JIE ZHANG

tel: +8201038363463|jie@camelab.org

Dr. Jie Zhang is currently engaged in the research and design of storage systems 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 more than 30 papers in top-tier conferences and journals and 18 papers as the first author, including ISCA, OSDI, HPCA (three papers), MICRO, FAST, DAC, Eurosys, PACT, and TPDS.

Actively seeking jobs in the area of OS, computer architecture and storage system.

EDUCATION

KAIST, Daejeon, Korea — **Advisor:** Dr. Myoungsoo Jung
Postdoctoral Researcher — March 2020 – expected Feb 2021

Yonsei University, Incheon, Korea — **Advisor:** Dr. Myoungsoo Jung
PhD in Engineering — August 2015 – Feb 2020

University of Texas at Dallas, Richardson, Texas — **Advisor:** Dr. Myoungsoo Jung
PhD in Computer Engineering — August 2014 – August 2015

University of Texas at Dallas, Richardson, Texas — **Advisor:** Dr. Myoungsoo Jung
Master of Science in Electrical Engineering — August 2012 – May 2014

PUBLICATIONS

Under review

ISCA	**Ohm-GPU: Integrating New Optical Network and Heterogeneous Memory into GPU**
Top Conference	**Multi-Processors**
ISCA	**Revamping Storage Class Memory with Hardware Automated Memory-Over-Storage**
Top Conference	**Solution**
DAC	**MobiFlash: Expanding Mobile Memory Space with Flash**
Top Conference	
DAC	**Check0-SSD: Designing a Computational SSD for Zero-Overhead Journaling Systems**
Top Conference	
USENIX ATC	**Remedy: Rethinking the Reliability Techniques in Error-Prone Storage**
Top Conference	
NVMW	**Architecting Throughput Processors with New Flash**
NVMW	**DRAM-less Accelerator for Energy Efficient Data Processing**
NVMW	**A Non-Volatile Memory Management Unit for Heterogeneous GPU-SSD Architectures**

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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**

Top Conference ***Jie Zhang***, *Miryeong Kwon, Hyojong Kim, Hyesoon Kim, Myoungsoo Jung,*

The 56th Design Automation Conference (DAC), 2019

TPDS **Exploring Fault-Tolerant Erasure Codes for Scalable All-Flash Array Clusters**

Top Conference *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-Detrapping for Reliable 3D NAND Flash Design**

Mustafa Shihab, ***Jie Zhang***, *Myoungsoo Jung, Mahmut Kandemir,*

10th Annual Non-Volatile Memories Workshop -- Nominated as Memorable Paper Award

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KCC **Maximizing GPU Cache Utilization with Adjustable Cache Line Management**

***Jie Zhang**, Myoungsoo Jung,*

Korean Computer Congress (KCC), 2019 -- Nominated as Excellent Paper Award

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,*

13th 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 51st 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,*

32nd IEEE International Parallel & Distributed Processing Symposium (IPDPS), 2018

2017

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,*

IEEE Computer Architecture Letters (CAL), 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,*

IEEE International Symposium on Workload Characterization (IISWC), 2017

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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,*

IEEE International Symposium on Workload Characterization (IISWC), 2017

NPC **An In-depth Performance Analysis of Many-Integrated Core for Communication Efficient Heterogeneous Computing**

***Jie Zhang**, Myoungsoo Jung,*

IFIP International Conference on Network and Parallel Computing (NPC), 2017

IJPP **Enabling Realistic Logical Device Interface and Driver for NVM Express Enabled Full System Simulations**

Major Journal

*Donghyun Gouk, **Jie Zhang**, Myoungsoo Jung,*

IFIP International Conference on Network and Parallel Computing (NPC) and Invited for International Journal of Parallel Programming (IJPP), 2017

2016

HPCA **DUANG: Fast and Lightweight Page Migration in Asymmetric Memory Systems**

Top Conference *Hao Wang, **Jie Zhang**, Gieseo Park, Sharmila Shridhar, Myoungsoo Jung, Nam Sung Kim,*

IEEE Symposium on High Performance Computer Architecture (HPCA), 2016

ASBD **A Study for Block-level I/O Trace Reconstruction on All-Flash Arrays**

Major Conference *Miryeong Kwon, **Jie Zhang**, Gyuyoung Park, Myoungsoo Jung,*

Workshop on Architectures and Systems for Big Data (ASBD@ISCA), 2016

NVMSA **An In-Depth Study of Next Generation Interface for Emerging Non-Volatile Memories**

*Wonil Choi, **Jie Zhang**, Shuwen Gao, Jaesoo Lee, Myoungsoo Jung, Mahmut Kandemir,*

IEEE Non-Volatile Memory Systems and Applications Symposium (NVMSA), 2016

INFLOW **ROSS: A Design of Read-Oriented STT-MRAM Storage for Energy-Efficient Non-Uniform Cache Architecture**

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**

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***Jie Zhang**, Damian Szmulewicz, Erick Macias, Myoungsoo Jung,*

The Fifth 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**, Gieseo Park, David Donofrio, Mustafa Shihab, John Shalf and Myoungsoo Jung,*

The 33rd International Conference on Computer Design (ICCD), 2015

PACT-SRC **Integrating 3D Resisteive 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 Mmeory 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)
- “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)

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- "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 - Present**

- 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).

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'18 '16
- HPCA'18 '16
- ASPLOS'19 '18 '17
- DATE'19
- IPDPS'18 '16
- ICCD'19 '18 '17 '15
- DAC'20 '19
- NVMSA'17 '16
- HotStorage'20

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

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- 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

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

Honors

- 2015 ACM Student Research Competition 2nd Runner Award
- 2018 OSDI travel grant
- 2019 Korea Computer Congress (KCC) -- Best Presentation Paper Award
- 2019 Annual Non-Volatile Memories Workshop (NVMW) -- Nominated as Memorable Paper Award
- 2020 HPCA travel grant
- 2020-2021 Korean BK21+ Scholarship