

Kai Wu

CONTACT INFORMATION

5200 N Lake Road SE2 Room 213C, Merced, CA, 95348
517-763-1599 kwu42@ucmerced.edu <http://kaikylewu.com>

RESEARCH INTERESTS

My research broadly falls into general areas of High Performance Computing (Large- Scale Parallel Systems). Specially, I focus on the following areas: (i) Parallel programming models and runtime; (ii) Performance optimization and modeling; (iii) Resilience and Consistency; (iv) Non-volatile memory; (v) Fault Tolerance in Extreme-Scale Parallel Systems.

EDUCATION

University of California, Merced, CA Jun 2016 – Now
Ph.D., in Electrical Engineering and Computer Sciences
Advisor: Dong Li

Michigan State University, East Lansing, MI Aug 2014 - May 2016
M.S., in Computer Science and Engineering
Advisor: Yiyong Tong

Harbin Normal University, Harbin, CHINA Aug 2010 - Jun 2014
B.S., Digital Media Technology

EXPERIENCE

Los Alamos National Laboratory (USRC)
Research Intern May 2017 – Aug 2017

- **New Storage Systems Software Solution**
The long-term objective of this project is to estimate the resilience of parallel program based on serial version.

UC Merced

Graduate Student Researcher with Prof. Dong Li Jun 2016 – Now

- **Data placement on Heterogeneous memory (NVM/DRAM) system**
We introduce a lightweight runtime solution that automatically and transparently manage data placement on HMS without the requirement of hardware modifications and disruptive change to applications. Leveraging online profiling and performance models, the runtime characterizes memory access patterns associated with data objects and minimizes unnecessary data movement.
- **Memory consistency on NVM system**
P1: We explore how to build resilient HPC with emerging NVM. Then we introduce a couple of schemes and optimization techniques, and explore how to leverage high performance and non-volatility of NVM to establish a consistent data status as the traditional checkpoint mechanism.
P2: We also study an algorithm-based method to establish crash consistence in NVM for HPC applications. We slightly extend application data structures or sparsely flush cache blocks, which introduce ignorable runtime overhead. Such extension or cache

flushing allows us to use algorithm knowledge to reason data consistence or correct inconsistent data when the application crashes.

➤ **Performance Implications of Persistent Memory on HPC Applications**

We study the implication of NVM (as a block device) on HPC applications. We focus on measuring and comparing the different performance of HDD, SSD and PMBD (NVM simulator) in three directions: POSIX I/O vs MPI I/O, Independent I/O vs Collective I/O, Read/Write and page cache.

➤ Others: I am maintaining a computing cluster ALPHA.

UC Merced

Teaching Assistant

Jun 2016 – Aug 2016

➤ CSE 20 - Introduction to Computing I

Center for Digital Humanities and Social Sciences at MSU

Back-end Developer(Intern)

May 2015 - May 2016

- Server-end development (PHP), Database modeling (MySQL).
- Created responsive, modern web a using JavaScript, jQuery and Bootstrap.

Yonyou Software Co., Ltd, CHINA

Software Engineer(Intern)

Dec 2013-Jun 2014

- ERP software development and Database modeling (MS SQL).
- System daily maintenance.

PUBLICATION

[SC'17] **Kai Wu**, Yingchao Huang and Dong Li, **Unimem: Runtime Data Management in Non-Volatile Memory-based Heterogeneous Main Memory**. In 29th ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis, 2017.

[Cluster'17] Shuo Yang, **Kai Wu**, Yifan Qiao, Dong Li and Jidong Zhai. **Algorithm-Directed Persistent Memory for High Performance Computing**. In 19th IEEE Cluster Conference.

[NAS'17] Wei Liu, **Kai Wu**, Jialin Liu, Feng Chen and Dong Li. **Performance Evaluation and Modeling of HPC I/O on Non-Volatile Memory**. In 12th International Conference on Networking, Architecture, and Storage.

Yingchao Huang, **Kai Wu** and Dong Li. **High Performance Data Persistence in Non-Volatile Memory for Resilient High Performance Computing** (co-first author)

PROFESSIONAL ACTIVITES

External reviewers: IPDPS'17, CLUSTER'17, HPCC'17, NAS'17, etc.
Student Volunteer SC'16

AWARDS

UC Merced Bobcat scholarship 2017
Student Travel Grant for NVMW'2017 2017
ACM/IEEE Travel Grant for SC'16 2016
First-Prize, 'LanQiao Cup' National Software & Information Technology

Competition, C/C++ group 2013
Third-Prize, International Mathematics and Computer Programming
Olympiad of RF and PCR university students 2013
Bronze Medal, ACM/ICPC International Collegiate Programming
Contest China Tonghua Invitational Contest 2013
Third-Prize, ACM/ICPC International Collegiate Programming Contest
China Hei Longjiang Province Contest 2012
China National Scholarship 2013
First Class Scholarship of Harbin Normal University 2011- 2014

SKILLS

Proficient in C/C++, Python, Fortran, Parallel Programming with
OpenMP, MPI, Web Development (PHP and JavaScript).
Experience with GPU (CUDA), Hadoop, Pig, Hive, Spark, Weka and
AWS.

REFERENCE

Dong Li

Assistant Professor
University of California, Merced
Email: dli35@ucmerced.edu

Qiang Guan

Staff Scientist
Los Alamos National Laboratory
Email: qguan@lanl.gov