

JIE ZHANG

tel: +8619910031394|jiez@pku.edu.cn

Dr. Jie Zhang is currently an assistant professor of the school of Computer Science at Peking University, China. He is engaged in the research and design of storage systems, non-volatile memory and specialized processors. His research addresses the requirements for high-performance storage systems in the era of big data and artificial intelligence from the perspective of computer architecture. He is dedicated to breaking through the bottlenecks of data migration and the limitations of memory walls in the Von Neumann architecture. The projects he leads and have participated in have been funded by the U.S. Department of Energy, the U.S. Natural Science Foundation, the Korea Natural Science Foundation, Samsung Electronics, SK Hynix, Texas Instruments, and Western Digital with a cumulative total of over 4 million dollars. He has published over 60 papers in top-tier conferences and journals, including ISCA (five papers), OSDI, SOSP, HPCA (ten papers), MICRO (four papers), ASPLOS, FAST, NSDI, DAC, Eurosys, PACT, TPDS and TACO. He was inducted to HPCA Hall of Fame in 2025.

WORK EXPERIENCE

Peking University, Beijing, China

School of Computer science

KAIST, Daejeon, Korea

Electrical Engineering (Computing Division)

Assistant Professor, PhD advisor

July 2021 –Current

Postdoctoral Researcher

March 2020 –May 2021

EDUCATION

Yonsei University, Incheon, Korea

PhD in Engineering

Advisor: Dr. Myoungsoo Jung

August 2015 – Feb 2020

University of Texas at Dallas, Richardson, Texas

PhD in Computer Engineering (transfer to Korea)

Advisor: Dr. Myoungsoo Jung

August 2014 – August 2015

University of Texas at Dallas, Richardson, Texas

Master of Science in Electrical Engineering

Advisor: Dr. Myoungsoo Jung

August 2012 – May 2014

Nanjing University of Posts and Telecommunications, Nanjing, China

BS in Communication Engineering (computer communication)

September 2008 – July 2012

PUBLICATIONS

2025

PACT

Exploring Memory Tiering Systems in the CXL Era via FPGA-based Emulation and Device-

Top Conference **Side Management**

Yiqi Chen, Xiping Dong, Zhe Zhou, Zhao Wang, [Jie Zhang](#), Guangyu Sun,

International Conference on Parallel Architecture and Compilation Techniques

NEWTON

Ultrafast and Reliable Domain-Wall and Skyrmion Logic in a Chirally Coupled Ferrimagnet

Top Journal

Yifei Ma, Dihua Wu, Fengbo Yan, Xiaoxiao Fang, Peixin Qin, Leran Wang, Li Liu, Laichuan Shen, Zhiqi Liu, Wenyun Yang, [Jie Zhang](#), Yanglong Hou, Yan Zhou, Feng Luo, Jinbo Yang, Kaiming Cai, Shuai Ning, Zhaochu Luo

Cell Press NEWTON

SOSP

Aeolia: Fast and Secure Userspace Interrupt-Based Storage Stack

Top Conference

Chuandong Li, Ran Yi, Zonghao Zhang, Jing Liu, Changwoo Min, [Jie Zhang](#), Yingwei Luo, Xiaolin Wang, Zhenling Wang, Diyu Zhou

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ACM Symposium on Operating Systems Principles

HotStorage

SPDK+: Low Latency or High Power Efficiency? We Take Both

Endian Li, Shushu Yi, Li Peng, Qiao Li, Diyu Zhou, Zhenlin Wang, Xiaolin Wang, Bo Mao, Yingwei Luo, Ke Zhou, [Jie Zhang](#)*

The 17th ACM Workshop on Hot Topics in Storage and File Systems

ICDE

BL-Tree: The Best of Both Worlds by combining B+-Tree on Top and LSM-Tree on Bottom

Top Conference

Maixin Ye, Zuocheng Wang, Shengzhe Wang, Jiahong Chen, Chunfeng Du, [Jie Zhang](#), Ke Zhou, Suzhen Wu, Bo Mao

IEEE International Conference on Data Engineering

ToS

Enhancing the Performance of Next-Generation SSD Arrays: A Holistic Approach

Top Journal

[Jie Zhang](#), Shushu Yi, Xiurui Pan, Qiao Li, Qiang Li, Chenxi Wang, Bo Mao, Myoungsoo Jung*

ACM Transactions on Storage

TCAD

FlexHMB: A Flexible HMB Design towards Bufferless Mobile Flash

Top Journal

Yong Peng, Li Peng, Shaocong Sun, Lujia Yin, Qiao Li, [Jie Zhang](#)*

ACM Transactions on Computer-Aided Design of Integrated Circuits and Systems

ISCA

XHarvest: Rethinking High-Performance and Cost-Efficient SSD Architecture with

Top Conference

CXL-Driven Harvesting

Li Peng, Wenbo Wu, Shushu Yi, Xianzhang Chen, Chenxi Wang, Shengwen Liang, Zhe Wang, Nong Xiao, Qiao Li, Mingzhe Zhang, [Jie Zhang](#)*

IEEE/ACM International Symposium on Computer Architecture

ISCA

ArtMem: Adaptive Migration in Reinforcement Learning-Enabled Tiered Memory

Top Conference

Xinyue Yi, Hongchao Du, Yu Wang, [Jie Zhang](#), Qiao Li, Chun Jason Xue

IEEE/ACM International Symposium on Computer Architecture

Eurosys

Daredevil: Rescue Your Flash Storage from Inflexible Kernel Storage Stack

Top Conference

Junzhe Li, Ran Shu, Jiayi Lin, Qingyu Zhang, Ziyue Yang, [Jie Zhang](#), Yongqiang Xiong, Chenxiong Qian

20th ACM European Conference on Computer Systems

NSDI

Beehive: A Scalable Disaggregated Memory Runtime Exploiting Asynchrony of

Top Conference

Multithreaded Programs

Quanxi Li, Hong Huang, Ying Liu, Yanwen Xia, [Jie Zhang](#), Mosong Zhou, Xiaobing Feng, Huimin Cui, Quan Chen, Yizhou Shan, Chenxi Wang

22nd USENIX Symposium on Networked Systems Design and Implementation

HPCA

InstAttention: In-Storage Attention Offloading for Cost-Effective Long-Context LLM

Top Conference

Inference

Xiurui Pan, Endian Li, Qiao Li, Shengwen Liang, Yizhou Shan, Ke Zhou, Yingwei Luo, Xiaolin Wang, [Jie Zhang](#)*

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IEEE International Symposium on High-Performance Computer Architecture

HPCA

NeuVSA: A Unified and Efficient Accelerator for Neural Vector Search

Top Conference

Ziming Yuan, Lei Dai, Wen Li, [Jie Zhang](#), Shengwen Liang, Ying Wang, Cheng Liu, Huawei Li, Jiafeng Guo, Peng Wang, Renhai Chen, Gong Zhang

IEEE International Symposium on High-Performance Computer Architecture

HPCA

Criticality-Aware Instruction-Centric Bandwidth Partitioning for Data Center Applications

Top Conference

Liren Zhu, Liujia Li, Jianyu Wu, Yiming Yao, Zhan Shi, [Jie Zhang](#), Zhenlin Wang, Xiaolin Wang, Yingwei Luo, Diyu Zhou

IEEE International Symposium on High-Performance Computer Architecture

2024

SOSP

BIZA: Design of Self-Governing Block-Interface ZNS AFA for Endurance and Performance

Top Conference

Shushu Yi, Shaocong Sun, Li Peng, Yingbo Sun, Ming-Chang Yang, Zhichao Cao, Qiao Li, Myoungsoo Jung, Ke Zhou, [Jie Zhang*](#)

ACM Symposium on Operating Systems Principles

MICRO

NeoMem: Hardware/Software Co-Design for CXL-Native Memory Tiering

Top Conference

Zhe Zhou, Yiqi Chen, Tao Zhang, Yang Wang, Ran Shu, Shuotao Xu, Peng Cheng, Lei Qu, Yongqiang Xiong, [Jie Zhang](#), Guangyu Sun

The 57th Annual IEEE/ACM International Symposium on Microarchitecture

MICRO

Cambricon-Ilm: A chiplet-based hybrid architecture for on-device Inference of 70B LLM

Top Conference

Zhongkai Yu, Shengwen Liang, Tianyu Ma, Yunke Cai, Ziyuan Nan, Di Huang, Xinkai Song, Yifan Hao, [Jie Zhang](#), Tian Zhi, Yongwei Zhao, Zidong Du, Xing Hu Qi Guo, Tianshi Chen

The 57th Annual IEEE/ACM International Symposium on Microarchitecture

ToS

Extremely-Compressed SSDs with I/O Behavior Prediction

Top Journal

Xiangyu Yao, Qiao Li, Kaihuan Lin, Xinbiao Gan, [Jie Zhang](#), Congming Gao, Zhirong Shen, Quanqing Xu, Chuanhui Yang, Jason Xue

ACM Transactions on Storage

TC

Land of Oz: Resolving Orderless Writes in Zoned Namespace SSDs

Top Journal

Yingjia Wang, You Zhou, Fei Wu, [Jie Zhang](#), Ming-Chang Yang

IEEE Transactions on Computers

USENIX ATC

ScalaAFA: Constructing User-Space All-Flash Array Engine with Holistic Designs

Top Conference

Shushu Yi, Xiurui Pan, Qiao Li, Qiang Li, Chenxi Wang, Bo Mao, Myoungsoo Jung, [Jie Zhang*](#)

USENIX Annual Technical Conference

USENIX ATC

ScalaCache: Scalable User-Space Page Cache Management with Software-Hardware

Top Conference

Coordination

Li Peng, Yuda An, You Zhou, Chenxi Wang, Qiao Li, Chuanning Chen, [Jie Zhang*](#)

USENIX Annual Technical Conference

Arxiv

From RDMA to RDCA: Toward High-Speed Last Mile of Data Center Networks Using

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Remote Direct Cache Access

Qiang Li, Qiao Xiang, Derui Liu, Yuxin Wang, Haonan Qiu, Xiaoliang Wang, [Jie Zhang](#), Ridi Wen, Haohao Song, Gexiao Tian, Chenyang Huang, Lulu Chen, Shaozong Liu, Yaohui Wu, Zhiwu Wu, Zicheng Luo, Yuchao Shao, Chao Han, Zongjie WU, Jianbo Dong, Zheng Cao, Jinbo WU, Jiwu Shu, Jiesheng Wu

Arxiv

TACO

Characterizing and Optimizing LDPC Performance on 3D NAND Flash Memories

Top Journal

Qiao Li, Yu Chen, Guanyu Wu, Yajuan Du, Min Ye, Xinbiao Gan, [Jie Zhang](#), Zhirong Shen, Jiwu Shu, Chun Jason Xue

ACM Transactions on Architecture and Code Optimization

ISCA

Flagger: Cooperative Acceleration for Large-Scale Cross-Silo Federated Learning

Top Conference

Aggregation

Xiurui Pan, Yuda An, Shengwen Liang, Bo Mao, Mingzhe Zhang, Qiao Li, Myoungsoo Jung, [Jie Zhang*](#)

IEEE/ACM International Symposium on Computer Architecture

ASPLOS

Achieving Near-Zero Read Retry for 3D NAND Flash Memory

Top Conference

Min Ye, Qiao Li, Yina Lv, [Jie Zhang](#), Tianyu Ren, Daniel Wen, Tei-Wei Kuo, Chun Jason Xue

ACM International Conference on Architectural Support for Programming Languages and Operating Systems

HPCA

StreamPIM: Streaming Matrix Computation in Racetrack Memory

Top Conference

Yuda An, Yunxiao Tang, Shushu Yi, Li Peng, Xiurui Pan, Guangyu Sun, Zhaochu Luo, Qiao Li, [Jie Zhang*](#)

IEEE International Symposium on High-Performance Computer Architecture

HPCA

BeaconGNN: Large-Scale GNN Acceleration with Asynchronous In-Storage Computing

Top Conference

Yuyue Wang, Xiurui Pan, Yuda An, [Jie Zhang*](#), Glenn Reinman*

IEEE International Symposium on High-Performance Computer Architecture

HPCA

LearnedFTL: A Learning-based Page-level FTL for Reducing Double Reads in Flash-based

Top Conference

SSDs

Shengzhe Wang, Zihang Lin, Suzhen Wu, Hong Jiang, [Jie Zhang](#), Bo Mao

IEEE International Symposium on High-Performance Computer Architecture

HPCA

Midas Touch: Invalid-Data Assisted Reliability and Performance Boost for 3D High-

Top Conference

Density Flash

QiaoLi, Hongyang Dang, Zheng Wan, Congming Gao, Min Ye, [Jie Zhang](#), Tei-Wei Kuo, Chun Jason Xue

IEEE International Symposium on High-Performance Computer Architecture

2023

NVMW

Optimizations of Linux Software RAID System for Next-Generation Storage

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Shushu Yi, Yanning Yang, Yunxiao Tang, Zixuan Zhou, Junzhe Li, Yue Chen, Myoungsoo Jung,
*Jie Zhang**,

The 14th Annual Non-volatile Memories Workshop

SAC **BcBench: Exploring Throughput Processor Designs based on Blockchain Benchmarking**

Xiurui Pan, Yue Chen, Shushu Yi, *Jie Zhang**,

The 38th ACM/SIGAPP Symposium on Applied Computing

CAL **Intelligent SSD Firmware for Zero-Overhead Journaling**

SCI Journal Hanyeoreum Bae, Donghyun Gouk, Seungjun Lee, Jiseon Kim, Sungjoon Koh, *Jie Zhang**,
and Myoungsoo Jung*,

IEEE Computer Architecture Letters (CAL)

2022

HotStorage **ScalaRAID: Optimizing Linux Software RAID System for Next-Generation Storage**

Shushu Yi, Yanning Yang, Yunxiao Tang, Zixuan Zhou, Junzhe Li, Yue Chen, Myoungsoo Jung,
*Jie Zhang**,

14th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage 22)

THPC **Survey on Storage-Accelerator Data Movement**

Zixuan Zhou, Shushu Yi, *Jie Zhang**,

CCF Transaction on High Performance Computing

NVMW **Integrating New Photonic-Based Heterogeneous Memory into Throughput Accelerators**
Jie Zhang, Myoungsoo Jung,

The 13th Annual Non-volatile Memories Workshop

NVMW **HAMS: Hardware Automated Memory-over-Storage for Large-scale Memory Expansion**
Jie Zhang, Miryeong Kwon, Donghyun Gouk, Sungjoon Koh, Nam Sung Kim,

Mahmut Taylan Kandemir, Myoungsoo Jung

The 13th Annual Non-volatile Memories Workshop

2021

MICRO **Ohm-GPU: Integrating New Optical Network and Heterogeneous Memory into GPU**

Top Conference **Multi-Processors**

Jie Zhang, Myoungsoo Jung,

The 54th Annual IEEE/ACM International Symposium on Microarchitecture

ISCA **Revamping Storage Class Memory with Hardware Automated Memory-Over-Storage**
Top Conference **Solution**

Jie Zhang, Miryeong Kwon, Donghyun Gouk, Sungjoon Koh, Nam Sung Kim,

Mahmut Kandemir, Myoungsoo Jung,

The IEEE/ACM International Symposium on Computer Architecture

NVMW **Architecting Throughput Processors with New Flash**

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Jie Zhang, Myoungsoo Jung,

The 12th Annual Non-volatile Memories Workshop

NVMW

DRAM-less Accelerator for Energy Efficient Data Processing

Jie Zhang, Gyuyoung Park, David Donofrio, John Shalf, Myoungsoo Jung

The 12th Annual Non-volatile Memories Workshop

NVMW

Manycore-Based Scalable SSD Architecture Towards One and More Million IOPS

Jie Zhang, Miryeong Kwon, Michael Swift, Myoungsoo Jung,

The 12th Annual Non-volatile Memories Workshop

2020

ISCA

ZnG: Architecting GPU Multi-Processors with New Flash for Scalable Data Analysis

Top Conference

Jie Zhang, Myoungsoo Jung,

The IEEE/ACM International Symposium on Computer Architecture

FAST

Scalable Parallel Flash Firmware for Many-core Architectures

Top Conference

Jie Zhang, Miryeong Kwon, Michael Swift, Myoungsoo Jung,

The 18th USENIX Conference on File and Storage Technologies

HPCA

DRAM-less: Hardware Acceleration of Data Processing with New Memory

Top Conference

Jie Zhang, Gyuyoung Park, David Donofrio, John Shalf, Myoungsoo Jung

26th IEEE International Symposium on High-Performance Computer Architecture

ISPASS

Data Direct I/O Characterization for Future I/O System Exploration

Major Conference

Mohammad Alian, Yifan Yuan, Jie Zhang, Ren Wang, Myoungsoo Jung, Nam Sung Kim

The IEEE International Symposium on Performance Analysis of Systems and Software

CAL

FastDrain: Removing Page Victimization Overheads in NVMe Storage Stack

SCI Journal

Jie Zhang, Miryeong Kwon, Sanghyun Han, Nam Sung Kim, Mahmut Kandemir and

Myoungsoo Jung

IEEE Computer Architecture Letters (CAL)

2019

HPCA

FUSE: Fusing STT-MRAM into GPUs to Alleviate Off-Chip Memory Access Overheads

Top Conference

Jie Zhang, Myoungsoo Jung, Mahmut Kandemir,

25th IEEE International Symposium on High-Performance Computer Architecture

IISWC

Faster than Flash: An In-Depth Study of System Challenges for Emerging Ultra-Low

Major Conference

Latency SSDs

Sungjoon Koh, Junkyeok Jang, Changrim Lee, Miryeong Kwon, Jie Zhang, Myoungsoo Jung,

The 2019 IEEE International Symposium on Workload Characterization

DAC

FlashGPU: Placing New Flash Next to GPU Cores

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Top Conference	Jie Zhang , Miryeong Kwon, Hyojong Kim, Hyesoon Kim, Myoungsoo Jung, The 56 th Design Automation Conference (DAC), 2019
TPDS	Exploring Fault-Tolerant Erasure Codes for Scalable All-Flash Array Clusters
Top Journal	Sungjoon Koh, Jie Zhang , Miryeong Kwon, Jungyeon Yoon, David Donofrio, Nam Sung Kim, Myoungsoo Jung, IEEE Transactions on Parallel and Distributed Systems (TPDS)
NVMW	Addressing Fast-De trapping for Reliable 3D NAND Flash Design Mustafa Shihab, Jie Zhang , Myoungsoo Jung, Mahmut Kandemir, 10 th Annual Non-Volatile Memories Workshop -- <i>Nominated as Memorable Paper Award</i>
KCC	Maximizing GPU Cache Utilization with Adjustable Cache Line Management Jie Zhang , Myoungsoo Jung, Korean Computer Congress (KCC), 2019 -- <i>Excellent Paper Award</i>

2018

OSDI	FlashShare: Punching Through Server Storage Stack from Kernel to Firmware for
Top Conference	Ultra-Low Latency SSDs Jie Zhang , Miryeong Kwon, Donghyun Gouk, Changlim Lee, Mohammad Alian, Myoungjun Chun, Mahmut Kandemir, Nam Sung Kim, Jihong Kim, Myoungsoo Jung, 13 th USENIX Symposium on Operating Systems Design and Implementation
MICRO	Amber: Enabling Precise Full-System Simulation with Detailed Modeling of All SSD
Top Conference	Resources Donghyun Gouk, Miryeong Kwon, Jie Zhang , Sungjoon Koh, Wonil Choi, Nam Sung Kim, Mahmut Kandemir, Myoungsoo Jung, The 51 st Annual IEEE/ACM International Symposium on Microarchitecture
TACO	ReveNAND: A Fast-Drift Aware Resilient 3D NAND Flash Design
Top Journal	Mustafa Shihab, Jie Zhang , Myoungsoo Jung, Mahmut Kandemir, ACM Transactions on Architecture and Code Optimization (TACO), 2018
Eurosys	FlashAbacus: A Self-governing Flash-based Accelerator for Low-power Systems
Top Conference	Jie Zhang , Myoungsoo Jung, The European Conference on Computer Systems (EuroSys), 2018
IPDPS	CIAO: Cache Interference-Aware Throughput-Oriented Architecture and Scheduling for
Major Conference	GPUs Jie Zhang , Shuwen Gao, Nam Sung Kim, Myoungsoo Jung, 32 nd IEEE International Parallel & Distributed Processing Symposium (IPDPS), 2018

2017

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CAL	SimpleSSD: Modeling Solid State Drive for Holistic System Simulation
Major Journal	Myoungsoo Jung, Jie Zhang , Ahmed Abulila, Miryeong Kwon, Narges Shahidi, John Shalf, Nam Sung Kim and Mahmut Kandemir, <i>IEEE Computer Architecture Letters (CAL)</i> , 2017
IISWC	Understanding System Characteristics of Online Erasure Coding on Scalable, Distributed
Major Conference	and Large-Scale SSD Array Systems Sungjoon Koh, Jie Zhang , Miryeong Kwon, Jungyeon Yoon, David Donofrio, Nam Sung Kim, Myoungsoo Jung, <i>IEEE International Symposium on Workload Characterization (IISWC)</i> , 2017
IISWC	TraceTracker: Hardware/Software Co-Evaluation for Large-Scale I/O Workload
Major Conference	Reconstruction Miryeong Kwon, Jie Zhang , Gyuyoung Park, Wonil Choi, David Donofrio, John Shalf, Mahmut Kandemir, Myoungsoo Jung, <i>IEEE International Symposium on Workload Characterization (IISWC)</i> , 2017
NPC	An In-depth Performance Analysis of Many-Integrated Core for Communication Efficient Heterogeneous Computing Jie Zhang , Myoungsoo Jung, <i>IFIP International Conference on Network and Parallel Computing (NPC)</i> , 2017
IJPP	Enabling Realistic Logical Device Interface and Driver for NVM Express Enabled Full
Major Journal	System Simulations Donghyun Gouk, Jie Zhang , Myoungsoo Jung, <i>IFIP International Conference on Network and Parallel Computing (NPC) and Invited for International Journal of Parallel Programming (IJPP)</i> , 2017

2016

HPCA	DUANG: Fast and Lightweight Page Migration in Asymmetric Memory Systems
Top Conference	Hao Wang, Jie Zhang , Gieseok Park, Sharmila Shridhar, Myoungsoo Jung, Nam Sung Kim, <i>IEEE Symposium on High Performance Computer Architecture (HPCA)</i> , 2016
ASBD	A Study for Block-level I/O Trace Reconstruction on All-Flash Arrays Miryeong Kwon, Jie Zhang , Gyuyoung Park, Myoungsoo Jung, <i>Workshop on Architectures and Systems for Big Data (ASBD@ISCA)</i> , 2016
NVMSA	An In-Depth Study of Next Generation Interface for Emerging Non-Volatile Memories
Major Conference	Wonil Choi, Jie Zhang , Shuwen Gao, Jaesoo Lee, Myoungsoo Jung, Mahmut Kandemir, <i>IEEE Non-Volatile Memory Systems and Applications Symposium (NVMSA)</i> , 2016
INFLOW	ROSS: A Design of Read-Oriented STT-MRAM Storage for Energy-Efficient Non-Uniform Cache Architecture

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Jie Zhang, Miryeong Kwon, Chanyoung Park, Myoungsoo Jung, Songkuk Kim,
USENIX Workshop on Interactions of NVM/Flash with Operating Systems and Workloads

INFLOW

Couture: Tailoring STT-MRAM for Persistent Main Memory

Mustafa Shihab, Jie Zhang, Shuwen Gao, Josep Sloan, Myoungsoo Jung,
USENIX Workshop on Interactions of NVM/Flash with Operating Systems and Workloads

2015

ASBD

CoDEN: A Hardware/Software CoDesign Emulation Platform for SSD-Accelerated Near Data Processing

Jie Zhang, Damian Szmulewicz, Erick Macias, Myoungsoo Jung,
The 5th Workshop on Architecture and System for Big Data (ASBD), 2015

PACT

NVMMU: Direct Solid State Disk Access for GPU-Accelerated Data Processing

Top Conference *Jie Zhang, David Donofrio, John Shalf, Myoungsoo Jung,*
The 24th International Conference on Parallel Architecture and Compilation Techniques

ICCD

OpenNVM: An Open-Sourced FPGA-based NVM Controller for Low Level Memory

Major Conference **Characterization**

Jie Zhang, Gieseok Park, David Donofrio, Mustafa Shihab, John Shalf and Myoungsoo Jung,
The 33rd International Conference on Computer Design (ICCD), 2015

PACT-SRC

Integrating 3D Resistive Memory Cache into GPGPU for Energy-Efficient Data Processing

Jie Zhang, David Donofrio, John Shalf and Myoungsoo Jung,
International Conference on parallel Architecture and Compilation Techniques (PACT) –
ACM SRC 2nd Runner Award, 2015

FAST-WiP

Shared Non-Volatile Memory Cache for Energy-Efficient High Throughput GPU Computing

Jie Zhang and Myoungsoo Jung,
USENIX Conference on File and Storage Technologies Working in Progress (FAST WiP), 2015

2014

HotStorage

Power, Energy, and Thermal Considerations in SSD-Based I/O Acceleration

Jie Zhang, Myoungsoo Jung,
6th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage 14), 2014

PATENTS

- “Memory controlling device and computing device including the same”, Myoungsoo Jung, Donghyun Gouk, Miryeong Kwon, Sungjoon Koh, Jie Zhang, America (US20190171566A1)
- “Flash-based accelerator and computing device including the same”, Myoungsoo Jung, Jie Zhang, America (US10824341B2, US20180321859, US20170285968)
- “基于闪存的加速器和包含其的计算设备”, Myoungsoo Jung, Jie Zhang, China (CN107291424)
- “基于闪存的加速器及包括该加速器的计算设备”, Myoungsoo Jung, Jie Zhang, China (CN109460369)

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-
- “Resistance switching memory-based accelerator”, Myoungsoo Jung, Gyuyoung PARK, Jie Zhang, America (US20180321880A1)
 - “PARALLEL PROCESSING UNIT, COMPUTING DEVICE INCLUDING THE SAME, AND THREAD SCHEDULING METHOD”, Jie Zhang, Myoungsoo Jung, America (WO2018021620)
 - “MEMORY CONTROL APPARATUS AND COMPUTING DEVICE INCLUDING SAME”, JUNG MYOUNGSOO, GOUK DONGHYUN, KWON MIRYEONG, KOH SUNGJOON, 정명수, JIE ZHANG, 국동현, 권미령, 고성준 장지에, Korea (KR1020180126267)
 - “COMPUTING DEVICE, METHOD OF PROCESSING INPUT/OUTPUT REQUEST, AND RECORDING MEDIUM”, Jie Zhang, Myoungsoo Jung, Donghyun Gouk, Miryeong Kwon, Sungjoon Koh, America (pending)
 - “FLASH-BASED COPROCESSOR”, Jie Zhang, Myoungsoo Jung, America (pending)
 - “FLASH STORAGE DEVICE AND METHOD OF SCHEDULING PAGE VICTIMIZATION”, Jie Zhang, Myoungsoo Jung, America (pending)
-

EXPERIENCE

Research Assistant, Computer Architecture and Memory System Lab

Sep 2013 – May 2021

- Cache and memory system optimization in GPGPU and multi-core system.
 - Non-volatile memory (including Spin-transfer torque magnetic random-access memory and Phase Change Random Access Memory) characterization and optimization.
 - Performance, power and thermal optimizations of Solid State Disk (SSD).
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External Activities

Journal Paper Review/Sub-review

- IEEE Transactions on Computer
- ACM Transactions on Storage
- ACM Transactions on Architecture and Code Optimization
- ACM Transactions on Computer Systems
- IEEE Transactions on Parallel and Distributed Systems
- IEEE Computer Architecture Letters
- IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems

Conference Paper Review/Sub-review

- MICRO'24'18 '16
 - ISCA'24
 - HPCA'24'18 '16
 - USENIX ATC'23
 - ChinaSys'22
 - SAC'22
 - HotStorage'20
 - DAC'20 '19
 - NVMSA'17 '16
 - ICCD'19 '18 '17 '15
 - IPDPS'18 '16
 - DATE'19
 - ASPLOS'19 '18 '17
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Invited Talks and Presentations

- Invited talk, “ZnG: Architecting GPU Multi-Processors with New Flash for Scalable Data Analysis”, Intel Computational Storage Lab, 2020
- Presentation, “ZnG: Architecting GPU Multi-Processors with New Flash for Scalable Data Analysis”, ISCA, online, 2020
- Presentation, “DRAM-less: Hardware Acceleration of Data Processing with New Memory”, HPCA, San Diego, CA, 2020
- Presentation, “Scalable Parallel Flash Firmware for Many-core Architectures”, FAST, Santa Clara, CA, 2020
- Presentation, “FUSE: Fusing STT-MRAM into GPUs to Alleviate Off-Chip Memory Access Overheads”, HPCA, Washington DC, 2019
- Presentation, “FlashGPU: Placing New Flash Next to GPU Cores”, DAC, Las Vegas, NV, 2019
- Presentation, “Maximizing GPU Cache Utilization with Adjustable Cache Line Management”, Jeju, South Korea, 2019
- Presentation, “FlashShare: Punching Through Server Storage Stack from Kernel to Firmware for Ultra-Low Latency SSDs”, Carlsbad, CA, 2018
- Presentation, “FlashAbacus: A Self-governing Flash-based Accelerator for Low-power Systems”, Porto, Portugal, 2018
- Presentation, “CIAO: Cache Interference-Aware Throughput-Oriented Architecture and Scheduling for GPUs”, IPDPS, Vancouver, Canada, 2018
- Presentation, “An In-depth Performance Analysis of Many-Integrated Core for Communication Efficient Heterogeneous Computing”, NPC, Anhui, China, 2017
- Presentation, “ROSS: A Design of Read-Oriented STT-MRAM Storage for Energy-Efficient Non-Uniform Cache Architecture”, Inflow, Savannah, GA, 2016
- Presentation, “Couture: Tailoring STT-MRAM for Persistent Main Memory”, Inflow, Savannah, GA, 2016
- Presentation, “CoDEN: A Hardware/Software CoDesign Emulation Platform for SSD-Accelerated Near Data Processing”, ASBD, Portland, OR, 2015
- Presentation, “NVMMU: Direct Solid State Disk Access for GPU-Accelerated Data Processing”, PACT, San Francisco, CA, 2015
- Presentation, “Integrating 3D Resistive Memory Cache into GPGPU for Energy-Efficient Data Processing”, PACT SRC, San Francisco, CA, 2015
- Presentation, “OpenNVM: An Open-Sourced FPGA-based NVM Controller for Low Level Memory Characterization”, ICCD, New York city, NY, 2015
- Presentation, “Shared Non-Volatile Memory Cache for Energy-Efficient High Throughput GPU Computing”, FAST WiP, Santa Clara, CA, 2015
- Presentation, “Power, Energy, and Thermal Considerations in SSD-Based I/O Acceleration”, HotStorage, Philadelphia, PA, 2014

Teaching Experience

- Computer Architecture (Fall’22)
 - Introduction of Computer System (Fall’22)
 - IIT 3002 Operating Systems (Fall’15, Fall’16)
 - IIT 6036 Computer Organization and Design (Fall’15, Fall’16)
 - IIT 7024 Advanced System Architecture (Spring’16)
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Honors

- 2025: HPCA Hall of Fame
- 2025: OlympicMons Award
- 2023: Intel Young Faculty Research Program
- 2022: ACM SIGCSE Rising Star Award
- 2021: Our storage-class memory research is selected as KAIST breakthrough 50 years
- 2020-2021: Korean BK21+ Scholarship
- 2020: HPCA travel grant
- 2019: Annual Non-Volatile Memories Workshop (NVMW) -- Nominated as Memorable Paper Award
- 2019: Korea Computer Congress (KCC) -- Best Presentation Paper Award
- 2018: OSDI travel grant
- 2015: ACM Student Research Competition 2nd Runner Award