Jungwon Kim

Computer Scientist · Oak Ridge National Laboratory
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Research Interests

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

Positions

Oak Ridge National Laboratory — *Oak Ridge, TN, USA*
Computer Scientist in Future Technologies Group at Computer Science and Mathematics Division — *2016 - present*

Oak Ridge National Laboratory — *Oak Ridge, TN, USA*
Postdoctoral Research Associate in Future Technologies Group at Computer Science and Mathematics Division — *2014 - 2016*

Education

Seoul National University — *Seoul, South Korea*
Ph.D. in Electrical Engineering and Computer Science, supervised by Prof. Jaejin Lee — *2006 - 2013*
- Thesis: An OpenCL Framework for Heterogeneous Clusters

Seoul National University — *Seoul, South Korea*
B.S. in Computer Science and Engineering — *1998 - 2006*

Research Experience

Programming Systems for Nonvolatile Memory

Exascale Computing Project @ Oak Ridge National Laboratory — *2016 - 2018*
- Papyrus (key-value store, STL-like C++ templates, virtual file system) for distributed NVM architectures
- SC 2017, IPDPS 2017
- C++, Python, MPI, UPC, NVMe, SSD, Burst Buffer, OLCF Summitdev, NERSC Cori, ALCF Theta, TACC Stampede, TACC Stampede2, CSCS Grand Tavé
- Open source (https://code.ornl.gov/eck/papyrus)

OpenACC Frameworks

X-Stack Software Research @ Oak Ridge National Laboratory — *2014 - 2018*
- OpenACC-based unifieid programming model for heterogeneous cluster, MPI+OpenACC framework, OpenACC framework for FPGAs
- ICS 2018, 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, UTK Beacon

SnuCL: An OpenCL Framework for Heterogeneous Clusters

Center for Manycore Programming @ Seoul National University — *2011 - 2016*
- 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, IWOCL OpenCL Libraries

Chundoong: A Low-Cost Energy-Efficient Heterogeneous Supercomputer

Center for Manycore Programming @ Seoul National University & ManyCoreSoft — *2011 - 2014*
- 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/)

Multi-GPU Virtualization

Center for Manycore Programming @ Seoul National University *2011*

- An OpenCL framework providing a single virtual GPU image for multiple GPUs
- PPoPP 2011
- C, C++, OpenCL, CUDA, LLVM Clang, NVIDIA GPU

SNU-SAMSUNG OpenCL Framework

Seoul National University & Samsung Advanced Institute of Technology *2009 - 2010*

- An OpenCL framework targeting IBM 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), IWOCL OpenCL Implementations

Publications

Conferences

ICS 2018 Jacob Lambert, Seyong Lee, Jungwon Kim, Jeffrey S. Vetter, and Allen D. Malony. "Directive-Based, High-Level Programming and Optimizations for High-Performance Computing with FPGAs". *In Proceedings of the 32nd ACM International Conference on Supercomputing*, to appear, Beijing, China, June 2018.

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*, pages 57:1–57:14, 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 26th 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%)

LCTES 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 of the 17th International Conference on Parallel Archtecture 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*, Volumne 26, Issue 7, pages 1800-1813, 2015. (IF: 4.181)

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: 4.181)

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 *Seoul, South Korea*

Software engineer *2003 - 2005*

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

NCubic *Seoul, South Korea*

Web programmer *2002 - 2003*

- Developed web applications.
- Java, Oracle

Jinisoft (Startup) *Seoul, South Korea*

Lead programmer *2000 - 2002*

- Developed a Java virtual desktop framework.
- Java

Skills

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