

# Kai Wu

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## CONTACT INFORMATION

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## OBJECTIVE

**To obtain an internship position in high performance computing/parallel computing for summer 2018.**

## 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) Resource Management in Heterogeneous Computing (Non-volatile memory); (ii) Parallel programming models and runtime; (iii) Performance optimization and modeling; (iv) Resilience and Consistency.

## 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: Yiying Tong

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

## EXPERIENCE

**Los Alamos National Laboratory**  
**Research Intern** May 2017 – Aug 2017  
**Mentor: Nathan DeBardleben and Qiang Guan**

➤ **Project: Characterizing and Modeling Application Resilience Difference Between Serial and Parallel Executions**

We study a new methodology to evaluate application resilience in the large scale. Instead of injecting faults into the application in the large scale, we use fault injection in a small-scale execution and the serial execution to model and predict application resilience in the large scale.

### UC Merced

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

➤ **Project 1: Runtime 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.

➤ **Project 2: Memory Persistency on NVM system (remove checkpoint)**

We explore how to build resilient HPC with emerging NVM. Then we introduce new 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.

➤ **Project 3: Algorithm-Directed Crash Consistence in Non-Volatile Memory for HPC**

We introduce 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.

➤ **Project 4: 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.

[SC'17] **Kai Wu**, Qiang Guan, Nathan DeBardeleben and Dong Li, “**Characterization and Comparison of Application Resilience for Serial and Parallel Executions**”. Poster 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.

[TR] **Kai Wu**, Frank Ober, Shari Hamlin, Qiang Guan and Dong Li, “**Early Evaluation of Intel Optane Non-Volatile Memory with HPC I/O Workloads**”. Technical Report, PASA Lab.

**Kai Wu**, Yingchao Huang and Dong Li. **High Performance Data Persistence in Non-Volatile Memory for Resilient High Performance Computing** (submitted to IPDPS 2018)

Wenqian Dong\*, **Kai Wu**\*, Qiang Guan, Nathan Debardeleben and Dong Li, “**Modeling Application Resilience in Large Scale Parallel Execution**” (\*indicates co-first authors.) (submitted to IPDPS 2018)

## **PROFESSIONAL ACTIVITIES**

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

## **AWARDS**

NSF student travel fund for Cluster’17	2017
UC Merced Bobcat scholarship	2017
Student Travel Grant for NVMW2017	2017
ACM/IEEE Travel Grant for SC’16	2016
First-Prize, ‘LanQiao Cup’ National Software & Information Technology Professional Talents 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**

C/C++, Python, Java, Fortran  
MPI, OpenMP, GPU (CUDA)  
Hadoop, Pig, Hive, Spark, Weka and AWS.  
Web Development (PHP and JavaScript).

## **REFERENCE**

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