



# Zhengchun Liu

 Assistant Computer Scientist at Argonne National Laboratory

 Scientist At-Large, CASE, The University of Chicago

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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, Argonne National Laboratory, Illinois, U.S.A.** 2016.09 - 2018.03  
*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. Universitat Autònoma de Barcelona, Barcelona, Spain** 2013.09 - 2016.08  
*Research Fellow, PhD candidate, Advisor: Emilio Luque*
  - Performance modeling for scientific simulation on GPU-accelerated supercomputer.
- 5. 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.
- 6. Northwestern Polytechnical University, Xi'an, China** 2010.09 - 2013.09  
*Research Assistant*
  - Designed and developed a rapid control prototype system for designing drones.
  - Developed a distributed, hardware-in-the-loop interactive simulation system for fixed-wing drone.

## Engineering Work Experience

- 1. Xi'an FengLiTong Electronic CO. LTD. Shaanxi, China** 2010.05 - 2013.06  
*Software Engineer (Part-time)*
  - $\mu$ C/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.
  - Implemented the over-the-air firmware updating service using In-Application Programming.
  - Developed a backend communication server for million vehicle-traveling-data-recorders.

2. **Outsourcing Service** as an Embedded 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

- **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 Data Science and Learning, Argonne National Laboratory . . . . Jan. 2019
- **Extraordinary Doctorate Award** by the Universitat Autònoma de Barcelona . . . . Jun. 2018
- **The 1st Place** in the 10th Marathon of Parallel Programming Contest . . . . . Oct. 2015
- **The 1st Place** in the 5th Spanish Parallel Programming Contest . . . . . Sep. 2015
- **China National Scholarship**, Ministry of Education, China  
(award to 0.2% of outstanding undergraduate) ×2 . . . . . 2008, 2009
- **Champion of the Chinese Robot Competition** (dancing session) . . . . . Dec. 2008

## Technical Skills

- Proficient in machine learning framework such as PyTorch, Tensorflow and Scikit-Learn.
- Extensive experience with parallel programming, including MPI, CUDA, OpenCL, OpenMP.
- Rich experience in data science and machine learning, basically, transfer data into information.
- Extensive experience with embedded system, real-time OS, hardware and firmware development.

## Professional Activities and Memberships

- *Professional Membership*: Association for Computing Machinery (ACM); HiPEAC.
- *Editorship*: Journal of Future Generation Computer Systems (FGCS).
- *Co-Chair*: [SRMPDS 2017-2020](#), [AI-Science'19](#).
- *Technical Program Committee*: [ICDS'19](#), [DAAC'17-19](#), [DLS'19](#), [ICDCS'20](#), [SC'20](#).
- *Journal Reviewer*: Algorithms-, Sustainability-, Sensors-MDPI; FGCS; JOCS; IEEE-Access.

## Advising

- **Joanna Czyżewska**, Wroclaw University of Science and Technology. Poland Summer 2015
  - *European Undergraduate Summer Internship program*
  - Modeling and simulating patients who Leave Without Being Seen in emergency department;
- **Yuanlai Liu**, University of California, Riverside. U.S.A; *MSc. thesis co-chair* 2018.06 – 2019.12
  - *Graduate Research Aide*
  - Developing analytical model to explain, predict and optimize file transfer performance.
  - Smart algorithms to support HPC application with energy efficiency.

- **Vibhatha Abeykoon**, Indiana University, Bloomington. U.S.A 2019.06 – 2019.09  
 – *Summer Internship*  
 – Edge computing and Deep learning for enhancing light-source images.

## 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

## Research Project

- *Tomographic reconstruction with accelerator technology and deep learning*; 2019 Laboratory Directed Research and Development, Argonne National Laboratory; **Principal Investigator**.
- *Extreme Scale Systems for Machine Learning*; 2018 Laboratory Directed Research and Development, Argonne National Laboratory; **Principal Investigator**.
- *Robust Analytic Models for Science at Extreme Scales*; U.S. DOE; **Investigator**.
- *Architecture and Management for Autonomic Science Ecosystems*; U.S. DOE; **Investigator**.

## Publications

§Refereed conference/workshop papers [\* student advised]

1. Tirthak Patel, Devesh Tiwari, **Zhengchun Liu**, Rajkumar Kettimuthu, Paul Rich, Bill Allcock *Job Characteristics on Production-Scale HPC Systems: Quantification, Characterization and Analysis*. The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'20).
2. **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).
3. 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.
4. 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.
5. 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**.
6. Vibhatha Abeykoon\*, **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu, Geoffrey Fox and Ian Foster. *Scientific Image Restoration Anywhere*. XLOOP @SC'19.

7. **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu and Ian Foster. *Deep Learning Accelerated Light Source Experiments*. IEEE/ACM Deep Learning on Supercomputers DLS@SC'19.
8. Joaquin Chung, **Zhengchun Liu**, Rajkumar Kettimuthu and Ian Foster. *Toward an Elastic Data Transfer Infrastructure*. IEEE International Conference on eScience (eScience'19)
9. 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).
10. **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).
11. 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).
12. 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**.
13. 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**.
14. **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).
15. 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).
16. **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).
17. **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).
18. **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.
19. **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.
20. **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
21. 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.
22. **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.

23. **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**, 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. [arXiv:1902.07582].
2. **Zhengchun Liu**, Rajkumar Kettimuthu, Ian Foster, Peter H. Beckman. *Towards a Smart Data Transfer Node*. Future Generation Computer Systems, 2018(89), Pages 10—18.
3. Rajkumar Kettimuthu, **Zhengchun Liu**, David Wheeler, Ian Foster, Katrin Heitmann, Franck Cappello. *Transferring a Petabyte in a Day*. Future Generation Computer Systems, 2018(88).
4. **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.
5. **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.
6. **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).
7. 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**, Hemant Sharma, Jun-Sang Park, Peter Kenesei, Jonathan Almer, Rajkumar Kettimuthu, Ian Foster. *BraggNN: Fast X-ray Bragg Peak Analysis Using Deep Learning*. arXiv:2008.08198.
2. **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*.

### §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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