtual Execution Environment) 2015
- MSPC (ACM SIGPLAN Workshop on Memory Systems Performance and Correctness) 2014
- Software: Practice and Experience Journal manuscript review 2014, 2015
- PPPJ (International Conference on Principles and Practices of Programming on the Java platform) 2013, 2014
- OOPSLA (ACM SIGPLAN Conference on Object Oriented Programming, Systems, Languages and Applications) 2013, ERC 2014, 2017
- CGO (The International Symposium on Code Generation and Optimization) 2013, 2014, 2015, 2017
- ISMM (International Symposium on Memory Management) 2011, 2013, ERC 2014, ERC 2015, ERC 2016, 2017
- Science of Computer Programming Journal manuscript review 2013
- IBM Journal of Research and Development manuscript review 2013
- SPLASH (Systems, Programming, Languages and Applications: Software for Humanity) Doctoral Symposium 2013
- SSPA (International Workshop on Software and System Performance Analytics) 2012
- IISWC (The IEEE International Symposium on Workload Characterization) 2012
- ICOOOLPS (Workshop on Implementation, Compilation, Optimization of Object-Oriented Languages, Programs and Systems) 2011, 2016

Invited to serve on the doctoral committee of Joeri De Koster at Vrije Universiteit Brussel. *Nov 2014*

Invited to present 1-day class on hot IT Trend: The Move to Multicore and Heterogeneous Hardware, at The Hogeschool West-Vlaanderen to Master's students. *April 2014*

Invited to be on ACM SIGPLAN's Programming Languages Software Award committee. *Feb 2014*

Invited to serve on the doctoral committee of Kristof Du Bois at Ghent University. *Feb 2014*

Invited to serve on the doctoral committee of Kenzo Van Craeynest at Ghent University. *April 2013*

Helped Professor Koen De Bosschere edit the HiPEAC Vision Roadmap for 2013, 2015. *2013, 2015*

Selected to participate in MenTa, Ghent University's post-doctoral mentoring program. *Nov 2012*

Accepted by National Science Foundation Advance Program to attend the Negotiating the Ideal Faculty Position Workshop at Rice University. *Sept 2010*

Helped Prof. Maria Jump edit her course packet for "Fundamentals of Programming". *Summer 2010*

Sponsored by CRA-W to attend Grad Cohort Workshop for women. *Spring 2005*

Attended "Tools for Teaching: A Seminar for Experienced TAs" given by The Center for Teaching Effectiveness and The UT Learning Center at UTexas. *Jan 2003*

Attended "New Beginnings: A Seminar for New TAs" given by The Center for Teaching Effectiveness and The UT Learning Center at UTexas. *Sept 2002*

*Institutional
Service*

Member of UTexas Women and Minorities in Computer Sciences committee. *Fall 2004 - Spring 2005*

Invited to present session at UTexas Graduate Student Instructor Seminar on "Leading Effective Discussions in Science Classes". *Fall 2004*

<i>Institutional Service cont.</i>	Member of UTexas Computer Science Gradfest committee, organizing prospective doctoral student weekend. <i>Spring 2004</i>
	Member of UTexas Graduate Representative Association of Computer Sciences. <i>Fall 2003 - Spr 2004</i>
	Member of UArizona Computer Science Undergraduate Curriculum Committee. <i>Fall 2001</i>
	Co-founder, treasurer, and committee head of UArizona ACM student chapter. <i>Spr 2001 - Fall 2001</i>
<i>Memberships of Scientific Societies</i>	Member of Association for Computing Machinery (ACM). <i>2010-present</i>
	DaCapo research group member with yearly meetings. <i>Jan 2005, 2006, 2007, 2008, April 2009</i>
	Invited to join Upsilon Pi Epsilon, International Honor Society for Computing Sciences. <i>Fall 2005</i>
	Member of Kappa Delta Pi International Honor Society in Education. <i>Spring 2003</i>
	Invited to join Phi Beta Kappa Honor Society. <i>Fall 2001</i>
	Member of The National Dean's List. <i>Spring 2000 - Fall 2001</i>
	Member of Golden Key National Honors Society. <i>Fall 1999 - Fall 2001</i>
<i>Research Talks</i>	SOFT lab, Vrije Universiteit Brussel - "Boosting the Priority of Garbage: Scheduling Collection on Heterogeneous Multicore Processors" <i>February 3, 2016</i>
	UPMC Sorbonne Universités, LIP6 Inria - invited talk at a Language Runtime Workshop <i>June 6, 2014</i>
	Technion, Israel Institute of Technology - "Visualization Tools to Analyze Multi-threaded Program Scalability and Performance" <i>June 24, 2013</i>
	IBM Zurich - "The Impact of Zeroing and Z-Rays for Memory Speed and Flexibility" <i>September 7, 2011</i>
	Ghent U. - "The Impact of Zeroing and Z-Rays for Memory Speed and Flexibility" <i>August 26, 2011</i>
	Ecole Polytechnique Federale de Lausanne (EPFL) to the Scala team - "The Impact of Zeroing and Z-Rays for Memory Speed and Flexibility" <i>July 12, 2011</i>
	University of British Columbia - "Exploiting Language Abstraction to Optimize Memory Efficiency" <i>May 18, 2010</i>
	Max Planck Institute for Software Systems - "Exploiting Language Abstraction to Optimize Memory Efficiency" <i>May 12, 2010</i>
	Univ. of Lugano - "Exploiting Language Abstraction to Optimize Memory Efficiency" <i>May 10, 2010</i>
	EPFL - "Exploiting Language Abstraction to Optimize Memory Efficiency" <i>May 7, 2010</i>
	INRIA Rennes - "Exploiting Language Abstraction to Optimize Memory Efficiency" <i>May 5, 2010</i>
	Australian National Univ. - "No Bit Left Behind: The Limits of Heap Data Compression" <i>June 2008</i>
	University of Melbourne - "No Bit Left Behind: The Limits of Heap Data Compression" <i>July 2008</i>
	Univ. of New South Wales - "No Bit Left Behind: The Limits of Heap Data Compression" <i>July 2008</i>
	DaCapo group research meeting at The University of New Mexico - "Object Migration in a cc-NUMA Aware JVM Guided by Dynamic Profiling" <i>January 2006</i>
	Intel's Software and Services Group Intern Research Day in Hillsboro, Oregon - Poster: "Bringing cc-NUMA Awareness to the Java Virtual Machine" <i>August 2005</i>