Qinglei Cao

✉ qinglei.cao@slu.edu   📱 (865) 686-2069   🏠 St. Louis, MO, US   ℮ www.qingleicao.com

🔖 RESEARCH INTERESTS

Parallel and distributed computing, Task-based runtime systems, Linear algebra algorithms, Extreme-scale climate and weather modeling, and Large-scale machine learning & deep learning

🎓 EDUCATION

The University of Tennessee, Knoxville (UTK), Computer Science   2016 - 2022
PhD, High Performance Computing
Advisor: Dr. Jack Dongarra (Turing Award 2021)
Group Leader & Co-Advisor: Dr. George Bosilca

Ocean University of China (OUC), Computer Application Technology   2013 - 2016
MS, Image Processing & Parallel Computing
Advisors: Dr. Yuntao Qian (Zhejiang University), Dr. Zhiqiang Wei (OUC)

Hunan University (HNU), Information and Computational Science   2005 - 2009
BS, Mathematics

💼 PROFESSIONAL EXPERIENCE

Department of Computer Science, Saint Louis University (SLU)   St. Louis, MO
Assistant Professor   2023 - Present

Innovative Computer Laboratory (ICL), UTK   Knoxville, TN
Post-Doctoral Research Associate   2023

Cerebras Systems, Inc.   Sunnyvale, CA
Member of Technical Staff   2022 - 2023

Innovative Computer Laboratory (ICL), UTK   Knoxville, TN
Graduate Research Assistant   2017 - 2022

Cerebras Systems, Inc.   Sunnyvale, CA
Summer Intern   2021

Cadence Design Systems, Inc.   Austin, TX
Summer Intern   2020

National University of Defense Technology (NUDT)   Changsha, China
HPC Software Developer & Research Scientist   2010 - 2013

🏆 HONORS & AWARDS

◇ ACM Gordon Bell Prize, Finalist   2024

◇ ACM Gordon Bell Prize for Climate Modelling, Finalist   2024

◇ 20,000 Node Hours on Frontier Supercomputer, Oak Ridge National Laboratory, US   2024

◇ 206,780 Node Hours on Summit Supercomputer, Oak Ridge National Laboratory, US   2024

◇ 20,000 Node Hours on Frontier Supercomputer, Oak Ridge National Laboratory, US   2024

◇ ACM Gordon Bell Prize, Finalist   2022

◇ 4,000,000 Node Hours on Fugaku Supercomputer, RIKEN, Japan   2022

◇ SIAM Student Travel Award   2021

◇ 40,000 Node Hours on Summit Supercomputer, Oak Ridge National Laboratory, US   2021

◇ Best Paper Award, CLUSTER   2020

◇ Graduate Student Senate (GSS) Travel Awards, UTK   2020

◇ Honor of Outstanding Graduates, OUC   2014

◇ Graduate Student Scholarship, OUC   2014

◇ Honor of Annual Advanced Worker, NUDT   2010, 2011

◇ Honor of Bronze Medal of TianHe-1A, NUDT   2010

◇ Outstanding Scholarship, HNU   2006, 2007

◇ Honor of Excellent Student Cadre, HNU   2006

📖 PUBLICATIONS

1   Hatem Ltaief, Rabab Alomairy, Jie Ren, Qinglei Cao, Lotfi Slim, Salim Bougouffa, David Ruau4, Rached Abdelkhalek, and David E. Keyes. Toward Capturing Genetic Epistasis From Multivariate Genome-Wide Association Studies Using Mixed-Precision Kernel Ridge Regression. ACM Gordon Bell Prize Finalist, 2024

2   Sameh Abdulah, Allison H. Baker, George Bosilca, Qinglei Cao, Stefano Castruccio, Marc G. Genton, David E. Keyes, Zubair Khalid, Hatem Ltaief, Yan Song, Georgiy L. Stenchikov, and Ying Sun. Boosting Earth System Model Outputs And Saving PetaBytes in their Storage Using Exascale Climate Emulators. ACM Gordon Bell Prize for Climate Modelling Finalist, 2024

3   Shihui Song, Yafan Huang, Peng Jiang, Xiaodong Yu, Weijian Zheng, Sheng Di, Qinglei Cao, Yunhe Feng, Zhen Xie, and Franck Cappello. CereSZ: Enabling and Scaling Error-bounded Lossy Compression on Cerebras CS-2. International Symposium on High-Performance Parallel and Distributed Computing (HPDC), 2024

4   Kareem Shaik, Dali Wang, Weijian Zheng, Qinglei Cao, Heng Fan, Peter Schwartz, and Yunhe Feng. S3LLM : Large-Scale Scientific Software Understanding with LLMs using Source, Metadata, and Document. International Conference on Computational Science (ICCS), 2024

5   Qinglei Cao, Thomas Herault, Aurelien Bouteiller, Joseph Schuchart, and George Bosilca. Evaluating PaRSEC through Matrix Computations in Scientific Applications. Workshop on Asynchronous Many-Task Systems and Applications (WAMTA), 2024

6   Qinglei Cao, Dali Wang, Zhuowei Gu, Yunhe Feng, Weijian Zheng, and Peter Schwart. Mixed-Precision for Extreme-Scale Geostatistical Modeling on Heterogeneous Platforms. International Congress on Environmental Modelling and Software (iEMSs, Abstract), 2024

7   Qinglei Cao, Sameh Abdulah, Hatem Ltaief, Marc G Genton, David E Keyes, and George Bosilca. Reducing Data Motion and Energy Consumption of Geospatial Modeling Applications Using Automated Precision Conversion. IEEE International Conference on Cluster Computing (CLUSTER), 2023

8   Qinglei Cao, Sameh Abdulah, Rabab Alomairy, Yu Pei, Pratik Nag, George Bosilca, Jack Dongarra, Marc G Genton, David E Keyes, Hatem Ltaief, and Ying Sun. Reshaping geostatistical modeling and prediction for extreme-scale environmental applications. International Conference for High Performance Computing, Networking, Storage and Analysis (SC, ACM Gordon Bell Prize Finalist), 2022

9   Qinglei Cao, Rabab Alomairy, Yu Pei, George Bosilca, Hatem Ltaief, David Keyes, and Jack Dongarra. A framework to exploit data sparsity in tile low-rank Cholesky factorization. IEEE International Parallel & Distributed Processing Symposium (IPDPS), 2022

10   Qinglei Cao, George Bosilca, Nuria Losada, Wei Wu, Dong Zhong, and Jack Dongarra. Evaluating data redistribution in parsec. IEEE Transactions on Parallel and Distributed Systems (TPDS), 2022

11   Sameh Abdulah, Qinglei Cao, Yu Pei, George Bosilca, Jack Dongarra, Marc G. Genton, David E. Keyes, Hatem Ltaief, and Ying Sun. Accelerating geostatistical modeling and prediction with mixed-precision computations: A high-productivity approach with parsec. IEEE Transactions on Parallel and Distributed Systems (TPDS), 2022

12 Qinglei Cao, Yu Pei, Kadir Akbudak, George Bosilca, Hatem Ltaief, David Keyes, and Jack Dongarra. Leveraging parsec runtime support to tackle challenging 3d data-sparse matrix problems. IEEE International Parallel and Distributed Processing Symposium (IPDPS), 2021

13 Dong Zhong, Qinglei Cao, George Bosilca, and Jack Dongarra. Using long vector extensions for MPI reductions. Parallel Computing (PARCO), 2021

14 Yunhe Feng, Dong Zhong, Peng Sun, Weijian Zheng, Qinglei Cao, Xi Luo, and Zheng Lu. Micromobility in smart cities: A closer look at shared dockless e-scooters via big social data. IEEE International Conference on Communications (ICC), 2021

15 Qinglei Cao, George Bosilca, Wei Wu, Dong Zhong, Aurelien Bouteiller, and Jack Dongarra. Flexible data redistribution in a task-based runtime system. IEEE International Conference on Cluster Computing (CLUSTER), 2020

16 Qinglei Cao, Yu Pei, Kadir Akbudak, Aleksandr Mikhalev, George Bosilca, Hatem Ltaief, David Keyes, and Jack Dongarra. Extreme-Scale Tile Low-Rank Cholesky Factorization Using the PaRSEC Task-Based Runtime. ACM Platform for Advanced Scientific Computing Conference (PASC), 2020

17 Qinglei Cao, Yu Pei, Kadir Akbudak, Aleksandr Mikhalev, George Bosilca, Hatem Ltaief, David Keyes, and Jack Dongarra. Extreme-scale task-based Cholesky factorization toward climate and weather prediction applications. ACM Platform for Advanced Scientific Computing Conference (PASC Poster), 2020

18 Elliott Slaughter, Wei Wu, Yuankun Fu, Legend Brandenburg, Nicolai Garcia, Wilhem Kautz, Emily Marx, Kaleb S. Morris, Qinglei Cao, George Bosilca, Seema Mirchandaney, Wonchan Lee, Sean Treichler, Patrick McCormick, and Alex Aiken. Task bench: a parameterized benchmark for evaluating parallel runtime performance. IEEE/ACM International Conference for High Performance Computing, Networking, Storage and Analysis (SC), 2020

19 Xi Luo, Wei Wu, George Bosilca, Yu Pei, Qinglei Cao, Thananon Patinyasakdikul, Dong Zhong, and Jack Dongarra. Han: a hierarchical autotuned collective communication framework. IEEE International Conference on Cluster Computing (CLUSTER, Best paper), 2020

20 Dong Zhong, Qinglei Cao, George Bosilca, and Jack Dongarra. Using advanced vector extensions AVX-512 for MPI reductions. ACM European MPI Users' Group Meeting (EuroMPI), 2020

21 Dong Zhong, Pavel Shamis, Qinglei Cao, George Bosilca, Shinji Sumimoto, Kenichi Miura, and Jack Dongarra. Using ARM scalable vector extension to optimize OpenMPI. IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (CCGRID), 2020

22 Yu Pei, Qinglei Cao, George Bosilca, Piotr Luszczek, Victor Eijkhout, and Jack Dongarra. Communication avoiding 2d stencil implementations over PaRSEC task-based runtime. IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW), 2020

23 Qinglei Cao, Yu Pei, Thomas Herault, Kadir Akbudak, Aleksandr Mikhalev, George Bosilca, Hatem Ltaief, David Keyes, and Jack Dongarra. Performance analysis of tile low-rank Cholesky factorization using parsec instrumentation tools. IEEE/ACM International Workshop on Programming and Performance Visualization Tools (ProTools at SC), 2019

24 Yan Yan, Jie Nie, Lei Huang, Zhen Li, Qinglei Cao, and Zhiqiang Wei. Exploring relationship between face and trustworthy impression using mid-level facial features. International Conference on Multimedia Modeling (MMM), 2016

25 Yan Yan, Jie Nie, Lei Huang, Zhen Li, Qinglei Cao, and Zhiqiang Wei. Is your first impression reliable? trustworthy analysis using facial traits in portraits. International Conference on Multimedia Modeling (MMM), 2015

⧖ PROFESSIONAL ACTIVITIES

⬦ **Editorial Board**

    ☞ American Journal of Computer Science and Technology   2023 - 2024

⬦ **Local Organizer**

☞ Workshop on Asynchronous Many-Task Systems and Applications   2025

⋄ **Technical Program Chair**

☞ Workshop on Asynchronous Many-Task Systems and Applications   2025

⋄ **Technical Program Committee**

☞ International Conference on Parallel Processing (ICPP)   2024

☞ Association for the Advancement of Artificial Intelligence (AAAI) Undergraduate Consortium   2024

☞ International Supercomputing Conference (ISC) High Performance   2024

☞ International Parallel & Distributed Processing Symposium (IPDPS)   2024

☞ Workshop on HPC on Heterogeneous Hardware   2022, 2023

☞ Intl Conference for High Performance Computing, Networking, Storage and Analysis AD/AE (SC) 2021

☞ Intl Conference on Advances and Trends in Software Engineering (SOFTENG)   2021 - 2024

⋄ **Conference & Journal External Reviewer**

☞ Workshop on Asynchronous Many-Task Systems and Applications   2024

☞ Parallel Computing   2023

☞ Journal of Supercomputing   2023

☞ IEEE Transactions on Multimedia   2023

☞ ACM Transactions on Mathematical Software (TOMS)   2023

☞ International Conference on Emerging Information Security and Applications   2022

☞ Intl Conference for High Performance Computing, Networking, Storage and Analysis (SC)   2020, 2021

☞ PeerJ Computer Science   2021

☞ International Conference on Cluster Computing (CLUSTER)   2020

☞ International Conferences on High Performance Computing and Communications (HPCC)   2020, 2021

⬢ TEACHING EXPERIENCE

⋄ **Lecturer**

☞ CSCI 4620/5620 **Distributed Computing**   Fall 2024, SLU

☞ CSCI 4620/5620 **Distributed Computing**   Spring 2024, SLU

☞ CSCI 4620/5620 **Distributed Computing**   Fall 2023, SLU

⋄ **Teaching Assistant**

☞ COSC 594 **Scientific Computing for Engineers**   Spring 2018, UTK

☞ COSC 361 **Operating Systems**   Spring 2017, UTK

☞ COSC 361 **Operating Systems**   Fall 2016, UTK

⋄ **Guest Lecturer**

☞ CSCI 5090 **Computer Science Colloquium**   Fall 2023, SLU

☞ CSCE 5300 **Introduction to Big Data and Data Science**   Fall 2023, UNT

☞ CSCE 5300 **Introduction to Big Data and Data Science**   Spring 2023, UNT

⊗ PRESENTATIONS & TALKS

◇ **Paper Presentation**

☞ Workshop on Asynchronous Many-Task Systems and Applications (WAMTA)   2024

☞ International Conference on Cluster Computing (CLUSTER)   2023

☞ International Parallel and Distributed Processing Symposium (IPDPS)   2021, 2022

☞ International Conference on Cluster Computing (CLUSTER)   2020

☞ Platform for Advanced Scientific Computing Conference (PASC)   2020

☞ International Workshop on Programming and Performance Visualization Tools (ProTools at SC)   2019

◇ **Talk**

☞ Annual Workshop on Charm++ and Its Applications   2024

☞ Innovative Computer Laboratory (ICL) Lunch Talk   2019, 2020, 2021, 2022

☞ Joint Laboratory on Extreme Scale Computing Workshop (JLESC)   2021

☞ SIAM Conference on Computational Science and Engineering (CSE)   2021

☞ SIAM Conference on Parallel Processing for Scientific Computing (PP)   2020

◇ **Poster**

☞ Joint Laboratory on Extreme Scale Computing Workshop (JLESC)   2020

☞ Platform for Advanced Scientific Computing Conference (PASC)   2020

♥ OPEN SOURCE CONTRIBUTIONS

◇ [**PaRSEC**]: Task-based runtime system, funded by Exascale Computing Project (ECP)

◇ [**DPLASMA**]: Leading implementation of a dense linear algebra package for distributed system

◇ [**HiCMA**]: Low-rank math library of exploiting the data sparsity of the matrix operator

◇ [**ExaGeostat**]: Parallel high performance unified framework for computational geostatistics

📖 MEDIA COVERAGE

◇ Gordon Bell Prize Finalists Develop Method for More Efficient Computing[AAAS Eurekalert][HLRS News]

◇ KAUST Supercomputing Expertise Shines at SC22[KAUST News]

◇ Inside the Gordon Bell Prize Finalist Projects[HPCwire]

◇ SC22 Unveils ACM Gordon Bell Prize Finalists[HPCwire]

◇ 2022 ACM Gordon Bell Prize Finalists Announced[Communications of the ACM]

◇ What's New in HPC Research: EXA2PRO, DQRA, and HiCMA-PaRSE Frameworks & More[HPCwire]

◇ KAUST Leverages Mixed Precision for Geospatial Data[HPCwire]

◇ Mixing Precision for Model Acceleration[Tech Xplore]

◇ Mixing It Up: Saudi Researchers Accelerate Environmental Models with Mixed Precision[Nvidia]

◇ 「富岳」を用いた3つの研究成果がゴードン・ベル賞ファイナリストに選出されました[RIKEN News]