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Zhengchun Liu

Machine Learning Scientist, PhD

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With 9+ years conducting research around data, Zhengchun currently works at the intersection of machine learning and large scale computer systems at AWS AI Labs.

Research Experience

Machine Learning Scientist — **Aug. 2022 — present**
AI Labs, Amazon Web Service (AWS) — *California, U.S.A.*
- Machinea Learning for large scale data systems.

Computer Scientist — **Aug. 2019 — Aug. 2022**
Data Science and Learning division, Argonne National Laboratory — *Illinois, U.S.A.*
- Artificial Intelligence for Science.
- HPC/Systems for Artificial Intelligence applications
- Data Science and Machine Learning for HPC System(Characterization, Predict and Optimize).

Research Scientist — **Mar. 2018 — Aug. 2019**
Computation Institute, University of Chicago — *Illinois, U.S.A.*
- Performance modeling and characterization of high performance computing system.
- Design a scalable architecture for smart science ecosystems.
- Methods for distributed and autonomous management of the systems.

Postdoctoral researcher — **Sep. 2016 — Mar. 2018**
Mathematics and Computer Science division, Argonne National Laboratory — *Illinois, U.S.A.*
- High performance file transfer over wide-area network.
- Building robust analytic models for science at extreme scales.
- Simulating to explain the behavior of scientific workflows over a distributed infrastructure.

Engineering Experience

Software Engineer (Part-time) — **May 2010 — Jun. 2013**
Xi'an FengLiTong Electronic — *China.*
- Board Support Package development for μC/OS-II real-time operating system.
- Developed a backend communication service for million vehicle-traveling-data-recorders.
- USB driver, file-system, GPS driver and GPRS communication and over-the-air firmware update on Cortex-M3.

Embedded System Outsourcing (Founder) — **Sep. 2010 — Jul. 2013**
- A temperature control system for machine oil-cooling (hardware and firmware).
- An integrated power management and delivery system for ambulances (hardware and firmware).

Selected Awards, Grants & Honors

- `Best Paper` award at XLOOP'21, FGCS'21, MLN'19, MLN'18, TRIDENTCOM'18. — 2021, 2018
- `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 Argonne National Laboratory — Jan. 2019
- `Extraordinary Doctorate Award` by Autonomous University of Barcelona — Jun. 2018
- `National Scholarship` by Ministry of Education, China (award to 0.2% of outstanding undergraduates) $\times 2$ — 2008, 2009

Education

- **PhD., Computer Science**, Autonomous University of Barcelona, Spain — Jul. 2016
- **MSc., Guidance, Navigation and Control**, Northwestern Polytechnical University, China — Apr. 2013
- **BSc., Aircraft Manufacturing Engineering**, Northwestern Polytechnical University, China — Jun. 2010

Activities

- `Professional Membership`: Association for Computing Machinery (ACM).
- `Editorship`: Journal of Future Generation Computer Systems (FGCS), Impact Factor: 7.2.
- `Workshop Co-Chair`: SRMPDS 2017, 2018, 2019, 2020; AI-Science'19.
- `Technical Program Committee`: ICDS'19; DAAC'17-19; DLS'19; ICDCS'20; SC'20; HPCC'20; HiPC'22.
- `Journal Reviewer`: MDPI Sensors; Elsevier FGCS, JOCS; IEEE Access, TPDS.

Selected Publications

Full list: Google Scholar

Papers on Machine Learning and Systems

1. **Zhengchun Liu**, Rajkumar Kettimuthu, Michael E. Papka, Ian Foster. ***BFTrainer: Low-Cost Training of Neural Networks on Unfillable Supercomputer Nodes***. arXiv:2106.12091
2. Ahsan Ali*, Hemant Sharma, Rajkumar Kettimuthu, Peter Kenesei, Dennis Trujillo, Antonino Miceli, Ian Foster, Ryan Coffee, Jana Thayer, **Zhengchun Liu**. ***fairDMS: Rapid Model Training by Data and Model Reuse***. 2022 IEEE International Conference on Cluster Computing. arXiv:2204.09805
3. Tirthak Patel, Devesh Tiwari, Raj Kettimuthu, William Allcock, Paul Rich and **Zhengchun Liu**. ***What does Inter-Cluster Job Submission and Execution Behavior Reveal to Us?***. 2022 IEEE International Conference on Cluster Computing.
4. Jakob R. Elias, Ryan Chard, Maksim Levental, **Zhengchun Liu**, Ian Foster, Santanu Chaudhuri. ***Real-Time Streaming and Event-driven Control of Scientific Experiments***. arXiv:2205.01476
5. Rafael Vescovi, Ryan Chard, Nickolaus Saint, Ben Blaiszik, Jim Pruyne, Tekin Bicer, Alex Lavens, **Zhengchun Liu**, Michael E. Papka, Suresh Narayanan, Nicholas Schwarz, Kyle Chard, Ian Foster. ***Linking Scientific Instruments and HPC: Patterns, Technologies, Experiences***.arXiv:2204.05128
6. Joaquin Chung, Wojciech Zacherek, AJ Wisniewski, **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu and Ian Foster. ***SciStream: Architecture and Toolkit for Data Streaming between Federated Science Instruments***. ACM HPDC'2022.
7. **Zhengchun Liu**, Ahsan Ali*, Peter Kenesei, Antonino Miceli, Hemant Sharma, Nicholas Schwarz, Dennis Trujillo, Hyunseung Yoo, Ryan Coffee, Ryan Herbst, Jana Thayer, Chun Hong Yoon, Ian Foster. ***Bridge Data Center AI Systems with Edge Computing for Actionable Information Retrieval***. XLOOP@SC'21. ***Best Paper Awarded***.
8. **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***. ACM Transactions on Modeling and Performance Evaluation of Computing Systems, 2021 Vol. 6, No.1.
9. Papadimitriou, George, Cong Wang, Karan Vahi, Rafael Ferreir da Silva, Anirban Mandal, **Zhengchun Liu**, Rajiv Mayania, Mats Rynge, Mariam Kiran, Vickie E. Lynch, Rajkumar Kettimuthu, Ewa Deelman, Jeffrey S. Vetter, Ian Foster. ***End-to-End Online Performance Data Capture and Analysis for Scientific Workflows***. Future Generation Computer Systems, Vol. 117, 2021, Pages 387-400, ***2021 Best Paper Award***.
10. Tirthak Patel, **Zhengchun Liu**, Rajkumar Kettimuthu, Paul Rich, Bill Allcock, Devesh Tiwari. ***Job Characteristics on Large-Scale Systems: Long-Term Analysis, Quantification, and Implications***. The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'20).
11. **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).
12. 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).
13. **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).
14. **Zhengchun Liu**, Rajkumar Kettimuthu, Ian Foster, Peter H. Beckman. ***Towards a Smart Data Transfer Node***. Future Generation Computer Systems, 2018(89), Pages 10—18.
15. Rajkumar Kettimuthu, **Zhengchun Liu**, David Wheeler, Ian Foster, Katrin Heitmann, Franck Cappello. ***Transferring a Petabyte in a Day***. Future Generation Computer Systems, 2018(88).
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, Wei-keng 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***. 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***. IEEE International Conference on eScience.
20. **Zhengchun Liu**, Prasanna Balaprakash, Rajkumar Kettimuthu and Ian Foster. ***Explaining Wide Area Data Transfer Performance***. International Symposium on High-Performance Parallel and Distributed Computing (HPDC'17), 167-178.

Papers on AI/HPC for Science

1. **Zhengchun Liu**, Hemant Sharma, Jun-Sang Park, Peter Kenesei, Antonino Miceli, Jonathan Almer, Rajkumar Kettimuthu and Ian Foster. ***BraggNN: Fast X-ray Bragg Peak Analysis Using Deep Learning***. IUCrJ, Vol. 9, No. 1, 2022.
2. Aniket Tekawade, **Zhengchun Liu**, Peter Kenesei, Tekin Bicer, Francesco De Carlo, Rajkumar Kettimuthu, Ian Foster. ***3D Autoencoders For Feature Extraction In X-ray Tomography***. 2021 IEEE International Conference on Image Processing.
3. Jiali Wang, **Zhengchun Liu**, Ian Foster, Won Chang, Rajkumar Kettimuthu, Rao Kotamarthi. ***Fast and accurate learned multiresolution dynamical downscaling for precipitation***. journal of Geoscientific Model Development.
4. Selin Aslan, **Zhengchun Liu**, Viktor Nikitin, Tekin Bicer, Sven Leyffer, Doga Gursoy. ***Joint Ptycho-Tomography with Deep Generative Priors***. Machine Learning Science and Technology, 2021, Vol. 2, No.4
5. 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.
6. **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***. Optical Society of America A, 2020, Vol. 37, No. 2.
7. Vibhatha Abeykoon*, **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu, Geoffrey Fox and Ian Foster. ***Scientific Image Restoration Anywhere***. XLOOP @SC'19.
8. **Zhengchun Liu**, Tekin Bicer, Rajkumar Kettimuthu and Ian Foster. ***Deep Learning Accelerated Light Source Experiments***. IEEE/ACM Deep Learning on Supercomputers DLS@SC'19.
9. **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, 2017.
10. 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.
11. **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.
12. **Zhengchun Liu**, Eduardo Cabrera, Dolores Rexachs and Emilio Luque. ***A Generalized Agent-Based Model to Simulate Emergency Departments***. The 6th International Conference on Advances in System Simulation (SIMUL'14).

– Last updated on September 3, 2022