

Jinyang Liu

EDUCATION	<p>Ph.D. in Computer Science University of California, Riverside, CA <i>September 2019–June 2024</i></p> <p>M.S. in Data Science Peking University, Beijing, China <i>September 2016–July 2019</i></p> <p>B.S. in Mathematics and Applied Mathematics Peking University, Beijing, China <i>September 2011–July 2016</i></p>
RESEARCH INTEREST	<p>High-Performance Computing Scientific Data Management, Analysis, and Reduction Deep Learning in High-Performance Computing and Data Compression AI for Science</p>
WORK EXPERIENCE	<p>Assistant Professor, Department of Computer Science, University of Houston, Houston, TX, <i>August 2024–Present</i></p> <p>Research Intern, Extreme Scale Resilience Group, Argonne National Laboratory, Lemont, IL, <i>May 2020–June 2024</i></p> <p>Graduate Student Researcher, Supercomputing Laboratory, University of California, Riverside, Riverside, CA, <i>September 2019–June 2024</i></p>
HONOURS AND AWARDS	<ul style="list-style-type: none">• Best Paper Finalist in International Conference on Supercomputing 2023 (ICS '23). 2023• Dissertation Year Program Fellowship, University of California, Riverside. 2023• 2021 R&D 100 Award (SZ compression framework). 2021• Outstanding Graduate Student, Peking University. 2019• Outstanding Research Award, Peking University. 2018
PROJECTS PARTICIPATED	<ul style="list-style-type: none">• NSF CSSI ROCCI: <i>Integrated Cyberinfrastructure for In Situ Lossy Compression Optimization Based on Post Hoc Analysis Requirements.</i>• DOE ASCR SDR: <i>Scalable Dynamic Scientific Data Reduction.</i>• NSF CDS&E HyLoC: <i>Objective-driven Adaptive Hybrid Lossy Compression Framework for Extreme-Scale Scientific Application.</i>• ECP VeloC/SZ: <i>Ensuring high reliability for long-running exascale simulations and reducing the data while keeping important scientific outcomes intact.</i>• ARAMCO: <i>Exploration of Lossy Data Compression for Seismic Imaging Application.</i>
REFEREED CONFERENCE PUBLICATIONS	<ul style="list-style-type: none">• [SC '24] Jinyang Liu*, Jiannan Tian*, Shixun Wu*, Sheng Di, Boyuan Zhang, Robert Underwood, Yafan Huang, Jiajun Huang, Kai Zhao, Guanpeng Li, Dingwen Tao, Zizhong Chen, and Franck Cappello. "High-ratio Scientific Lossy Compression on GPUs with Optimized Multi-level Interpolation." <i>arXiv preprint arXiv:2312.05492 (2023)</i>, 2023. (*: Co-first authors)• [SIGMOD '24] Jinyang Liu, Sheng Di, Kai Zhao, Xin Liang, Sian Jin, Zizhe Jian, Jiajun Huang, Shixun Wu, Zizhong Chen, and Franck Cappello. 2023. "High-performance Effective Scientific Error-bounded Lossy Compression with Auto-tuned Multi-component Interpolation." in <i>Proceedings of the ACM on Management of Data 2, no. 1 (2024)</i>: 1-27• [ICS '23 (Best Paper Finalist)] Jinyang Liu, Sheng Di, Kai Zhao, Xin Liang, Zizhong Chen, and Franck Cappello. "FAZ: A flexible auto-tuned modular error-bounded compression framework for scientific data." In <i>Proceedings of the 37th International Conference on Supercomputing</i>, pp. 1-13. 2023.• [SC '22] Jinyang Liu, Sheng Di, Sian Jin, Kai Zhao, Xin Liang, Zizhong Chen, and Franck Cappello. "Dynamic quality metric oriented error bounded lossy compression for scientific datasets." In <i>SC22: International Conference for High Performance Computing, Networking, Storage and Analysis</i>, pp. 1-15. IEEE, 2022.• [BigData '23] Jinyang Liu, Sheng Di, Kai Zhao, Xin Liang, Zizhong Chen, and Franck Cappello. "Scientific Error-bounded Lossy Compression with Super-resolution Neural Networks."

In *2023 IEEE International Conference on Big Data (BigData)*, pp. 229-236. IEEE Computer Society, 2023.

- [Cluster '21] **Jinyang Liu**, Sheng Di, Kai Zhao, Sian Jin, Dingwen Tao, Xin Liang, Zizhong Chen, and Franck Cappello. "Exploring autoencoder-based error-bounded compression for scientific data." In *2021 IEEE International Conference on Cluster Computing (CLUSTER)*, pp. 294-306. IEEE, 2021.
- [SC '24] Jiajun Huang, Sheng Di, Xiaodong Yu, Yujia Zhai, **Jinyang Liu**, Zizhe Jian, Xin Liang, Kai Zhao, Xiaoyi Lu, Zizhong Chen, Franck Cappello, Yanfei Guo, and Rajeev Thakur. "hZCC: Accelerating Collective Communication with Co-designed Operation-supported Compression.", 2024.
- [ICS '24] Jiajun Huang, Sheng Di, Xiaodong Yu, Yujia Zhai, **Jinyang Liu**, Yafan Huang, Ken Raffanetti, Hui Zhou, Kai Zhao, Xiaoyi Lu, Zizhong Chen, Franck Cappello, Yanfei Guo, and Rajeev Thakur. "gZCCL: Compression-Accelerated Collective Communication Framework for GPU Clusters." *38th International Conference on Supercomputing*, 2024.
- [Cluster '24] Shixun Wu, Yitong Ding, Yujia Zhai, **Jinyang Liu**, Jiajun Huang, Zizhe Jian, Huangliang Dai, Sheng Di, Bryan Wong, Zizhong Chen, and Franck Cappello. "FT K-means: A High-Performance K-means on GPU with Fault Tolerance.", 2024.
- [IPDPS '24] Zizhe Jian, Sheng Di, **Jinyang Liu**, Kai Zhao, Xin Liang, Haiying Xu, Robert Underwood, Shixun Wu, Jiajun Huang, Zizhong Chen, and Franck Cappello. "CliZ: Optimizing Lossy Compression for Climate Datasets with Adaptive Fine-tuned Data Prediction."
- [IPDPS '24] Jiajun Huang, Sheng Di, Xiaodong Yu, Yujia Zhai, Zhaorui Zhang, **Jinyang Liu**, Xiaoyi Lu, Ken Raffanetti, Hui Zhou, Kai Zhao, Zizhong Chen, Franck Cappello, Yanfei Guo, and Rajeev Thakur. "An Optimized Error-controlled MPI Collective Framework Integrated with Lossy Compression."
- [ICDE '24] Mingze Xia, Sheng Di, Franck Cappello, Pu Jiao, Kai Zhao, **Jinyang Liu**, Xuan Wu, Xin Liang, and Hanqi Guo. "Preserving Topological Feature with Sign-of-Determinant Predicates in Lossy Compression: A Case Study of Vector Field Critical Points."
- [HiPC '23] Arham Khan, Sheng Di, Kai Zhao, **Jinyang Liu**, Kyle Chard, Ian Foster, and Franck Cappello. "SECRE: Surrogate-based Error-controlled Lossy Compression Ratio Estimation Framework." In *2023 IEEE 30th International Conference on High Performance Computing, Data, and Analytics (HiPC)*, pp. 132-142. IEEE, 2023.
- [HiPC '23] Pu Jiao, Sheng Di, **Jinyang Liu**, Xin Liang, and Franck Cappello. "Characterization and Detection of Artifacts for Error-controlled Lossy Compressors." In *2023 IEEE 30th International Conference on High Performance Computing, Data, and Analytics (HiPC)*, pp. 117-126. IEEE, 2023.
- [ICS '23] Shixun Wu, Yujia Zhai, **Jinyang Liu**, Jiajun Huang, Zizhe Jian, Bryan Wong, and Zizhong Chen. "Anatomy of High-Performance GEMM with Online Fault Tolerance on GPUs." In *Proceedings of the 37th International Conference on Supercomputing*, pp. 360-372. 2023.
- [Cluster '23] Jiajun Huang, Kaiming Ouyang, Yujia Zhai, **Jinyang Liu**, Min Si, Ken Raffanetti, Hui Zhou, Atsushi Hori, Zizhong Chen, Yanfei Guo, and Rajeev Thakur. "PiP-MColl: Process-in-Process-based Multi-object MPI Collectives." In *2023 IEEE International Conference on Cluster Computing (CLUSTER)*, pp. 354-364. IEEE, 2023.
- [BigData '23] Kaiming Ouyang, Vincent Tran, **Jinyang Liu**, Bryan M. Wong, and Zizhong Chen. "KF K-means: A High Performance K-means Implementation using Kernel Fusion." In *2023 IEEE International Conference on Big Data (BigData)*, pp. 121-127. IEEE, 2023.
- [ICS '21] Yujia Zhai, Elisabeth Gien, Quan Fan, Kai Zhao, **Jinyang Liu**, and Zizhong Chen. "FT-BLAS: a high performance BLAS implementation with online fault tolerance." In *Proceedings of the ACM International Conference on Supercomputing*, pp. 127-138. 2021.
- [IWBDR-4] Jiajun Huang, **Jinyang Liu**, Sheng Di, Yujia Zhai, Zizhe Jian, Shixun Wu, Kai Zhao, Zizhong Chen, Yanfei Guo, and Franck Cappello. "Exploring Wavelet Transform Usages for Error-bounded Scientific Data Compression." In *2023 IEEE International Conference on Big Data (BigData)*, pp. 4233-4239. IEEE, 2023.
- [IWBDR-2] **Jinyang Liu**, Sihuan Li, Sheng Di, Xin Liang, Kai Zhao, Dingwen Tao, Zizhong Chen, and Franck Cappello. "Improving lossy compression for SZ by exploring the best-fit lossless compression techniques." In *2021 IEEE International Conference on Big Data (Big Data)*, pp. 2986-2991. IEEE, 2021.
- [TPDS] Yujia Zhai, Elisabeth Gien, Kai Zhao, **Jinyang Liu**, Jiajun Huang, Bryan Wong,

Christian Shelton, and Zizhong Chen, "FT-BLAS: A Fault Tolerant High Performance BLAS Implementation on x86 CPUs." *IEEE Transactions on Parallel and Distributed Systems*.

CONFERENCE
POSTERS

- **[Cluster '23]** Arham Khan, Sheng Di, Kai Zhao, **Jinyang Liu**, Kyle Chard, Ian Foster, and Franck Cappello. "An Efficient and Accurate Compression Ratio Estimation Model for SZx."
- **[HPDC '23]** Jiajun Huang, Kaiming Ouyang, Yujia Zhai, **Jinyang Liu**, Min Si, Ken Raffenetti, and Hui Zhou. "Accelerating MPI Collectives with Process-in-Process-based Multi-object Techniques." arXiv preprint arXiv:2305.10612 (2023).

SERVICES

- **Programs Committee:** IWBDR 2023, DRBSD-10.
- **Reviewers:** HiPC 2024, IPDPS 2024, ICS 2023, DCC 2023, HDIS 2022, IWBDR 2022, IWBDR 2023, DRBSD-10, ICMLA 2021, TPDS, THPC.
- **Artifact Evaluation Committee:** SC 2024.

TEACHING

- **Lecturer**, COSC 2306: Data Programming, University of Houston, Houston, TX, September–December, 2024.
- **Teaching Assistant**, CS211: High Performance Computing, University of California, Riverside, Riverside, CA, September–December, 2020–2022.
- **Teaching Assistant**, CS160: Concurrent Programming and Parallel Systems, University of California, Riverside, Riverside, CA, January–March, 2021.

TALKS AND
PRESENTATIONS

- 2024/03, research seminar, **Managing Exa-scale Scientific Data with Error-bounded Lossy Compression**, Oregon State University, Corvallis, OR, USA.
- 2024/02, research seminar, **Managing Exa-scale Scientific Data with Error-bounded Lossy Compression**, University of Houston, Houston, TX, USA.
- 2024/01, research seminar, **Managing Exa-scale Scientific Data with Error-bounded Lossy Compression**, University of South Florida, Tampa, FL, USA.
- 2023/06, presentation, **FAZ: A flexible auto-tuned modular error-bounded compression framework for scientific data**, the 37th International Conference on Supercomputing, Orlando, FL, USA.
- 2022/11, presentation, **Dynamic quality metric oriented error bounded lossy compression for scientific datasets**, SC22: International Conference for High Performance Computing, Networking, Storage and Analysis, Dallas, TX, USA.
- 2021/12, presentation, **Improving lossy compression for SZ by exploring the best-fit lossless compression techniques**, 2021 IEEE International Conference on Big Data (Big Data), online.
- 2021/09, presentation, **Exploring autoencoder-based error-bounded compression for scientific data**, 2021 IEEE International Conference on Cluster Computing (CLUSTER), online.

SOFTWARE
DEVELOPED OR
PARTICIPATED

- SZ3, <https://github.com/szcompressor/SZ3>, SZ3: A Modular Error-bounded Lossy Compression Framework for Scientific Datasets.
- QoZ, <https://github.com/szcompressor/QoZ>, QoZ: Dynamic Quality Metric Oriented Error Bounded Lossy Compression for Scientific Datasets.
- HPEZ, <https://github.com/JLiu-1/HPEZ>, HPEZ: High-performance Effective Scientific Error-bounded Lossy Compression with Auto-tuned Multi-component Interpolation.
- cuSZ-I, <https://github.com/JLiu-1/cusz-I/>, cuSZ-I: High-Fidelity Error-Bounded Lossy Compression for Scientific Data on GPUs.