

QINGLEI CAO

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📖 SUMMARY

I am a 4th-year graduate research assistant at Innovative Computer Laboratory (ICL), and a 5th-year Ph.D. candidate in The University of Tennessee. With Mathematics background and more than 10 years of software engineer experience, my research interests involve linear algebra, distributed/parallel computing and task-based runtime system, mainly focusing on PaRSEC, DPLASMA and Open MPI.

🎓 EDUCATION

The University of Tennessee, Computer Science *Aug. 2016 - Present*
Ph.D. Program, Distributed Computing *Expected graduation July 2022*

Advisors: Jack Dongarra, George Bosilca

Awards: Graduate Student Senate Travel Awards (Spring, 2020), SIAM Student Travel Award for CSE21

Ocean University of China, Computer Application Technology *Sep. 2013 - Jun. 2016*
Master, Image Processing & Parallel Computing

Advisors: Yuntao Qian (Zhejiang University), Zhiqiang Wei (Ocean University of China)

awards: Honour of “Outstanding Graduates” (2014); Graduate Student Scholarship (2014)

Hunan University, Information and Computational Science *Sep. 2005 - Jun. 2009*
Bachelor of Science, Mathematics

awards: Honour of “Excellent Student Cadre” (2006); Outstanding Scholarship (2006, 2007)

🧰 PROFESSIONAL EXPERIENCE

Innovative Computer Laboratory (ICL) *Knoxville, TN*
Graduate Research Assistant, Distributed Computing Group *Aug. 2017 ~Present*

- ◇ **PaRSEC:** task-based Runtime System, being funded by Exascale Computing Project (ECP); development and optimization.
- ◇ **DPLASMA:** leading implementation of a dense linear algebra package for distributed heterogeneous systems using PaRSEC; development and optimization.
- ◇ **Adaptive Mesh Refinement:** within task-based runtime scenario and includes **stencil computation** and **data redistribution**.
- ◇ **Low-rank and Mix-Precision Cholesky Factorization:** task-based factorization towards **Exascale Computing** for Climate and Weather Prediction Applications.

Internship at Cadence Design Systems, Inc. *Austin, Tx*
Graduate Software Engineer *May 04, 2020 ~July 31, 2020*

- ◇ General mix-precision solver for dense and sparse (CHOLMOD) Cholesky factorization;
- ◇ Porting the implemented general mix-precision solver (dense and sparse) to Arm platform;
- ◇ Evaluating them in multi-threads environment for both Intel and Arm platforms.

Committee Member of SOFTENG 2021; External Reviewer of SC2020, Cluster2020, and HPCC2020

National University of Defense Technology (NUDT) *Changsha, China*
Software Engineer && Internal Quality Auditor (full-time work) *May. 2010 ~Jul. 2013*
Awards: Honour of “Annual advanced Worker” (2010, 2011); Honour of “Bronze Medal of TH-1A”(2010)

- ◇ **National Program of Tianhe-1A and Tianhe-2:** System management and Linpack optimization, parameters adjustment and testing.

- ◇ **Cooperated Project for the GCC3.4.4 Compiler Verification:** Analyze the compiler error according to the C89 manual on special hardware platform.
- ◇ **C++ compiler verification for Capability Maturity Model Integration:** The **Capability Maturity Model Integration (CMMI)** Level-three-quality certification, e.g. project planning and supervision, and also the configuration management.

📖 PUBLICATIONS

1. **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. In *35th IEEE International Parallel & Distributed Processing Symposium (IPDPS)*, 2021
2. Yunhe Feng, Dong Zhong, Peng Sun, Weijian Zheng, **Qinglei Cao**, Xi Luo, and Zheng Lu. Micro-mobility in smart cities: A closer look at shared dockless e-scooters via big social data. In *IEEE International Conference on Communications (ICC)*, 2021
3. 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. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '20. IEEE Press, 2020
4. Xi Luo, Wei Wu, George Bosilca, Yu Pei, **Qinglei Cao**, Thananon Patinyasakdikul, Dong Zhong, and Jack Dongarra. Han: a hierarchical autotuned collective communication framework. In *2020 IEEE International Conference on Cluster Computing (CLUSTER, Best paper)*, pages 23–34. IEEE, 2020
5. **Qinglei Cao**, George Bosilca, Wei Wu, Dong Zhong, Aurelien Bouteiller, and Jack Dongarra. Flexible data redistribution in a task-based runtime system. In *2020 IEEE International Conference on Cluster Computing (CLUSTER)*, pages 221–225. IEEE, 2020
6. Dong Zhong, **Qinglei Cao**, George Bosilca, and Jack Dongarra. Using advanced vector extensions avx-512 for mpi reductions. In *27th European MPI Users' Group Meeting*, pages 1–10, 2020
7. **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. In *Proceedings of the Platform for Advanced Scientific Computing Conference (PASC)*, pages 1–11, 2020
8. Dong Zhong, Pavel Shamis, **Qinglei Cao**, George Bosilca, Shinji Sumimoto, Kenichi Miura, and Jack Dongarra. Using arm scalable vector extension to optimize open mpi. In *2020 20th IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (CCGRID)*, pages 222–231. IEEE, 2020
9. Yu Pei, **Qinglei Cao**, George Bosilca, Piotr Luszczek, Victor Eijkhout, and Jack Dongarra. Communication avoiding 2d stencil implementations over parsec task-based runtime. In *2020 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)*, 2020
10. **Qinglei Cao**, Yu Pei, Thomas Haurault, 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. In *2019 IEEE/ACM International Workshop on Programming and Performance Visualization Tools (ProTools) at SC19*, pages 25–32. IEEE, 2019
11. Sameh Abdulah, **Qinglei Cao**, Yu Pei, George Bosilca, Jack Dongarra, Marc Genton, David Keyes, Hatem Ltaief, and Ying Sun. Accelerating geostatistical modeling and prediction with mixed-precision computations: A high-productivity approach with parsec. *JOURNAL OF IEEE TRANSACTIONS ON PARALLEL AND DISTRIBUTED SYSTEMS (TPDS)*, submitted

🔗 SKILLS & PROFICIENCY

- ◇ **Languages:** C (advanced: major language), MPI, CUDA, Pthread, OpenMP, C++, Python, Shell, Fortran
- ◇ **Software & Tools:** Linux, Git, Cmake, Makefile, Matlab, GDB, VTune