

# Abhinav Bhatele

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CONTACT INFORMATION	4103 Siebel Center for Computer Science University of Illinois at Urbana-Champaign 201 N Goodwin Avenue Urbana, IL 61801-2302 USA	<i>Voice:</i> 217.417.7579 <i>Fax:</i> 217.244.6306 <i>E-mail:</i> <a href="mailto:bhatele@illinois.edu">bhatele@illinois.edu</a> <i>www:</i> <a href="http://www.bhatele.org">www.bhatele.org</a>
RESEARCH INTERESTS	Topology aware mapping, load balancing, communication optimizations, performance analysis; exascale feasibility studies	
EDUCATION	<b>University of Illinois at Urbana-Champaign</b> , Urbana, Illinois, USA <i>Doctor of Philosophy</i> , Computer Science August 2010 Dissertation Topic: “Automating Topology Aware Mapping for Supercomputers” Advisor: Laxmikant V. Kalé <i>Master of Science</i> , Computer Science December 2007  <b>Indian Institute of Technology, Kanpur</b> , Kanpur, INDIA <i>Bachelor of Technology</i> , Computer Science and Engineering May, 2005	
HONORS AND AWARDS	<b>David J. Kuck Outstanding Ph.D. Thesis Award</b> , Dept. of CS, Illinois, 2011 <b>Feng Chen Memorial Best Paper Award</b> , Dept. of CS, Illinois, 2010 Teacher Scholar Certificate, Center of Teaching Excellence, Illinois, 2010 <b>ACM/IEEE George Michael Memorial HPC Fellowship Award</b> , 2009 Selected for Doctoral Showcase at Supercomputing Conference (SC), Portland, 2009 <b>Distinguished Paper Award</b> , Euro-Par, Amsterdam, Netherlands, 2009 <b>David J. Kuck Outstanding M.S. Thesis Award</b> , Dept. of CS, Illinois, 2009 3rd Prize for <b>Best Graduate Poster</b> at the <i>ACM Student Research Competition</i> at Supercomputing Conference (SC), Austin, TX, 2008 Selected for the <b>TCPD PhD Forum</b> at IPDPS, Miami, FL, 2008 Nominated in the top six B. Tech. projects in Computer Science, IIT Kanpur, 2005 <b>Student Benefit Fund Scholarship</b> for excellent performance in academics in 2002 <b>Academic Excellence Award</b> at IIT Kanpur for the year 2001-2002	
RESEARCH EXPERIENCE	<b>Department of Computer Science, Illinois</b> Aug 2010 – present <i>Post-doctoral Research Associate</i> Advisors: Laxmikant Kalé & William Gropp <ul style="list-style-type: none"><li>• Topology studies on new architectures (Blue Waters and Blue Gene/Q)</li><li>• Exascale feasibility studies of scientific applications</li></ul> <b>Parallel Programming Laboratory, Illinois</b> Aug 2005 – Aug 2010 <i>Research Assistant</i> Advisor: Laxmikant V. Kalé <ul style="list-style-type: none"><li>• Automatic topology aware mapping for parallel applications</li><li>• Load balancing of molecular dynamics applications</li><li>• Static topology aware mapping of OpenAtom, a quantum chemistry application</li></ul> <b>IBM T J Watson Research Center, NY, USA</b> May – Jul 2007	

*Summer Intern*

*Blue Gene Software Group*

- Devised topology sensitive load balancing algorithms to be applied to Charm++ programs in general and NAMD in particular.

**IBM T J Watson Research Center, NY, USA**

**May – Jul 2006**

*Summer Intern*

*Advanced Computing Technology Center*

- Developed a tool for automatic and detailed profiling of programs at finer levels.

**INRIA Labs, Nancy, France**

**May – Jul 2004**

*Summer Intern*

*Advisor: Stephen Merz (Group: MOSEL)*

- Developed a GUI for a model checker, TLC and a theorem prover, Xprove.

TEACHING  
EXPERIENCE

**Instructor**, Computer Architecture I (CS231), Department of Computer Science, University of Illinois, Summer 2008 and 2009

- Full responsibility for the course, worked with a TA
- Prepared and gave lectures, awarded final grades
- Used i>clickers to enhance pedagogical technique for the first time in a computer science course at Illinois

**Instructor**, Data Structures and Algorithms, Summer course at IIT Kanpur, 2005

- Prepared and gave lectures, created and graded homeworks and exams

JOURNAL  
PUBLICATIONS

Gengbin Zheng, Abhinav Bhatele, Esteban Meneses and Laxmikant V. Kale, Periodic Hierarchical Load Balancing for Large Supercomputers, *invited submission to International Journal of High Performance Computing Applications (IJHPCA)*, 2010

Abhinav Bhatele, Eric Bohm and Laxmikant V. Kale, Optimizing communication for Charm++ applications by reducing network contention, *Concurrency and Computation: Practice and Experience*, doi: 10.1002/cpe.1637, 2010

Abhinav Bhatele, Lukasz Wesolowski, Eric Bohm, Edgar Solomonik and Laxmikant V. Kale, Understanding application performance via micro-benchmarks on three large supercomputers: Intrepid, Ranger and Jaguar, *International Journal of High Performance Computing Applications (IJHPCA)*, 2010 url: <http://hpc.sagepub.com/cgi/content/abstract/1094342010370603v1>

Abhinav Bhatele and Laxmikant V. Kale, Quantifying Network Contention on Large Parallel Machines, *Parallel Processing Letters (Special Issue on Large-Scale Parallel Processing)*, Vol. 19 Issue 4, Pages 553-572, 2009

Abhinav Bhatele, Laxmikant V. Kale, Benefits of Topology-aware Mapping for Mesh Topologies, *Parallel Processing Letters (Special issue on Large Scale Parallel Processing)*, Vol. 18, Issue 4, Pages 549-566, 2008

Eric Bohm, Abhinav Bhatele, Laxmikant V. Kale, Mark E. Tuckerman, Sameer Kumar, John A. Gunnels, Glenn Martyna, Fine grained parallelization of the Car-Parrinello ab initio MD method on Blue Gene/L, *IBM J. Res. Dev.*, Volume 52, No. 1/2, 2007

Sameer Kumar, Chao Huang, Gengbin Zheng, Eric Bohm, Abhinav Bhatele, Jim

	Phillips, Gheorghe Almasi, Hao Yu, Laxmikant V. Kale, Achieving Strong Scaling with NAMD on Blue Gene/L, <i>IBM J. Res. Dev.</i> , Volume 52, No. 1/2, 2007	
CONFERENCE AND WORKSHOP PUBLICATIONS	Abhinav Bhatele, Gagan Gupta, Laxmikant V. Kale and I-Hsin Chung, Automated Mapping of Regular Communication Graphs on Mesh Interconnects, <i>Proceedings of International Conference on High Performance Computing (HiPC)</i> , 2010 (to appear)	
	Abhinav Bhatele, Eric Bohm and Laxmikant V. Kale, A Case Study of Communication Optimizations on 3D Mesh Interconnects, <i>Proceedings of Euro-Par (Topic 13 - High Performance Networks)</i> , 2009	
	Abhinav Bhatele, Laxmikant V. Kale and Sameer Kumar. Dynamic Topology Aware Load Balancing Algorithms for Molecular Dynamics Applications, <i>Proceedings of 23rd ACM International Conference on Supercomputing</i> , 2009	
	Abhinav Bhatele, Laxmikant V. Kale, Nicholas Chen and Ralph E. Johnson, A Pattern Language for Topology Aware Mapping, <i>Workshop on Parallel Programming Patterns (ParaPLOT)</i> , 2009	
	Eric Bohm, Sayantan Chakravorty, Pritish Jetley, Abhinav Bhatele and Laxmikant V. Kale, CkDirect: Unsynchronized One-Sided Communication in a Message-Driven Paradigm, <i>Proceedings of International Workshop on Parallel Programming Models and Systems Software for High-End Computing (P2S2)</i> , 2009	
	Abhinav Bhatele, Sameer Kumar, Chao Mei, James Phillips, Gengbin Zheng, Laxmikant V. Kale, Overcoming Scaling Challenges in Biomolecular Simulations across Multiple Platforms, <i>In Proceedings of IEEE International Parallel and Distributed Processing Symposium (IPDPS)</i> 2008	
SIGNIFICANT PRESENTATIONS	Mapping parallel applications on the machine topology: Lessons learned <b>TeraGrid '10</b> , Pittsburgh, PA	August 2010
	Biomolecular Simulations using NAMD on TeraGrid machines <b>TeraGrid '10</b> , Pittsburgh, PA	August 2010
	Automating Topology Aware Task Mapping for Large Supercomputers <b>Doctoral Showcase</b> , SC '09, Portland, OR	November 2009
	Load Balancing and Topology Aware Mapping for Petascale Machines <b>Scaling to Petascale Summer School</b> , NCSA, Urbana, IL	August 2009
	The Charm++ Programming Model and NAMD <b>Barcelona Supercomputing Center</b> , Barcelona, Spain	February 2009
	IS TOPOLOGY IMPORTANT AGAIN? - Effects of Contention on Message Latencies in Large Supercomputers <b>ACM Student Research Competition</b> , SC '08, Austin, TX	November 2008
	Topology Aware Mapping for Performance Optimization of Science Applications <b>IACAT Seminar</b> , U of I, Urbana, IL	October 2008
	Dynamic Topology Aware Load Balancing Algorithms for MD Applications <b>UK e-Science All Hands Meeting</b> , Edinburgh, UK	September 2008

PROFESSIONAL SERVICE	<p>Technical Reviewer, PPOPP 2011, JPDC 2010 and IJHPCA 2010</p> <p>CS Grad Ambassador, Dept. of Computer Science, Illinois, 2010</p> <p>Facilitator, Graduate Academy for College Teaching, Fall 2009 and 2010</p> <p>Co-authored proposals for medium sized projects and undergraduate funding from NSF, 2009 and 2010</p> <p>Mentoring undergraduate students working for my advisor, 2008 – 2010</p> <p>Mentor for the WCS Mentoring Program, Dept. of CS, Illinois, 2009 and 2010</p> <p>Technical Reviewer, CHI 2008 and ICPP 2009</p> <p>Mentor for Undergraduate Research Lab (CS498la), Dept. of CS, Illinois, Spring 2009</p> <p>Volunteer for the Grad Recruitment weekends, Dept. of CS, Illinois, 2008 and 2009</p> <p>Student Volunteer, Supercomputing, Austin, TX 2008 and Portland, OR 2009</p> <p>Helped in organization of Charm++ Workshops, 2007 – 2010</p>
RELEVANT COURSEWORK	<p>Graduate Advanced Computer Architecture, Formal Methods of Computation, Parallel Programming Methods, Programming Languages and Compilers, Advanced Topics in Compiler Construction, Social Computing, Improving your Research Skills, Parallel Processing</p> <p>Undergraduate Advanced Compiler Optimizations, Computer Architecture, Compilers, Computer Networks, Operating Systems, Algorithms II, Theory of Computation, Data Structures and Algorithms, Discrete Mathematics</p>
PROGRAMMING SKILLS	<p>Languages: Charm++, C, C++, JAVA, MPI, OpenMP, VHDL, Ocaml</p> <p>Tools: Lex, Yacc, LaTeX, Make, Perl</p> <p>Operating Systems: Unix/Linux, MacOSX and Windows</p>
REFERENCES	<p>Prof. Laxmikant V. Kalé (kale@illinois.edu), Professor of Computer Science, Illinois</p> <p>Prof. David A. Padua (padua@illinois.edu), Professor of Computer Science, Illinois</p> <p>Prof. William D. Gropp (wgropp@illinois.edu), Professor of Computer Science, Illinois</p> <p>Prof. Klaus Schulten (kschulte@ks.uiuc.edu), Professor, Beckman Institute, Illinois</p> <p>Dr. Matthew Reilly (matt.reilly@ieee.org), Co-founder &amp; Chief Engineer, SiCortex Inc.</p>