

Preeti Malakar
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Department of Computer Science and Engineering
Indian Institute of Technology Kanpur, U.P. 208016, India
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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 submitted in Jul'13*

- 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

Book Chapters

- “Theta and Mira at Argonne National Laboratory” in Contemporary High Performance Computing: From Petascale toward Exascale, Volume 3, edited by Jeffrey S. Vetter, CRC press, May 2019.

Journal Publications

- “A Terminology for In Situ Visualization and Analysis Systems”, Hank Childs et al., *International Journal of High Performance Computing Applications*, Vol. 34, November 2020.
- “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

- “Adaptive and Efficient Transfer for Online Remote Visualization of Critical Weather Applications”, Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar, *International Conference on Computational Science (ICCS 2020)*, Amsterdam, June 2020.
- “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, *42nd 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

- “MAP: A Visual Analytics System for Job Monitoring and Analysis”, Ashish Pal, Preeti Malakar, Workshop on Monitoring and Analysis for High Performance Computing Systems Plus Applications (HPCMASPA), Held in conjunction with IEEE Cluster, Kobe, Japan, September 2020.
- “Communication-aware Job Scheduling using SLURM”, Priya Mishra, Tushar Agrawal, Preeti Malakar, 16th International Workshop on Scheduling and Resource Management for Parallel and Distributed Systems (SRMPDS), Held in conjunction with International Conference on Parallel Processing, Edmonton, Canada, August 2020.
- “Network and Load-aware Resource Manager for MPI Programs”, Ashish Kumar, Naman Jain, Preeti Malakar, 16th International Workshop on Scheduling and Resource Management for Parallel and Distributed Systems (SRMPDS), Held in conjunction with International Conference on Parallel Processing, Edmonton, Canada, August 2020.
- “Experiences of Teaching Parallel Computing to Undergraduates and Post-graduates”, Preeti Malakar, 2nd *Workshop on Education for High Performance Computing (EduHiPC)*, Held in conjunction with IEEE International Conference on High Performance Computing, Data, and Analytics, Hyderabad, India, December 2019. **Best Paper Award**
- “Active Learning-Based Automatic Tuning and Prediction of Parallel I/O Performance”, Megha Agarwal, Divyansh Singhvi, Preeti Malakar, Suren Byna, *International Parallel Data Systems Workshop (PDSW 2019)*, Held in conjunction with ACM/IEEE Supercomputing Conference, Denver, CO, November 2019.
- “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

- “Network and Load-aware Node Allocator for MPI Programs”, Ashish Kumar, Naman Jain, Preeti Malakar, *Student Research Symposium, International Conference on High Performance Computing (HiPC)*, Hyderabad, India, December 2019.
- “A Comprehensive Job Monitoring and Analysis Framework”, Ashish Pal, Preeti Malakar, *Student Research Symposium, International Conference on High Performance Computing (HiPC)*, Hyderabad, India, December 2019.
- “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.
- “Scheduling Simulation-time Analyses for Large-scale Scientific Simulations”, Preeti Malakar, Margaret Butler Celebration, Lemont, IL, June 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

- Best Paper Award, EduHiPC, 2019.
- 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

- “Optimizing Data Movements in the Intraconnect and the Interconnect”, Advances in Computational Science and Parallel Computing, MiniSymposium at the International Conference on Advances in Differential Equations and Numerical Analysis (ADENA), IIT Guwahati, Oct 2020 (online).
- “A Step towards Reducing the Gap between FLOPS and Gbps”, India Research Flavors, HiPC, Hyderabad, Dec 2019.
- “Introduction to MPI”, An Introductory Course on High-Performance Computing in Engineering, IIT Kanpur, Sep 2019.
- “Building Blocks of Research and Post-PhD Academic Path”, 2nd ACM Grad Cohort, IIT Delhi, July 2019.
- “Introduction to MPI”, An Introductory Course on High-Performance Computing in Science and Engineering, IIT Kanpur, Feb 2019.
- “Scaling up In situ Analysis for Molecular Dynamics Simulations”, 254th American Chemical Society National Meeting & Exposition, Washington DC, Aug 2017.
- “High-performance Computing at ANL”, Lewis University, Romeoville, IL, 2016.
- “Basic Parallel Programming”, 1st CSA Undergraduate Summer School Initiative, IISc Bangalore, June 2012.
- “Efficient Online Visualization for Large-scale Weather Simulations”, Women Engineers Leading Global Innovation (organized by Society of Women Engineers), Bangalore, Aug 2012.
- “Integrated Parallelization of Computations and Visualization for Large-scale Applications”, Women in Technology and Science Meet, GE Global Research, Bangalore, Nov 2011.
- Panelist, “Experiencing HPC for Undergraduates - Graduate Student Perspective”, SC12, Salt Lake City, UT, Nov 2012.

TALKS/PRESENTATIONS

- ADENA, IIT Guwahati, October 2020. (online)
- IIIT Allahabad, India, March 2020.
- IEEE HiPC, Hyderabad, India, December 2019.
- ACM Grad Cohort, IIT Delhi, July 2019.
- 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.

TEACHING

- Parallel Computing, Spring 2019 (35 students).
- Parallel Computing, Fall 2019 (57 students).
- Topics in Parallel Computing, Spring 2020 (9 students).
- Parallel Computing, Spring 2021 .

SERVICE

- PC Member, IEEE Cluster 2020, 2021.
- PC Co-chair, Indian Symposium on Computer Systems (IndoSys) 2020.
- PC Member, IEEE/ACM International Conference for High Performance Computing, Networking, Storage and Analysis (SC) 2020 (Research Posters).
- PC Member, ISC High Performance (ISC) 2020.
- PC Member, IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (CCGrid) 2020, 2021.
- EC Member, International Conference on Communication Systems & Networks (COMSNETS) Graduate Forum, 2019.
- PC Member, IEEE International Conference on High Performance Computing (HiPC), 2017, 2018, 2020.
- PC Member, In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV) 2015, 2018, 2019, 2020.
- PC Member, International Conference on Parallel Programming (ICPP), 2018, 2020.
- PC Member, Grace Hopper Celebration (GHC), 2018.
- Associate Editor, IEEE Computing in Science & Engineering (CiSE), IEEE Computer Society Press, 7/16 – Present.

WORKSHOPS/SCHOOLS

ORGANIZED

- ACM Winter School on High Performance Computing, 5-11 December 2019, IIT Kanpur.
- NDIVIA Bootcamp, 1-2 Mar 2020, IIT Kanpur.

REVIEWER

International 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.

International Journals/Conferences

- IEEE Pacific Visualization Symposium (PacificVis) 2020.
- ACM Special Interest Group on Computer Science Education (SIGCSE) 2020.
- Elsevier Future Generation Computer Systems, 2019.
- IEEE Transactions on Cloud Computing, 2018.
- IEEE Transactions on Parallel and Distributed Systems, 2017.
- Parallel Computing, 2017, 2018, 2020.
- Elsevier Journal of Parallel and Distributed Computing, 2017, 2018, 2019.
- 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.
- 17th International Conference on Advanced Computing and Communications (ADCOM), 2009.

RESEARCH FUNDING (PAST AND PRESENT)

- PI, Optimal Online Data Analysis and Visualization of Weather Simulations at Exascale. Funding Agency: SERB Start-up Research Grant, 2020 – 2022.
- PI, Optimized Data Movement for End-to-end Simulation-Analysis at Exascale. Funding Agency: IIT Kanpur Initiation Grant, 2020 – 2022.
- PI, Auto scaling of a Distributed Cloud Database Service. Funding Agency: Nutanix Inc., 2019 – 2020.
- 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.

ADMINISTRIVIA

- Member, Women's Cell, IITK (Jun 2020 - present).
- Member, Diversity and Inclusion Cell, IITK (Nov 2019 - present).
- Member, Departmental Student Wellbeing Committee (Nov 2019 - present).
- Warden, Girls Hostel - I (Aug 2019 - present).
- Member, Department Admission Committee (May 2018 - present).

STUDENTS

- Madhusmita Sahoo, PhD (2020-).
- Muzafar Ahmad Wani, PhD (2020-).
- Abir Mukherjee, MTech (2020-21).
- Prashant Piprotar, MTech (2020-21).
- Tushar Agarwal, MTech (2020-21).
- Ankit Sharma, MTech (2019-20).
- Ashish Pal, MTech (2019-20).
- Sanjay Kumar, MTech (2019-20).
- Ashish Kumar, BTech UGP (Fall 2019). *Won the Dr. Elizabeth and Dr. Varkey Cherian Convocation Award*
- Naman Jain, BTech UGP (Fall 2019). *Won the Dr. Elizabeth and Dr. Varkey Cherian Convocation Award*
- Pragya Jain, BTech UGP (Fall 2019).
- Priya Mishra, EE BTech UGP (Fall 2019, Spring 2020).

INTERNS

- Soumik Dey, BCET Durgapur, (SURGE Intern) June – July 2020.
- Abdul Rouf, NIT Srinagar (KIT Intern) Dec 2019 – Jan 2020.
- Abhijeet Agnihotri, IIT Jammu May – July 2019.
- Debashish Reang, IIT Kanpur May – July 2019.
- Deepcharran N., Anna University May – July 2019.
- Jinang Shah, IIT Kanpur (SURGE Intern) May – July 2019.
- Priya Mishra, IIT Kanpur May – July 2019.
- 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.

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.
- Huy Bui, University of Illinois, Chicago October 2014 – July 2015.