

# 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 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

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

◇ 3,000,000 Node Hours on Shaheen II Supercomputer, KAUST, Saudi Arabia 2019 - 2023

◇ **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 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\***, 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 Dong Zhong, **Qinglei Cao**, George Bosilca, and Jack Dongarra. Using long vector extensions for MPI reductions. Parallel Computing (**PARCO**), 2021
- 8 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
- 9 **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
- 10 **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
- 11 **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
- 12 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
- 13 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

- 14 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
- 15 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
- 16 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
- 17 **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
- 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

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### Editorial Board

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|  American Journal of Computer Science and Technology | 2023 - 2024 |
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### Technical Program Committee

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|  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 ( <b>SC</b> ) | 2021        |
|  Intl Conference on Advances and Trends in Software Engineering (SOFTENG)                             | 2021 - 2024 |

### Conference & Journal External Reviewer

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|  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 ( <b>SC</b> ) | 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

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#### ◇ Lecturer

- 📖 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

### 📖 PRESENTATION & TALK

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#### ◇ Paper Presentation

- 📖 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

- 📖 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

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- ◇ [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

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- ◇ 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: January 3, 2024