Milind Kulkarni

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RESEARCH INTERESTS

My research interests lie in the area of parallel programming. Specifically, I am interested in various language features, compiler techniques and run time systems that will be necessary to unlock the potential of multicore processors.

EDUCATION

Cornell University
Ithaca, NY — Ph.D. in Computer Science, 2008

Cornell University
Ithaca, NY — M.S. in Computer Science, 2005

North Carolina State University
Raleigh, NC — B.S. in Computer Science (Summa Cum Laude & with Honors), 2002

North Carolina State University
Raleigh, NC — B.S. in Computer Engineering (Summa Cum Laude), 2002

EXPERIENCE

Assistant Professor
School of Electrical and Computer Engineering
Purdue University, West Lafayette, IN
August 2009 – present

Postdoctoral Research Associate
Institute for Computational Engineering and Sciences (ICES)
The University of Texas at Austin, Austin, TX
May 2008 – August 2009

AWARDS & HONORS

- "Structure-driven Optimizations for Amorphous Data-parallel Programs" nominated for best paper at PPoPP 2010. *One of 3 nominees.*
- "Optimistic Parallelism Requires Abstractions" selected to appear in Research Highlights in the Communications of the ACM. *One of 24 papers selected per year across all fields of computer science.*
- Department of Energy High Performance Computer Science Fellowship, 2004-2008. *Provided full tuition support and stipend for four years of graduate study. ~3 fellows selected per year.*

PUBLICATIONS

CONFERENCES

InContext: Simple Parallelism for Distributed Applications
Sungwhan Yoo, Hyojeong Lee, Charles Killian and Milind Kulkarni
Symposium on High Performance Parallel and Distributed Computing (HPDC) 2011

Vrisha: Using Scaling Properties of Parallel Programs for Bug Detection and Localization
Bowen Zhou, Milind Kulkarni and Saurabh Bagchi
Symposium on High Performance Parallel and Distributed Computing (HPDC) 2011

Exploiting the Commutativity Lattice
Milind Kulkarni, Donald Nguyen, Dimitrios Prountzos, Xin Sui and Keshav Pingali
Programming Languages Design and Implementation (PLDI) 2011

The Tao of Parallelism in Algorithms
Keshav Pingali, Donald Nguyen, Milind Kulkarni, Martin Burtscher, M. Amber Hassan, Rashid Kaleem, Tsung-Hsien Lee, Andrew Lenharth, Roman Manevich, Mario Mendez-Lojo, Dimitrios Prountzos and Xin Sui
Programming Languages Design and Implementation (PLDI) 2011

Techniques for Fine-grained, Multi-site Computation Offloading
Kanad Sinha and Milind Kulkarni
International Symposium on Cluster, Cloud, and Grid Computing (CCGrid) 2011

uSETL: A Set Based Programming Abstraction for Wireless Sensor Networks
Mohammad S. Hossain, A. B. M. Alim al Islam, Milind Kulkarni and Vijay Raghunathan
Information Processing in Sensor Networks (IPSN) 2011

Accelerating Multicore Reuse Distance Analysis with Sampling and Parallelization
Derek Schuff, Milind Kulkarni and Vijay Pai
Parallel Architectures and Compilation Techniques (PACT) 2010

Structure-driven Optimizations for Amorphous Data-parallel Programs
Mario Mendez-Lojo, Donald Nguyen, Dimitrios Prountzos, Xin Sui, Muhammad Hassan, Milind Kulkarni, Martin Burtscher and Keshav Pingali
Principles and Practices of Parallel Programming (PPoPP) 2010

Lonestar: A Suite of Parallel Irregular Programs
Milind Kulkarni, Martin Burtscher, Keshav Pingali and Calin Cascaval
International Symposium on Performance Analysis of Systems and Software (ISPASS) 2009

PUBLICATIONS (CONT.)

How Much Parallelism is There in Irregular Applications?
Milind Kulkarni, Martin Burtscher, Rajeshkar Inkulu, Keshav Pingali and Calin Cascaval
Principles and Practices of Parallel Programming (PPoPP) 2009

Fast Agglomerative Clustering for Rendering
Bruce Walter, Kavita Bala, Milind Kulkarni and Keshav Pingali
Interactive Ray-Tracing Symposium (RT) 2008

Scheduling Strategies for Optimistic Parallel Execution of Irregular Programs
Milind Kulkarni, Patrick Carribault, Keshav Pingali, Ganesh Ramanaraynan, Bruce Walter, Kavita Bala and L. Paul Chew
Symposium on Parallelism in Algorithms and Architectures (SPAA) 2008

Optimistic Parallelism Benefits From Data Partitioning
Milind Kulkarni, Keshav Pingali, Ganesh Ramanarayanan, Bruce Walter, Kavita Bala and L. Paul Chew
Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2008

Optimistic Parallelism Requires Abstractions
Milind Kulkarni, Keshav Pingali, Bruce Walter, Ganesh Ramanarayanan, Kavita Bala and L. Paul Chew
Programming Languages Design and Implementation (PLDI) 2007

JOURNALS

An Experimental Study of Self-Optimizing Dense Linear Algebra Software
Milind Kulkarni and Keshav Pingali
Invited paper. Proceedings of IEEE. 96(5):832-848, 2008

MAGAZINES

Optimistic Parallelism Requires Abstractions
Milind Kulkarni, Keshav Pingali, Bruce Walter, Ganesh Ramanarayanan, Kavita Bala and L. Paul Chew
Research Highlights. Communications of the ACM (CACM). 52(9):89-97, 2009

WORKSHOPS

Towards Architecture Independent Metrics for Multicore Performance Analysis
Milind Kulkarni, Vijay Pai and Derek Schuff
Third Workshop on Hot Topics in Measurement & Modeling of Computer Systems (HotMetrics) 2010

On the Scalability of an Automatically Parallelized Irregular Application
Martin Burtscher, Milind Kulkarni, Dimitrios Prountzos and Keshav Pingali
21st Annual Workshop on Languages and Compilers for Parallel Computing (LCPC) 2008

PUBLICATIONS (CONT.)

Scheduling Issues in Optimistic Parallelization
Milind Kulkarni and Keshav Pingali
NSF Next Generation Software (NGS) Workshop, 2007

Using Transactions in Delaunay Mesh Generation
Milind Kulkarni, Keshav Pingali and L. Paul Chew
Workshop on Transactional Memory Workloads (WTW) 2006

ETC.

Brief Announcement: Locality-enhancing Transformations for Tree Traversal Algorithms
Youngjoon Jo and Milind Kulkarni
Symposium on Parallelism in Algorithms and Architectures (SPAA) 2011

Brief Announcement: Locality-Aware Load Balancing for Speculatively-Parallelized Irregular Applications
Youngjoon Jo and Milind Kulkarni
Symposium on Parallelism in Algorithms and Architectures (SPAA) 2010

PATENTS

Programming Model to Exploit Parallelism in Multi-core Systems
Keshav Pingali and Milind Kulkarni
(Pending)

TECH REPORTS

Defining and Implementing Commutativity Conditions for Parallel Execution
Milind Kulkarni, Dimitrios Prountzos, Donald Nguyen and Keshav Pingali
Purdue University, School of Electrical and Computer Engineering,
Report# TR-ECE-09-11

Amorphous Data-parallelism in Irregular Applications
Keshav Pingali, Milind Kulkarni, Donald Nguyen, Martin Burtscher, Mario Mendez-Lojo, Dimitrios Prountzos, Xin Sui and Zifei Zhong
The University of Texas at Austin, Department of Computer Sciences,
Report# TR-09-05

MISCELLANEOUS

The Galois System: Optimistic Parallelization of Irregular Programs
Milind Kulkarni
Ph.D. Dissertation, Cornell University. August, 2008.

TALKS/PRESENTATIONS

INVITED TALKS

"Finding and Exploiting Parallelism in Irregular Applications"
Department of CS & E, Ohio State University, Columbus, OH. April 22, 2011
Computer Science Department, Indiana University, Bloomington, IN. April 29, 2010
NEC Labs, Princeton, NJ. April 29, 2009

TALKS/PRESENTATIONS (CONT.)

"Exploiting the Commutativity Lattice"
Verification of Concurrent Data-Structures (Verico), Austin, TX. January 29, 2011

"Architecture Independent Metrics for Characterizing Parallelism and Locality"
ScalPerf Workshop, Bertinoro, Italy. September 23, 2010

"The Galois Project"
CScADS Autotuning Workshop, Snowbird, UT. July 9, 2008

"Optimistic Parallelism Benefits From Data Partitioning"
Intel, Santa Monica, CA. March 26, 2008
IBM T.J. Watson Research Labs, Yorktown Heights, NY. January 31, 2008

TUTORIALS

"Parallelizing Irregular Applications Through the Exploitation of Amorphous Data Parallelism"
Programming Languages, Design and Implementation, Toronto, Canada. June 6, 2020
Principles and Practices of Parallel Programming, Bangalore, India. January 10, 2010

PRESENTATIONS

"Lonestar: A Suite of Parallel Irregular Programs"
International Symposium on Performance Analysis of Software and Systems, Boston, MA. April 27, 2009

"How Much Parallelism is There in Irregular Programs?"
Principles and Practices of Parallel Programming, Raleigh, NC. February 16, 2009

"Scheduling Strategies for Optimistic Parallel Execution of Irregular Programs"
Symposium on Parallelism in Algorithms and Architectures, Munich, Germany. June 14, 2008

"Optimistic Parallelism Benefits From Data Partitioning"
Architectural Support for Programming Languages and Operating Systems, Seattle. WA. March 3, 2008

"Optimistic Parallelism Requires Abstractions"
Programming Languages Design and Implementation, San Diego, CA. June 11, 2007

"Using Transactions in Delaunay Mesh Generation"
Workshop on Transactional Memory Workloads, Ottawa, Canada. June 10, 2006

SOFTWARE ARTIFACTS

Galois
A speculative parallelization system for irregular applications
http://iss.ices.utexas.edu/galois/

ParaMeter
A profiling tool for studying parallelism in irregular applications
http://iss.ices.utexas.edu/parameter/

LoneStar Benchmark Suite
A suite of irregular applications that are amenable to optimistic parallelization
http://iss.ices.utexas.edu/lonestar/

PROFESSIONAL ACTIVITIES

PROGRAM COMMITTEES

PACT 2011 (member)
PLDI 2011 (external review committee, FIT co-chair, session chair)
IPDPS 2011 (member)
PPoPP 2011 (member)
TRANSACT 2010 (member)
PPoPP 2010 (member, session chair)

REVIEWER

HotPar 2010, ASPLOS 2010, POPL 2010, MICRO 2009, OOPSLA 2009, IPDPS 2009, CGO 2009, ASPLOS 2008, PLDI 2007, LCPC 2007, ASPLOS 2006

PROFESSIONAL SOCIETIES

Member, IEEE; Member, ACM; Member, SIAM