

JIE ZHANG

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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 40 papers in top-tier conferences and journals and 22 papers as the first author, including ISCA (three papers), OSDI, HPCA (seven papers), MICRO (two papers), ASPLOS, FAST, DAC, Eurosys, PACT, TPDS and TACO.

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

2024

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

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HPCA	StreamPIM: Streaming Matrix Computation in Racetrack Memory
Top Conference	Yuda An, Yunxiao Tang, Shushu Yi, Li Peng, Xlurui Pan, Guangyu Sun, Zhaochu Luo, Qiao Li, Jie Zhang <i>IEEE International Symposium on High-Performance Computer Architecture</i>
HPCA	BeaconGNN: Large-Scale GNN Acceleration with Asynchronous In-Storage Computing
Top Conference	Yuyue Wang, Xiurui Pan, Yuda An, Jie Zhang* , Glenn Reinman* <i>IEEE International Symposium on High-Performance Computer Architecture</i>
HPCA	LearnedFTL: A Learning-based Page-level FTL for Reducing Double Reads in Flash-based SSDs
Top Conference	Shengzhe Wang, Zihang Lin, Suzhen Wu, Hong Jiang, Jie Zhang , Bo Mao <i>IEEE International Symposium on High-Performance Computer Architecture</i>
HPCA	Midas Touch: Invalid-Data Assisted Reliability and Performance Boost for 3D High-Density Flash
Top Conference	QiaoLi, Hongyang Dang, Zheng Wan, Congming Gao, Min Ye, Jie Zhang , Tei-Wei Kuo, Chun Jason Xue <i>IEEE International Symposium on High-Performance Computer Architecture</i>

2023

NVMW	Optimizations of Linux Software RAID System for Next-Generation Storage
	Shushu Yi, Yanning Yang, Yunxiao Tang, Zixuan Zhou, Junzhe Li, Yue Chen, Myoungsoo Jung, Jie Zhang , <i>The 14th Annual Non-volatile Memories Workshop</i>
SAC	BcBench: Exploring Throughput Processor Designs based on Blockchain Benchmarking
	Xiurui Pan, Yue Chen, Shushu Yi, Jie Zhang , <i>The 38th ACM/SIGAPP Symposium on Applied Computing</i>
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, <i>IEEE Computer Architecture Letters (CAL)</i>

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 , <i>14th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage 22)</i>
THPC	Survey on Storage-Accelerator Data Movement
	Zixuan Zhou, Shushu Yi, Jie Zhang , <i>CCF Transaction on High Performance Computing</i>

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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 (to appear)**
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 (to appear)**
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 (to appear)**
Jie Zhang, Myoungsoo Jung,
The 12th Annual Non-volatile Memories Workshop

NVMW **DRAM-less Accelerator for Energy Efficient Data Processing (to appear)**
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**
(to appear)
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**

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- 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 Latency SSDs**
- Major Conference** 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 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-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
- KCC** **Maximizing GPU Cache Utilization with Adjustable Cache Line Management**
- Jie Zhang**, Myoungsoo Jung,
Korean Computer Congress (KCC), 2019 -- 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

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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

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,

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

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

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](#), Gieseok 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**
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**
Major Conference *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**
[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,

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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)
- “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 장치에, 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

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

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- 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
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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

- 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