Zhengchun Liu

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Research Work Experience

1. **Data Science and Learning, Argonne National Laboratory, U.S.A.** 2019.08 - present
   Assistant Computer Scientist
   – Data Science and Learning for Computer System(Explain, Predict and Optimize).
   – Artificial Intelligence for Science.
   – Performance modeling and characterization of high performance computing system.

2. **Computation Institute, University of Chicago, Illinois, U.S.A.** 2018.03 - 2019.08
   Research Scientist, also hold a joint appointment at Argonne National Laboratory
   – Design a scalable architecture for smart science ecosystems.
   – Embed intelligence in relevant computer systems via machine learning.

3. **Mathematics and Computer Science Division,** 2016.09 - 2018.03
   Argonne National Laboratory, Illinois, U.S.A.
   Postdoctoral Appointee, Advisor: Rajkumar Kettimuthu, Mentor: Sven Leyffer
   – Building robust analytic models for science at extreme scales
   – Modeling, simulating & optimizing for large data transfers over wide area networks.

4. **Oak Ridge National Laboratory, Tennessee, U.S.A.** 2015.12 - 2016.04
   Visiting Researcher, Host: Kalyan S. Perumalla
   – Performance modeling, verification and validation for scientific simulation on multi-GPU clusters.
   – Designed and developed a large-scale vehicle evacuation simulator on GPUs using CUDA.
   – Implemented an earthquake wave propagation model on multiple GPUs using CUDA.

Research Interests and Technical Skills

- Machine Learning for Computer System (eps. High Performance Computing systems).
- HPC and AI systems (AI Domain-Specific Architecture) for AI applications.
- Machine Learning to **solve** science problems and **accelerate** scientific applications.
- High Performance data transfer over wide-area network.
- Production-level programming and Problem solver.

</> Engineering Work Experience

1. **Xi'an FengLiTong Electronic, China** *Software Engineer (Part-time)* 2010.05 - 2013.06
   – μC/OS-II real-time operating system porting and board support package developing.
   – USB driver and filesystem on ARM Cortex-M3 MCUs for exchanging data.
   – GPS data parsing, reliable communication via GSM network.
   – Developed a backend communication server for million vehicle-traveling-data-recorders.

2. **Outsourcing Service** Founder, Embedded System Engineer 2010.09 - 2013.07
   – An integrated power management for ambulances (hardware and firmware).
   – Developed a temperature control system for machine oil-cooling (hardware and firmware).

Selected Awards, Grants & Honors

- `Best Paper` award at XLOOP'21, FGCS'21, MLN'19, MLN'18, TRIDENTCOM'18. 2021, 2018
- `Impact Argonne` award for notable achievement in Innovation. . . . . May 2020
- `Top Winner` of the first Technology Challenge at SC'19. . . . . Nov. 2019
- `Pacesetter` award by Argonne National Laboratory . . . . . Jan. 2019
- `Extraordinary Doctorate Award` by the Universitat Autònoma de Barcelona . . . . . Jun. 2018
- China National Scholarship, Ministry of Education, China
  (award to 0.2% of outstanding undergraduates) ×2 . . . . . 2008, 2009

Professional Activities and Memberships

- *Professional Membership*: Association for Computing Machinery (ACM).
- *Editorship*: Journal of Future Generation Computer Systems (FGCS), Impact Factor: 7.2.
- *Workshop Co-Chair*: SRMPDS 2017, 2018, 2019, 2020; AI-Science'19.
- *Technical Program Committee*: ICDS'19; DAAC'17-19; DLS'19; ICDCS'20; SC'20; HPCC'20; HiPC'22.
- *Journal Reviewer*: MDPI Sensors; Elsevier FGCS, JOCS; IEEE Access, TPDS.

Education

- **Universitat Autònoma de Barcelona** Barcelona, Spain
  Ph.D. in Computer Science, Advisor: Prof. Emilio Luque *2013.09 - 2016.07*
  – `Cum Laude` (the highest honor) and international mention
- **Northwestern Polytechnical University** Xi'an, China
  MSc. in Guidance, Navigation and Control *2010.09 - 2013.04*
- **Northwestern Polytechnical University** Xi'an, China
  BSc. in Aircraft Manufacturing Engineering *2006.09 - 2010.06*

Publications

§Refereed conference/workshop papers [* student/postdoc supervised]

1. Joaquin Chung, Wojciech Zacherek, AJ Wisniewski, **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu and Ian Foster. *SciStream: Architecture and Toolkit for Data Streaming between Federated Science Instruments.* ACM HPDC'2022.
2. Justin Wozniak, **Zhengchun Liu**, Rafael Vescovi, Ryan Chard, Bogdan Nicolae, Ian Foster. *Braid-DB: Toward AI-Driven Science with Machine Learning Provenance.* CCIS, vol 1512. Springer.

3. **Zhengchun Liu**, Ahsan Ali*, Peter Kenesei, Antonino Miceli, Hemant Sharma, Nicholas Schwarz, Dennis Trujillo, Hyunseung Yoo, Ryan Coffee, Ryan Herbst, Jana Thayer, Chun Hong Yoon, Ian Foster. *Bridge Data Center AI Systems with Edge Computing for Actionable Information Retrieval.* XLOOP@SC'21. ***Best Paper Awarded***.
4. Aniket Tekawade, **Zhengchun Liu**, Peter Kenesei, Tekin Bicer, Francesco De Carlo, Rajkumar Kettimuthu, Ian Foster. *3D Autoencoders For Feature Extraction In X-ray Tomography.* 2021 IEEE International Conference on Image Processing.
5. Ryan D. Lewis*, **Zhengchun Liu**, Rajkumar Kettimuthu, Michael E. Papka. *Log-Based Identification, Classification, and Behavior Prediction of HPC Applications.* HPCSYSPROS@SC'20.
6. Ziling Wu*, Tekin Bicer, **Zhengchun Liu**, Vincent De Andrade, Yunhui Zhu, Ian T. Foster. *Deep Learning-based Low-dose Tomography Reconstruction with Hybrid-dose Measurements.* AI4S@SC'20.
7. Tirthak Patel, **Zhengchun Liu**, Rajkumar Kettimuthu, Paul Rich, Bill Allcock, Devesh Tiwari. *Job Characteristics on Large-Scale Systems: Long-Term Analysis, Quantification, and Implications.* The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'20).
8. **Zhengchun Liu**, Ryan Lewis*, Rajkumar Kettimuthu, Kevin Harms, Philip Carns, Nageswara Rao, Ian Foster and Michael Papka. *Characterization and Identification of HPC Applications at Leadership Computing Facility.* International Conference on Supercomputing (ICS'20).
9. Qiao Kang, Ankit Agrawal, Alok Choudhary, Alex Sim, Kesheng Wu, Rajkumar Kettimuthu, Peter Beckman, **Zhengchun Liu** and Wei-keng Liao. *Spatiotemporal Real-Time Anomaly Detection for Supercomputing Systems.* BDPM@IEEE Big Data.
10. Nageswara Rao, Neena Imam, Rajkumar Kettimuthu, **Zhengchun Liu** and Ian Foster,*Estimation of RTT and Loss Rate of Wide-Area Connections Using MPI Measurements*, IEEE/ACM INDIS'19.
11. Nageswara Rao, Neena Imam, Rajkumar Kettimuthu, **Zhengchun Liu** and Ian Foster,*Machine Learning Methods for Connection RTT and Loss Rate Estimation Using MPI Measurements Under Random Losses*, Machine Learning for Networking (MLN'19), ***Best Paper Awarded***.
12. Vibhatha Abeykoon*, **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu, Geoffrey Fox and Ian Foster. *Scientific Image Restoration Anywhere.* XLOOP @SC'19.
13. **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu and Ian Foster. *Deep Learning Accelerated Light Source Experiments.* IEEE/ACM Deep Learning on Supercomputers DLS@SC'19.
14. Joaquin Chung, **Zhengchun Liu**, Rajkumar Kettimuthu and Ian Foster. *Toward an Elastic Data Transfer Infrastructure.* IEEE International Conference on eScience (eScience'19)
15. Yuanlai Liu*, **Zhengchun Liu**, Rajkumar Kettimuthu, Nageswara Rao, Zizhong Chen and Ian Foster. *Data transfer between scientific facilities - bottleneck analysis, insights and optimizations.* IEEE/ACM International Symposium in Cluster, Cloud, and Grid Computing (CCGrid'19).
16. **Zhengchun Liu**, Rajkumar Kettimuthu, Prasanna Balaprakash, Nageswara S. V. Rao and Ian Foster. *Building a Wide-Area Data Transfer Performance Predictor: An Empirical Study.* International Conference on Machine Learning for Networking (MLN'18).
17. Nageswara Rao, Qiang Liu, Satyabrata Sen, **Zhengchun Liu**, Rajkumar Kettimuthu, and Ian Foster. *Measurements and Analytics of Wide-Area File Transfers over Dedicated Connections.* The 20th International Conference on Distributed Computing and Networking (ICDCN'19).
18. Nageswara Rao, Satyabrata Sen, **Zhengchun Liu**, Rajkumar Kettimuthu, and Ian Foster. *Learning Concave-Convex Profiles of Data Transport Over Dedicated Connections.* International Conference on Machine Learning for Networking (MLN'18), ***Best Paper Awarded***.

19. Nageswara Rao, Qiang Liu, **Zhengchun Liu**, Rajkumar Kettimuthu, and Ian Foster. *Throughput Analytics of Data Transfer Infrastructures.* EAI Conference on Testbeds and Research Infrastructures for the Development of Networks & Communities (TRIDENTCOM'18),***Best Paper Awarded***.
20. **Zhengchun Liu**, Rajkumar Kettimuthu, Ian Foster and Yuanlai Liu. *A comprehensive study of wide area data movement at a scientific computing facility.* IEEE 38th International Conference on Distributed Computing Systems (SNTA@ICDCS'18).
21. Rajkumar Kettimuthu, **Zhengchun Liu**, Ian Foster, Peter H. Beckman, Alex Sim, John Wu, Weikeng Liao, Qiao Kang, Ankit Agrawal, and Alok Choudhary. 2018. *Toward Autonomic Science Infrastructure: Architecture, Limitations, and Open Issues.* The 1st Autonomous Infrastructure for Science workshop (AI-Science@HPDC'18).
22. **Zhengchun Liu**, Rajkumar Kettimuthu, Ian Foster and Nageswara S.V. Rao. *Cross-geography Scientific Data Transfer Trends and User Behavior Patterns.* Proceedings of the 27th International Symposium on High-Performance Parallel and Distributed Computing (HPDC'18).
23. **Zhengchun Liu**, Rajkumar Kettimuthu, Sven Leyffer, Prashant Palkar and Ian Foster. *A mathematical programming and simulation based framework to evaluate cyberinfrastructure design choices.* The 13th IEEE International Conference on eScience (IEEE eScience'17).
24. **Zhengchun Liu**, Prasanna Balaprakash, Rajkumar Kettimuthu and Ian Foster. *Explaining Wide Area Data Transfer Performance.* Proceedings of the 26th International Symposium on High-Performance Parallel and Distributed Computing (HPDC'17), 167-178.
25. **Zhengchun Liu**, Dolores Rexachs, Francisco Epelde, and Emilio Luque. *Support managing population aging stress of emergency departments in a computational way.* 2017 International Conference on Computational Science (ICCS'17), Volume 108, 2017, Pages 149-158.
26. **Zhengchun Liu**, Eduardo Cabrera, Dolores Rexachs, Francisco Epelde, and Emilio Luque. *Simulating the Micro-level Behavior of Emergency Department for Macro-level Features Prediction.* Proceedings of the 2015 Winter Simulation Conference (WSC'15). Pages 171–182
27. Xueping Zhu, **Zhengchun Liu** and Jun Yang. *Model of Collaborative UAV Swarm Toward Coordination and Control Mechanisms Study.* 2015 International Conference on Computational Science (ICCS'15), Vol 51, 493-502.
28. **Zhengchun Liu**, Eduardo Cabrera, Manel Taboada, Francisco Epelde, Dolores Rexachs and Emilio Luque. *Quantitative Evaluation of Decision Effects in the Management of Emergency Department Problems.* International Conference on Computational Science (ICCS'15), Vol 51, Pages 433-442.
29. **Zhengchun Liu**, Eduardo Cabrera, Dolores Rexachs and Emilio Luque. *A Generalized Agent-Based Model to Simulate Emergency Departments.* Proceeding of the 6th International Conference on Advances in System Simulation (SIMUL'14).

§Refereed journal papers

1. **Zhengchun Liu**, Hemant Sharma, Jun-Sang Park, Peter Kenesei, Antonino Miceli, Jonathan Almer, Rajkumar Kettimuthu and Ian Foster. *BraggNN: Fast X-ray Bragg Peak Analysis Using Deep Learning.* IUCrJ, Vol. 9, No. 1, 2022.
2. Jiali Wang, **Zhengchun Liu**, Ian Foster, Won Chang, Rajkumar Kettimuthu, Rao Kotamarthi. *Fast and accurate learned multiresolution dynamical downscaling for precipitation.* journal of Geoscientific Model Development of the European Geosciences Union.
3. Selin Aslan, **Zhengchun Liu**, Viktor Nikitin, Tekin Bicer, Sven Leyffer, Doga Gursoy. *Joint Ptycho-Tomography with Deep Generative Priorsy.* Machine Learning Science and Technology, Vol. 2, No.4

4. **Zhengchun Liu**, Rajkumar Kettimuthu, Joaquin Chung, Rachana Ananthakrishnan, Michael Link, Ian Foster. *Design and Evaluation of a Simple Data Interface for Efficient Data Transfer Across Diverse Storage.* ACM Transactions on Modeling and Performance Evaluation of Computing Systems, 2021 Vol. 6, No.1.
5. Papadimitriou, George, Cong Wang, Karan Vahi, Rafael Ferreir da Silva, Anirban Mandal, **Zhengchun Liu**, Rajiv Mayania, Mats Rynge, Mariam Kiran, Vickie E. Lynch, Rajkumar Kettimuthu, Ewa Deelman, Jeffrey S. Vetter, Ian Foster. *End-to-End Online Performance Data Capture and Analysis for Scientific Workflows.* Future Generation Computer Systems, 2021(117), ***2021 Best Paper Award***.
6. **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu, Doga Gursoy, Francesco De Carlo and Ian Foster. *TomoGAN: Low-Dose Synchrotron X-Ray Tomography with Generative Adversarial Networks.* Journal of the Optical Society of America A, Vol. 37, No. 2.
7. **Zhengchun Liu**, Rajkumar Kettimuthu, Ian Foster, Peter H. Beckman. *Towards a Smart Data Transfer Node.* Future Generation Computer Systems, 2018(89), Pages 10—18.
8. Rajkumar Kettimuthu, **Zhengchun Liu**, David Wheeler, Ian Foster, Katrin Heitmann, Franck Cappello. *Transferring a Petabyte in a Day.* Future Generation Computer Systems, 2018(88).
9. **Zhengchun Liu**, Dolores Rexachs, Francisco Epelde, and Emilio Luque. *An Agent-based Model for Quantitatively Predicting and Analyzing the Complex Behavior of Emergency Departments.* Journal of Computational Science, Vol. 21, Pages 11—23, 2017.
10. **Zhengchun Liu**, Dolores Rexachs, Francisco Epelde, and Emilio Luque. *A simulation and optimization based method for calibrating agent-based emergency department models under data scarcity.* Computers & Industrial Engineering, Vol. 103, Pages 300–309, 2017.
11. **Zhengchun Liu**, Francisco Epelde, Dolores Rexachs and Emilio Luque. *A Bottom-up Simulation Method to Quantitatively Predict Integrated Care System Performance.* International Journal of Integrated Care. 2016;16(6).
12. Linglong Li, Yaodong Yang, **Zhengchun Liu**, Stephen Jesse, Sergei V. Kalinin and Rama K. Vasudevan. *Correlation between Piezoresponse Nonlinearity and Hysteresis in Ferroelectric Crystals at Nanoscale.* Applied Physics Letters. 2016;17(108).

§Preprint

1. **Zhengchun Liu**, Rajkumar Kettimuthu, Michael E. Papka, Ian Foster. *BFTrainer: Low-Cost Training of Neural Networks on UnfillableSupercomputer Nodes.* arXiv
2. **Ahsan Ali***, Hemant Sharma, Rajkumar Kettimuthu, Peter Kenesei, Dennis Trujillo, Antonino Miceli, Ian Foster, Ryan Coffee, Jana Thayer, **Zhengchun Liu**. *fairDMS: Rapid Model Training by Data and Model Reuse.* arXiv
3. Jakob R. Elias, Ryan Chard, Maksim Levental, **Zhengchun Liu**, Ian Foster, Santanu Chaudhuri. *Real-Time Streaming and Event-driven Control of Scientific Experiments.* arXiv
4. Rafael Vescovi, Ryan Chard, Nickolaus Saint, Ben Blaiszik, Jim Pruyne, Tekin Bicer, Alex Lavens, **Zhengchun Liu**, Michael E. Papka, Suresh Narayanan, Nicholas Schwarz, Kyle Chard, Ian Foster. *Linking Scientific Instruments and HPC: Patterns, Technologies, Experiences.*

§Book Chapter

1. Rajkumar Kettimuthu, **Zhengchun Liu**, Tekin Bicer, Ian Foster. *Cyberinfrastructure and System Software for Online Analysis of Large-Scale Data: Challenges and Design Choices.* Handbook on Big Data and Machine Learning in the Physical Sciences. Volume 2: Advanced Analysis Solutions for Leading Experimental Techniques.

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