

Jinyang Liu

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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,
August 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 PARTICIPATED • **NSF CSSI ROCCI**: *Integrated Cyberinfrastructure for In Situ Lossy Compression Optimization Based on Post Hoc Analysis Requirements*
• **DOE ASCR SDR**: *Scalable Dynamic Scientific Data Reduction*
• **NSF CDS&E HyLoC**: *Objective-driven Adaptive Hybrid Lossy Compression Framework for Extreme-Scale Scientific Application*
• **ECP VeloC/SZ**: *Ensuring high reliability for long-running exascale simulations and reducing the data while keeping important scientific outcomes intact*
• **ARAMCO**: *Exploration of Lossy Data Compression for Seismic Imaging Application*

REFEREED CONFERENCE PUBLICATIONS • **[Accepted by 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." *arXiv preprint arXiv:2312.05492 (2023)*, 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 *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.
 - **[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.
 - **[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.
 - **[FAIML '19] Shuai Wang***, **Jinyang Liu***, Ye Qiu, Zhiyi Ma, Junfei Liu, and Zhonghai Wu. "Deep learning based code completion models for programming codes." In *Proceedings of the 2019 3rd International Symposium on Computer Science and Intelligent Control*, pp. 1-9. 2019. (*: Co-first authors)
 - **[ICCSE '19] Jinyang Liu**, Ye Qiu, Zhiyi Ma, and Zhonghai Wu. "Autoencoder based API recommendation system for Android programming." In *2019 14th International Conference on Computer Science Education (ICCSE)*, pp. 273-277. IEEE, 2019.

- **[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 Raffanetti, 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.
- **Reviewers:** HiPC 2024, IPDPS 2024, ICS 2023, DCC 2023, HDIS 2022, IWBDR 2022, 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, 2022.
- **Teaching Assistant**, CS211: High Performance Computing, University of California, Riverside, Riverside, CA, September–December, 2021.
- **Teaching Assistant**, CS160: Concurrent Programming and Parallel Systems, University of California, Riverside, Riverside, CA, January–March, 2021.
- **Teaching Assistant**, CS211: High Performance Computing, University of California, Riverside, Riverside, CA, September–December, 2020.

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.