

Xin Liang

CONTACT	900 University Avenue 459 Winton Chung Hall Riverside, CA 92521	Phone: 951-318-9402 E-mail: xliao007@ucr.edu Web: https://www.cs.ucr.edu/~xliao007
EDUCATION	Ph.D. in Computer Science September 2014–present University of California, Riverside, CA Dissertation: “Towards Resilience and Data Reduction in Exascale Scientific Computing” Advisors: Dr. Zizhong Chen, and Dr. Franck Cappello (Argonne National Laboratory)	
	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	Research Intern , Extreme Scale Resilience Group, Argonne National Laboratory, Lemont, IL, January 2018–present <ul style="list-style-type: none">Designed a linear-regression-based predictor for scientific data which could provide high compression ratios with little visual loss.Proposed the log-based transform scheme to efficiently transform a relative-error-bound compression problem to an equivalent absolute-error-bound problem.Designed a hybrid scheme to unify the prediction-based compression model and transformation-based compression model as well as an adaptive selection algorithm.Studied the impact of compression speed and compression ratio on overall data dumping performance for parallel file systems and proposed an adaptive solution to automatically choose the best lossy compressor given the scale.Designed and implemented feature-preserving lossy compression algorithm for 2D and 3D piece-wise linear vector fields. Research Intern , Scalable Machine Learning Group, Pacific Northwest National Laboratory, Richland, WA, October 2017–December 2017 <ul style="list-style-type: none">Evaluated the performance of distributed deep learning framework (distributed Caffe) and identified the bottleneck of large-scale deep learning.Researched on communication reduction algorithms and communication-computation overlap techniques to scale distributed Caffe to thousands of cores on distributed systems. Research Intern , Data Science at Scale Team, Los Alamos National Laboratory, Los Alamos, NM, June 2017–September 2017 <ul style="list-style-type: none">Participated in the BEE (Build and Execution Environment) development which aims at providing a unified software stack to containerize HPC applications.Worked on in-situ visualization for deep neural networks and designed an algorithm to compress neural networks for 10x less memory and 2x less computation while retaining accuracy.Explored on applying machine learning (both supervised learning and unsupervised learning) techniques to the phase transition problem in the condensed matter theory.	

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

- Designed and implemented an efficient fault tolerant algorithm for large-scale 1D Fast Fourier Transforms.
- Participated in the development of fault tolerant algorithm for linear algebra libraries and iterative methods.
- Participated in developing the energy-efficient algorithm which uses dynamic voltage and frequency scaling (DVFS) to minimize slack between heterogeneous workers.

REFEREED
CONFERENCE &
WORKSHOP
PUBLICATIONS

1. [**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." *Accepted in the 13rd IEEE Pacific Visualization Symposium*, Tianjin, China, Apr 14 - 17, 2020
2. [**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: 20.9% (72/344)
3. [**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. Acceptance Rate: 27.7% (39/141)
4. [**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. Less than 2.6% (4/154) of submissions are awarded best papers.
5. [**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)
6. [**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)
7. [**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.
8. [**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: 20.9% (72/344)
9. [**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)
10. [**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)

11. [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)
12. [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).
13. [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.
14. [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.

REFEREED
JOURNAL
PUBLICATIONS

SERVICES

Reviewers

- [TC] IEEE Transaction on Computers **2019**
- [TPDS] IEEE Transaction on Parallel and Distributed Systems **2019**
- [JSA] Elsevier Journal of Systems Architecture: Embedded Software Design **2019**

Subreviewers

- [HPDC] ACM International Symposium on High-Performance Parallel and Distributed Computing **2019**
- [HiPC] IEEE International Conference on High- Performance Computing, Data, Analytics, and Data Science **2019**
- [SC] ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis **2018**
- [HPML] International Workshop on High Performance Machine Learning **2018**
- [ICPADS] IEEE International Conference on Parallel and Distributed Systems **2016**

External Reviewers

- [TCC] IEEE Transactions on Cloud Computing **2018**
- [HPDC] ACM International Symposium on High-Performance Parallel and Distributed Computing **2018**
- [SC] ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis **2015-2016**
- [IPDPS] IEEE International Parallel & Distributed Processing Symposium **2016**
- [PACT] International Conference on Parallel Architectures and Compilation Techniques **2015**
- [PDCAT] International Conference on Parallel and Distributed Computing, Applications and Technologies **2014**

PROJECTS
INVOLVED

- **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

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.

	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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, NM, 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, CO, 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	<ul style="list-style-type: none"> • Best Paper Award in the Data, Storage, and Visualization area, 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
GRANTS	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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
TECHNICAL SKILLS	<ul style="list-style-type: none"> • Programming Languages: C/C++, Java, Python, PHP, SQL, JavaScript, Matlab, etc. • Parallel & Distributed Systems: MPI, OpenMP, PThreads, CUDA, etc. • Deep Learning Frameworks: Caffe, TensorFlow, etc.

SOFTWARE
DEVELOPED OR
PARTICIPATED

- FP-SZ, https://github.com/lxAltria/meta_compressor.git, feature preserving lossy compression. **2019**
- FTK, <https://github.com/hguo/ftk.git>, feature tracking kit. **2019**
- LossyVeloc, <https://github.com/lxAltria/lossyVELOC.git>, integrating lossy compression in the VeloC checkpointing library. **2018**
- SZ, <https://github.com/disheng222/SZ.git>, error-bounded lossy compressor for floating point data. **2018**
- BEE, <https://github.com/lanl/BEE.git>, building and execution environment. **2017**
- FT-FFTW, <https://github.com/lxAltria/FT-FFTW.git>, fault-tolerant 1D FFT **2017**