Zhengchun Liu

Assistant Computer Scientist at Argonne National Laboratory
https://lzhengchun.github.io, LinkedIn, GitHub
zhengchun.liu(-AT-)anl.gov
+1-630-252-3474

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).
   – Deep Learning in High Performance Computing environment.
   – Artificial Intelligence for Science.

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
   – 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.

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
   – 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.

4. **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.

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.
   – 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.

6. **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)*
   – 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.
   – 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

- `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
- 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 programming, including MPI, CUDA, OpenCL, OpenMP.
- Rich Experienced in backend software development, data mining and machine learning.
- 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'17; SRMPDS'18; SRMPDS'19; AI-Science'19.
- *Technical Program Committee*: SIMUL'15; SIMUL'16; DAAC'17; DAAC'18; DLonSC'19.
- *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; 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;
- **Yuanlai Liu**, University of California, Riverside. U.S.A — 2018.06 – 2019.06
  – *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 – present
  – *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

1. 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.

   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*, International Conference on Machine Learning for Networking (MLN'19).

2. Vibhatha Abeykoon, **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu, Geoffrey Fox and Ian Foster. *Scientific Image Restoration Anywhere.* XLOOP @SC'19.

3. **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu and Ian Foster. *Deep Learning Accelerated Light Source Experiments.* IEEE/ACM Workshop on Deep Learning on Supercomputers DLS@SC'19

4. Joaquin Chung, **Zhengchun Liu**, Rajkumar Kettimuthu and Ian Foster. *Elastic Data Transfer Infrastructure for a Dynamic Science DMZ.* IEEE International Conference on eScience (eScience'19)

5. **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].

6. Yuanlai Liu, **Zhengchun Liu**, Rajkumar Kettimuthu, Nageswara 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'19).

7. **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).

8. 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).

9. 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***.

10. 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***.

11. **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).

12. 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).

13. **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).

14. **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).

15. **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.
16. **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.
17. **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
18. 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.
19. **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.
20. **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).

– Last updated on December 3, 2019