# Kun Li

## Personal Information


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## Biography

Kun Li received the B.E. degree in computer science and technology from Shandong University in 2016. He is currently pursuing the Ph.D. degree with the State Key Laboratory of Computer Architecture, Institute of Computing Technology, Chinese Academy of Sciences under supervision of Prof. Yunquan Zhang.

His research focuses on high performance computing (HPC), e.g. optimization of large-scale scientific computing applications, design for parallel numerical algorithm, and development of distributed machine learning framework.

He has authored featured publications at prestigious international conferences and journals like SC, IPDPS, IEEE TPDS, etc. His contributions have also been adopted in domestic software ecology, such as OpenKMC for China Institute of Atomic Energy, AGCM for Institute of Atmospheric Physics in Chinese Academy of Sciences, swMD for Sunway Taihulight supercomputer, etc.

## Education

**Institute of Computing Technology (ICT), Chinese Academy of Sciences** — Beijing
*Ph.D. candidate in State Key Lab. of Computer Architecture* — *Jul. 2016 – Jul. 2022*

**Shandong University** — Jinan, Shandong
*B.E. in Computer Science and Technology (Elite Class)* — *Sep. 2012 – Jul. 2016*

## Internship

**Microsoft Research Asia** — Beijing
*Intern in System Research Group* — *Aug. 2021 – Feb. 2022*

## Scholarships

2022 ICT President Award (Special Prize) (Top 3 in ICT).
2021 National Scholarship for Graduate Students.
2021 CAS-BHBT Joint Scholarship of University of Chinese Academy of Sciences (Top 27 in CAS).
2020 Sugon Scholarship of University of Chinese Academy of Sciences.
2020 Outstanding Ph.D. Students Scholarship of University of Chinese Academy of Sciences (Grade 1).
2020 Outstanding Student Scholarship of State Key Lab. of Computer Architecture (Grade 1).
2019 International Academic Conference Scholarship of University of Chinese Academy of Sciences.
2019 Outstanding Student Scholarship of State Key Lab. of Computer Architecture (Grade 1).
2017 Outstanding Undergraduate Scholarship of University of Chinese Academy of Sciences.

## Selected Awards

2020 Outstanding Student of the State Key Lab. of Computer Architecture, ICT, CAS.
2019 Outstanding League Member of Chinese Academy of Sciences.
2017&2018 Excellent Student Cadre of University of Chinese Academy of Sciences.
2017&2018 Merit Student of University of Chinese Academy of Sciences.
2017&2018 Outstanding Communist Member of University of Chinese Academy of Sciences.
2017&2018 Outstanding Volunteer of ICT, CAS.
2017 Outstanding Cooperation Award of the Huawei Technologies Co., Ltd.
2016 Bronze Award of National Parallel Challenge.
2016 Second Prize of National Information Security Contest.

## Projects

**Research of Distributed Scientific Computing on CPU+GPU** *Aug 2021 – Present*
*Microsoft Research Asia Internship Program*
- Deploy WRF model on Tianhe-2 and Sunway Taihulight with standard cases.
- Explore auto-tuning distributed design on heterogenous architectures.

**Research of Large-Scale Clustering and Regression** *Nov 2020 – Jul 2021*
*Natural Science Foundation of Beijing*
- Accurate, fast, and parameter-free clustering.
- Explore efficient parallel regression through clustering.

**Vectorization for Stencils** *Dec 2019 – Oct 2020*
*National High Technology Research and Development Program of China (863)*
- Explore high performance vectorization for stencil computation in atmospheric simulation.

**Research and Development of Prototype System for Numerical Reactor** *Nov 2018 – Nov 2019*
*National Key Research and Development Program*
- Develop open-source kinetic Monte Carlo software OpenKMC with a good scalability over 5.2 million cores.
- It has been used for research by China institute of atomic energy (CIAE).

**Reasearch of Large-scale Molecular Dynamics Simulation** *Dec 2017 – Oct 2018*
*National Key Research and Development Program, Peking University Joint Key Program*
- Design efficient FastNBL algorithm and Vectorization on Intel Xeon/ARM-v8/SW26010 over 266,240 cores.

**The Science Data Process in Square Kilometre Array (SKA)** *Oct 2016 – Nov 2017*
*The National Natural Science Foundation, National Key Research and Development Program*
- Develop high performance FFT library by using many-core architecture on Sunway Taihulight supercomputer.
- Noise reduction processing of pulsar signal with optimized FFT algorithm on TH-1 and TH-2.

## Publications

- **[IPDPS'22, CCF-B] Kun Li**, Liang Yuan, Yunquan Zhang, Yue Yue, and Hang Cao. An Efficient Vectorization Scheme for Stencil Computation, 2022.

- **[IEEE TPDS, CCF-A] Kun Li**, Liang Yuan, Yunquan Zhang, and Gongwei Chen. An Accurate and Efficient Large-scale Regression Method through Best Friend Clustering. IEEE Transactions on Parallel and Distributed Systems, 2022.

- **[SC'21, CCF-A] Kun Li**, Liang Yuan, Yunquan Zhang, and Yue Yue. Reducing Redundancy in Data Organization and Arithmetic Calculation for Stencil Computations. Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis, 2021.

- **[SC'21, CCF-A]** Liang Yuan, Hang Cao, Yunquan Zhang, **Kun Li**, Pengqi Lu, and Yue Yue. Temporal Vectorization for Stencils. Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis, 2021.

- **[SC'19, CCF-A] Kun Li**, Honghui Shang, Yunquan Zhang, Shigang Li, Baodong Wu, Dong Wang, Libo Zhang, Fang Li, Dexun Chen, and Zhiqiang Wei. OpenKMC : a KMC design for hundred-billion-atom simulation using millions of cores on Sunway Taihulight. Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis, 2019.

- **[CS'19, CCF-B]** Dong Wang, Honghui Shang, Yunquan Zhang, **Kun Li**, Xinfu He, and Lixia Jia. Application of Atomic Dynamics Monte Carlo Program MISA-KMC in the Study of Irradiation Damage of Reactor Pressure Vessel Steel. Computer Science, 2019

- **[TJSC, CCF-B] Kun Li**, Shigang Li, Shan Huang, Yifeng Chen, and Yunquan Zhang. FastNBL : fast neighbor lists establishment for molecular dynamics simulation based on bitwise operations. The Journal of Supercomputing, 2019.

- **[ISPA'19, CCF-C] Kun Li**, Shigang Li, Bei Wang, Yifeng Chen, and Yunquan Zhang. swMD : Performance Optimizations for MolecularDynamics Simulation on Sunway Taihulight. International Conference on Parallel & Distributed Processing with Applications, 2019.

- **[ICPP'18, CCF-B]** Junmin Xiao, Shigang Li, Baodong Wu, He Zhang, **Kun Li**, Erlin Yao, Yunquan Zhang, and Guangming Tan. Communication-Avoiding for Dynamical Core of Atmospheric General Circulation Model. Proceedings of the 47th International Conference on Parallel Processing, 2018.

- **[JCST'17, CCF-B] Kun Li**, Haipeng Jia, Ting Cao, and Yunquan Zhang. The Implementation and Optimization of Multidimensional FFT Algorithm on Large-scale Clusters. The Journal of Frontiers of Computer Science and Technology, 2017.

- **[HPCChina'16] Kun Li**, Yan Li, Ting Cao, Haipeng Jia, and Yunquan Zhang. An MPI-based 3D FFT Implementation on CPUGPU Heterogeneous Clusters. National Annual Conference on High Performance Computing 2016.

- **[To be appeared]** Hang Cao, Liang Yuan, Zhang H, Yunquan Zhang, Wu B, **Kun Li**, et al. AGCM-3DLF : Accelerating Atmospheric General Circulation Model via 3D Parallelization and Leap-Format

## Patents

Shigang Li, Kun Li, Yifeng Chen, Yunquan Zhang. CN109032667A, A fast neighbor list method for molecular dynamics simulation.

Shigang Li, Kun Li, Baodong Wu, Yunquan Zhang. CN109840306A, An optimized communication method and system for parallel fast

Fourier transform based on recursion.

## Service

2020&2021 Reviewer of the Journal of Supercomputing.
2021 Reviewer of International Conference on High Performance Big Data and Intelligent Systems.
2018&2019 Reviewer of National Annual Conference on High Performance Computing.
2018 Volunteer of International Conference on Supercomputing.

## Activities

2017-present Youth League Committee Member of Institute of Computing Technology.
2018 Chairman of Student Union in Institute of Computing Technology.
2018 President of Career Development Association in Institute of Computing Technology.
Volunteer for 130+ hours so far.