Xin Liang

CONTACT

1 Bethel Valley Rd
Building 4100, Room C222
Oak Ridge, TN 37830

Phone: 951-318-9402
E-mail: liangx@ornl.gov
Web: https://lxaltria.github.io

EDUCATION

Ph.D. in Computer Science — *September 2014–December 2019*
University of California, Riverside, CA

B.S. in Computer Science — *September 2010–July 2014*
Peking University, Beijing, China

Minor in Math and Applied Math — *September 2011–July 2014*
Peking University, Beijing, China

RESEARCH INTEREST

High Performance Computing
Parallel, Distributed & Heterogeneous Systems
Lossy Compression & Data Management
Scientific Data Analysis & Visualization
Fault Tolerance & Resilience in HPC Systems
High Performance Machine Learning Algorithms & Applications
Large Scale Deep Neural Networks
Parallel File Systems & I/O Libraries

WORK EXPERIENCE

Computer/Data Scientist, Scientific Data Group, Oak Ridge National Laboratory, Oak Ridge, TN, *March 2020–present*

Research Intern, Extreme Scale Resilience Group, Argonne National Laboratory, Lemont, IL, *January 2018–December 2019*

Research Intern, Scalable Machine Learning Group, Pacific Northwest National Laboratory, Richland, WA, *October 2017–December 2017*

Research Intern, Data Science at Scale Team, Los Alamos National Laboratory, Los Alamos, NM, *June 2017–September 2017*

Research Assitant, Supercomputing Laboratory, University of California, Riverside, Riverside, CA, *September 2014–June 2017*

GRANTS

- **ESAMR:** *Enabling Scalable Analytics using Multi-precision Refactoring*, Principle Investigator, $320K/year, ORNL LDRD, 10/2020 - 09/2022.
- **SIRIUS-2:** *Science-driven Data Management for Multitier Storage 2.0*, Senior Personnel, $500K/year, DOE ASCR, 10/2020 - 09/2025.
- **RAPIDS-2:** *A SciDAC Institute for Computer Science, Data, and Artificial Intelligence*, Senior Personnel, $5.75M/year, DOE ASCR, 10/2020 - 09/2025.

OTHER PROJECTS PARTICAPATED

- **ECP-ADIOS:** *Providing A Framework For Scientific Data On Exascale Systems*
- **ECP-CODAR:** *Co-design Center For Online Data Analysis And Reduction At Exascale*
- **ECP-ExaSky:** *Computing The Sky At Extreme Scales*
- **ECP-VeloC:** *Very Low Overhead Transparent Multilevel Checkpoint/restart*
- **ECP-EZ:** *Fast, Effective, Parallel Error-bounded Exascale Lossy Compression For Scientific Data*
- **NNSA/DoE ASC BEE:** *Building and Execution Environment*

REFEREED CONFERENCE PUBLICATIONS

- [**Cluster'20**] Sihuan Li, Sheng Di, Kai Zhao, **Xin Liang**, Zizhong Chen, and Franck Cappello, "Towards End-to-end SDC Detection for HPC Applications Equipped with Lossy Compression." *Proceedings of the 22nd IEEE International Conference on Cluster Computing*, Kobe, Japan, September 14 - 17 2020. Acceptance Rate: 20% (27/132)
- [**PACT'20**] Jiannan Tian, Sheng Di, Kai Zhao, Cody Rivera, Megan Hickman, Robert Underwood, Sian Jin, **Xin Liang**, Jon Calhoun, Dingwen Tao, and Franck Cappello, "cuSZ: An Efficient GPU Based Error-Bounded Lossy Compression Framework for Scientific Data."

Proceedings of the 29th International Conference on Parallel Architectures and Compilation Techniques, Atlanta, GA, USA, October 3 - 7, 2020. Acceptance Rate: 25% (35/137)

- [**HPDC'20**] Kai Zhao, Sheng Di, **Xin Liang**, Sihuan Li, Dingwen Tao, Zizhong Chen, and Franck Cappello, "Significantly Improving Lossy Compression for HPC Datasets with Second-Order Prediction and Parameter Optimization." *Proceedings of the 28th ACM International Symposium on High-Performance Parallel and Distributed Computing*, Stockholm, Sweden, June 23 - 26, 2020. Acceptance Rate: 22% (16/71)
- [**PPOPP'20**] Jiannan Tian, Sheng Di, Chengming Zhang, **Xin Liang**, Sian Jin, Dazhao Cheng, Dingwen Tao, and Franck Cappello, "waveSZ: A Hardware-Algorithm Co-Design of Efficient Lossy Compression for Scientific Data." *Proceedings of the 25th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, San Diego, California, USA, February 22 - 26, 2020. Acceptance Rate: 23% (28/121)
- [**PacificVis'20**] **Xin Liang**, Hanqi Guo, Sheng Di, Franck Cappello, Mukund Raj, Chunhui Liu, Kenji Ono, Zizhong Chen, and Tom Peterka, "Towards Feature Preserving 2D and 3D Vector Field Compression." *Proceedings of the 13rd IEEE Pacific Visualization Symposium*, Tianjin, China, Apr 14 - 17, 2020. Acceptance Rate: 24% (23/96)
- [**SC'19**] **Xin Liang**, Sheng Di, Sihuan Li, Dingwen Tao, Bogdan Nicolae, Zizhong Chen, and Franck Cappello, "Significantly Improving Lossy Compression Quality based on An Optimized Hybrid Prediction Model." *Proceedings of the 31st ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis*, Denver, Colorado, USA, Nov 17 - 22, 2019. Acceptance Rate: 25.3% (87/344)
- [**SC'19**] Sihuan Li, Hongbo Li, **Xin Liang**, Jieyang Chen, Elisabeth Giem, Kaiming Ouyang, Kai Zhao, Sheng Di, Franck Cappello, and Zizhong Chen, "FT-iSort: Efficient Fault Tolerance for Introsort." *Proceedings of the 31st ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis*, Denver, Colorado, USA, Nov 17 - 22, 2019. Acceptance Rate: 25.3% (87/344)
- [**Cluster'19**] **Xin Liang**, Sheng Di, Dingwen Tao, Sihuan Li, Bogdan Nicolae, Zizhong Chen, and Franck Cappello, "Improving Performance of Data Dumping with Lossy Compression for Scientific Simulation." *Proceedings of the 2019 IEEE International Conference on Cluster Computing*, Albuquerque, New Mexico USA, September 23 - 26, 2019.
- [**ICS'19**] Jieyang Chen, Nan Xiong, **Xin Liang**, Dingwen Tao, Sihuan Li, Kaiming Ouyang, Kai Zhao, Nathan DeBardeleben, Qiang Guan, and Zizhong Chen, "TSM2: Optimizing Tall-and-Skinny Matrix-Matrix Multiplication on GPUs." *Proceedings of the 33rd ACM International Conference on Supercomputing*, Phoenix, AZ, USA, June 26 - 28, 2019. Acceptance Rate: 23.3% (45/193)
- [**HPDC'19**] Sian Jin, Sheng Di, **Xin Liang**, Jiannan Tian, Dingwen Tao, and Franck Cappello, "DeepSZ: A Novel Framework to Compress Deep Neural Networks by Using Error-Bounded Lossy Compression." *Proceedings of the 28th ACM International Symposium on High-Performance Parallel and Distributed Computing*, Phoenix, AZ, USA, June 24 - 28, 2019. Acceptance Rate: 20.7% (22/106)
- [**BigData'18**] **Xin Liang**, Sheng Di, Dingwen Tao, Sihuan Li, Shaomeng Li, Hanqi Guo, Zizhong Chen, and Franck Cappello, "Error-Controlled Lossy Compression Optimized for High Compression Ratios of Scientific Datasets." *Proceedings of the 2018 IEEE International Conference on Big Data*, Seattle, WA, USA, December 10 - 13, 2018. Acceptance Rate: 18.9% (98/518)
- [**BigData'18**] Sihuan Li, Sheng Di, **Xin Liang**, Zizhong Chen, and Franck Cappello, "Optimizing Lossy Compression with Adjacent Snapshots for N-body Simulation Data." *Proceedings of the 2018 IEEE International Conference on Big Data*, Seattle, WA, USA, December 10 - 13, 2018. Acceptance Rate: 18.9% (98/518)
- [**BigData'18**] Jieyang Chen, Qiang Guan, **Xin Liang**, Paul Bryant, Patricia Grubel, Allen McPherson, Li-Ta Lo, Timothy Randles, Zizhong Chen and James Ahrens, "Build and Execution Environment (BEE): an Encapsulated Environment Enabling HPC Applications Running Everywhere." *Proceedings of the 2018 IEEE International Conference on Big Data*, Seattle, WA, USA, December 10 - 13, 2018. Acceptance Rate: 18.9% (98/518)
- [**Cluster'18**] **Xin Liang**, Sheng Di, Dingwen Tao, Zizhong Chen, and Franck Cappello, "An Efficient Transformation Scheme for Lossy Data Compression with Point-wise Relative Error Bound." (**Best Paper Award in the Data, Storage, and Visualization area**) *Proceedings of the 2018 IEEE International Conference on Cluster Computing*, Belfast, UK, September 10 - 13, 2018.
- [**Cluster'18**] Ali Murat Gok, Sheng Di, Yuri Alexeev, Dingwen Tao, Vladimir Mironov, **Xin**

Liang, and Franck Cappello, "PaSTRI: Error-Bounded Lossy Compression for Two-Electron Integrals in Quantum Chemistry." (**Best Paper Award in the Application, Algorithms and Libraries area, Overall Best Paper Award**) *Proceedings of the 2018 IEEE International Conference on Cluster Computing*, Belfast, UK, September 10 - 13, 2018.

- [**Cluster'18**] Dingwen Tao, Sheng Di, **Xin Liang**, Zizhong Chen, and Franck Cappello, "Fixed-PSNR Lossy Compression for Scientific Data." (short paper) *Proceedings of the 2018 IEEE International Conference on Cluster Computing*, Belfast, UK, September 10 - 13, 2018.
- [**SC'18**] Jieyang Chen, Hongbo Li, Sihuan Li, **Xin Liang**, Panruo Wu, Dingwen Tao, Kaiming Ouyang, Yuanlai Liu, Qiang Guan, and Zizhong Chen, "FT-MAGMA: Fault Tolerance Dense Matrix Decomposition on Heterogeneous Systems with GPUs." *Proceedings of the 30th ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis*, Dallas, Texas, USA, Nov 11 - 16, 2018. Acceptance Rate: 19.1% (55/288)
- [**ICDCS'18**] Jieyang Chen, Qiang Guan, Zhao Zhang, **Xin Liang**, Louis Vernon, Allen Mcpherson, Li-Ta Lo, Zizhong Chen, Patricia Grubel, and James Ahrens, "BeeFlow : a Workflow Management System for In situ Processing Across HPC and Cloud Systems." *Proceedings of the 38th IEEE International Conference on Distributed Computing Systems*, Vienna, Austria, July 2-5, 2018. Acceptance Rate: 20.6% (78/378).
- [**HPDC'18**] Dingwen Tao, Sheng Di, **Xin Liang**, Zizhong Chen, and Franck Cappello, "Improving Performance of Iterative Methods by Lossy Checkpointing." *Proceedings of the 27th ACM International Symposium on High-Performance Parallel and Distributed Computing*, Tempe, AZ, USA, June 11 - 15, 2018. Acceptance Rate: 19.6% (22/112)
- [**SC'17**] **Xin Liang**, Jieyang Chen, Dingwen Tao, Sihuan Li, Panruo Wu, Hongbo Li, Kaiming Ouyang, Yuanlai Liu, Fengguang Song, and Zizhong Chen, "Correcting Soft Errors Online in Fast Fourier Transform." *Proceedings of the 29th ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis*, Denver, Colorado, USA, Nov 12 - 17, 2017. Acceptance Rate: 18.6% (61/327)
- [**PPoPP'17**] Panruo Wu, Qiang Guan, Nathan DeBardeleben, Sean Blanchard, Jieyang Chen, Dingwen Tao, **Xin Liang**, Sihuan Li, Kaiming Ouyang, and Zizhong Chen, "Silent Data Corruption Resilient Two-sided Matrix Factorizations." *Proceedings of the 22nd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, Austin, Texas, USA, February 4 - 8 2017. Acceptance Rate: 21.9%. 29/132)
- [**SC'16**] Jieyang Chen, Li Tan, Panruo Wu, Dingwen Tao, Hongbo Li, **Xin Liang**, Sihuan Li, Rong Ge, Laxmi Bhuyan, and Zizhong Chen, "GreenLA: Green Linear Algebra Software for GPU-Accelerated Heterogeneous Computing." *Proceedings of the 28th ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis*, Salt Lake City, Utah, USA, Nov 13 - 18, 2016. Acceptance Rate: 18.4% (82/446).
- [**HPDC'16**] Dingwen Tao, Shuaiwen Leon Song, Sriram Krishnamoorthy, Panruo Wu, **Xin Liang**, Zheng Eddy Zhang, Darren Kerbyson, and Zizhong Chen, "New-Sum: A Novel Online ABFT Scheme for General Iterative Methods." *Proceedings of the 25th ACM International Symposium on High-Performance Parallel and Distributed Computing*, Kyoto, JAPAN, May 31- June 4, 2016 Acceptance Rate: 15.5% (20/129).
- [**HPDC'16**] Panruo Wu, Qiang Guan, Nathan DeBardeleben, Sean Blanchard, Dingwen Tao, **Xin Liang**, Jieyang Chen, and Zizhong Chen, "Towards Practical Algorithm Based Fault Tolerance in Dense Linear Algebra." *Proceedings of the 25th ACM International Symposium on High-Performance Parallel and Distributed Computing*, Kyoto, JAPAN, May 31 - June 4, 2016. Acceptance Rate: 15.5% (20/129).
- [**IPDPS'16**] Jieyang Chen, **Xin Liang**, and Zizhong Chen, "Online Algorithm-Based Fault Tolerance for Cholesky Decomposition on Heterogeneous Systems with GPUs." *Proceedings of the 30th IEEE International Parallel & Distributed Processing Symposium*, Chicago, Illinois, USA, May 23-27, 2016. Acceptance Rate: 22.98% (114/496).
- [**HPCC'15**] Teresa Davies, **Xin Liang**, Jieyang Chen, Zizhong Chen, "Simulated Annealing to Generate Numerically Stable Real Number Error Correction Codes." *Proceedings of the 2015 IEEE 17th International Conference on High Performance Computing and Communications*, New York, USA, August 24 - 26, 2015

Refereed Workshop Publications

- [**DRBSD-4**] **Xin Liang**, Sheng Di, Sihuan Li, Dingwen Tao, Zizhong Chen, and Franck Cappello, "Exploring Best Lossy Compression Strategy By Combining SZ with Spatiotemporal Decimation." *Proceedings of the 4th International Workshop on Data Reduction for Big Scientific Data@SC'18*, Dallas, Texas, USA, Nov 11 - 16, 2018.
- [**DIDL-1**] Xinyu Chen, Qiang Guan, **Xin Liang**, Li-Ta Lo, Simon Su, Trilce Estrada, and

James Ahrens, "TensorViz: Visualizing the Training of Convolutional Neural Network Using Paraview." *Proceedings of the 1st Workshop on Distributed Infrastructures for Deep Learning@Middleware'17*, Las Vegas, Nevada, USA, Dec 11 - 15, 2017.

Refereed Journal Publications

- [**IJHPCA**] Franck Cappello, Sheng Di, Sihuan Li, **Xin Liang**, Ali Murat Gok, Dingwen Tao, Chun Hong Yoon, Xin-Chuan Wu, Yuri Alexeev, and Frederic T Chong, "Use Cases of Lossy Compression for Floating-Point Data in Scientific Data Sets." *The International Journal of High Performance Computing Applications*, 2019.
- [**TPDS**] Dingwen Tao, Sheng Di, **Xin Liang**, Zizhong Chen, and Franck Cappello, "Optimizing Lossy Compression Rate-Distortion from Automatic Online Selection between SZ and ZFP." *IEEE Transactions on Parallel and Distributed Systems*, 2019.
- [**TPDS**] Sheng Di, Dingwen Tao, **Xin Liang**, and Franck Cappello, "Efficient Lossy Compression for Scientific Data based on Pointwise Relative Error Bound." *IEEE Transactions on Parallel and Distributed Systems*, 2018.

Conference Posters

- [**SC'18**] Sihuan Li, Sheng Di, **Xin Liang**, Zizhong Chen, Franck Cappello, "Improving Error-bounded Compression for Cosmological Simulation." *Poster in the 30th ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis*, Dallas, Texas, USA, Nov 11 - 16, 2018.
- [**SC'17**] Xinyu Chen, Qiang Guan, **Xin Liang**, Li-Ta Lo, Trilce Estrada, and James Ahrens, "TensorViz: Visualizing the Training of Convolutional Neural Network Using Paraview." *Poster in the 29th ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis*, Denver, Colorado, USA, Nov 12 - 17, 2017.

Services

- **Programs Committees:** DRBSD, IWBDR, ChinaVis, HPCC
- **Reviewers:** TPDS, TC, JSA, JV
- **Subreviewers:** HPDC, HiPC, SC, IPDPS, HPML, ICPADS

Teaching

- **Teaching Assistant**, CS150: Automata and Formal Languages, University of California, Riverside, Riverside, CA, April–June, 2016.
- **Teaching Assistant**, CS008: Introduction to Computing, University of California, Riverside, Riverside, CA, April–June, 2016.
- **Teaching Assistant**, CS161: Design & Architecture of Computer Systems, University of California, Riverside, Riverside, CA, January–March, 2016.
- **Teaching Assistant**, CS203: Advanced Computer Architecture, University of California, Riverside, Riverside, CA, January–March, 2016.
- **Teaching Assistant**, CS010: Intro: CS for Sci, Math & Engr I, University of California, Riverside, Riverside, CA, October–December, 2015.
- **Teaching Assistant**, CS008: Introduction to Computing, University of California, Riverside, Riverside, CA, October–December, 2015.

Talks and Presentations

- 2020/2, invited talk, Fidelity-Oriented Data Reduction for Exascale Data Management, Oak Ridge National Laboratory, Oak Ridge, TN, USA.
- 2020/2, invited talk, Keeping-up with Exascale Data Flood with Adaptive Error-bounded Lossy Compression, Missouri University of Science and Technology, Rolla, MO, USA.
- 2019/12, seminar talk, Keeping-up with Exascale Data Flood with Adaptive Error-bounded Lossy Compression, Argonne National Laboratory, Lemont, IL, USA.
- 2019/11, invited talk, Keeping-up with Exascale Data Flood with Adaptive Error-bounded Lossy Compression, Oak Ridge National Laboratory, Oak Ridge, TN, USA.
- 2019/11, presentation, Significantly Improving Lossy Compression Quality based on An Optimized Hybrid Prediction Model, the 31st ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis, Denver, CO, USA.
- 2019/9, presentation, Improving Performance of Data Dumping with Lossy Compression for Scientific Simulation, the 2019 IEEE International Conference on Cluster Computing, Albuquerque, New Mexico, USA.
- 2019/04, presentation, DeepSZ: A Novel Framework to Compress Deep Neural Networks by Using Error-Bounded Lossy Compression, the Joint Laboratory for Extreme Scale Computing Workshop, Knoxville, TN, USA.

- 2019/04, poster presentation, Significantly Improving Lossy Compression Quality based on An Optimized Hybrid Prediction Model, the Joint Laboratory for Extreme Scale Computing Workshop, Knoxville, TN, USA.
- 2019/01, poster presentation, EZ: Exascale Lossy Compression for Scientific Data, 2019 ECP Annual Meeting, Houston, TX, USA.
- 2018/12, presentation, Error-Controlled Lossy Compression Optimized for High Compression Ratios of Scientific Datasets, the 2018 IEEE International Conference on Big Data, Seattle, WA, USA.
- 2018/9, presentation, An Efficient Transformation Scheme for Lossy Data Compression with Point-wise Relative Error Bound, the 2018 IEEE International Conference on Cluster Computing, Belfast, UK.
- 2017/11, presentation, Correcting Soft Errors Online in Fast Fourier Transform, the 29th ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis, Denver, Colorado, USA.
- 2015/08, presentation, Simulated Annealing to Generate Numerically Stable Real Number Error Correction Codes. 17th IEEE International Conference on High Performance Computing and Communications, New York, USA.

Honours and Awards

- Best Paper Award in the Data, Storage, and Visualization area, IEEE Cluster 2018, Belfast, UK **2018**
- Best Paper Award in the Application, Algorithms and Libraries area & Overall Best Paper Award, IEEE Cluster 2018, Belfast, UK **2018**
- Dissertation Year Program (DYP) Fellowship, University of California, Riverside, Riverside, CA, USA **2018**
- Dean's Distinguished Fellowship, University of California, Riverside, Riverside, CA, USA **2014**

Travel Grants

- Student Travel Grant, IEEE Big Data 2018 **2018**
- Student Travel Grant, IEEE Cluster 2018 **2018**
- Student Travel Grant, IEEE/ACM SC'16 **2016**
- Student Travel Grant, IEEE/ACM SC'15 **2015**

Activities

- Student Volunteer, IEEE BigData'18 **2018**
- Student Volunteer, NAS'16 **2016**
- Student Volunteer, IEEE/ACM SC'16 **2016**
- Student Volunteer, IEEE/ACM SC'15 **2015**

reference

Dr. Zizhong Chen
Professor
University of California, Riverside
E-mail: `chen@cs.ucr.edu`

Dr. Franck Cappello
Senior Computer Scientist
Argonne National Laboratory
E-mail: `cappello@mcs.anl.gov`

Dr. Scott Klasky
Distinguished Scientist
Oak Ridge National Laboratory
E-mail: `klasky@ornl.gov`

Dr. Sheng Di
Computer Scientist
Argonne National Laboratory
E-mail: `sdi1@anl.gov`