

# Zhengchun Liu

 Research Scientist at the University of Chicago  
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## 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 Manufacturing Engineering of Flight Vehicle* 2006.09 - 2010.06  
– Overall Evaluation: 94.2/100, Ranking: 3/94; GPA: 84.6/100

## Research Work Experience

1. **Computation Institute, University of Chicago, Illinois, U.S.A.** 2018.03 - present  
*Research Scientist*, also hold a joint appointment at Argonne National Laboratory  
– Performance modeling and characterization of high performance computing system.  
– Design a scalable architecture for smart science ecosystems.  
– Explore methods for distributed and autonomous management of the systems.  
– Embed intelligence in relevant computer systems via machine learning.
2. **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  
– Simulating to explain the behavior of scientific workflows over a distributed infrastructure.  
– Designing cyberinfrastructure for on-demand scientific experiment data analysis.  
– Architecture, methods, and algorithms to support self-tune and self-manage science ecosystems.
3. **Universitat Autònoma de Barcelona, Barcelona, Spain** 2013.09 - 2016.08  
*Research Fellow, PhD candidate, Advisor: Emilio Luque*  
– Modeling & simulating hospital emergency department using HPC and agent-based model.  
– Modeling & simulation for healthcare operations management.  
– Healthcare system operation data analysis and population aging study.  
– Model verification, model parameters calibration and model validation.  
– Optimization, Parallel programming, Agent-based modeling and simulation.
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.  
– Developed a framework template for efficient simulation on multi-GPU and multi-Core 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.

5. **Northwestern Polytechnical University, Xi'an, China** 2006.09 - 2013.09  
*Research Assistant*
- Designed and developed a rapid control prototype and testbed system for designing drones.
  - Design and implement flight control algorithms on real-time embedded control systems.
  - Developed a distributed, hardware-in-the-loop interactive simulation system for fixed-wing drone.
  - Learned and earned collaborative leadership.
  - Six-Degree-of-Freedom flight dynamics model of 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
- Designed and developed a Human Machine Interfaces, and 8051 MCU based integrated power management for ambulances (hardware design and firmware programming).
  - Designed and developed a temperature control system for machine tool oil-cooling (hardware design and firmware programming).

## Selected Awards, Grants & Honors

- **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
- **The 2nd Place in the 4th Spanish Parallel Programming Contest** . . . . . Sep. 2014
- **China National Scholarship, Ministry of Education, China**  
(award to 0.2% of outstanding undergraduate students) . . . . . Oct. 2009
- **Champion of the Chinese Robot Competition** (dancing session) . . . . . Dec. 2008
- **China National Scholarship, Ministry of Education, China**  
(award to 0.2% of outstanding undergraduate students) . . . . . Oct. 2008
- **First Class Scholarship for Undergraduate Students** (three times) . . . . . 2007, 2008, 2009

## Technical Skills

- Proficient in C/C++, Python, MATLAB and Embedded C Programming.
- Extensive experience with Parallel software development, including MPI and programming models for multicore and heterogeneous architectures (e.g. CUDA, OpenCL, OpenMP).
- Familiar with cluster computing framework (e.g., Apache Spark) and massive datasets mining.
- Rich experience on backend software development.

- 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*: AJCSIT-iMedPub.
- *Co-Chair*: SRMPDS 2017; SRMPDS 2018; SRMPDS 2019; AI-Science 2019.
- *Technical Program Committee*: SIMUL 2015; SIMUL 2016; DAAC 2017; DAAC 2018.
- *External Reviewer*: COMPUTATION TOOLS 2015; Euro-Par 2017; CLUSTER 2017; HiPC 2017; WoWS 2017; IPDPS 2018; SRMPDS 2017; SRMPDS 2018.
- *Journal Reviewer*: Algorithms-MDPI; Sustainability-MDPI; Sensors-MDPI; FGCS; JOCS; AJCSIT-iMedPub (***Outstanding Reviewer***); IEEE-Access.

## Advising

- **Zhaoyang Liu**, Northwestern Polytechnical University. China Summer 2013
  - *Summer Internship*
  - Developing a distributed, hardware-in-the-loop simulation system for fixed-wing drone.
- **Joanna Czyżewska**, Wrocław 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;
  - Characterizing overcrowding in emergency department under unforeseen scenarios.
- **Yuanlai Liu**, University of California, Riverside. U.S.A 2018.06 – 2018.09
  - *Summer Internship*
  - Collecting system data about end-to-end file transfer.
- **Yuanlai Liu**, University of California, Riverside. U.S.A 2018.09 – present
  - *Graduate Research Aide*
  - Developing analytical model to explain, predict and possibly optimize the transfer performance.
  - Smart HPC for energy efficiency.

## Research Project

- *Robust Analytic Models for Science at Extreme Scales*; U.S. Department of Energy; **Investigator**.
- *Architecture and Management for Autonomic Science Ecosystems*; U.S. Department of Energy; **Investigator**.
- *Extreme Scale Systems for Machine Learning*; Argonne National Laboratory; **Principal Investigator**.

## Publications

### §Refereed conference/workshop papers

1. **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu, Doga Gursoy, Francesco De Carlo and Ian Foster. *TomoGAN: Low-Dose X-Ray Tomography with Generative Adversarial Networks*. [arXiv:1902.07582].

2. Yuanlai Liu, **Zhengchun Liu**, Rajkumar Kettimuthu, Nageswara S. V. Rao, Zizhong Chen and Ian Foster. *Data transfer between scientific facilities - bottleneck analysis, insights and optimizations*. The 19th Annual IEEE/ACM International Symposium in Cluster, Cloud, and Grid Computing (CCGrid 2019)[in press].
3. **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).
4. 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).
5. 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**.
6. Nageswara Rao, Qiang Liu, **Zhengchun Liu**, Rajkumar Kettimuthu, and Ian Foster. *Throughput Analytics of Data Transfer Infrastructures*. The 13th EAI International Conference on Testbeds and Research Infrastructures for the Development of Networks & Communities (TRIDENTCOM'18), **Best Paper Awarded**.
7. 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).
8. **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).
9. **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).
10. **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.
11. **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.
12. **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
13. 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.
14. **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.
15. **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**, Rajkumar Kettimuthu, Ian Foster, Peter H. Beckman. *Towards a Smart Data Transfer Node*. Future Generation Computer Systems, 2018(89), Pages 10-18.
2. Rajkumar Kettimuthu, **Zhengchun Liu**, David Wheeler, Ian Foster, Katrin Heitmann, Franck Cappello. *Transferring a Petabyte in a Day*. Future Generation Computer Systems, 2018(88).
3. **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.
4. **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.
5. **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).
6. 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).

### §Invited paper

1. **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).

### §Other selected papers

1. **Zhengchun Liu** and Emilio Luque. Modeling and Simulation for Healthcare Operations Management using High Performance Computing and Agent-Based Model. [thesis overview] Journal of Computer Science & Technology, Vol. 17, No. 1, 2017.
2. **Zhengchun Liu**. High Performance Computing Based Simulation for Healthcare Decision Support. The Second International BSC Doctoral Symposium, Barcelona, Spain. May 5 - 7, 2015.
3. **Zhengchun Liu**, Qi Liu and Jun Yang. Research on Missile's Integrated Testing Platform Based on HLA. Computer and Modernization. 2013, 1(6): 179-181.
4. Xueping Zhu, **Zhengchun Liu**, and Jun Yang. Research on Co-simulation Method in ADAMS and MATLAB for Missile Seeker's Stabilization Platform Design. AsiaSim 2013. November 6 - 8, 2013.
5. **Zhengchun Liu**, and Jun Yang. Design and Implementation of a Missile Seeker Virtual Test-Bed Based on High Level Architecture. Proceedings of the 3d MACE. July 27-29, 2012.

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