

Nikhil Jain

Contact Information

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Professional Preparation

2009 **B.Tech., Computer Science & Engineering**, *Indian Institute of Technology, Kanpur*
2009 **M.Tech., Computer Science & Engineering**, *Indian Institute of Technology, Kanpur*
2016 **Ph.D., Computer Science**, *University of Illinois at Urbana-Champaign*

Appointments

2016–present **Fernbach Postdoctoral Fellow**, *Center for Applied Scientific Computing, LLNL*
2011–2016 **Research Assistant**, *Parallel Programming Laboratory, UIllinois*
Summer 2014 **Research Intern**, *Center for Applied Scientific Computing, LLNL*
Summer 2012 **Research Intern**, *Center for Applied Scientific Computing, LLNL*
Spring 2011 **Visiting Scholar**, *Parallel Programming Laboratory, UIllinois*
2009–2011 **Blue Scholar**, *IBM Research, New Delhi*
Summer 2007 **Research Scholar**, *Polytechnic Institute of NYU*

Research Interests

High performance computing networks, Applications of parallel computing, Runtime systems, Performance analysis and visualization, Parallel programming paradigms, Topology-aware mapping, Collective operations on parallel systems

Awards

- NERSC Award for Innovative Use of HPC, 2017.
- Fernbach Postdoctoral Fellow, 2016-2018.
- IBM PhD Fellow, 2014-2015.
- Silver Award, ACM Student Research Poster Competition, SC 2013.
- Andrew and Shana Laursen Fellow, Department of Computer Science, UIUC, 2011-2012.
- Best Poster, LLNL Annual Student Poster Session, 2012.
- Co-winner of HPC Challenge Class 2 (performance), Charm++ Team, Supercomputing 2011.

Synergistic Activities

Book Chapter	Programming Models for Parallel Computing
TPC	COMHPC '16, Cluster '17, HPC Asia '18, IPDPS '18, PMBS '17, SCSC '16 '17, Supercomputing Asia '18,
Other Reviewing	TPDS, IJHPCA, JPDC, Biophysical, PACT '17, IPDPS '14 '17, Cluster '12
Memberships	ACM, IEEE

Graduate and Postdoctoral Advisors: Todd Gamblin (LLNL), Abhinav Bhatele (LLNL), Laxmikant V. Kale (UIllinois)

Peer Reviewed Publications

- [30] **Nikhil Jain**, Abhinav Bhatele, Louis Howell, David Bohme, Ian Karlin, Edgar Leon, Misbah Mubarak, Noah Wolfe, Todd Gamblin, and Matthew Leininger. Predicting the Performance Impact of Different Fat-tree Configurations. *SC 2017*. (acceptance rate: 18.6%)
- [29] Aniruddha Marathe, Rushil Anirudh, **Nikhil Jain**, Abhinav Bhatele, Jayaraman Thiagarajan, Bhavya Kailkhura, Jae-Seung Yeom, Barry Rountree, and Todd Gamblin. Performance Modeling Under Resource constraints using Deep Transfer Learning. *SC 2017*. (acceptance rate: 18.6%)
- [28] Misbah Mubarak, **Nikhil Jain**, Jens Domke, Noah Wolfe, Caitlin Ross, Jianping Li, Abhinav Bhatele, Christopher D. Carothers, Kwan-Liu Ma, and Robert B. Ross. Toward Reliable Validation of HPC Interconnect Simulations. *Winter Simulation Conference 2017*.
- [27] Xiang Ni, **Nikhil Jain**, Kavitha Chandrasekar, and Laxmikant Kale. Runtime Techniques for Programming with Fast and Slow Memory. *Cluster 2017*.
- [26] Misbah Mubarak, Philip Carns, Jonathan Jenkins, Jianping Li, **Nikhil Jain**, Shane Snyder, Robert B. Ross, Christopher D. Carothers, Abhinav Bhatele, and Kwan-Liu Ma. Quantifying I/O and Communication Traffic Interference on Dragonfly Networks Equipped with Burst Buffers. *Cluster 2017*.
- [25] Juan J. Galvez, **Nikhil Jain**, and Laxmikant V. Kale. Automatic Topology Mapping of Diverse Large-scale Parallel Applications. *ICS 2017*. (acceptance rate: 15.8%, 28/177)
- [24] **Nikhil Jain**, Abhinav Bhatele, Xiang Ni, Todd Gamblin, and Laxmikant V. Kale. Partitioning low-diameter networks to eliminate inter-job interference. *IPDPS 2017*.
- [23] Abhinav Bhatele, Jae-Seung Yeom, **Nikhil Jain**, Chris J. Kuhlman, Yarden Livnat, Keith R. Bisset, Laxmikant V. Kale, and Madhav V. Marathe. Massively parallel simulations of spread of infectious diseases over realistic social networks. *CCGrid 2017 Scale Challenge*.
- [22] Noah Wolfe, Misbah Mubarak, **Nikhil Jain**, Jens Domke, Abhinav Bhatele, Christopher D. Carothers, and Robert B. Ross. Preliminary Performance Analysis of Multi-rail Fat-tree Networks. *CCGrid 2017*.
- [21] **Nikhil Jain**, Abhinav Bhatele, Sam White, Todd Gamblin, and Laxmikant Kale. Evaluating HPC Networks via Simulation of Parallel Workloads. *SC 2016*. (acceptance rate: 18.3%, 82/446)
- [20] **Nikhil Jain**, Eric Bohm, Eric Mikida, Subhasish Mandal, Minjung Kim, Prateek Jindal, Qi Li, Sohrab Ismail-Beigi, Glenn J. Martyna, and Laxmikant V. Kale. OpenAtom: Scalable Ab-Initio Molecular Dynamics with Diverse Capability. *ISC HPC 2016*.
- [19] Abhinav Bhatele, **Nikhil Jain**, Yarden Livnat, Valerio Pascucci, and Peer-Timo Bremer. Analyzing network health and congestion in dragonfly-based systems. *IPDPS 2016*.
- [18] Eric Mikida, **Nikhil Jain**, Elsa Gonsiorowski, Peter D. Barnes, Jr., David Jefferson, Christopher Carothers, and Laxmikant Kale. Towards PDES in a Message-Driven Paradigm: A Preliminary Case Study Using Charm++. *SIGSIM PADS 2016*.
- [17] **Nikhil Jain**, Abhinav Bhatele, Jae-Seung Yeom, Mark F. Adams, Francesco Miniati, Chao Mei, Laxmikant Kale. Charm++ & MPI: Combining the Best of Both Worlds. *IPDPS 2015*. (acceptance rate: 21.8%, 108/496)
- [16] Abhinav Bhatele, Andrew Titus, Jayaraman Thiagarajan, **Nikhil Jain**, Todd Gamblin, Peer-Timo Bremer, Martin Schulz, Laxmikant Kale. Identifying the Culprits behind Network Congestion. *IPDPS 2015*. (acceptance rate: 21.8%, 108/496)
- [15] Ehsan Toton, **Nikhil Jain**, Laxmikant Kale. Power Management of Extreme-scale Networks with

On/Off Links in Runtime Systems. *TOPC 2014, Journal*.

[14] Abhinav Bhatele, **Nikhil Jain**, Katherine E. Isaacs, Ronak Buch, Todd Gamblin, Steven H. Langer, Laxmikant V. Kale. Improving Application Performance via Task Mapping on IBM Blue Gene/Q. *HiPC 2014*. (acceptance rate: 22.6%, 49/216)

[13] **Nikhil Jain**, Abhinav Bhatele, Xiang Ni, Nicholas J. Wright, Laxmikant Kale. Maximizing Network Throughput on the Dragonfly Interconnect. *SC 2014*. (acceptance rate: 21%, 82/394)

[12] Bilge Acun, Abhishek Gupta, **Nikhil Jain**, Akhil Langer, Harshitha Menon, Eric Mikida, Xiang Ni, Michael Robson, Yanhua Sun, Ehsan Toton, Lukasz Wesolowski, Laxmikant Kale. Parallel Programming with Migratable Objects: Charm++ in Practice. *SC 2014*. (acceptance rate: 21%, 82/394)

[11] James Phillips, Yanhua Sun, **Nikhil Jain**, Eric J. Bohm, Laxmikant Kale. Mapping to Irregular Torus Topologies and Other Techniques for Petascale Biomolecular Simulation. *SC 2014*. (acceptance rate: 21%, 82/394)

[10] **Nikhil Jain**, Abhinav Bhatele, Michael Robson, Todd Gamblin, Laxmikant Kale. Predicting application performance using supervised learning on communication features. *SC 2013*. (acceptance rate: 20%, 92/457)

[9] Xiang Ni, Esteban Meneses, **Nikhil Jain**, Laxmikant Kale. ACR: Automatic Checkpoint/Restart for Soft and Hard Error Protection. *SC 2013*. (acceptance rate: 20%, 92/457)

[8] **Nikhil Jain**, JohnMark Lau, Laxmikant Kale. Collectives on Two-tier Direct Networks. *EuroMPI 2012*.

[7] Harshitha Menon, **Nikhil Jain**, Gengbin Zheng, Laxmikant Kale. Automated Load Balancing Invocation based on Application Characteristics. *Cluster 2012*. (acceptance rate: 28.9%, 58/200)

[6] Anshul Mittal, **Nikhil Jain**, Thomas George, Yogish Sabharwal, Sameer Kumar. Collective Algorithms for Sub-communicators. *ICS 2012*. (acceptance rate: 22.3%, 36/161)

[5] Abhinav Bhatele, **Nikhil Jain**, William Gropp and Laxmikant Kale. Avoiding hot-spots on two-level direct networks. *SC 2011*. (acceptance rate: 21%, 74/352)

[4] Ehsan Toton, Abhinav Bhatele, Eric Bohm, **Nikhil Jain**, Celso Mendes, Ryan Mokos, Gengbin Zheng and Laxmikant Kale. Simulation-based Performance Analysis and Tuning for a Two-level Directly Connected System. *ICPADS 2011*.

[3] Anshul Mittal, Jagobondhu Hazra, **Nikhil Jain**, Vivek Goyal, Deva Seetharam and Yogish Sabharwal. Real Time Contingency Analysis for Power Grids. *Euro-Par 2011*. (acceptance rate 29.9%, 81/271)

[2] **Nikhil Jain** and Yogish Sabharwal. Optimal Bucket Algorithms for large MPI Collectives on Torus Interconnect. *ICS 2010*. (acceptance rate: 17.8%, 32/180)

[1] Venkatesan Chakaravarthy, **Nikhil Jain** and Yogish Sabharwal. Optimizing Matrix Transpose on Torus Interconnects. *Euro-Par 2010*.

Peer Reviewed Workshop Publications

[5] Bilge Acun, **Nikhil Jain**, Abhinav Bhatele, Misbah Mubarak, Christopher Carothers, Laxmikant Kale. Preliminary Evaluation of a Parallel Trace Replay Tool for HPC Network Simulations. *Workshop on Parallel and Distributed Agent-Based Simulations at EURO-PAR 2015*.

[4] Ehsan Toton, **Nikhil Jain**, Laxmikant Kale. Toward Runtime Power Management of Exascale Networks by On/Off Control of Links. *Workshop on Higher Performance Power Aware Computing at*

IPDPS 2013.

[3] Laxmikant Kale, **Nikhil Jain**, Akhil Langer, Esteban Meneses, Phil Miller, Osman Sarood, Ehsan Toton. A Multi-resolution Emulation + Simulation Methodology. *Position paper at Workshop on Modeling & Simulation of Exascale Systems & Applications 2013.*

[2] Laxmikant Kale, Osman Sarood, Eric Bohm, **Nikhil Jain**, Akhil Langer, Esteban Meneses. Actionable Performance Modeling for Future Supercomputers. *Position paper at Workshop on Modeling & Simulation of Exascale Systems & Applications 2013.*

[1] **Nikhil Jain**, Brajesh Pande and Phalguni Gupta. SMP Based Solver for Large Binary Systems. *The Tenth International Workshop on Parallel and Distributed Algorithms and Applications 2009.*

Posters

[7] Model-Agnostic Influence Analysis for Performance Data. *SC 2017.*

[6] Improving Performance of Networks & Applications using Simulations. *Computation, LLNL Postdoc Poster Session 2017. 2nd Place.*

[5] Simulating and visualizing traffic on the dragonfly network. *SC 2015.*

[4] Interoperating MPI and Charm++ for Productivity and Performance. *Poster at SC 2014.*

[3] Fast Prediction of Network Performance: k-packet Simulation. *Poster at SC 2013. Silver Award.*

[2] Understanding Network Contention on Blue Gene Supercomputers. *LLNL Student Poster Session 2012. Best Poster Award.*

[1] Collective Algorithms for Sub-communicators. *PPoPP 2012.*