Dong Dai, Ph.D

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Computer & Information Science
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Research Interests

I am interested in developing intelligent infrastructure for high performance and robust data-intensive computing, including I/O scheduling, parallel file systems, and metadata management.

Education

- Ph.D. Computer Science, University of Science and Technology of China, 2013.
- B.S. Computer Science, University of Science and Technology of China, 2006.

Professional Experience

- **Associate Professor**, *Graduate Program Director* 2024 – Current

  Computer & Information Sciences Department, University of Delaware
- **Assistant Professor** 2018 – 2024

  Computer Science Department, University of North Carolina at Charlotte
- **Research Assistant Professor** 2016 - 2018

  Computer Science Department, Texas Tech University
- **Post-doctoral Researcher** 2013 - 2016

  Texas Tech University and Argonne National Lab.

Selected Publications

Names with (*) are the Ph.D. students I mentored; (†) are master or undergraduate students I mentored.

[1] Minqiu Sun*, Xin Huang, Luanzheng Guo, Nathan R. Tallent, Kento Sato, Dong Dai. ZOCheck: CPU-Shadow Checkpointing for Zeroth-Order LLM Fine-Tuning. *Accepted to appear in the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'26**), 2026.*

[2] Chris Egersdoerfer*, Orcun Yildiz, Kevin Harms, Robert Latham, Robert Ross, Dong Dai. Understanding Reliability Bottlenecks in LLM Agents for HPC I/O Telemetry Analysis. *Accepted to appear in the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'26**), 2026.*

[3] Minqiu Sun*, Xin Huang, Luanzheng Guo, Nathan R. Tallent, Kento Sato, Dong Dai. LayerCheck: Adaptive Layer-wise Checkpointing for Large Language Model Post-training. *Accepted to appear in the IEEE International Conference on Cluster Computing (**CLUSTER'26**), 2026.*

[4] Khondoker Mirazul Mumenin*, Robert Underwood, Dong Dai, Jinzhen Wang, Sheng Di, Zarija Lukić, Franck Cappello. DeepCQ: A Two-Stage Deep-Surrogate Framework for Lossy Compression Quality Prediction. *Accepted to appear in the IEEE International Conference on Cluster Computing (**CLUSTER'26**), 2026.*

[5] Md. Hasanur Rashid*, Jesun Firoz, Nathan R. Tallent, Luanzheng Guo, Meng Tang, Dong Dai. QoSFlow: Ensuring QoS of Distributed Workflows Using Interpretable Sensitivity Models. *Accepted to appear in the 40th IEEE International Parallel & Distributed Processing Symposium (**IPDPS'26**), 2026.*

[6] Md. Hasanur Rashid*, Nathan R. Tallent, Forrest Sheng Bao, Dong Dai. CARAT: Client-Side Adaptive RPC and Cache Co-Tuning for Parallel File Systems. *Accepted to appear in the 40th IEEE International Parallel & Distributed Processing Symposium (**IPDPS'26**), 2026.*

[7] Osman Goni Ridwan, Sylvain Pitié, Monish Soundar Raj, Dong Dai, Gilles Frapper, Hongfei Xue, Qiang Zhu. AI-assisted rapid crystal structure generation towards a target local environment. ***npj Computational Materials***, 2026. (IF=11.09)

[8] Chris Egersdoerfer*, Philip Carns, Shane Snyder, Robert Ross, Dong Dai. STELLAR: Storage Tuning Engine Leveraging LLM Autonomous Reasoning for High Performance Parallel File Systems. *Accepted to appear in the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'25**), 2025.*

[9] Abdullah Al Raqibul Islam*, Helen Xu, Dong Dai, Aydin Buluç. Improving SpGEMM Performance Through Matrix-Reordering and Cluster-wise Computation. *Accepted to appear in the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'25**), 2025.*

[10] Zheng Wei, Jing Xing, Yida Gu, Wenjing Huang, Dong Dai, Guangming Tan, Dingwen Tao. TSUE: A Two-Stage Data Update Method for an Erasure Coded Cluster File System. *Accepted to appear in the 34th International ACM Symposium on High-Performance Parallel and Distributed Computing (**HPDC'25**), 2025*

[11] Philip Carns, Matthieu Dorier, Rob Latham, Shane Snyder, Amal Gueroudji, Seth Ockerman, Jerome Soumagne, Dong Dai, Robert Ross. Towards Empirical Roofline Modeling of Distributed Data Services: Mapping the Boundaries of RPC Throughput. *Proceedings of the Cray User Group, (**CUG'25**).* 2025.

[12] Md Hasanur Rashid*, Xinyi Li, Youbiao He, Forrest Sheng Bao, Dong Dai. DIAL: Decentralized I/O AutoTuning via Learned Client-side Local Metrics for Parallel File System. *Accepted*

*to appear in the 25th IEEE International Symposium on Cluster, Cloud and Internet Computing (**CCGRID'25**), 2025*

[13] Chris Egersdoerfer*, Arnav Sareen†, Jean Luca Bez, Suren Byna, Dongkuan Xu, Dong Dai. IOAgent: Democratizing Trustworthy HPC I/O Performance Diagnosis Capability via LLMs. *Accepted to appear in the 39th IEEE International Parallel & Distributed Processing Symposium (**IPDPS'25**), 2025*

[14] Saisha Kamat*, Mai Zheng, Bo Fang, Dong Dai. Be Aware of Metadata Corruption in Parallel File Systems: It Can Be Silent and Catastrophic. *Accepted to appear in the 39th IEEE International Parallel & Distributed Processing Symposium (**IPDPS'25**), 2025*

[15] Md. Hasanur Rashid*, Dong Dai. AdapTBF: Decentralized Bandwidth Control via Adaptive Token Borrowing for HPC Storage. *Accepted to appear in the 39th IEEE International Parallel & Distributed Processing Symposium (**IPDPS'25**), 2025*

[16] Minqiu Sun*, Xin Huang, Luanzheng Guo, Nathan R. Tallent, Kento Sato, Dong Dai. LLM-Tailor: A Layer-wise Tailoring Tool for Efficient Checkpointing of Large Language Models. *Accepted to appear in the 10th International Parallel Data Systems Workshop (**PDSW'25**), 2025.*

[17] Jiaxin Dong*, Md. Hasanur Rashid*, Helen Xu, Dong Dai. RL4Sys: A Lightweight System-driven RL Framework for Drop-in Integration in System Optimization. *Accepted to appear in the 10th International Parallel Data Systems Workshop (**PDSW'25**), 2025.*

[18] Yingxue Gao, Teng Wang, Lei Gong, Chao Wang, Dong Dai, Yang Yang, Xianglan Chen, Xi Li, Xuehai Zhou. Hardware Accelerated Vision Transformer via Heterogeneous Architecture Design and Adaptive Dataflow Mapping. *Accepted to IEEE Transactions on Computers (**IEEE TC'24**), 2024.*

[19] Khondoker Mirazul Mumenin*, Dong Dai, Jinzhen Wang, Sheng Di. QualityNet: Error-bounded Lossy Compression Quality Prediction via Deep Surrogate. *Accepted to appear in the IEEE International Conference on Big Data (**IEEE BigData'24**), 2024.* (acceptance rate: 18.8%)

[20] Chris Egersdoerfer*, Md. Hasanur Rashid*, Dong Dai, Bo Fang, Tallent Nathan. Understanding and Predicting Cross-Application I/O Interference in HPC Storage Systems. *Accepted to appear in the 9th International Parallel Data Systems Workshop (**PDSW'24**), 2024.*

[21] Abdullah Al Raqibul Islam*, Helen Xu, Dong Dai, Aydin Buluc. Improving SpGEMM Performance Through Reordering and Cluster-wise Computation. **The third place winner of the ACM Student Research Competition at SC24 (Graduate category)**!

[22] Chris Egersdoerfer†, Arnav Sareen†, Jean Luca Bez, Suren Byna, Dong Dai. ION: Navigating HPC I/O Optimization Journey using Large Language Models. *in proceeding of the 16th ACM Workshop on Hot Topics in Storage and File Systems (**HotStorage'24**), 2024.*

[23] Monish Soundar Raj†, Thomas MacDougall†, Di Zhang*, Dong Dai. An Empirical Study of Machine Learning-based Synthetic Job Trace Generation Methods. *Accepted to appear in the 27th Workshop on Job Scheduling Strategies for Parallel Processing (**JSSPP@IPDPS'24**).*

[24] Di Zhang*, Monish Soundar Raj†, Bing Xie, Sheng Di, Dong Dai. Cross-System Analysis of Job Characterization and Scheduling in Large-Scale Computing Clusters. *Accepted to appear in the 38th IEEE International Parallel & Distributed Processing Symposium (**IPDPS'24**), 2024* (acceptance rate: 24%).

[25] Abdullah Al Raqibul Islam*, Dong Dai. DGAP: Efficient Dynamic Graph Analysis on Persistent Memory. *Accepted to appear in the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'23**), 2023.* (acceptance rate: 23%).

[26] Di Zhang*, Chris Egersdoerfer†, Tabassum Mahmud, Mai Zheng, Dong Dai. Drill: Log-based Anomaly Detection for Large-scale Storage Systems Using Source Code Analysis. *Accepted to appear in 37th IEEE International Parallel & Distributed Processing Symposium (**IPDPS'23**), 2023* (acceptance rate: 23%).

[27] Saisha Kamat*, Abdullah Al Raqibul Islam*, Mai Zheng, Dong Dai. FaultyRank: A Graph-based Parallel File System Checker. *Accepted to appear in 37th IEEE International Parallel & Distributed Processing Symposium (**IPDPS'23**), 2023* (acceptance rate: 23%).

[28] Abdullah Al Raqibul Islam*, Dong Dai, A Framework for Large Dynamic Graph Analysis on Persistent Memory, *The 21st USENIX Conference on File and Storage Technologies Work-in-Progress Session (**FAST'23 WiP**), 2023*

[29] Duo Zhang, Om Rameshwar Gatla, Abdullah Al Raqibul Islam*, Dong Dai, Mai Zheng, On the Scalability of Testing the Crash Consistency of PM Systems, *The 21st USENIX Conference on File and Storage Technologies Work-in-Progress Session (**FAST'23 WiP**), 2023*

[30] Chris Egersdoerfer†, Di Zhang*, Dong Dai. ClusterLog: Clustering Logs for Effective Log-based Anomaly Detection. *in the proceeding of 2022 IEEE/ACM 12th Workshop on Fault Tolerance for HPC at eXtreme Scale (**FTXS'22 @ SC'22**), 2022*

[31] Abdullah Al Raqibul Islam*, Christopher York†, Dong Dai. A performance study of Optane persistent memory: from storage data structures' perspective. *CCF Transactions on High Performance Computing (**THPC'22**), 2022*

[32] Di Zhang*, Dong Dai, Bing Xie. SchedInspector: A Batch Job Scheduling Inspector Using Reinforcement Learning. *in proceeding of the 31st International ACM Symposium on High-Performance Parallel and Distributed Computing (**HPDC'22**), 2022* (acceptance rate: 19%).

[33] Abdullah Al Raqibul Islam*, Dong Dai, Dazhao Cheng. VCSR: Mutable CSR Graph Format Using Vertex-Centric Packed Memory Array. *in the proceeding of the 22nd IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (**CCGrid'22**), 2022* (acceptance rate: 28%).

[34] Runzhou Han, Om Rameshwar Gatla, Mai Zheng, Jinrui Cao, Di Zhang*, Dong Dai, Yong Chen, Jonathan Cook. A Study of Failure Recovery and Logging of High-Performance Parallel File Systems. *ACM Transactions on Storage 18, no. 2 (2022): 1-44. (**TOS'22**), 2022.*

[35] Dazhao Cheng, Yu Wang, Dong Dai. Dynamic Resource Provisioning for Iterative Workloads

on Apache Spark. *IEEE Transactions on Cloud Computing (**TCC'21**), 2021.*

[36] Di Zhang*, Dong Dai, Runzhou Han, Mai Zheng. SentiLog: Anomaly Detecting on Parallel File Systems via Log-based Sentiment Analysis. *in the proceeding of the 13th ACM Workshop on Hot Topics in Storage and File Systems (**HotStorage'21**), 2021* **Best Paper Nominee!**.

[37] Jiang Zhou, Yong Chen, Dong Dai, Yu Zhuang, Weiping Wang. I/O characteristic discovery for storage system optimizations. *Journal of Parallel and Distributed Computing (**JPDC'21**), Vol 148, Pages 1-13, 2021.*

[38] Di Zhang*, Dong Dai, Youbiao He, Forrest Sheng Bao, and Bing Xie. RLScheduler: An Automated HPC Batch Job Scheduler Using Reinforcement Learning. *in the proceeding of the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'20**), 2020.* (acceptance rate: 22.3%).

[39] Abdullah Al Raqibul Islam*, Anirudh Narayanan, Christopher York†, and Dong Dai. A Performance Study of Optane Persistent Memory: From Indexing Data Structures' Perspective. *in proceeding of the 36th International Conference on Massive Storage Systems and Technology (**MSST'20**), 2020.*

[40] Abdullah Al Raqibul Islam*, and Dong Dai. Understand the Overheads of Storage Data Structures on Persistent Memory. *in proceeding of the 25th ACM SIGPLAN Symposium on Principle and Practice of Parallel Programming (**PPoPP'20 Poster**), 2020.*

[41] Jiang Zhou, Yong Chen, Wei Xie, Dong Dai, Shuibing He, and Weiping Wang. PRS: A Pattern-Directed Replication Scheme for Heterogeneous Object-Based Storage. *IEEE Transactions on Computers (**TC'19**), 2019.*

[42] Dong Dai, Om Rameshwar Gatla, and Mai Zheng. A Performance Study of Lustre File System Checker: Bottlenecks and Potentials. *in proceedings of the 35th International Conference on Massive Storage Systems and Technology (**MSST'19**), 2019.*

[43] Dong Dai, Yong Chen, Philip Carns, John Jenkins, Wei Zhang, and Robert Ross. Managing Rich Metadata in High-Performance Computing Systems Using a Graph Model. *IEEE Transactions on Parallel and Distributed Systems (**TPDS'18**), 2018.*

[44] Jinrui Cao, Om Rameshwar Gatla, Mai Zheng, Dong Dai, Vidya Eswarappa, Yan Mu and Yong Chen. PFault: A General Framework for Analyzing the Reliability of High-Performance Parallel File Systems. *in proceedings of the 32nd ACM/SIGARCH International Conference on Supercomputing (**ICS'18**), 2018.* (acceptance rate: 18.7%).

[45] Wei Zhang, Dong Dai, and Yong Chen. AKIN: A Streaming Graph Partitioning Algorithm for Distributed Graph Storage Systems. *in proceedings of the 18th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (**CCGrid'18**), 2018.* (acceptance rate: 20.8%).

[46] Jiang Zhou, Dong Dai, Yu Mao, Xin Chen, Yu Zhuang, and Yong Chen. I/O Characteristics Discovery in Cloud Storage Systems. *in proceedings of the 11th International Conference on Cloud Computing (**CLOUD'18**), 2018.*

[47] Dong Dai, Yong Chen, Philip Carns, John Jenkins, and Robert Ross. Lightweight Provenance Service for High Performance Computing. *in proceedings of the 26th International Conference on Parallel Architectures and Compilation Techniques (**PACT'17**), 2017.* (acceptance rate: 23%, Conference CORE ***Ranking B***).

[48] Dong Dai, Wei Zhang, and Yong Chen. IOGP: An Incremental Online Graph Partitioning Algorithm for Distributed Graph Databases. *in proceedings of the 26th ACM International Symposium on High Performance Parallel and Distributed Computing (**HPDC'17**), 2017.* (acceptance rate: 19%).

[49] Jiang Zhou, Wei Xie, Dong Dai, and Yong Chen. Pattern-Directed Replication Scheme for Heterogeneous Object-based Storage. *in proceedings of the 17th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (**CCGrid'17**), 2017.* (Conference CORE ***Ranking A***)

[50] Dong Dai, Yong Chen, Phil Carns, John Jenkins, Wei Zhang, and Robert Ross. GraphMeta: A Graph-based Engine for Managing Large-Scale HPC Rich Metadata. *in proceedings of the IEEE International Conference on Cluster Computing (**CLUSTER'16**), 2016.* (acceptance rate: 24%).

[51] Dong Dai, Phil Carns, Robert Ross, John Jenkins, Kyle Blauer†, and Yong Chen. Graph-Trek: Asynchronous Graph Traversal for Property Graph Based Metadata Management. *In Proceedings of the IEEE International Conference on Cluster Computing (**CLUSTER'15**), 2015.* (acceptance rate: 24%).

[52] Dong Dai, Yong Chen, Dries Kimpe, and Robert Ross. Two-Choice Randomized Dynamic I/O Scheduler for Object Storage Systems. *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (**SC'14**), 2014.* (acceptance rate: 20.8%).

[53] Dong Dai, Yong Chen, Dries Kimpe, and Robert Ross. Provenance-Based Object Storage Prediction Scheme for Scientific Big Data Applications. *In Proceedings of the 2014 IEEE International Conference on Big Data (**BigData'14**), 2014.* (acceptance rate: 18.6%, ***Ranking B***).

Professional Service

- **Journal Editor Board**
  - Review Editor on the Editorial Board of High Performance Big Data Systems (specialty section of Frontiers in High Performance Computing), 2023.
- **Conference Organization/Chair/Co-Chair**
  - *Program Track Co-Chair*: ICPP: International Conference on Parallel Processing 2025 (ICPP 2025)
  - *Program Co-Chair*: International Conference on Scalable Scientific Data Management 2025 (SSDBM 2025)

  - Served as the Digital Conference Organization Chairs at the 14th ACM International Conference on Future Energy Systems (ACM e-Energy 2023)
  - Served as the Finance Chair at the 33rd IEEE International Symposium on Software Reliability Engineering (ISSRE 2022)
  - Served as the Program Chair at the 4th Industry/University Joint International Workshop on Data Center Automation, Analytics, and Control, held in conjunction with UCC 2021
  - Served as the Program Co-Chair at the 3rd/2nd Industry/University Joint International Workshop on Data Center Automation, Analytics, and Control, held in conjunction with SC 2019, SC 2018.

- **Conference Program Committees**
  - Served as the program committee member at International Conference for High Performance Computing, Networking, Storage and Analysis (SC) in 2020 (*Poster*), 2022 (*Workshop*), 2023 (*Poster*), 2024 (*Tech Program Storage&Viz Track*, *Poster*), 2025 (*Tech Program*).
  - Served as the technical program committee members at IEEE International Parallel & Distributed Processing Symposium (IPDPS) in 2021, 2022, 2023, 2024, and 2025.
  - Served as the Chair's Special Committee at IEEE International Parallel & Distributed Processing Symposium (IPDPS 2023)
  - Served as Best Open-Source Contribution Award Committee at IEEE International Parallel & Distributed Processing Symposium (IPDPS 2023)
  - Served as the technical program committee member at International Conference on Parallel Processing (ICPP) in 2020, 2022, 2023, 2024.
  - Served as the technical program committee member at IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (CCGRID) in 2021, 2022, 2024, 2026.
  - Served as the technical program committee member at IEEE International Conference on Cluster Computing (CLUSTER) in 2024.
  - Served as technical program committee member at International Parallel Data Systems Workshop (PDSW 2022, 2023, 2024)
  - Served as the technical program committee member at IEEE International Conference on Big Data (BigData) in 2021, 2022, and 2023.
  - Served as the Artifact Evaluation committee member at OSDI-ATC 2022.

- **Panels**
  - National Science Foundation (NSF), Computer Systems Research (CSR) 2017, 2018, 2019, 2021, 2022, 2023, 2024
  - National Science Foundation (NSF), Software Hardware Foundation (SHF), 2025, 2026

  - National Science Foundation (NSF), Office of Advanced CyberInfrastructure (OAC) 2022
  - National Science Foundation (NSF), SBIR/STTR 2021, 2024

- **Journal Reviewer**
  - Reviewer for ACM Computing Surveys, 2021, 2022, 2023, 2024
  - Reviewer for IEEE Transactions on Parallel and Distributed Systems 2015-2026
  - Reviewer for IEEE Transactions on Dependable and Secure Computing, 2025
  - ACM Transactions on Internet of Things, 2025
  - IEEE Internet of Things Journal, 2025
  - Reviewer for IEEE Transactions on Storage 2020-2022
  - Reviewer for IEEE Transactions on Computers 2022
  - Reviewer for IEEE Transactions on Cloud Computing 2015,2017
  - Reviewer for IEEE Transactions on Industrial Informatics 2016, 2017
  - Reviewer for International Journal of Parallel Programming 2015, 2023

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