# Zhengchun Liu

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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,** 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. **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*

## Publications

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

1. Ryan D. Lewis*, **Zhengchun Liu**, Rajkumar Kettimuthu, Michael E. Papka. *Log-Based Identification, Classification, and Behavior Prediction of HPC Applications.* HPCSYSPROS@SC'20.
2. 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.
3. 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).
4. **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).
5. 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.
6. 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.
7. 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***.
8. Vibhatha Abeykoon*, **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu, Geoffrey Fox and Ian Foster. *Scientific Image Restoration Anywhere.* XLOOP @SC'19.
9. **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu and Ian Foster. *Deep Learning Accelerated Light Source Experiments.* IEEE/ACM Deep Learning on Supercomputers DLS@SC'19.
10. Joaquin Chung, **Zhengchun Liu**, Rajkumar Kettimuthu and Ian Foster. *Toward an Elastic Data Transfer Infrastructure.* IEEE International Conference on eScience (eScience'19)
11. 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).

12. **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).
13. 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).
14. 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***.
15. 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***.
16. **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).
17. 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).
18. **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).
19. **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).
20. **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.
21. **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.
22. **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
23. 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.
24. **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.
25. **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.* arXiv:2009.03190.
3. Selin Aslan, **Zhengchun Liu**, Viktor Nikitin, Tekin Bicer, Sven Leyffer, Doga Gursoy. *Distributed Optimization with Tunable Learned Priors for Robust Ptycho-Tomography.* arXiv:2009.09498

## §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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