

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>September 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 Nomination in the 34th ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC '25). 2025• Best Paper Nomination 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 SGCC: <i>An Efficient GPU-oriented Data Reduction Cyberinfrastructure for Scientific Data Analysis</i> (2025 to 2028, Lead PI, project total: \$600K, my share: \$180K)• NSF CSSI FZ: <i>A fine-tunable cyberinfrastructure framework to streamline specialized lossy compression development</i> (Collaborator)• NSF CSSI ROCCI: <i>Integrated Cyberinfrastructure for In Situ Lossy Compression Optimization Based on Post Hoc Analysis Requirements</i>. (Student participator)• DOE ASCR SDR: <i>Scalable Dynamic Scientific Data Reduction</i>. (Student participator)• NSF CDS&E HyLoC: <i>Objective-driven Adaptive Hybrid Lossy Compression Framework for Extreme-Scale Scientific Application</i>. (Student participator)• ECP VeloC/SZ: <i>Ensuring high reliability for long-running exascale simulations and reducing the data while keeping important scientific outcomes intact</i>. (Student participator)• ARAMCO: <i>Exploration of Lossy Data Compression for Seismic Imaging Application</i>. (Student participator)
REFEREED CONFERENCE PUBLICATIONS	<ul style="list-style-type: none">• [VLDB '25] Jinyang Liu*, Pu Jiao*, Kai Zhao, Xin Liang, Sheng Di, and Franck Cappello. “QPET: A Versatile and Portable Quantity-of-Interest-Preservation Framework for Error-Bounded Lossy Compression.” <i>arXiv preprint arXiv:2412.02799</i> (2024). (*: Co-first authors)• [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. “CUSZ-i: High-Ratio Scientific Lossy Compression on GPUs with Optimized Multi-Level Interpolation.” In <i>2024 SC24: International Conference for High Performance Computing, Networking, Storage and Analysis (SC)</i>, pp. 158-172. IEEE Computer Society, 2024. (*: 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 *Proceedings of the ACM on Management of Data* 2, no. 1 (2024): 1-27.

- **[ICS '23 (Best Paper Nomination)] 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 *Proceedings of the 37th International Conference on Supercomputing*, 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 *SC22: International Conference for High Performance Computing, Networking, Storage and Analysis*, 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.
- **[HPDC '25 (Best Paper Nomination)] Zhuoxun Yang**, Sheng Di, Longtao Zhang, Ruoyu Li, Ximiao Li, Jiajun Huang, **Jinyang Liu**, Franck Capello, and Kai Zhao. “IPComp: Interpolation Based Progressive Lossy Compression for Scientific Applications.”
- **[ICS '25] Wenqi Xia**, Zewen Hu, Youyuan Liu, Boyuan Zhang, Jinzhen Wang, **Jinyang Liu**, Wei Niu, Stavros Kalafatis, Junzhou Huang, Sian Jin, Daoce Wang, Jiannan Tian, and Miao Yin. “NeurLZ: An Online Neural Learning-based Method to Enhance Scientific Lossy Compression.”
- **[IPDPS '25] Pu Jiao**, Sheng Di, Mingze Xia, Xuan Wu, **Jinyang Liu**, Xin Liang, and Franck Capello. “Improving the Efficiency of Interpolation-Based Scientific Data Compressors with Adaptive Quantization Index Prediction.”
- **[SIGMOD '25] Longtao Zhang**, Ruoyu Li, Congrong Ren, Sheng Di, **Jinyang Liu**, Jiajun Huang, Robert Underwood, Pascal Grosset, Dingwen Tao, Xin Liang, Hanqi Guo, Franck Capello, and Kai Zhao. “High-performance Effective Scientific Error-bounded Lossy Compression with Auto-tuned Multi-component Interpolation.” In *Proceedings of the ACM on Management of Data* 3, no. 1 (2025): 1-27.
- **[PPoPP '25] Shixun Wu**, Yujia Zhai, **Jinyang Liu**, Jiajun Huang, Zizhe Jian, Huangliang Dai, Sheng Di, Zizhong Chen, and Franck Cappello. “TurboFFT: Co-Designed High-Performance and Fault-Tolerant Fast Fourier Transform on GPUs.” In *Proceedings of the 30th ACM SIGPLAN Annual Symposium on Principles and Practice of Parallel Programming*, pp. 70-84. 2025.
- **[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. “hZCCL: Accelerating Collective Communication with Co-Designed Homomorphic Compression.” In *2024 SC24: International Conference for High Performance Computing, Networking, Storage and Analysis (SC)*, pp. 1666-1680. IEEE Computer Society, 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.” In *2024 IEEE International Conference on Cluster Computing (CLUSTER)*, pp. 322-334. IEEE, 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.” In *Proceedings of the 38th ACM International Conference on Supercomputing*, pp. 437-448. 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.” In *2024 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pp. 417-429. IEEE, 2024.
- **[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.” In *2024 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pp. 752-764. IEEE, 2024.

	<ul style="list-style-type: none"> • [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." In <i>2024 IEEE 40th International Conference on Data Engineering (ICDE)</i>, pp. 4979-4992. IEEE, 2024. • [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 <i>2023 IEEE 30th International Conference on High Performance Computing, Data, and Analytics (HiPC)</i>, 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 <i>2023 IEEE 30th International Conference on High Performance Computing, Data, and Analytics (HiPC)</i>, 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 <i>Proceedings of the 37th International Conference on Supercomputing</i>, 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 <i>2023 IEEE International Conference on Cluster Computing (CLUSTER)</i>, 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 <i>2023 IEEE International Conference on Big Data (BigData)</i>, pp. 121-127. IEEE, 2023. • [ICS '21] Yujia Zhai, Elisabeth Giem, Quan Fan, Kai Zhao, Jinyang Liu, and Zizhong Chen. "FT-BLAS: a high performance BLAS implementation with online fault tolerance." In <i>Proceedings of the ACM International Conference on Supercomputing</i>, pp. 127-138. 2021.
REFEREED WORKSHOP PUBLICATIONS	<ul style="list-style-type: none"> • [IWDDR-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 <i>2023 IEEE International Conference on Big Data (BigData)</i>, pp. 4233-4239. IEEE, 2023. • [IWDDR-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 <i>2021 IEEE International Conference on Big Data (Big Data)</i>, pp. 2986-2991. IEEE, 2021.
REFEREED JOURNAL PUBLICATIONS	<ul style="list-style-type: none"> • [CSUR] Sheng Di, Jinyang Liu, Kai Zhao, Xin Liang, Robert Underwood, Zhaorui Zhang, Milan Shah et al. "A survey on error-bounded lossy compression for scientific datasets." <i>ACM Computing Surveys</i>. • [TPDS] Yujia Zhai, Elisabeth Giem, 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." <i>IEEE Transactions on Parallel and Distributed Systems</i>.
CONFERENCE POSTERS	<ul style="list-style-type: none"> • [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 Raffanetti, and Hui Zhou. "Accelerating MPI Collectives with Process-in-Process-based Multi-object Techniques." arXiv:2305.10612 (2023).
SERVICES	<ul style="list-style-type: none"> • Program Committee: ICS 2025, Cluster 2025, CCGrid 2025, ICDCS 2025, GPGPU 2025, IWDDR 2023, DRBSD-10. • Reviewer: HiPC 2024, IPDPS 2024, CCGrid 2024, ICS 2023, DCC 2023, HDIS 2022, IWDDR 2022, IWDDR 2023, DRBSD-10, ICMLA 2021, TPDS, THPC, TOMM. • Artifact Evaluation Committee: SC 2024.
TEACHING	<ul style="list-style-type: none"> • Instructor, COSC 2306: Data Programming, University of Houston, Houston, TX, September–December, 2024, January–May, 2025. • 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.
- 2024/11, presentation, **cuSZ-i: High-Ratio Scientific Lossy Compression on GPUs with Optimized Multi-Level Interpolation**, SC24: International Conference for High Performance Computing, Networking, Storage and Analysis, Atlanta, GA, 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.
- pSZ/cuSZ, <https://github.com/szcompressor/cusz/>, pSZ/cuSZ: A GPU accelerated error-bounded lossy compression for scientific data.