

Curriculum Vitae of *Abhishek Gupta*

CONTACT INFORMATION	Intel Corporation Cloud Computing Architect 2200 Mission College Blvd. Santa Clara, CA 95054-1549, USA	<i>E-mail:</i> gupta59@illinois.edu http://charm.cs.uiuc.edu/people/abhishekgupta http://www.linkedin.com/in/abhishekguptaiuc
RESEARCH INTERESTS	Cloud Computing, Parallel and Distributed Systems, High Performance Computing (HPC), Scheduling, Cloud Security, Performance Evaluation	
EDUCATION	University of Illinois at Urbana-Champaign , Urbana, Illinois USA Ph.D. in Computer Science, August 2009 - July 2014 <ul style="list-style-type: none">• Thesis topic : <i>Techniques for Efficient High Performance Computing in the Cloud</i>• Advisor: Professor Laxmikant V. Kalé• GPA: 4.0/4.0 University of Illinois at Urbana-Champaign , Urbana, Illinois USA M.S. in Computer Science, December 2011 <ul style="list-style-type: none">• Thesis topic: <i>A Multi-level Scalable Startup for Parallel Applications</i>• Advisor: Professor Laxmikant V. Kalé• GPA: 4.0/4.0 Indian Institute of Technology (IIT) Roorkee , Roorkee, India B.Tech in Computer Science, 2004 - 2008 <ul style="list-style-type: none">• Senior project: <i>Parallelization of Crucial Video Surveillance algorithms for Cell Broadband Engine Processor</i>• GPA: 9.84/10.0, Institute Rank: 1 (President's Gold Medal)	
PROFESSIONAL EXPERIENCE	Intel Corporation , Santa Clara, CA, USA <i>Researcher and Software Architect</i> July 2014 to Present <ul style="list-style-type: none">• Research and development of high performance cloud security solutions• Path-finding to enable mass movement towards clouds through improved security of high performance cloud software Parallel Programming Laboratory , Urbana, Illinois USA <i>Research Assistant</i> August 2009 to May 2014 <ul style="list-style-type: none">• Worked on various projects: large-scale HPC applications, parallel runtime systems, and schedulers for both clouds and HPC (select projects listed below). HP Labs , Palo Alto, California, USA <i>Visiting Researcher/Contingent Worker</i> August 2011 to October 2013 <ul style="list-style-type: none">• Designed and implemented methods for bridging HPC-cloud divide• Collaborating on performance evaluation and simulation of next-generation systems for compute and data-intensive applications <i>Research Associate Intern</i> May 2012 to August 2012 <ul style="list-style-type: none">• Researched techniques for application-aware VM placement in cloud (mentor Dr. Dejan Milojicic) <i>Research Associate Intern</i> May 2011 to August 2011	

- Evaluated the performance and mapping of HPC applications in cloud (mentor Dr. Dejan Milojicic)

Microsoft India (R & D) Pvt. Ltd., Hyderabad, India

Software Design Engineer

July 2008 to January 2009

- Worked in the team *Microsoft CRM (Customer Relationship Management)*

SELECTED
RESEARCH
PROJECTS

HPC in the Cloud

- **Performance analysis and benchmarking:** Evaluated the performance, cost, virtualization mechanism, and business models for HPC in the cloud.
- **HPC-aware cloud schedulers:** Designed an application-aware VM scheduler for improving cloud resource utilization and HPC application performance in infrastructure clouds. Demonstrated benefits using OpenStack and CloudSim.
- **Cloud-aware HPC runtime:** Developed a heterogeneity and multi-tenancy aware load balancing technique to improve HPC performance in cloud. Also, working on extension of the Charm++ runtime to exploit inherent elasticity in clouds.

Runtime Systems and Schedulers

- **Charm++ Runtime system:** Worked on various projects for research and development of Charm++ parallel programming system and the associated ecosystem.
- **Adaptive Job Scheduler:** Working on extending an open-source job scheduler (SLURM) for enabling malleable HPC jobs. Also, added runtime support in Charm++ for such dynamic shrink/expand capability.
- **Scalable Tree Startup:** Developed a multi-level scalable startup technique for parallel applications.

Large scale HPC Applications

- **EpiSimdemics:** Collaborated with V-tech researchers to enable parallel simulation of contagion diffusion over very large social networks. The application scales up to 300,000 cores on Blue Waters. My focus was on leveraging (and developing) Charm++ runtime features to optimize performance of EpiSimdemics.
- **Information Set for Game Trees:** Parallelized information set generation for game tree search applications. Analyzed the impact of load balancing strategies, problem sizes, and computational granularity on parallel scaling.

PATENTS

Abhishek Gupta, Dejan Milojicic, Paolo Faraboschi. Mapping high-performance computing applications to platforms. Filed, US Patent App. 13/363,722, 2012.

Abhishek Gupta, Dejan Milojicic, Paolo Faraboschi. Balancing the allocation of virtual machines in cloud systems. Filed, US Patent App. 13/741,949, 2013.

AWARDS AND
ACHIEVEMENTS

- **Best paper** at 5th IEEE International Conference on Cloud Computing Technology and Science (CloudCom), 2013. Selected from 60 accepted papers.
- **Best Ph.D. Forum poster award** at IEEE IPDPS, 2013.
- Selected for Dissertation Showcase at Supercomputing Conference (SC) 2013.
- HPC in the Cloud research supported by **HP Labs Innovation Research Awards**, Sept 2012 - August 2013
- **Best student paper** at Open Cirrus Summit, 2011.
- **Media Recognition:** HPC-Cloud research appeared as top feature at **HPC in the Cloud** online magazine.
- Recipient of **Saburo Muroga Endowed Fellowship**, Department of Computer Science at Illinois, August 2010 - May 2011.

- Member of the team which won the **2011 HPC Challenge Class 2 Performance Award** for Charm++ system at Supercomputing Conference (SC), 2011.
- **Presidents Gold Medalist** for being the topper of B-Tech (all branches – 400 students) of graduating batch 2008, IIT Roorkee, India.
- Received **Certificate of merit and trust prize** for consecutive years for securing highest GPA in B-Tech from session 2004-05 to 2006-07. IIT Roorkee.
- Was awarded **Certificate of Merit and National Gold Medal** for being in the top 25 candidates in India at the **Indian National Physics Olympiad-2004**

RELEVANT
COURSEWORK

Graduate - Parallel programming, Distributed Systems, Parallel Computer Architecture, Parallel Numerical Algorithm, Advanced Operating System, Parallel Search, Cloud Computing, Advanced Operating Systems, Managing Advanced Technologies

Undergraduate - Operating Systems, Advanced Computer Networks, Advanced Computer Architecture, Computer Networks, Artificial Intelligence, Computer Architecture, Design and Analysis of Algorithms, Database Management System, Software Engineering, Data Structures, Theory of Computation, Compiler design, Graph Theory

TECHNICAL SKILLS

Programming: C, C++, C#, Java, Charm++, OpenMP, pthreads, MPI, Python, JavaScript, UNIX shell scripting, GNU make, Cell Programming, CUDA, Assembly language(x86)

Computer Applications: T_EX (L^AT_EX), most common productivity packages (for Windows, OS X, and Linux platforms), Vim

Operating Systems: Most flavors of Microsoft Windows and Linux

SERVICE

Conference Program Committee member

- Technical Program Committee member for 15th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing, to be held in Shenzhen, China.

Journal Reviewer

- Reviewed several papers for top IEEE journal such as IEEE's Transactions on Cloud Computing, IEEE's Transaction on Computer, IEEE's Transaction on Parallel and Distributed Systems (Invited)
- Reviewed several papers for Elsevier journal: Parallel Computing Systems and Applications (Invited) and Wiley Wireless Communications and Mobile Computing journal (Invited)

SELECTED TALKS

Efficient High Performance Computing in the Cloud. **Keynote talk** at *8th International Workshop on Virtualization Technologies in Distributed Computing (VTDC15) held with 24th ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC) 2015* Portland, USA

Towards Realizing Potential of Malleable Parallel Jobs. *22nd IEEE International Conference on High Performance Computing. HiPC '14.* Goa, India

Towards Efficient High Performance Computing in Cloud. *25th IEEE /ACM International Conference for High Performance Computing Networking, Storage, and Analysis (SC), 2013* Denver, Colorado, USA

Improving Publications HPC Application Performance in Cloud through Dynamic Load Balancing. *13th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid), 2013.* Delft, The Netherlands

HPC-Aware VM Placement in Infrastructure Clouds. *IEEE International Conference Cloud Engineering (IC2E)*, 2013. San Jose, USA

The Who, What, Why, and How of HPC Applications in the Cloud. *5th IEEE International Conference on Cloud Computing Technology and Science (CloudCom) 2013 Best paper*. Bristol, UK

Towards Efficient Mapping, Scheduling, and Execution of HPC Applications on Platforms in Cloud. *27th International Parallel and Distributed Processing symposium(IPDPS) Ph.D Forum13*. Boston, USA

Exploring the Performance and Mapping of HPC Applications to Platforms in the cloud. *21st ACM Symposium on High-Performance Parallel and Distributed Computing, 2012* Delft, The Netherlands

Optimizing VM placement for HPC in the cloud. *2012 workshop on Cloud services, federation, and the 8th open cirrus summit, FederatedClouds 12*. San Jose, CA, USA

Evaluation of HPC Applications on Cloud. *IEEE Open Cirrus Summit, Oct 2011 Best Student Paper*. Atlanta, GA, Oct. 2011

A multi-level scalable startup for parallel applications. *1st International Workshop on Runtime and Operating Systems for Supercomputers, ROSS 11, held with International Conferences on Supercomputing (ICS)* Tuscon, Arizona, USA

Parallelizing Information Set Generation for Game Tree Search Applications. *2012 IEEE 24th International Symposium on Computer Architecture and High Performance Computing, SBAC-PAD 12* New York, USA

SELECTED
PUBLICATIONS

Abhishek Gupta, P. Faraboschi, F. Gioachin, L.V. Kale, R. Kaufmann, B.-S. Lee, V. March, D. Milojevic, and C.H. Suen. Evaluating and improving the performance and scheduling of hpc applications in cloud. *Cloud Computing, IEEE Transactions on*, PP(99):1–14, 2014

Keith R. Bisset, Ashwin M. Aji, Tariq Kamal, Jae-Seung Yeom, Madhav V. Marathe, Eric J. Bohm, and **Abhishek Gupta**. Parallel Science and Engineering Applications: The Charm++ Approach. chapter Contagion Diffusion with EpiSimdemics. Taylor & Francis Group, CRC Press, November 2013

Abhishek Gupta, Bilge Acun, Osman Sarood, and Laxmikant Kale. Towards Realizing the Potential of Malleable Parallel Jobs, (10 pages, 23% acceptance rate). In *IEEE International Conference on High Performance Computing (HiPC)*, 2014

Abhishek Gupta. *Techniques for Efficient High Performance Computing in the Cloud*. PhD thesis, Dept. of Computer Science, University of Illinois, August 2014. <http://hdl.handle.net/2142/50718>

Abhsihek Gupta, Osman Sarood, Laxmikant Kale, and Dejan Milojevic. Improving HPC Application Performance in Cloud through Dynamic Load Balancing. In *Cluster, Cloud and Grid Computing (CCGrid)*, 2013 13th IEEE/ACM International Symposium on, pages 402–409 (22.1% acceptance rate)

Abhishek Gupta, Laxmikant Kale, Dejan Milojicic, Paolo Faraboschi, and Susanne Balle. HPC-Aware VM Placement in Infrastructure Clouds. In *Cloud Engineering (IC2E), 2013 IEEE International Conference on*, pages 11–20 (20.6% acceptance rate)

Abhishek Gupta, Laxmikant V. Kalé, Dejan S. Milojicic, Paolo Faraboschi, Richard Kaufmann, Verdi March, Filippo Gioachin, Chun Hui Suen, and Bu-Sung Lee. The Who, What, Why, and How of HPC Applications in the Cloud. In *5th IEEE International Conference on Cloud Computing Technology and Science (CloudCom) 2013 (9 pages, 17.8 % acceptance rate) Best Paper*

Abhishek Gupta, Laxmikant V. Kalé, Dejan S. Milojicic, Paolo Faraboschi, Richard Kaufmann, Verdi March, Filippo Gioachin, Chun Hui Suen, and Bu-Sung Lee. Exploring the Performance and Mapping of HPC Applications to Platforms in the cloud. In *HPDC '12*, pages 121–122, selected based on full submission, (23.1 % total acceptance rate full papers + short papers), New York, NY, USA, 2012. ACM

Abhishek Gupta and Dejan Milojicic. Evaluation of HPC Applications on Cloud. In *Open Cirrus Summit Best Student Paper*, pages 22 –26, Atlanta, GA, Oct. 2011

Suraj Prabhakaran, Marcel Neumann, Sebastian Rinke, Felix Wolf, **Abhishek Gupta**, and Laxmikant V. Kalé. A batch system with efficient scheduling for malleable and evolving applications. In *Proceedings of the 29th IEEE International Parallel and Distributed Processing Symposium*, 2015. (accepted)

Osman Sarood, Akhil Langer, **Abhishek Gupta**, and Laxmikant V. Kale. Maximizing throughput of overprovisioned hpc data centers under a strict power budget. In *Proceedings of the International Conference on High Performance Computing, Networking, Storage and Analysis*, SC '14, New York, NY, USA, 2014. ACM

Bilge Acun, **Abhishek Gupta**, Nikhil Jain, Akhil Langer, Harshitha Menon, Eric Mikida, Xiang Ni, Michael Robson, Yanhua Sun, Ehsan Totoni, Lukasz Wesolowski, and Laxmikant Kale. Parallel Programming with Migratable Objects: Charm++ in Practice. In *Proceedings of the International Conference on High Performance Computing, Networking, Storage and Analysis*, SC '14, New York, NY, USA, 2014. ACM

Lukasz Wesolowski, Ramprasad Venkataraman, **Abhishek Gupta**, Jae-Seung Yeom, Keith Bisset, Yanhua Sun, Pritish Jetley, Thomas R. Quinn, and Laxmikant V. Kale. TRAM: Optimizing Fine-grained Communication with Topological Routing and Aggregation of Messages. In *Proceedings of the International Conference on Parallel Processing*, ICPP '14, Minneapolis, MN, September 2014

Jae-Seung Yeom, Abhinav Bhatele, Keith Bisset, Eric Bohm, **Abhishek Gupta**, Laxmikant Kale, Madhav Marathe, Dimitrios S. Nikolopoulos, Martin Schulz, and Lukasz Wesolowski. Overcoming the Scalability Challenges of Epidemic Simulations on Blue Waters, (10 pages, 21.1 % acceptance rate). In *28th International Parallel and Distributed Processing Symposium(IPDPS) '14*, 2014

Abhishek Gupta and Laxmikant V. Kale. Towards Efficient Mapping, Scheduling, and Execution of HPC Applications on Platforms in Cloud. In *short paper and best poster at 27th International Parallel and Distributed Processing Symposium(IPDPS) Ph.D Forum'13*

Mark Richards, **Abhishek Gupta**, Osman Sarood, and Laxmikant V. Kale. Parallelizing Information Set Generation for Game Tree Search Applications. In *Proceedings*

of the 2012 IEEE 24th International Symposium on Computer Architecture and High Performance Computing, SBAC-PAD '12, pages 116–123, Washington, DC, USA, 2012. IEEE Computer Society

Abhishek Gupta, Dejan Milojicic, and Laxmikant V. Kalé. Optimizing VM placement for HPC in the cloud. In *Proceedings of the 2012 workshop on Cloud services, federation, and the 8th open cirrus summit*, FederatedClouds '12, pages 1–6, New York, NY, USA, 2012. ACM

Osman Sarood, **Abhishek Gupta**, and Laxmikant V. Kale. Cloud Friendly Load Balancing for HPC Applications: Preliminary Work. In *Parallel Processing Workshops (ICPPW), 2012 41st Intl. Conf. on*, pages 200–205, sept. 2012

Laxmikant Kale, Anshu Arya, Abhinav Bhatele, **Abhishek Gupta**, Nikhil Jain, Pritish Jetley, Jonathan Lifflander, Phil Miller, Yanhua Sun, Ramprasad Venkataraman, Lukasz Wesolowski, and Gengbin Zheng. Charm++ for Productivity and Performance: A Submission to the 2011 HPC Class II Challenge. Technical Report 11-49, Parallel Programming Laboratory, November 2011

Abhishek Gupta, Gengbin Zheng, and Laxmikant V. Kalé. A multi-level scalable startup for parallel applications. In *Proceedings of the 1st International Workshop on Runtime and Operating Systems for Supercomputers*, ROSS '11, pages 41–48, New York, NY, USA, 2011. ACM

Osman Sarood, **Abhishek Gupta**, and Laxmikant V. Kale. Temperature aware load balancing for parallel applications: Preliminary work. In *Proceedings of the 2011 IEEE International Symposium on Parallel and Distributed Processing Workshops and PhD Forum*, IPDPSW '11, pages 796–803, Washington, DC, USA, 2011. IEEE Computer Society