

James S. Dinan

Education

- 2005–Present **The Ohio State University, *PhD***, Columbus, Ohio.
Ph.D. Computer Science, July 2010 (*expected*)
M.S. Computer Science, September 2009
Advisor: P. Sadayappan
Thesis: *Programming model and runtime support for unbalanced and dynamic parallelism.*
- 1999–2004 **University of Massachusetts, *BSCSE***, Amherst, MA.
B.S. Computer Systems Engineering, May 2004
Minors: Computer Science, Germanic Studies.

Research Interests

I am interested in developing innovative hardware and software systems to address the needs of emerging computational problems. A significant and engaging challenge in harnessing the benefits of these systems is the availability of effective programming models and tools that enable broader, more efficient use of such advanced computing platforms. Additional interests include: Parallel programming models, tools, and runtime systems for High Performance Computing (HPC); operating systems; computer architecture; parallel and distributed algorithms; fault tolerance; scientific and engineering applications; and power-aware systems.

Professional Experience

- 2005–Present **Graduate Research Associate, *The Ohio State University***, Advisor: Prof. P. Sadayappan.
Research in the area of High Performance and Parallel Computing. Focus on programming models, runtime systems, and tools to support scalable global view parallel programming on distributed memory systems. Specific projects include:
- *Parallel programming models*: My thesis work has resulted in the development of Scioto, a task parallel programming model for expressing dynamic and unbalanced parallelism in the context of a shared, Partitioned Global Address Space (PGAS). I am also a member of the Global Trees project which provides a PGAS model for distributed, shared linked data structures. In addition, I have worked to construct a hybrid parallel programming model that combines MPI with Unified Parallel C (UPC), allowing the programmer to extend MPI codes with access to one or more global address spaces.
 - *Scalable runtime systems*: Development of the Scioto runtime system which has been demonstrated to support task parallel execution and dynamic load balancing on over 8,192 processor cores. Work on the Global Trees runtime system which leverages bulk data movement and relaxed memory semantics to enable tree-based data structures on distributed memory clusters.
 - *Fault tolerance*: Development of algorithms and runtime components to leverage task parallelism as a means for selective restart in response to failures. Work on developing a scalable, fault tolerant runtime system to support Global Arrays.
 - *Parallel benchmarking*: Development of the Unbalanced Tree Search (UTS) benchmark. UTS evaluates a system's end-to-end performance on highly unbalanced computations. Parallel implementations of UTS using Chapel, MPI, OpenMP, Shmem, Cray MTA/XMT, UPC, Pthreads, Scioto, and hybrid MPI + Pthreads.

- *Energy aware computer architecture*: Work on developing architectural techniques for operating the cache subsystem at voltages within the near-threshold region. Such low voltages increase the transient error rate and the impact of process variation requiring new techniques for correcting multi-bit errors.

- Spring 2009 **Research Aide**, *Argonne National Laboratory*, Argonne, IL.
 Research into hybrid programming models formed by mixing PGAS models with MPI. Developed a hybrid MPI+UPC programming model, explored the semantics of mixed MPI+UPC programming, and developed techniques to mitigate complexity in the hybrid model. Work is currently under peer review.
- Winter 2008 **PhD. Intern**, *Pacific Northwest National Laboratory*, Richland, WA.
 Investigation into a scalable runtime system to support dynamic load balancing via work stealing on large-scale distributed memory clusters. Our system achieved high efficiency on 8192 processor cores and results were published at Supercomputing '09.
- Summer 2007 **Engineering Intern**, *Cray Inc.*, Seattle, WA.
 Evaluated the effectiveness of the new Chapel high productivity parallel programming language through concrete parallel computing applications. Implemented scientific computing codes including the UTS benchmark and MADNESS, an adaptive multiresolution computational chemistry system. This work motivate new language features and provided valuable insight into runtime system work. Findings presented at a company-wide technical forum and in a poster at Supercomputing '08.
- 2003–2004 **Undergraduate Research Assistant**, *Architecture and Language Implementation Laboratory*, *University of Massachusetts*, Amherst, MA, Advisor: Prof. J. Eliot B. Moss.
 Member of the Dynamic SimpleScalar (DSS) development team. Extended the DSS microarchitectural research toolset with DSSWattch dynamic power modeling capabilities. Helped develop support for the simulated PowerPC target and simulated Linux, AIX, and MacOS X operating systems.

Teaching Experience

- Autumn '08 **Graduate Teaching Associate**, *CSE 360: Introduction to Computer Systems*, Instructor of Record,
 Autumn '09 The Ohio State University, Columbus, OH.
 Taught computer systems fundamentals including computer organization and architecture, register transfer level design, instruction set architecture, data representation, and low level programming through assembly language. Required core class in the undergraduate curriculum. Class size: 38 students. Overall student ratings: 4.9 (Au '09) and 4.5 (Au '08) out of 5. University average for similar classes: 4.3.

Honors and Awards

- 2010 **Research Award Nominee**, *Dept. Computer Science and Engineering*, The Ohio State University, Columbus, OH.
 Nominated for the departmental research award.
- 2009 **Ray Travel Award**, *Council of Graduate Students*, The Ohio State University, Columbus, OH.
 Awarded to present research work at the IEEE/ACM Conference on Supercomputing.
- 2004 **German Consulate Award**, *Consulate General of Germany*, Boston, MA.
 Awarded for excellence in the study of Germanic languages and literature.
- 2002 **Engineering Tutor Award**, *Dept. Electrical and Comp. Eng.*, Univ. Massachusetts, Amherst, MA.
 Established and lead weekly tutoring sessions on the Java programming language for ECE students to complement a required class in algorithms and data structures.
- 1999-2004 **Dean's List**, *Dept. Electrical and Computer Engineering*, Univ. Massachusetts, Amherst, MA.
 Awarded for outstanding academic performance.

Publications

- Resilience '10 **Selective Recovery From Failures In A Task Parallel Programming Model**.
 James Dinan, Sriram Krishnamoorthy, Arjun Singri, P. Sadayappan. Proc. 3rd Workshop on Resiliency in High Performance Computing (Resilience) held in conjunction with Clusters, Clouds, and Grids (CCGrid). Melbourne, Australia. May 17-20, 2010.

- SC '09 **Scalable Work Stealing.**
James Dinan, Sriram Krishnamoorthy, D. Brian Larkins, P. Sadayappan. Proc. 21st Intl. Conference on Supercomputing. Portland, OR, Nov. 14-20, 2009. (22.6% Acceptance).
- SC '08 **Global Trees: A Framework for Linked Data Structures on Distributed Memory Parallel Systems.**
D. Brian Larkins, James Dinan, Sriram Krishnamoorthy, Atanas Rountev, P. Sadayappan. Proc. 20th Intl. Conference on Supercomputing. Austin, TX, Nov. 15-21, 2008. (21.3% Acceptance).
- ICPP '08 **Scioto: A Framework for Global-View Task Parallelism.**
James Dinan, Sriram Krishnamoorthy, D. Brian Larkins, Jarek Nieplocha, P. Sadayappan. Proc. 37th Intl. Conference on Parallel Processing. Portland, OR, Sept. 8-12, 2008. (31% Acceptance).
- SIMPAT '08 **A message passing benchmark for unbalanced applications.**
James Dinan, Stephen Olivier, Gerald Sabin, Jan Prins, P. Sadayappan, Chau-Wen Tseng. Journal of Simulation Modelling Practice and Theory. Volume 16, Issue 9, Pages 1177-1189. October, 2008.
- PMEO-PDS '07 **Dynamic Load Balancing of Unbalanced Computations Using Message Passing.**
James Dinan, Stephen Olivier, Jan Prins, Gerald Sabin, P. Sadayappan and Chau-Wen Tseng. Proc. 6th Intl. Workshop on Performance Modeling, Evaluation, and Optimization of Parallel and Distributed Systems. Long Beach, CA, March 26-30, 2007.
- LCPC '06 **UTS: An Unbalanced Tree Search Benchmark.**
Stephen Olivier, Jun Huan, Jinze Liu, Jan Prins, James Dinan, P. Sadayappan and Chau-Wen Tseng. Proc. 19th Intl. Workshop on Languages and Compilers for Parallel Computing. New Orleans, LA, November 2-4, 2006.
- FCCM '06 **Hardware/Software Integration for FPGA-based All-Pairs Shortest-Paths.**
Uday Bondhugula, A. Devulapalli, James Dinan, J. Fernando, Pete Wyckoff, E. Stahlberg, and P. Sadayappan. Proc. IEEE Symposium on Field-Programmable Custom Computing Machines. Napa Valley, CA, 2006.

Currently Under Peer Review

- ISCA '10 **Details omitted due to double blind review.**
Submitted to International Symposium on Computer Architecture (ISCA). Saint-Malo, France. June 19-23, 2010
- CF '10 **Hybrid Parallel Programming with MPI and Unified Parallel C.**
James Dinan, Pavan Balaji, Ewing Lusk, P. Sadayappan, Rajeev Thakur. Submitted to ACM Intl. Conf. on Computing Frontiers. Bertinoro, Italy. May 17-19, 2010.

Refereed Posters

- SC '08 **Multiresolution Analysis, Computational Chemistry, and Implications for High Productivity Parallel Programming.**
Aniruddha G. Shet, James Dinan, Robert J. Harrison, P. Sadayappan

Technical Reports

- OSU-TR '06 **Hardware/Software Codesign for All-Pairs Shortest-Paths on a Reconfigurable Supercomputer.**
Uday Bondhugula, A. Devulapalli, James Dinan, J. Fernando, Pete Wyckoff, E. Stahlberg, and P. Sadayappan. OSU-CISRC-1/06-TR13.
- UMass-TR '04 **DSSWattch: Power Estimation in Dynamic SimpleScalar.**
James Dinan, Eliot Moss. University of Massachusetts Technical Report, May 2004

Presentations

- May '09 **Hybrid Parallel Programming with MPI and Unified Parallel C**, Argonne National Laboratory. Argonne, IL.
- May '09 **An Introduction to Unified Parallel C**, Argonne National Laboratory. Argonne, IL.

September 2007 **Early Impressions of the Chapel HPCS Language: Unbalanced Tree Search and Multiresolution Analysis**, Cray Technical Forum. Seattle, WA.

Professional Activities

Affiliations

IEEE, ACM, HKN (Eta Kappa Nu).

2009-Present **MPI Forum**, *Committee on hybrid programming models.*

Peer Review

ICPP '09 **International Conference on Parallel Processing.**

Computer '09 **IEEE Computer Magazine.**

MTAAP '09 **Workshop on Multithreaded Architectures and Applications.**

PMEO-PDS '07 **Workshop on Performance Modeling, Evaluation, and Optimization of Parallel and Distributed Systems.**

Activities and Service

Spring '09 **PyOhio Organizing and Program Committees Member.**

2008–2009 **Graduate Steering Committee, OSU Department of Computer Science.**

2007–2008 **Faculty Search Committee and Graduate Steering Committee, OSU Department of Computer Science.**

2006–2007 **Computer Committee, OSU Department of Computer Science.**

2006–Present **Mentor, The Open Source Club at OSU.**

Mentor to one of the largest student organizations in the department of Computer Science. Helped organize hosting of PyOhio '09 conference at OSU, increase community involvement, and host invited speakers.

References

Available upon request.