

Jungwon Kim

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Research Interests

High-performance computing, compilers, runtime systems, and programming models

Appointments

Oak Ridge National Laboratory

COMPUTER SCIENTIST IN FUTURE TECHNOLOGIES GROUP AT COMPUTER SCIENCE AND MATHEMATICS DIVISION

Oak Ridge, TN, USA

2016 - present

Oak Ridge National Laboratory

POSTDOCTORAL RESEARCH ASSOCIATE IN FUTURE TECHNOLOGIES GROUP AT COMPUTER SCIENCE AND MATHEMATICS DIVISION

Oak Ridge, TN, USA

2014 - 2016

Education

Seoul National University

PH.D. IN ELECTRICAL ENGINEERING AND COMPUTER SCIENCE, SUPERVISED BY PROF. JAEJIN LEE

- Thesis: An OpenCL Framework for Heterogeneous Clusters

Seoul, South Korea

2006 - 2013

Seoul National University

B.S. IN COMPUTER SCIENCE AND ENGINEERING

Seoul, South Korea

1998 - 2006

Research Experience

Programming Systems for Nonvolatile Memory

EXASCALE COMPUTING PROJECT @ OAK RIDGE NATIONAL LABORATORY

- Papyrus (virtual file system, STL-like C++ templates, key-value store) for distributed NVM architectures
- SC 2017, IPDPS 2017
- C++, MPI, UPC, KNL, NVMe, SSD, Burst Buffer, OLCF Summitdev, NERSC Cori, TACC Stampede, UTK Beacon

2016 - 2017

OpenACC Frameworks

X-STACK SOFTWARE RESEARCH @ OAK RIDGE NATIONAL LABORATORY

- OpenACC-based unified programming model for heterogeneous accelerator cluster, tightly-integrated MPI+OpenACC framework, OpenACC framework for Altera FPGAs
- AsHES 2017, HPDC 2016, IPDPS 2016, PPOPP 2015
- C++, OpenCL, CUDA, MPI, OpenMP, OpenACC, LLVM Clang, NVIDIA GPU, AMD GPU, Intel Xeon Phi KNC, Altera FPGA, OLCF Titan, ALCF Mira, ALCF Cooley, NERSC Cori Phase I, UTK Beacon

2014 - 2017

SnuCL: An OpenCL Framework for Heterogeneous Clusters

CENTER FOR MANYCORE PROGRAMMING @ SEOUL NATIONAL UNIVERSITY

- SnuCL extends the platform model of OpenCL to heterogeneous clusters
- PLDI 2016, TPDS 2015, ICS 2012, PPOPP 2012, PACT 2011, LCPC 2011, US9485303, US9396033
- C++, OpenCL, MPI, LLVM Clang, NVIDIA GPU, AMD GPU
- Open source (<http://snucl.snu.ac.kr/>), Khronos OpenCL Resources, AMD Developer Central

2011 - 2016

Chundoong: A Low-Cost Energy-Efficient Heterogeneous Supercomputer

CENTER FOR MANYCORE PROGRAMMING @ SEOUL NATIONAL UNIVERSITY & MANYCORESOFT

- A heterogeneous CPU/GPU supercomputer designed and built by the Center for Manycore Programming at Seoul National University and ManyCoreSoft in October 2012
- Ranked 277th in the TOP500, 32nd in the Green500 of November 2012
- Participated in building the Chundoong system
- Open to the public (<http://chundoong.snu.ac.kr/>)

2011 - 2014

GPU Virtualization

CENTER FOR MANYCORE PROGRAMMING @ SEOUL NATIONAL UNIVERSITY

2011

- OpenCL framework that provides a single virtual GPU image to the user for the multiple GPUs available in the system
- PPOP 2011
- C, C++, OpenCL, CUDA, LLVM Clang, NVIDIA GPU

SNU-SAMSUNG OpenCL Framework

SEOUL NATIONAL UNIVERSITY & SAMSUNG ADVANCED INSTITUTE OF TECHNOLOGY

2009 - 2010

- OpenCL framework targeting Cell-BEs, ARM CPUs, and TI DSPs
- PACT 2010
- C, OpenCL, IBM Cell-BE, ARM Cortex-A8, TI C64x+
- Open source (<http://aces.snu.ac.kr/>), Khronos Conformant Products (Samsung Electronics 2010-02-03 OpenCL_1_0)

Publications

CONFERENCES

- SC 2017** Jungwon Kim, Seyong Lee, and Jeffrey S. Vetter. "PapyrusKV: A High-Performance Parallel Key-Value Store for Distributed NVM Architectures". In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, to appear, Denver, Colorado, USA, November 2017. (61/327, 18.6%)
- IPDPS 2017** Jungwon Kim, Kittisak Sajjapongse, Seyong Lee, and Jeffrey S. Vetter. "Design and Implementation of Papyrus: Parallel Aggregate Persistent Storage". In *Proceedings of the 31st IEEE International Parallel and Distributed Processing Symposium*, pages 1151-1162, Orlando, Florida, USA, May 2017. (116/508, 22.8%)
- PLDI 2016** Junghyun Kim, Gangwon Jo, Jaehoon Jung, Jungwon Kim, and Jaejin Lee. "A Distributed OpenCL Framework using Redundant Computation and Data Replication". In *Proceedings of the 37th ACM SIGPLAN conference on Programming Language Design and Implementation*, pages 553-569, Santa Barbara, California, USA, June 2016. (48/304, 15.8%)
- HPDC 2016** Jungwon Kim, Seyong Lee, and Jeffrey S. Vetter. "IMPACC: A Tightly Integrated MPI+OpenACC Framework Exploiting Shared Memory Parallelism". In *Proceedings of the 25th ACM International Symposium on High-Performance Parallel and Distributed Computing*, pages 189-201, Kyoto, Japan, May 2016. (20/129, 15.5%)
- IPDPS 2016** Seyong Lee, Jungwon Kim, and Jeffrey S. Vetter. "OpenACC to FPGA: A Framework for Directive-based High-Performance Reconfigurable Computing". In *Proceedings of the 30th IEEE International Parallel and Distributed Processing Symposium*, pages 544-554, Chicago, Illinois, USA, May 2016. (114/496, 22.9%)
- ICS 2012** Jungwon Kim, Sangmin Seo, Jun Lee, Jeongho Nah, Gangwon Jo, and Jaejin Lee. "SnuCL: An OpenCL Framework for Heterogeneous CPU/GPU Clusters". In *Proceedings of the 32th ACM International Conference on Supercomputing*, pages 341-352, Venice, Italy, June 2012. (36/161, 22.3%)
- PACT 2011** Jun Lee, Jungwon Kim, Junghyun Kim, Sangmin Seo, and Jaejin Lee. "An OpenCL Framework for Homogeneous Manycores with no Hardware Cache Coherence". In *Proceedings of the 20th ACM/IEEE/IFIP International Conference on Parallel Architectures and Compilation Techniques*, pages 56-67, Galveston Island, Texas, USA, October 2011. (36/221, 16.3%)
- LCDES 2011** Choonki Jang, Jungwon Kim, Jaejin Lee, Hee-Seok Kim, Dong-Hoon Yoo, Sujkin Kim, Hong-Seok Kim and Soojung Ryu. "An Instruction-Scheduling-Aware Data Partitioning Technique for Coarse-Grained Reconfigurable Architectures". In *Proceedings of the ACM SIGPLAN/SIGBED 2011 International Conference on Languages, Compilers, and Tools for Embedded Systems*, pages 151-160, Chicago, Illinois, USA, April 2011. (17/51, 33.3%)
- PPoPP 2011** Jungwon Kim, Honggyu Kim, Joo Hwan Lee, and Jaejin Lee. "Achieving a Single Compute Device Image in OpenCL for Multiple GPUs". In *Proceedings of the 16th ACM SIGPLAN Annual Symposium on Principles and Practice of Parallel Programming*, pages 277-287, San Antonio, Texas, USA, February 2011. (26/165, 15.6%)
- PACT 2010** Jaejin Lee, Jungwon Kim, Sangmin Seo, Seungkyun Kim, Jungho Park, Honggyu Kim, Thanh Tuan Dao, Yongjin Cho, Sung Jong Seo, Seung Hak Lee, Seung Mo Cho, Hyo Jung Song, Sang-Bum Suh, and Jong-Deok Choi. "An OpenCL Framework for Heterogeneous Multicores with Local Memory". In *Proceedings of the 19th ACM/IEEE/IFIP International Conference on Parallel Architectures and Compilation Techniques*, pages 193-204, Vienna, Austria, September 2010. (46/266, 17.3%)
- HPCA 2010** Jaejin Lee, Jun Lee, Sangmin Seo, Jungwon Kim, Seungkyun Kim, and Zehra Sura. "COMIC++: A Software SVM System for Heterogeneous Multicore Accelerator Clusters". In *Proceedings of the 16th IEEE International Symposium on High Performance Computer Architecture*, pages 329-340, Bangalore, India, January 2010. (32/175, 18.3%)
- PACT 2008** Jaein Lee, Sangmin Seo, Chihun Kim, Junghyun Kim, Posung Chun, Zehra Sura, Jungwon Kim, and Sangyong Han. "COMIC: A Coherent Shared Memory Interface for Cell BE". In *Proceedings fo the 17th International Conference on Parallel Architecture and Compilation Techniques*, pages 303-314, Toronto, Canada, October 2008. (30/159, 18.9%)

JOURNALS

- TPDS 2015** Thanh Tuan Dao, Jungwon Kim, Sangmin Seo, Bernhard Egger, and Jaejin Lee. "A Performance Model for GPUs with Caches". *IEEE Transactions on Parallel and Distributed Systems*, Volume 26, Issue 7, pages 1800-1813, 2015. (IF: 2.661)
- TPDS 2015** Gangwon Jo, Jeongho Nah, Jun Lee, Jungwon Kim, and Jaejin Lee. "Accelerating LINPACK with MPI-OpenCL on Clusters of Multi-GPU Nodes". *IEEE Transactions on Parallel and Distributed Systems*, Volume 26, Issue 7, pages 1814-1825, 2015. (IF: 2.661)

WORKSHOPS

- AsHES 2017** Michael Wolfe, Seyong Lee, Jungwon Kim, Xiaonan Tian, Rengan Xu, Sunita Chandrasekaran and Barbara Chapman. "Implementing the OpenACC Data Model", *In Proceedings of the 31st IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW), 7th International Workshop on Accelerators and Hybrid Exascale Systems*, pages 663-672, Orlando, Florida, USA, May 2017. (9/9, 100%)
- LCPC 2011** Jungwon Kim, Sangmin Seo, Jun Lee, Jeongho Nah, Gangwon Jo, and Jaejin Lee. "OpenCL as a Programming Model for GPU Clusters". *In Proceedings of the 24th International Workshop on Languages and Compilers for Parallel Computing*, pages 76-90, Fort Collins, Colorado, USA, September 2011. (19/52, 36.5%)

POSTERS

- PPoPP 2015** Jungwon Kim, Seyong Lee, and Jeffrey S. Vetter. "An OpenACC-Based Unified Programming Model for Multi-Accelerator Systems". *In Proceedings of the 20th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, pages 257-258, Bay Area, California, USA, February 2015.
- PPoPP 2012** Jungwon Kim, Sangmin Seo, Jun Lee, Jeongho Nah, Gangwon Jo, and Jaejin Lee. "OpenCL as a Unified Programming Model for Heterogeneous CPU/GPU Clusters". *In Proceedings of the 17th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, pages 299-300, New Orleans, Louisiana, USA, February 2012.

Patents

- US9485303** Jaejin Lee and Jungwon Kim. "Cluster System Based on Parallel Computing Framework, and Host Node, Computing Node and Method for Executing Application Therein". *US Patent 9485303B2*, November 2016.
- US9396033** Jaejin Lee and Jungwon Kim. "Method of Executing Parallel Application on Manycore Cluster System and the Manycore Cluster System". *US Patent 9396033B2*, July 2016.
- US8395701** Jungwon Kim, Jaejin Lee, Kyu-Won Kim, and Sung-Kwan Heo. "Method for Scaling Voltage in Mobile Terminal". *US Patent 8395701B2*, March 2013.

Industry Experience

Naver Corporation

SOFTWARE ENGINEER

- Developed a middleware for communication between the main database and the customer service center.
- Java, Oracle

Seoul, South Korea

2003 - 2005

NCubic

WEB PROGRAMMER

- Developed web applications.
- Java, Oracle

Seoul, South Korea

2002 - 2003

Jinisoft (Startup)

LEAD PROGRAMMER

- Developed a Java virtual desktop infrastructure.
- Java

Seoul, South Korea

2000 - 2002

Skills

C, C++, Java, CUDA, OpenCL, OpenACC, OpenMP, MPI, LLVM