# Zhengchun Liu

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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.
– Effective communication skills were improved through collaborating with more than 20 engineers.

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

- 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.
- *Co-Chair*: SRMPDS 2017; SRMPDS 2018; SRMPDS 2019.
- *Technical Program Committee*: SIMUL 2015; SIMUL 2016; DAAC 2017
- *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; FGCS; AJCSIT; 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**, 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;
  – 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**, 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).
2. 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).

3. 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)
4. 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)
5. 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).
6. **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).
7. **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).
8. **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.
9. **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.
10. **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
11. 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.
12. **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.
13. **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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