Qinglei Cao

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RESEARCH INTERESTS

High performance computing (HPC) and Artificial Intelligence (AI), including Task-based runtime systems, Linear algebra algorithms, and Large-scale machine learning & deep learning

EDUCATION

The University of Tennessee, Knoxville (UTK), Computer Science — Aug. 2016 - July 2022
PhD, High Performance Computing
Advisor: Dr. Jack Dongarra (**Turing Award, 2021**)

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

Hunan University (HNU), Information and Computational Science — Sept. 2005 - June 2009
BS, Mathematics

PROFESSIONAL EXPERIENCE

Department of Computer Science, Saint Louis University — St. Louis, MO
Assistant Professor — Aug. 2023 - Present

Innovative Computer Laboratory (ICL), UTK — Knoxville, TN
Post-Doctoral Research Associate, Distributed Computing Group — Mar. 2023 - July 2023

Cerebras Systems, Inc. — Sunnyvale, CA
Member of Technical Staff for HPC and Machine Learning — Aug. 2022 - Jan. 2023

Innovative Computer Laboratory (ICL), UTK — Knoxville, TN
Graduate Research Assistant, Distributed Computing Group — Aug. 2017 - July 2022

Cerebras Systems, Inc. — Sunnyvale, CA
HPC and Machine Learning Research Intern — May 2021 - Aug. 2021

Cadence Design Systems, Inc. — Austin, TX
HPC Research Intern — May 2020 - July 2020

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

HONORS & AWARDS

- 3,000,000 Node Hours on Shaheen II Supercomputer (rank #104), KAUST, Saudi Arabia — 2019 - 2023
- ACM Gordon Bell Prize Finalist — 2022
- 4,000,000 Node Hours on Fugaku Supercomputer (rank #2), RIKEN, Japan — 2022
- SIAM Student Travel Award — 2021
- 40,000 Node Hours on Summit Supercomputer(rank #5), 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 TH-1A, NUDT 2010

◇ Outstanding Scholarship, HNU 2006, 2007

◇ Honor of Excellent Student Cadre, HNU 2006

PUBLICATIONS

1 **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

2 **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

3 **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

4 **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

5 Sameh Abdulah, **Qinglei Cao (main contributor)**, 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

6 **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

7 **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

8 **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

9 **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

10 **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

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

12 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

13 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

14 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

15 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

16 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

17 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

18 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

19 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

◇ **Technical Program Committee**

☞ Workshop on HPC on Heterogeneous Hardware 2022, 2023

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

☞ Intl Conference on Advances and Trends in Software Engineering (SOFTENG) 2021, 2022, 2023

◇ **Conference & Journal External Reviewer**

☞ 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

◇ **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**

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

PRESENTATION & TALK

◇ **Paper Presentation**

- ☞ 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**

- ☞ 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[KUAST 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]

Last updated: August 12, 2023