

## Shoaib Kamil

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### CONTACT INFORMATION

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### RESEARCH INTERESTS

Programming systems for domain-specific optimization, compilers, program synthesis, scientific computing, parallel programming languages, auto-tuning, software as a service.

### EDUCATION

**University of California**, Berkeley, California USA

Ph.D., Computer Science, December 2012

- Dissertation Topic: “Productive High Performance Parallel Programming with Auto-tuned Domain-Specific Embedded Languages”
- Advisers: Armando Fox and Katherine Yelick

**University of California**, Berkeley, California USA

B.A. with honors, Computer Science, 2003

### TEACHING EXPERIENCE

**University of California**, Berkeley, California USA

*Co-Lecturer*

**Spring 2013**

6.005: Software Construction (Undergraduate course). With Saman Amarasinghe and Max Goldman.

*Graduate Student Instructor*

**Fall 2010**

CS169: Software Engineering (Senior-level undergraduate course). Instructor: Prof. Armando Fox

*Graduate Student Instructor*

**Spring 2008**

CS267: Applications of Parallel Computing (Graduate course). Instructor: Prof. Horst Simon

*Teaching Assistant*

**Fall 2002**

CS164: Compilers and Programming Languages (Junior-level undergraduate course). Instructor: Prof. Richard Fateman

*Teaching Assistant*

**Spring 2001**

CS170: Efficient Algorithms and Intractable Problems (Junior-level undergraduate course). Instructors: Prof. James Demmel and Prof. Jonathan Shewchuk

### PUBLICATIONS & INVITED TALKS

*PhD Dissertation*

- *Productive High Performance Parallel Programming with Auto-tuned Domain-Specific Embedded Languages*. PhD Dissertation, EECS Dept, University of California, Berkeley (Tech Report EECS-2012-255), 2012.

*Peer-Reviewed Publications*

- Alvin Cheung, Shoaib Kamil, Armando Solar-Lezama. *Bridging the Gap Between General-Purpose and Domain-Specific Compilers with Synthesis*. Summit on Advances in Programming Languages (SNAPL), to appear, 2015.
- Charith Mendis, Jeffrey Bosboom, Kevin Lu, Shoaib Kamil, Jonathan Ragan-Kelly, Qin Zhao, Sylvain Paris, Saman Amarasinghe. *Helium: Lifting High-Performance Stencil Kernels from Stripped x86 Binaries to Halide DSL Code*. Program Language Design and Implementation (PLDI), to appear, 2015.

- Zhilei Xu, Shoaib Kamil, Armando Solar-Lezama. *MSL: A Synthesis-Enabled Language for Distributed Implementations*. Supercomputing: The International Conference for High Performance Computing Networking, Storage, and Analysis (SC), 2014.
- Jason Ansel, Shoaib Kamil, Kalyan Veeramachaneni, Una-May O'Reilly, Saman Amarasinghe. *OpenTuner: An Extensible Framework for Program Autotuning*. Parallel Architectures and Compilation Techniques (PACT), 2014.
- Adam Lugowski, Shoaib Kamil, Aydin Buluc, Samuel Williams, Erika Duriakova, Leonid Oliker, Armando Fox, John Gilbert. *Parallel Processing of Filtered Queries in Attributed Semantic Graphs*. Journal of Parallel and Distributed Computing (JPDC), 2014.
- James Demmel, David Elichu, Armando Fox, Shoaib Kamil, Benjamin Lipshitz, Oded Schwartz, Omer Spillinger. *Communication-Optimal Parallel Recursive Rectangular Matrix Multiplication*. International Parallel and Distributed Processing Symposium (IPDPS), 2013.
- Aydin Buluc, Erika Duriakova, Armando Fox, John Gilbert, Shoaib Kamil, Adam Lugowski, Leonid Oliker, Samuel Williams. *High-Productivity and High-Performance Analysis of Filtered Semantic Graphs*. International Parallel and Distributed Processing Symposium (IPDPS), 2013.
- Jeffrey Morlan, Shoaib Kamil, Armando Fox. *Auto-tuning the Matrix Powers Kernel with SEJITS*. Seventh International Workshop on Automatic Performance Tuning (iWAPT), 2012.
- Aakash Prasad, David Howard, Shoaib Kamil, Armando Fox. *Parallel High Performance Statistical Bootstrapping in Python*. Scientific Computing with Python Conference, 2012.
- S. Kamil, D. Coetzee, S. Beamer, H. Cook, E. Gonina, J. Harper, J. Morlan, A. Fox. *Portable Parallel Performance from Sequential, Productive, Embedded Domain Specific Languages*. ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP), Extended Abstract, 2012.
- Shoaib Kamil, Derrick Coetzee, Armando Fox. *Bringing Parallel Performance to Python with Domain-Specific Selective Embedded Just-in-Time Specialization*. 10th Python for Scientific Computing Conference, 2011.
- H. Cook, E. Gonina, S. Kamil, G. Friedland, D. Patterson, A. Fox. *CUDA-level Performance with Python-level Productivity for Gaussian Mixture Model Applications*. USENIX Workshop on Hot Topics in Parallelism (HotPar), 2011.
- M. F. Wehner, L. Oliker, J. Shalf, D. Donofrio, L. A. Drummond, R. Heikes, S. Kamil, C. Kono, N. Miller, H. Miura, M. Mohiyuddin, D. Randall, W.-S. Yang. *Hardware/Software Co-design of Global Cloud System Resolving Models*. Journal of Advances in Modeling Earth Systems, 2011.
- G. Hendry, J. Chan, S. Kamil, L. Oliker, J. Shalf, L. P. Carloni, K. Bergman. *Silicon Nanophotonic Network-On-Chip Using TDM Arbitration*. IEEE Symposium on High Performance Interconnects (HOTI), 2011.
- Shoaib Kamil, Cy Chan, Leonid Oliker, John Shalf, Samuel Williams. *An Auto-tuning Framework for Parallel Multicore Stencil Computations*. IEEE International Parallel and Distributed Processing Symposium (IPDPS), 2010.
- Bryan Catanzaro, Shoaib Kamil, Yunsup Lee, Krste Asanovic, James Demmel, Kurt Keutzer, John Shalf, Kathy Yelick, Armando Fox. *SEJITS: Getting Productivity and Performance with Selective Embedded JIT Specialization*. Workshop on Programming Models for Emerging Architectures (PMEA), 2009.
- Shoaib Kamil, Cy Chan, Sam Williams, Leonid Oliker, John Shalf, Mark Howison, E. Wes Bethel, Prabhat. *A Generalized Framework for Auto-tuning Stencil Computations*. Cray User Group Conference, 2009. Best Paper Award
- Gilbert Hendry, Shoaib Kamil, A. Biberman, J. Chan, B. Lee, M. Mohiyuddin, A. Jain, K. Bergman, L. Carloni, J. Kubiawicz, L. Oliker, J. Shalf. *Analysis of Photonic Networks for a Chip Multiprocessor Using Scientific Applications*. International Symposium on Networks-on-Chip (NOCS), 2009.

- Shoaib Kamil, Leonid Oliker, Ali Pinar, John Shalf. *Communication Requirements and Interconnect Optimization for High-End Scientific Applications*. IEEE Transactions on Parallel and Distributed Systems (TPDS), 2009.
- Kaushik Datta, Shoaib Kamil, Sam Williams, Leonid Oliker, John Shalf, Katherine Yelick. *Optimization and Performance Modeling of Stencil Computations on Modern Microprocessors*. SIAM Review, 2009.
- Shoaib Kamil, John Shalf, Erich Strohmaier. *Power Efficiency in High Performance Computing*. International Parallel and Distributed Processing Symposium, 2008.
- Ankit Jain, Shoaib Kamil, Marghoob Mohiyuddin, John Shalf, John Kubiawicz. *Performance and Energy Comparison of Electrical and Hybrid Photonic Networks for CMPs*. High Performance Embedded Computing (HPEC), 2008.
- Shoaib Kamil, Ali Pinar, Daniel Gunter, Michael Lijewski, Leonid Oliker, John Shalf. *Reconfigurable Hybrid Interconnection for Static and Dynamic Scientific Applications*. ACM International Conference on Computing Frontiers, 2007.
- Leonid Oliker, Andrew Canning, Jonathan Carter, Costin Iancu, Michael Lijewski, Shoaib Kamil, John Shalf, H. Shan, Erich Strohmaier, Stephane Ethier, Tim Goodale. *Scientific Application Performance on Candidate PetaScale Platforms*. International Parallel and Distributed Processing Symposium (IPDPS), 2007. Best Paper Award
- Samuel Williams, John Shalf, Leonid Oliker, Shoaib Kamil, Parry Husbands, Katherine Yelick. *Scientific Computing Kernels on the Cell Processor*. International Journal of Parallel Programming (IJPP), 2007.
- Shoaib Kamil, Kaushik Datta, Samuel Williams, Leonid Oliker, John Shalf, Katherine Yelick. *Implicit and Explicit Optimizations for Stencil Computations*. Memory Systems Performance and Correctness (MSPC), 2006.
- Sam Williams, John Shalf, Parry Husbands, Shoaib Kamil, Leonid Oliker, Katherine Yelick. *The Potential of the Cell Processor for Scientific Computing*. ACM International Conference on Computing Frontiers, 2006.
- John Shalf, Shoaib Kamil, Leonid Oliker, David Skinner. *Analyzing Ultra-Scale Application Communication Requirements for a Reconfigurable Hybrid Interconnect*. Supercomputing: The International Conference for High Performance Computing Networking, Storage, and Analysis (SC), 2005.
- Shoaib Kamil, Leonid Oliker, John Shalf, David Skinner. *Understanding Ultra-Scale Application Communication Requirements*. IEEE International Symposium on Workload Characterization (IISWC), 2005.
- Shoaib Kamil, Parry Husbands, Leonid Oliker, John Shalf, Katherine Yelick. *Impact of Modern Memory Subsystems on Cache Optimizations for Stencil Computations*. ACM SIGPLAN Workshop on Memory Systems Performance (MSP), 2005.
- Richard Vuduc, James W. Demmel, Katherine A. Yelick, Shoaib Kamil, Rajesh Nishtala, Benjamin Lee. *Performance Optimizations and Bounds for Sparse Matrix-Vector Multiply*. Supercomputing: The International Conference for High Performance Computing Networking, Storage, and Analysis (SC), 2002. Finalist, Best Student Paper
- Richard Vuduc, Shoaib Kamil, Jen Hsu, Rajesh Nishtala, James W. Demmel, Katherine A. Yelick. *Automatic Performance Tuning and Analysis of Sparse Triangular Solve*. Workshop on Performance Optimization of High-level Languages and Libraries (POHLL), 2002. Best Student Paper, Best Presentation

#### *Other Publications*

- Shoaib Kamil. *StencilMark: Towards a Benchmark for Stencil Computations*. 1st Workshop on Stencil Computations (WOSC), 2013.

- Shoaib Kamil and Armando Fox. *Ubiquitous Dynamic Code Generation and Compilation on Future Computing Devices*. International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), Provocative Ideas Session, 2012.
- David Donofrio, Leonid Oliker, John Shalf, Michael Wehner, Chris Rowen, Jens Krueger, Shoaib Kamil, Marghoob Mohiyuddin. *Energy-Efficient Computing for Extreme Scale Science*. IEEE Computer Magazine, 2009.

*Invited Talks*

- *Recent Results, Insights, and Lessons from Auto-tuning Three Motifs*. Center for Scalable Application Development Software (CScADS), 2008.
- *Bridging the Productivity-Performance Gap with Selective Embedded Just-in-Time Specialization*. IEEE International Symposium on Embedded Multicore SoCs, 2012.
- *SEJITS - Bridging the Productivity-Performance Gap*. Workshop on Domain Specific Multicore Computing (DSMC) at ICCAD, 2012.

PROFESSIONAL  
EXPERIENCE

**MIT CSAIL**, Cambridge, Massachusetts USA

*Research Scientist*

**September 2012 -**

Research into domain-specific languages and auto-tuning as part of the D-TEC X-STACK project, funded by DOE. Assist in guiding students in research on parallel languages & parallel programming.

**Lawrence Berkeley National Laboratory**, Berkeley, California USA

*Computer Science Researcher*

**December 2002 - August 2006**

Research into high-performance computing open questions, including auto-tuning for stencil computations, performance modeling, and energy efficiency.

SERVICE

Organizing Committee, ACM Workshop on Optimizing Stencil Computations (WOSC), 2013-2014.

External Reviewer, PLDI, CGO, Supercomputing, JPDC.

SUPERB Mentor, 2011.

AWARDS

Best Paper Award, CUG Conference 2009.

Best Paper Award, IEEE IPDPS Conference 2007.

Best Student Paper Award, Workshop on Automated Tuning for Petascale Systems, 2002.

Tong Leong Lim Pre-Doctoral Prize (Highest Preliminary Exam Score), 2008.

CITIZENSHIP

United States of America