

## Preeti Malakar

Assistant Professor

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**RESEARCH INTERESTS** I am broadly interested in the area of high performance computing. My current research interests are scalable parallel communications, modeling and optimizing scientific workflows, data movement optimization, parallel I/O, and application performance analysis.

**EDUCATION** Ph.D., Department of Computer Science and Automation, Indian Institute of Science, Bangalore, India (August 2008 – April 2014).

- Thesis: Integrated Parallel Simulations and Visualization for Large-scale Weather Applications
- Advisors: Prof. Sathish S. Vadhiyar and Prof. Vijay Natarajan

M.Tech., Department of Computer Science and Engineering, Indian Institute of Technology Guwahati, Guwahati, India (2004 – 2006).

- Thesis: A Simple Security Policy for the Linux Kernel
- Advisor: Prof. Gautam Barua

B.E., Department of Computer Science and Engineering, University of Burdwan, India (2000 – 2004).

- Thesis: Delay Analysis for a Heterogeneous Multi-Server System
- Advisor: Prof. Guru Prasanna Bhattacharjee (ex-Professor, IIT Kharagpur)

## PUBLICATIONS

### Journal Publications

- “Hierarchical Read-write Optimizations for Scientific Applications with Multi-variable Structured Datasets”, Preeti Malakar, Venkatram Vishwanath, *International Journal of Parallel Programming: Special Issue on Network and Parallel Computing*, Vol. 45, February 2017.
- “Data Movement Optimizations for Independent MPI I/O on the Blue Gene/Q”, Preeti Malakar, Venkatram Vishwanath, *Parallel Computing*, Vol. 61, January 2017.
- “A Divide and Conquer Strategy for Scaling Weather Simulations with Multiple Regions of Interest”, Preeti Malakar, Thomas George, Sameer Kumar, Rashmi Mittal, Vijay Natarajan, Yogish Sabharwal, Vaibhav Saxena, Sathish Vadhiyar, *Scientific Programming: Selected Papers from Super Computing 2012*, Vol. 21, no. 3-4, 2013.

### Conference Proceedings

- “Topology-Aware Space-Shared Co-Analysis of Large-Scale Molecular Dynamics Simulations”, Preeti Malakar, Todd Munson, Venkatram Vishwanath, Christopher Knight, Michael E. Papka, *ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (SC18)*, Dallas, TX, November 2018.

- “A Visual Analytics System for Optimizing Communications in Massively Parallel Applications”, Takanori Fujiwara, Preeti Malakar, Khairi Reda, Venkatram Vishwanath, Michael E. Papka, Kwan-Liu Ma, *IEEE Conference on Visual Analytics Science and Technology (IEEE VAST)*, Phoenix, AZ, October 2017.
- “Optimal Execution of Co-analysis for Large-scale Molecular Dynamics Simulations”, Preeti Malakar, Venkatram Vishwanath, Christopher Knight, Todd Munson, Michael E. Papka, *IEEE/ACM International Conference for High Performance Computing, Networking, Storage and Analysis (SC16)*, Salt Lake City, UT, November 2016.
- “Improving Communication Throughput by Multipath Load Balancing on Blue Gene/Q”, Huy Bui, Preeti Malakar, Venkatram Vishwanath, Todd Munson, Eun-Sung Jung, Andrew E Johnson, Michael E. Papka, Jason Leigh, *IEEE International Conference on High Performance Computing (HiPC 2015)*, Bengaluru, India, December 2015.
- “Optimal Scheduling of Simulation-time Analysis for Large-scale Scientific Simulations”, Preeti Malakar, Venkatram Vishwanath, Todd Munson, Christopher Knight, Mark Hereld, Sven Leyffer, Michael E. Papka, *IEEE/ACM International Conference for High Performance Computing, Networking, Storage and Analysis (SC15)*, Austin, TX, November 2015.
- “A Diffusion-Based Processor Reallocation Strategy for Tracking Multiple Dynamically Varying Weather Phenomena”, Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar, Ravi Nanjundiah, *42<sup>nd</sup> International Conference on Parallel Processing (ICPP 2013)*, Lyon, France, October 2013.
- “A Divide and Conquer Strategy for Scaling Weather Simulations with Multiple Regions of Interest”, Preeti Malakar, Thomas George, Sameer Kumar, Rashmi Mittal, Vijay Natarajan, Yogish Sabharwal, Vaibhav Saxena, Sathish Vadhiyar, *IEEE/ACM International Conference for High Performance Computing, Networking, Storage and Analysis (SC12)*, Salt Lake City, UT, November 2012. **Best Student Paper Finalist**
- “Performance Evaluation and Optimization of Nested High Resolution Weather Simulations”, Preeti Malakar, Vaibhav Saxena, Thomas George, Rashmi Mittal, Sameer Kumar, Abdul Naim, Saiful A. Husain, *International European Conference on Parallel and Distributed Computing (Euro-Par 2012)*, Greece, August 2012.
- “InSt: An Integrated Steering Framework for Critical Weather Applications”, Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar, *International Conference on Computational Science (ICCS 2011)*, Singapore, June 2011.
- “An Adaptive Framework for Simulation and Online Remote Visualization of Critical Climate Applications in Resource-constrained Environments”, Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar, *IEEE/ACM International Conference for High Performance Computing, Networking, Storage and Analysis (SC10)*, New Orleans, LA, November 2010.

## Refereed Workshops

- “Benchmarking Machine Learning Methods for Performance Modeling of Scientific Applications”, Preeti Malakar, Prasanna Balaprakash, Venkatram Vishwanath, Vitali Morozov, Kalyan Kumaran, *Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS18)*, Held in conjunction with ACM/IEEE Supercomputing Conference, Dallas, TX, November 2018.

- “Scalable In situ Analysis of Molecular Dynamics Simulations”, Preeti Malakar, Christopher Knight, Todd Munson, Venkatram Vishwanath and Michael Papka, *In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV 2017)*, Held in conjunction with ACM/IEEE Supercomputing Conference, Denver, CO, November 2017.
- “Topology-Aware Data Aggregation for Intensive I/O on Large-Scale Supercomputers”, Francois Tessier, Venkatram Vishwanath, Preeti Malakar, Emmanuel Jeannot, and Florin Isaila, *First International Workshop on Communication Optimizations in High-Performance Computing (COMHPC 2016)*, Held in conjunction with ACM/IEEE Supercomputing Conference, Salt Lake City, UT, November 2016.
- “Coupling LAMMPS and the v13 Framework for Co-Visualization of Atomistic Simulations”, Silvio Rizzi, Mark Hereld, Joseph Insley, Preeti Malakar, Michael E. Papka, Thomas Uram, Venkatram Vishwanath, *High Performance Data Analysis and Visualization (HPDAV 2016)*, Held in conjunction with IEEE International Parallel and Distributed Processing Symposium, Chicago, IL, May 2016.
- “Route-aware Independent MPI I/O on the Blue Gene/Q”, Preeti Malakar, Venkatram Vishwanath, *International Workshop on Data-Intensive Scalable Computing Systems (DISCS 2015)*, Held in conjunction with ACM/IEEE Supercomputing Conference, Austin, TX, November 2015.
- “Multipath Load Balancing for M x N Communication Patterns on the Blue Gene/Q Supercomputer Interconnection Network”, Huy Bui, Robert Jacob, Preeti Malakar, Venkatram Vishwanath, Andrew Johnson, Michael E. Papka, Jason Leigh, *1st IEEE International Workshop on High-Performance Interconnection Networks Towards the Exascale and Big-Data Era (HiPINEB 2015)*, Held in conjunction with IEEE Cluster 2015, Chicago, September 2015.

## Refereed Posters/Short Papers

- “Empirical Study of I/O Performance of Lustre-based Storage System on a Cray XC40 Supercomputer”, Francois Tessier, Paul Coffman, Preeti Malakar, Richard Zamora, Venkatram Vishwanath, George Brown, *Lustre User Group (LUG) Conference*, Chicago, IL, April 2018.
- “Modeling Analysis Computations and End-to-end Simulation-analysis Workflows”, Preeti Malakar, Gagan Agrawal, Tekin Bicer, Venkatram Vishwanath, Todd Munson, Rajkumar Kettimuthu, Ian Foster, *Workshop on Modeling & Simulation of Systems and Applications (ModSim 2016)*, Seattle, August 2016.
- “Topology-aware data aggregation for parallel I/O on BG/Q supercomputing system”, Francois Tessier, Preeti Malakar, Venkatram Vishwanath, Emmanuel Jeannot, *5th Greater Chicago Area Systems Research Workshop (GCASR)*, Chicago, April 2016.
- “Internal variability and boundary read performance of a high resolution regional climate model (WRF)”, Jiali Wang, Preeti Malakar, Rao Kotamarthi, Venkat Vishwanath, *16th Annual WRF Users’ Workshop*, Boulder, CO, July 2015.
- “Integrated Parallel Simulation and Visualization for Large-scale Weather Applications”, Preeti Malakar, *9th Global TCS Technical Architects’ Conference (TAC-TiCS)*, Chennai, India, April, 2013.
- “Integrated Parallelization of Computation and Visualization for Large-scale Weather Applications”, Preeti Malakar, *Dissertation Research Showcase, International Conference for High Performance Computing, Networking, Storage and Analysis*, Salt Lake City, UT, November 2012.

- “Integrated Parallelization of Computations and Visualization for Large-scale Applications”, Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar, *International Parallel & Distributed Processing Symposium PhD Forum (IPDPS)*, Shanghai, May 2012.
- “A Coupled Framework for Parallel Simulation and Visualization”, Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar, *Grace Hopper Celebration of Women in Computing INDIA (GHC)*, Bangalore, India, December 2010.
- “An Integrated Simulation and Visualization Framework for Tracking Cyclone Aila”, Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar, Ravi Nanjundiah, *Student Research Symposium, International Conference on High Performance Computing (HiPC)*, Kochi, India, December 2009. **TCPP Best Paper Award**
- “An Integrated Simulation and Visualization Framework for Tracking Cyclone Aila”, Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar, Ravi Nanjundiah, *Workshop on HPC in India held in conjunction with International Conference for High Performance Computing, Networking, Storage and Analysis*, Portland, OR, November 2009.

#### AWARDS/RECOGNITIONS

- Outstanding Reviewer, Parallel Computing, 2018.
- Outstanding Reviewer, Journal of Parallel and Distributed Computing, 2017.
- Best Student Paper finalist in ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis 2012.
- TCS Research Scholarship 2010 – 2013.
- Google India Women in Engineering Award (*now Anita Borg Scholarship*) 2011.
- TCPP Best Paper Award in Student Research Symposium, HiPC 2009.
- Selected in Early Faculty Induction Programme 2004.
- MHRD GATE scholarship 2004 – 2006.
- 2nd prize in National Level Programming contest in Aarohan 2004 at NIT Durgapur.

#### PROFESSIONAL EXPERIENCE

- Visiting Affiliate, Lawrence Berkeley National Laboratory, (January 2017 – May 2018)
- Assistant Computer Scientist, Argonne Leadership Computing Facility, Argonne National Laboratory (June 2017 – May 2018)
- Postdoctoral Appointee, Argonne Leadership Computing Facility, Argonne National Laboratory (June 2014 – May 2017)
- Research Associate, Indian Institute of Science, Bangalore, August 2013 – April 2014.
- Summer Intern, IBM India Research Lab, Delhi, May 2011 – August 2011.
- Member Technical Staff, Oracle India Pvt. Ltd., Bangalore, August 2006 – July 2008.
- Teaching Assistant, Indian Institute of Technology Guwahati, August 2004 – April 2006.

## INVITED TALKS AND PANELS

- “Scaling up In situ Analysis for Molecular Dynamics Simulations”, 254th American Chemical Society National Meeting & Exposition, Washington DC, 2017.
- “High-performance Computing at ANL”, Lewis University, Romeoville, IL, 2016.
- “Basic Parallel Programming”, 1<sup>st</sup> CSA Undergraduate Summer School Initiative, IISc Bangalore, 2012.
- “Efficient Online Visualization for Large-scale Weather Simulations”, Women Engineers Leading Global Innovation (organized by Society of Women Engineers), Bangalore, 2012.
- “Integrated Parallelization of Computations and Visualization for Large-scale Applications”, Women in Technology and Science Meet, GE Global Research, Bangalore, 2011.
- Panelist, “Experiencing HPC for Undergraduates - Graduate Student Perspective”, SC12, Salt Lake City, UT, 2012.

## TALKS/PRESENTATIONS

- IEEE/ACM Supercomputing Conference, Denver, CO, November 2017.
- American Chemical Society National Meeting & Exposition, Washington DC, 2017.
- IEEE/ACM Supercomputing Conference, Salt Lake City, UT, November 2016.
- Rice University, Houston, TX, October 2016.
- IEEE/ACM Supercomputing Conference, Austin, TX, November 2015.
- Network and Parallel Computing Conference, New York City, NY, September 2015.
- International Conference on Parallel Processing, Lyon, France, October 2013.
- Scripps Institution of Oceanography, San Diego, CA, November 2012.
- IEEE/ACM Supercomputing Conference, Salt Lake City, UT, November 2012.
- The Third Electrical Sciences Divisional Symposium, IISc, Bangalore, January 2012.
- International Conference on Computational Science, Singapore, June 2011.
- IEEE/ACM Supercomputing Conference, New Orleans, LA, November 2010.
- Student Research Symposium, HiPC, Kochi, India, December 2009.

## MENTORING

- Sera Singha Roy, Dr. B. C. Roy Engg. College, Durgapur July 2016 – April 2018.
- Joyita Chakroborty, Dr. B. C. Roy Engg. College, Durgapur July 2016 – April 2018.
- Takanori Fujiwara, University of California, Davis June 2016 – March 2017.
- Michael Lewis, University of Illinois, Chicago June – August 2015.
- William Fortin, University of Chicago January – April 2015.
- Huy Bui, University of Illinois, Chicago October 2014 – July 2015.

## SERVICE

- EC Member, International Conference on Communication Systems & Networks (COMSNETS) Graduate Forum, 2019.
- PC Member, IEEE International Conference on High Performance Computing (HiPC), 2017, 2018.
- PC Member, In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV) 2015, 2018.
- PC Member, International Conference on Parallel Programming (ICPP), 2018.
- PC Member, Grace Hopper Celebration (GHC), 2018.
- Associate Editor, IEEE Computing in Science & Engineering (CiSE), IEEE Computer Society Press, 7/16 – Present.

## REVIEWER

### Proposals

- Argonne Leadership Computing Facility Data Science Program Proposals, 2017.
- US Department of Energy INCITE (Innovative and Novel Computational Impact on Theory and Experiment) Proposals, 2016, 2017.

### Journals/Conferences

- IEEE Transactions on Cloud Computing, 2018.
- IEEE Transactions on Parallel and Distributed Systems, 2017.
- Parallel Computing, 2017, 2018.
- Elsevier Journal of Parallel and Distributed Computing, 2017, 2018.
- International Conference on Distributed Computing and Internet Technology (ICD-CIT), 2016.
- Sadhana, published by Indian Academy of Sciences, 2014.
- IEEE International Conference on Electronics, Computing and Communication Technologies (IEEE CONECCT), 2014.
- IEEE International Conference on High Performance Computing, 2013.
- Grace Hopper Celebration India, 2012.
- 17<sup>th</sup> International Conference on Advanced Computing and Communications (ADCOM), 2009.

## RESEARCH FUNDING

- Co-PI, Linking Climate to Water: Implementing a 4KM Regional Climate Model with hydrologic Model Coupling (WRF-Hydro) using Argonne's HPC Resources. PI: Veerabhadra Kotamarthi, ANL. Funding Agency: DOE Laboratory Directed Research and Development (LDRD) Prime, 2017 – 2018.
- Co-PI, ExaHDF5: Delivering Efficient Parallel I/O on Exascale Computing Systems. PI: Surendra Byna, LBNL. Funding Agency: DOE Exascale Computing Project (ECP) Software Development, 2017 – 2019.