Jinyang Liu

Education

Ph.D. in Computer Science — *September 2019–June 2024*
University of California, Riverside, CA

M.S. in Data Science — *September 2016–July 2019*
Peking University, Beijing, China

B.S. in Mathematics and Applied Mathematics — *September 2011–July 2016*
Peking University, Beijing, China

Research Interest

High-Performance Computing
Scientific Data Management, Analysis, and Reduction
Deep Learning in High-Performance Computing and Data Compression
AI for Science

Work Experience

Assistant Professor, Department of Computer Science, University of Houston, Houston, TX, *September 2024–Present*

Research Intern, Extreme Scale Resilience Group, Argonne National Laboratory, Lemont, IL, *May 2020–June 2024*

Graduate Student Researcher, Supercomputing Laboratory, University of California, Riverside, Riverside, CA, *September 2019–June 2024*

Honours and Awards

- 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 Particapated

- **NSF CSSI FZ:** *A fine-tunable cyberinfrastructure framework to streamline specialized lossy compression development* (Collaborator)
- **NSF CSSI ROCCI:** *Integrated Cyberinfrastructure for In Situ Lossy Compression Optimization Based on Post Hoc Analysis Requirements.* (Student participator)
- **DOE ASCR SDR:** *Scalable Dynamic Scientific Data Reduction.* (Student participator)
- **NSF CDS&E HyLoC:** *Objective-driven Adaptive Hybrid Lossy Compression Framework for Extreme-Scale Scientific Application.* (Student participator)
- **ECP VeloC/SZ:** *Ensuring high reliability for long-running exascale simulations and reducing the data while keeping important scientific outcomes intact.* (Student participator)
- **ARAMCO:** *Exploration of Lossy Data Compression for Seismic Imaging Application.* (Student participator)

Refereed Conference Publications

- **[Accepted by 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." *arXiv preprint* arXiv:2412.02799 (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 *2024 SC24: International Conference for High Performance Computing, Networking, Storage and Analysis (SC)*, 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 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 *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.
- [**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 Raffenetti, 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 Raffenetti, 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.
- [**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 *2024 IEEE 40th International Conference on Data Engineering (ICDE)*, 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 *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 Raffenetti, 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 Giem, 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.

Refereed Workshop Publications

- [**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.

Refereed Journal Publications

- [**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." *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:2305.10612 (2023).

Services

- **Program Committee:** ICS 2025, Cluster 2025, CCGrid 2025, ICDCS 2025, GPGPU 2025, IWBDR 2023, DRBSD-10.
- **Reviewer:** HiPC 2024, IPDPS 2024, CCGrid 2024, ICS 2023, DCC 2023, HDIS 2022, IWBDR 2022, IWBDR 2023, DRBSD-10, ICMLA 2021, TPDS, THPC, TOMM.
- **Artifact Evaluation Committee:** SC 2024.

Teaching

- **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.