

# Tanzima Islam

Assistant Professor  
Texas State University

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## Research Objective

My research involves modeling both compute and data movement performance for large-scale applications in HPC environments. I am interested in leveraging machine learning for comparative performance modeling, focusing on HPC co-design in the short term. My long-term research objective is to leverage data-driven decision-making to address the challenges of developing scalable systems in extremely heterogeneous computing environments.

## Education

- 2013 **Ph.D., Computer Engineering, Purdue University.**  
*Thesis: Reliable and scalable checkpointing systems for distributed computing environments.*
- 2006 **B.Sc., Computer Science & Engineering, Bangladesh University of Engineering & Technology.**

## Professional Experience

- 2020-Present **Assistant Professor, Department of Computer Science, Texas State University.**
- Summer 2022 **Visiting Scholar, Brookhaven National Laboratory, Computational Science Initiative.**
- Summer 2019 **Visiting Scholar, Lawrence Berkeley National Laboratory, Computation Directorate.**
- 2017-2019 **Assistant Professor, Department of Computer Science, Western Washington University.**
- 2013-2017 **Postdoctoral Research Staff Member, Lawrence Livermore National Laboratory, Center for Applied Scientific Computing.**  
Developed machine-learning techniques for performance analysis.
- 2006-2007 **Member, Research and Development, Commlink Info Tech Ltd., Bangladesh.**  
Developed software for a service-independent telecommunication network (Intelligent Network).

## Awards & Honors

- 2021 **Dean's College Achievement Award for Excellence in Scholarly/Creative Activities** at Texas State University.
- 2019-2020 **R&D 100 award**, in collaboration with Lawrence Livermore National Laboratory for the Scalable Checkpoint/Restart Framework 2.0 (SCR).
- 2014 **LLNL Director's Science & Technology Award.**
- 2016, 2015, 2014 **Best Poster Award, Lawrence Livermore National Laboratory Annual Scholars Poster Symposium.**
- 2014 **2<sup>nd</sup> Place Winner, LLNL Computation Directorate Postdoctoral Poster Symposium.**
- 2012, 2009 **Best Student Paper Nominations, International Conference for High Performance Computing, Networking, Storage and Analysis (SC).**
- 2010 **2<sup>nd</sup> Place Winner, ACM Student Research Competition, Grace Hopper Celebration of Women in Computing.**
- Travel Awards **Sustainable Research Pathways Program at Lawrence Berkeley National Laboratory'18.**  
**CRA-W Career Mentoring Workshop at Phoenix, AZ'18.**  
**Google Computer Science Grad Forum'12.**  
**SC'09—'11, HPDC'12.**

## Research and Other Funding

- 2022 **PI, Performance Characterization of Workflow Applications, DOE SRP Fellowship, \$68K.**
- 2022 **PI, Cross-platform performance prediction and analysis using deep learning, AMD Research Gift, \$50K.**

- 2022 **Member**, REU Site: Research Experiences for Undergraduates in Edge Computing, NSF, \$389K.
- 2021 **Co-PI**, 5-petaflops Research cluster for COVID-19 research, AMD, \$400K.
- 2021 **PI**, PerfROCm: A study of hardware resource utilization behaviors of HPC and ML applications on AMD GPUs, AMD Research Gift, \$50K.
- 2021 **PI**, Predicting Performance using Few Shot Learning, Research Enhancement Program (REP) at Texas State University, \$8K.
- Summer 2019 **PI**, Proxy Application Validation for Exascale Co-design, DOE Sustainable Research Pathway Fellowship, \$40K.
- 2018, 2019, 2021, 2022 **PI**, Parallel Computing course, Time allocation grant from XSEDE, 100,000 core-hours.
- 2018 **Co-PI**, Scientific Data Visualization course development, Office of Research and Sponsored Programs at Western Washington University, \$12K.
- 2016 **PI**, VERITAS for Understanding Performance Evolution during Code Development, Linking Exploratory Application Research to Next-gen Development at Lawrence Livermore National Laboratory, \$200K.

## Publications

### Peer Reviewed Conference & Journal Papers

- [1] Holland Schutte, Chase Phelps, Aniruddha Marathe, and **Tanzima Islam**. LIBNVCD: An extendable and user-friendly multi-gpu performance measurement tool. In *46th Annual Computers, Software, and Applications Conference (COMPSAC)*. IEEE, 2022. (Accepted). Acceptance rate: 20%.
- [2] Tanzima Z Islam, Philip Wu Liang, Forest Sweeney, Cody Pragner, Jayaraman J Thiagarajan, Moushumi Sharmin, and Shameem Ahmed. College life is hard!-shedding light on stress prediction for autistic college students using data-driven analysis. In *45th Annual Computers, Software, and Applications Conference (COMPSAC)*, pages 428–437. IEEE, 2021.
- [3] Nathan Pinnow, Tarek Ramadan, **Tanzima Islam**, Chase Phelps, and Jayaraman J. Thiagarajan. Comparative code structure analysis using deep learning for performance prediction. In *International Symposium on Performance Analysis of Systems and Software (ISPASS)*. IEEE, March 28-30 2021.
- [4] Tapasya Patki, Jayaraman J. Thiagarajan, Alexis Ayala, and **Tanzima Islam**. Performance optimality or reproducibility: that is the question. In *International Conference for High Performance Computing, Networking, Storage and Analysis (SC)*, November 17-22 2019. Acceptance rate: 20%.
- [5] Jayaraman J. Thiagarajan, Rushil Anirudh, Bhavya Kailkhura, Nikhil Jain, **Tanzima Islam**, Abhinav Bhatele, Jae-Seung Yeom, and Todd Gamblin. PADDLE: Performance Analysis using a Data-driven Learning Environment. In *IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, May 21-25 2018. Acceptance rate: 24.5%.
- [6] Teng Wang, Adam Moody, Yeh Zhu, Kathryn Mohror, Kento Sato, **Tanzima Islam**, and Waikuan Yu. MetaKV: A Key-Value Store for Metadata Management of Distributed Burst Buffers. In *IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pages 1174–1183, May 2017. Acceptance rate: 22%.
- [7] **Tanzima Islam**, Kathryn Mohror, and Martin Schulz. Exploring the MPI Tool Information Interface: Features and Capabilities. In *The International Journal of High Performance Computing Applications (IJHPCA)*, volume 30, pages 212–222, 2016.
- [8] Tania Banerjee, Jason Hackl, Mrugesh Shringarpure, **Tanzima Islam**, S Balachandar, Thomas Jackson, and Sanjay Ranka. CMT-Bone — A Proxy Application for Compressible Multiphase Turbulent Flows. In *IEEE 23rd International Conference on High Performance Computing (HiPC)*, pages 173–182, Dec 2016. Acceptance rate: 23%.
- [9] **Tanzima Islam**, Jayaraman J. Thiagarajan, Abhinav Bhatele, Martin Schulz, and Todd Gamblin. A Machine-Learning Framework for Performance Coverage Analysis of Proxy Applications. In *International Conference for High Performance Computing, Networking, Storage and Analysis (SC)*, Salt Lake City, UT, November 13-18 2016. Acceptance rate: 23%.
- [10] Lee Savoie, David K. Lowenthal, Bronis R. de Supinski, **Tanzima Islam**, Kathryn Mohror, Barry Rountree, and Martin Schulz. I/O Aware Power Shifting. In *IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pages 740–749, May 2016. Acceptance rate: 23%.

- [11] Anup Mohan, Thomas Hacker, Gregory P. Rodgers, and **Tanzima Islam**. Batchsubmit: A high-volume Batch Submission System for Earthquake Engineering Simulation. In *Concurrency and Computation: Practice and Experience*, volume 26, pages 2240–2252. Wiley Online Library, 2014.
- [12] **Tanzima Islam**, Saurabh Bagchi, and Rudolf Eigenmann. Reliable and Efficient Distributed Checkpointing System for Grid Environments. In *Journal of Grid Computing (JoGC)*, volume 12, pages 593–613, Dec 2014.
- [13] **Tanzima Islam**, Kathryn Mohror, Saurabh Bagchi, Adam Moody, Bronis R De Supinski, and Rudolf Eigenmann. McrEngine: A Scalable Checkpointing System Using Data-Aware Aggregation and Compression. In *Scientific Programming*, volume 21, pages 149–163. Hindawi, 2013.
- \* [14] **Tanzima Islam**, Kathryn Mohror, Saurabh Bagchi, Adam Moody, Bronis R. de Supinski, and Rudolf Eigenmann. McrEngine: A Scalable Checkpointing System Using Data-aware Aggregation and Compression. In *International Conference on High Performance Computing, Networking, Storage and Analysis (SC)*, pages 17:1–17:11, 2012. Acceptance rate: 20%. **Best student paper finalist**.
- \* [15] **Tanzima Islam**, Saurabh Bagchi, and Rudolf Eigenmann. **FALCON**: A System for Reliable Checkpoint Recovery in Shared Grid Environments. In *Proceedings of the Conference on High Performance Computing Networking, Storage and Analysis (SC)*, pages 1–12, 2009. **Best student paper nomination**.
- [16] Hemayet Hossain, Mostofa Ahmed, Abdullah Al-Nayeem, **Tanzima Islam**, and Md Mostofa Akbar. gpNoCSim - A General Purpose Simulator for Network-On-Chip. pages 254–257, March 2007.

### Workshop Papers

- [17] **Tanzima Islam** and Chase Phelps. Hpc@scale: A hands-on approach for training next-gen hpc software architects. In *EduHiPC workshop at the 28th International Conference on High Performance Computing, Data, Analytics (HiPC)*. IEEE, 2021. Invited paper.
- [18] Quentin Jensen, Filip Jagodzinski, and **Tanzima Islam**. Filcio: Application agnostic i/o aggregation to scale scientific workflows. In *2021 IEEE 45th Annual Computers, Software, and Applications Conference (COMPSAC)*, pages 1587–1592. IEEE, 2021.
- [19] Jack Stratton, Michael Albert, Quentin Jensen, Max Ismailov, Filip Jagodzinski, and **Tanzima Islam**. Towards aggregation based i/o optimization for scaling bioinformatics applications. In *2020 IEEE 44th Annual Computers, Software, and Applications Conference (COMPSAC)*, pages 1250–1255, 2020.
- [20] **Tanzima Islam**, Alexis Ayala, Quentin Jensen, and Khaled Ibrahim. Towards A Programmable Analysis and Visualization Framework for Interactive Performance Analytics. In *Workshop on Programming and Performance Visualization Tools held in conjunction with International Conference for High Performance Computing, Networking, Storage and Analysis (SC)*, Denver, CO, November 16-23 2019. IEEE.
- [21] Nicholas Majeske, Filip Jagodzinski, Brian Hutchinson, and **Tanzima Islam**. Low Rank Smoothed Sampling Methods for Identifying Impactful Pairwise Mutations. In *International Conference on Bioinformatics, Computational Biology, and Health Informatics*, pages 681–686. ACM, 2018.
- [22] Aiman Fang, Ignacio Laguna, Kento Sato, **Tanzima Islam**, and Kathryn Mohror. Fault Tolerance Assistant (FTA): An Exception Handling Programming Model for MPI Applications. 2015.
- [23] **Tanzima Islam**, Kathryn Mohror, and Martin Schulz. Exploring the Capabilities of the New MPI\_T Interface. In *Proceedings of the 21st European MPI Users' Group Meeting*, page 91. ACM, 2014.
- [24] John Tramm, Andrew Siegel, **Tanzima Islam**, and Martin Schulz. XSBench-the Development and Verification of a Performance Abstraction for Monte Carlo Reactor Analysis. *The Role of Reactor Physics toward a Sustainable Future (PHYSOR)*, 2014.

### Ph.D. Dissertation

- [25] **Tanzima Islam**. *Reliable and scalable checkpointing systems for distributed computing environments*. PhD thesis, Purdue University, West Lafayette, IN, May 2013.

### Research Posters

- [26] Logan Moody, Nathan Pinnow, Michael Lam, Harshitha Menon, Markus Schordan, Scott G. Lloyd, and **Tanzima Islam**. Automatic Generation of Mixed-Prevision Programs. In *International Conference for High Performance Computing, Networking, Storage and Analysis (SC'18)*, 2018.
- [27] Simone Smarr, **Tanzima Islam**, and Yolanda Rankin. Modular Extensible Framework for Performance Comparative Analysis. In *ACM Richard Tapia Celebration of Diversity in Computing Conference*, 2015.

- [28] Xiang Ni, **Tanzima Islam**, Kathryn Mohror, Adam Moody, and Laxmikant V. Kale. Lossy Compression for Checkpointing: Fallible or Feasible. In *International Conference for High Performance Computing, Networking, Storage and Analysis (SC'14)*, 2014.
- \* [29] **Tanzima Islam**, Saurabh Bagchi, and Rudolf Eigenmann. Harnessing multiple cores for efficient checkpointing in grid systems. In *ACM Student Research Competition (SRC) at Anita Borg Institute Grace Hopper Celebration of Women in Computing*, 2010. **ACM Student Research Competition 2<sup>nd</sup> prize winner.**
- [30] **Tanzima Islam**, Kathryn Mohror, Adam Moody, Bronis de Supinski, Saurabh Bagchi, and Rudolf Eigenmann. Data-Aware Inter-Process Checkpoint Compression. In *International Conference for High Performance Computing, Networking, Storage and Analysis (SC'10)*, 2010.
- [31] Mohammad S. Hossain, **Tanzima Islam**, Saurabh Bagchi, and Vijay Raghunathan. Fast and Collaborative Interference Avoidance for Wireless Medical Devices. In *International Conference on Dependable Systems and Networks (DSN)*, 2009.

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## Professional Activities

Organizer	Chair, Performance track, SC'22. Vice/Co-Chair, Performance track, International Conference on Parallel Processing, 2019. IEEE International Workshop on Big Data Computation, Analysis & Applications in conjunction with IEEE COMPSAC, 2019-Present.
Technical Review Board	IEEE Transactions on Parallel and Distributed Systems (TPDS)
Technical Program Committees	High-Performance Distributed Computing (HPDC)'22, International Parallel & Distributed Processing Symposium (IPDPS)'17–, International Conference for High Performance Computing, Networking, Storage and Analysis (SC)'17– (Performance track). SC'19-'21 (Posters). SC'18 (HPC for Undergrad), International Conference in Supercomputing (ISC)'19–, Women in HPC Technical Conference'20, Euro/MPI User Forum'20, The Platform for Advanced Scientific Computing (PASC)'19, International Conference on Parallel Processing (ICPP)'18, International Symposium on Computer Architecture and High Performance Computing (SBAD-PAD)'13–'14, Symposium on Principles and Practice of Parallel Programming (PPoPP)'11, Dependable Systems and Networks (DSN)'10, '22.
Grant Review Committees	DOE SBIR, NSF CISE/CSSI, NSF HBCU-UP, NSF CISE/OAC, NSF CISE/CCF, DOE SciDAC.
Journal Reviewing	IEEE Transactions on Parallel and Distributed Systems (TPDS)'19–, International Conference on Parallel Computing (ParCo)'19-'21, Journal of Grid Computing (JoGC)'17–'21, International Journal of High Performance Computing (IJHPCA)'18.
Memberships	IEEE, ACM

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## Invited Talks and Panels

May, 2022	<b>How to be a Great Mentor</b> , <i>Exascale Computing Project (ECP)</i> , Virtual.
April, 2022	<b>Scalability challenges and opportunities for I/O bound applications</b> , <i>CHEOPS Workshop at EuroSys</i> , Virtual, <a href="https://tinyurl.com/2xyb2wnr">https://tinyurl.com/2xyb2wnr</a> .
March, 2022	<b>Exascale Computing Project (ECP): Enabling Next-Generation of Hardware-Software Co-design using Data Science</b> , <i>LLNL</i> , Virtual.
February, 2022	<b>Sustainable Horizons Institute</b> , <i>SHI</i> , Virtual.
Dec, 2021	<b>Characterizing Performance of Workflow Applications</b> , <i>Brookhaven National Laboratory</i> , Virtual.
Dec, 2021	<b>Center of Excellence: Performance Characterization of Deep Learning Workloads</b> , <i>AMD</i> , Virtual.
Sep, 2021	<b>Enabling Next-Generation Software and Co-Design</b> , <i>AMD at Texas State</i> , San Marcos, TX.
Sep, 2021	<b>HPC Enables Digitalization Panel</b> , <i>Digital 360 Summit</i> , San Marcos, TX.
Nov, 2020	<b>Careers in HPC Panel, Taking the Leap: Changing Careers</b> , <i>International Conference for High Performance Computing, Networking, Storage and Analysis (SC)</i> , Virtual.
Oct, 2020	<b>May the HPC Force be with you!</b> , <i>Organized a panel for undergraduate students</i> , Richard Tapia Celebration of Diversity in Computing.
Aug, 2020	<b>Data-Driven Performance Modeling for HPC Co-design</b> , <i>Invited scholar's talk</i> , AMD.
Aug, 2020	<b>DASHING: An Interpretable Machine Learning Toolkit for Performance Analysis and Visualization</b> , <i>Exascale Computing Project Hackathon</i> , Oak Ridge National Laboratory.

- May, 2019 **The NIMBioS Workshop on Scientific Collaboration Enabled by High Performance Computing, Scalable I/O Performance for Scientific Applications—Challenges and Potentials**, Knoxville, TN.
- December, 2018 **Lawrence Berkeley National Laboratory, Understanding the Performance Portability Challenges and Opportunities using Machine Learning**, Berkeley, CA.
- November, 2018 **HPC for Undergraduates**, *International Conference for High Performance Computing, Networking, Storage and Analysis*, Dallas, TX.
- July, 2018 **The Platform for Advanced Scientific Computing Conference, Machine Learning Framework for Performance Coverage Analysis of Proxy Applications**, ACM and the Swiss National Supercomputing Center (CSC), Basel, Switzerland.
- February, 2015 **JOWOG-34, Proxy Application Validation using Machine Learning (Veritas)**, Sandia National Laboratories, Albuquerque, NM.

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## Teaching Experience

- 2017 - Present Foundations of CS-II, Scalable Systems for Supercomputing, Compiler Construction, Parallel Computing, Data Structures, Computer Networks, Scientific Data Visualization (co-instructor).

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## Outreach and Mentoring Students

- 2014-Present **Co-founder**, *Bangladeshi Women in Computer Science and Engineering*, Dhaka, Bangladesh, First research, networking, and mentoring platform for female Computer Science and Engineering students of Bangladesh.
- 2017–2019 **Research advisor**, *Undergraduate (7) and graduate (3) students (Western Washington University); Undergraduate (3) and graduate (5) students, Texas State University.*
- 2017-Present **Faculty advisor**, *ACM-W chapter at Western Washington University.*
- 2014–2016 **Intern supervisor**, *Undergraduate, M.S. and Ph.D. students from University of Hamburg, University of Illinois Urbana-Champaign, Spelman College, University of California San Diego.*
- 2019-Present **Mentor**, *Graduate students (3), SC Student Volunteer Program.*
- 2011–2013 **Student mentor**, *Undergrad, M.S., and Ph.D. students, Purdue University.*