Jisung Park

Assistant Professor, Department of Computer Science and Engineering, POSTECH, Pohang, Republic of Korea

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Research Interests

Computer architecture; System software; Memory/storage systems; System security; Operating systems; Embedded systems; Machine learning; Bioinformatics; Hardware-software interaction

Education

Seoul National University, Seoul, Republic of Korea — August 2019
Ph.D. in Electrical Engineering and Computer Science
Advisor: Prof. Jihong Kim
Dissertation Title: *Performance and Lifetime Optimizations for Large-capacity NAND Storage Systems*
Outstanding Doctoral Dissertation Award by the Dept. of CSE at Seoul National University

Seoul National University, Seoul, Republic of Korea — August 2011
B.S.E. in Computer Science and Engineering

Honors & Awards

Intel Hardware Security Academic Award Finalist, Intel. 2022
Postdoctoral Research Fellowship, National Research Foundation of Korea. 2020
Outstanding Ph.D. Dissertation Award, Dept. of CSE at Seoul National University. 2019
Naver Ph.D. Fellowship, Naver Cooperation. 2017
Samsung Humantech Paper Award – Encouragement Prize, Samsung Electronics. 2017
Best Paper Award Nomination, The 53rd ACM/IEEE Design Automation Conference (DAC). 2016
Samsung Humantech Paper Award – Bronze Prize, Samsung Electronics. 2016
Samsung Electronics Ph.D. Fellowship, Samsung Electronics. 2013 – 2019
Minister of Education and Science Technology Award (2nd Place), Capstone Design Contest. 2009

Work Experience

Main areas of my research have been:

- ◇ hardware/software co-optimizations for improving SSD performance [DAC'16 & '17, MICRO'19, ASPLOS'21]
- ◇ storage compression techniques to reduce system-management cost [DATE'13 & '17, US Patent'16, FAST'22]
- ◇ security enhancement techniques for NAND flash-based SSDs [DAC'19, ASPLOS'20]
- ◇ processing in memory and in-storage processing [ASPLOS'22, MICRO'22]
- ◇ RowHammer characterization and mitigation [HPCA'21, MICRO'21, DSN'22]
- ◇ architectural supports for improving main memory performance [ISCA'20]
- ◇ machine learning-based system optimizations [DAC'19, FAST'22, ISCA'22]
- ◇ system optimizations for bioinformatics [ASPLOS'22, NARGAB'23]
- ◇ energy-efficient system designs [MICRO'21, HPCA'22]

Assistant Professor — September 2022 – Present
Pohang University of Science and Technology, Dept. of Computer Science and Engineering

Postdoctoral Research Associate and Lecturer — September 2019 – August 2022
ETH Zürich, Dept. of Information Technology and Electrical Engineering, Zürich, Switzerland
Advisor: Prof. Onur Mutlu

Peer-Reviewed International Publications

[**ISCA 2023**] Rakesh Nadig, Mohammad Sadrosadati, Haiyu Mao, Nika Mansouri Chiasi, Arash Tavakool, **Jisung Park**, Hamid Sarbazi-Azad, Juan Gómez Luna, and Onur Mutlu, "Venice: Improving Solid-State Drive Parallelism at Low Cost via Conflict-Free Accesses," in *Proceedings of the 49th IEEE/ACM International Symposium on Computer Architecture*, Orlando, FL, USA, June 2023.

[**NARGAB'23**] Can Firtina, **Jisung Park**, Mohammaed Alser, Jeremie S. Kim, Damla Senol Cali, Taha Shahroodi, Nika Mansouri Chiasi, Gagandeep Singh, Konstantinos Kanellopoulos, Can Alkan, and Onur Mutlu, "BLEND: A Fast, Memory-Efficient and Accurate Mechanism to Find Fuzzy Seed Matches in Genome Analysis," *NAR Genomics and Bioinfomatics*, March 2023.

[**MICRO'22**] **Jisung Park**, Roknoddin Azizibarzoki, Geraldo Francisco de Oliveira Junior, Mohammad Sadrosadati, Rakesh Nadig, David Novo, Juan Gómez Luna, Myungsuk Kim, and Onur Mutlu, "Flash-Cosmos: In-Flash Bulk Bitwise Operations Using Inherent Computation Capability of NAND Flash Memory," in *Proceedings of the 55th IEEE/ACM International Symposium on Microarchitecture*, Chicago, IL, USA, October 2022.

[**MICRO'22**] Sina Darabi, Mohammad Sadrosadati, Negar Akbarzadeh, Joël Lindegger, S. Mohammad Hosseini, **Jisung Park**, Juan Gómez Luna, Onur Mutlu, and Hamid Sarbazi-Azad, "Morpheus: Extending the Last Level Cache in GPU Systems with Idle GPU Cores Resources," in *Proceedings of the 55th IEEE/ACM International Symposium on Microarchitecture*, Chicago, IL, USA, October 2022.

[**DSN'22**] A. Giray Yaglikci, Haocong Luo, Ataberk Olgun, Geraldo Francisco de Oliveira Junior, Minesh Patel, **Jisung Park**, Hasan Hassan, Lois Orosa, Jeremie Kim, and Onur Mutlu, "Understanding the RowHammer Vulnerability Under Reduced Wordline Voltage: An Experimental Study Using Real Devices," in *Proceedings of the 52nd Annual IEEE/IFIP International Conference on Dependable Systems and Networks*, Baltimore, MD, USA, June 2022.

[**ISCA'22**] Gagandeep Singh, Rakesh Nadig, **Jisung Park**, Rahul Bera, Nastaran Hajinazar, David Novo, Juan Gómez Luna, Sander Stuijk, Henk Corporaal, and Onur Mutlu, "Sibyl: Adaptive and Extensible Data Placement in Hybrid Storage Systems Using Online Reinforcement Learning," in *Proceedings of the 49th International Symposium on Computer Architecture*, New York, NY, USA, June 2022.

[**HPCA'22**] Jawad Haj-Yahya, Jeremie S. Kim, A. Giray Yaglikci, **Jisung Park**, Efraim Rotem, Yanos Sazeides, and Onur Mutlu, "DarkGates: A Hybrid Power-Gating Architecture to Mitigate Dark Sides of Dark-Silicon in High Performance Processors," in *Proceedings of the 28th IEEE International Symposium on High-Performance Computer Architecture*, Virtual, April 2022.

[**ASPLOS'22**] Nika Mansouri Ghiasi, **Jisung Park**, Harun Mustafa, Jeremie S. Kim, Ataberk Olgun, Arvid Gollwitzer, Damla Senol Cali, Can Firtina, Haiyu Mao, Nour Almadhoun Alserr, Rachata Ausavarungnirun, Nandita Vijaykumar, Mohammded Alser, and Onur Mutlu, "GenStore: A High-Performance In-Storage Processing System for Genome Sequence Analysis," in *Proceedings of the 27th International Conference on Architectural Support for Programming Languages and Operating Systems*, Lausanne, Switzerland, February 2022.

[**FAST'22**] **Jisung Park***, Jeonggyun Kim*, Yeseong Kim, Sungjin Lee, and Onur Mutlu, "DeepSketch: A New Machine Learning-Based Reference Search Technique for Post-Deduplication Delta Compression," in *Proceedings of the 20th USENIX Conference on File and Storage Technologies*, Santa Clara, CA, USA, February 2022 (***co-first authorship**).

[**MICRO'21**] Jawad Haj-Yahya, **Jisung Park**, Rahul Bera, Juan Gómez Luna, Efraim Rotem, Taha Shahroodi, Jeremie Kim, and Onur Mutlu, "BurstLink: Techniques for Energy-Efficient Conventional and Virtual Reality Video Display," in *Proceedings of the 54th IEEE/ACM International Symposium on Microarchitecture*, Virtual, October 2021.

[**MICRO'21**] Lois Orosa*, A. Giray Yaglikci*, Haocong Luo, Ataberk Olgun, **Jisung Park**, Hasan Hassan, Minesh Patel, Jeremie S. Kim, and Onur Mutlu, "A Deeper Look into RowHammer's Sensitivities: Experimental Analysis of Real DRAM Dchips and Implications on Future Attacks and Defenses," in *Proceedings of the 54th IEEE/ACM International Symposium on Microarchitecture*, Virtual, October 2021 (***co-first authorship**).

[**ASPLOS'21**] **Jisung Park**, Myungsuk Kim, Myoungjun Chun, Lois Orosa, Jihong Kim, and Onur Mutlu, "Reducing Solid-State Drive Read Latency by Optimizing Read-Retry," in *Proceedings of the 26th International Conference on Architectural Support for Programming Languages and Operating Systems*, Virtual, April 2021.

[**HPCA'21**] A. Giray Yaglikci, Minesh Patel, Jeremie Kim, Roknoddin Azizibarzoki, Ataberk Olgun, Lois Orosa, Hasan Hassan, **Jisung Park**, Konstantinos Kanellopoulos, Taha Shahroodi, Saugata Ghose, and Onur Mutlu, "BlockHammer: Preventing RowHammer at Low Cost by Blacklisting Rapidly-Accessed DRAM Rows," in *Proceedings of the 27th IEEE International Symposium on High-Performance Computer Architecture*, Virtual, February 2021.

[**ISCA'20**] Haocong Luo, Taha Shahroodi, Hasan Hassan, Minesh Patel, A. Giray Yaglikci, Lois Orosa, **Jisung Park**, and Onur Mutlu, "CLR-DRAM: A Low-Cost DRAM Architecture Enabling Dynamic Capacity-Latency Trade-Off," in *Proceedings of the 47th International Symposium on Computer Architecture*, Virtual, May 2020.

[**ASPLOS'20**] Myungsuk Kim*, **Jisung Park***, Geonhee Cho, Yoona Kim, Lois Orosa, Onur Mutlu, and Jihong Kim, "Evanesco: Architectural Support for Efficient Data Sanitization in Modern Flash-Based Storage Systems," in *Proceedings of the 25th International Conference on Architectural Support for Programming Languages and Operating Systems*, Virtual, March 2020 (***co-first authorship**).

[**MICRO'19**] Youngseop Shim*, Myungsuk Kim*, Myoungjun Chun, **Jisung Park**, Yoona Kim, and Jihong Kim, "Exploiting Process Similarity of 3D Flash Memory for High Performance SSDs," in *Proceedings of the 52nd IEEE/ACM International Symposium on Microarchitecture*, Columbus, OH, USA, October 2019 (***co-first authorship**).

[**NVMSA'19**] Duwon Hong, Myungsuk Kim, **Jisung Park**, Myoungsoo Jung, and Jihong Kim, "Improving SSD Performance Using Adaptive Restricted-Copyback Operations," in *Proceedings of the 8th IEEE Non-Volatile Memory System and Application Symposium*, Hangzhou, China, August 2019.

[**DAC'19**] **Jisung Park**, Youngdon Jung, Jonghoon Won, Minji Kang, Sungjin Lee, and Jihong Kim, "RansomBlocker: a Low-Overhead Ransomware-Proof SSD," in *Proceedings of the 56th ACM/ IEEE Design Automation Conference*, Las Vegas, NV, USA, June, 2019.

[**NVMSA'18**] **Jisung Park**, Myungsuk Kim, Sungjin Lee, and Jihong Kim, "Improving I/O Performance of Large-Page Flash Storage Systems Using Subpage-Parallel Reads," in *Proceedings of the 7th IEEE Non-Volatile Memory System and Applications Symposium*, Hakodate, Japan, August 2018.

[**DAC'17**] Myungsuk Kim, Jaehoon Lee, Sungjin Lee, **Jisung Park**, and Jihong Kim, "Improving Performance and Lifetime of Large-Page NAND Storages Using Erase-Free Subpage Programming," in *Proceedings of the ACM/IEEE 54th Design Automation Conference*, Austin, TX, USA, June 2017.

[**DATE'17**] **Jisung Park**, Sungjin Lee, and Jihong Kim, "DAC: Dedup-Assited Compression Scheme for Improving the Lifetime of NAND Storage Systems," in *Proceedings of the Design, Automation and Test in Europe Conference & Exhibition*, Lausanne, Switzerland, March, 2017.

[**DAC'16**] **Jisung Park**, Jaeyong Jeong, Sungjin Lee, Youngsun Song, and Jihong Kim, "Improving Performance and Lifetime of NAND Storage Systems Using Relaxed Program Sequence," in *Proceedings of the 53rd ACM/IEEE Design Automation Conference*, Austin, TX, USA, June 2016 (**Best Paper Award Nomination**).

[**NVMSA'16**] Taejin Kim, Sungjin Lee, **Jisung Park**, and Jihong Kim, "Efficient Lifetime Management of SSD-based RAIDs Using Dedup-Assited Partial Stripe Writes," in *Proceedings of the 5th IEEE Non-Volatile Memory System and Applications Symposium*, Daegu, Republic of Korea, August, 2016.

[**DATE'13**] Sungjin Lee, Taejin Kim, **Jisung Park**, and Jihong Kim, "An Integrated Approach for Managing the Lifetime of Flash-Based SSDs," in *Proceedings of the Design, Automation & Test in Europe Conference & Exhibition*, Grenoble, France, March, 2013.

[**RSP'12**] Sungjin Lee, **Jisung Park**, and Jihong Kim, "FlashBench: A Workbench for a Rapid Development of Flash-Based Storage Devices," in *Proceedings of the 23rd IEEE International Symposium on Rapid System Prototyping*, Tampere, Finland, October, 2012.

Patents

Sangkwon Moon, Jihong Kim, **Jisung Park**, Hyunchul Park, and Kyungho Kim, "Storage Device and Method of Operating the Same," Korea Patent 10-2218732, February 2021.

Jihong Kim, **Jisung Park**, Sangkwon Moon, Hyunchul Park, and Kyungho Kim, "Storage Device and Method of Operating the Same," US Patent 9,477,589, October 2016.

Jihong Kim, Taejin Kim, **Jisung Park**, and Sungjin Lee, "Nonvolatile Memory Device, Distributed Disk Controller, and Deduplication Method Thereof," US Patent Application 14/565,107, December 2014.

Jihong Kim, Taejin Kim, Sungjin Lee, and **Jisung Park**, "Nonvolatile Memory Device, Distributed Disk Controller, and Deduplication Method Thereof," Korea Patent Application 10-2013-0153199, December, 2013.

Talks

"In-Storage Processing: Opportunities and Challenges"
- ◇ KIISE Computer System Society Winter Conference, Pyeongchang, Republic of Korea — February 2023
- ◇ Electronics and Telecommunications Research Institute (ETRI), Daejun, Republic of Korea — May 2023

"Flash-Cosmos: In-Flash Bulk Bitwise Operations Using Inherent Computation Capability of NAND Flash Memory"
- ◇ MICRO-55, Chicago, IL, USA — August 2022
- ◇ NVRAMOS'22, Sokcho, Republic of Korea — October 2022
- ◇ SIGARCH Korea Workshop, Republic of Korea — July 2023

"GenStore: A High-Performance In-Storage Processing System for Genome Sequence Analysis"
- ◇ Flash Memory Summit 2022, Santa Clara, CA, USA — August 2022

"Cross-Layer Optimizations for Fast and Secure Storage Systems"
- ◇ POSTECH, Pohang, Republic of Korea — April 2022

"DeepSketch: A New Machine Learning-Based Reference Search Technique for Post-Deduplication Delta Compression"
- ◇ USENIX FAST'22, Santa Clara, CA, USA — February 2022

"Reducing Solid-State Drive Read Latency by Optimizing Read-Retry"
- ◇ ASPLOS-26, Virtual — April 2021
- ◇ Flash Memory Summit 2022, Santa Clara, CA, USA — August 2022

"Evanesco: Architectural Support for Efficient Data Sanitization in Modern Flash-based Storage Systems"
- ◇ ASPLOS-25, Virtual — March 2020
- ◇ DGIST, Daegu, Republic of Korea — December 2020
- ◇ Flash Memory Summit 2022, Santa Clara, CA, USA — August 2022

"Cross-layer Optimization for Improving Performance of Large-capacity NAND Flash-based SSDs"
- ◇ ETH Zürich, Zürich, Switzerland — July 2019
- ◇ DGIST, Daegu, Republic of Korea — January 2019

"RansomBlocker: a Low-overhead Ransomware-proof SSD"
- ◇ DAC-56, Las Vegas, NV, USA — June 2019

"DAC: Dedup-assisted Compression Scheme for Improving the Lifetime of NAND Storage Systems,"
- ◇ DATE, Lausanne, Switzerland — March 2017

"Improving Performance and Lifetime of NAND Storage Systems Using Ralxed Program Sequence"
- ◇ DAC-53, Austin, TX, USA, — June 2016

Grants & Research Funding

Design of Next-Generation Large-Capacity NAND Flash-Based Storage Systems
Principal Investigator — March 2023 – February 2026
Samsung Electronics — Total Grant: 180,000,000 KRW

POSTECH Start-Up Funding
Principal Investigator — September 2022 – February 2025
Pohang University of Science and Technology — Total Grant: 250,000,000 KRW

Storage System Design for Machine Learning Applications
Principal Investigator September 2020 – August 2021
National Research Foundation of Korea Total Grant: 45,000,000 KRW

Teaching Experience

POSTECH, Instructor
- ◇ Advanced Operating Systems — Spring 2023
- ◇ Memory and Storage Systems — Fall 2022

ETH Zürich, Lecturer
- ◇ Understanding and Designing Modern NAND Flash-based SSDs — Spring & Fall 2021, Spring 2022

ETH Zürich, Teaching Assistant
- ◇ Computer Architecture — Fall 2019 – 2021
- ◇ Seminar in Computer Architecture — Spring & Fall 2019 – 2021
- ◇ Digital Design and Computer Architecture — Spring 2020, 2021

Seoul National University, Teaching Assistant
- ◇ Computer Architecture — Spring 2012 – 2014, 2016, 2017
- ◇ Logic Design — Fall 2011, 2015, 2017
- ◇ Logic Design Lab — Fall 2011, 2013, 2014

Samsung Electronics, Teaching Assistant
- ◇ Flash Software Expert Course — 2013

SK Hynix, Teaching Assistant
- ◇ Advanced Flash Software — 2012 – 2014

Student Mentoring

Sungju Cho 2022 – Present
Ph.D Research, POSTECH
Topic: *Cross-Layer Optimization for NAND Flash-Based Storage Systems*

Nika Mansourighiasi 2020 – Present
Ph.D. Research, ETH Zürich
Topic: *In-Storage Processing for Genomics Applications* (ASPLOS'22)

Myoungjun Chun 2019 – Present
Ph.D. Research, Seoul National University
Topic: *Improving SSD Read Performance Using an Accurate Error Model*

Rakesh Nadig 2020 – Present
Ph.D. Research, ETH Zürich
Topic: *Performance & Wear-Out Attacks on SSDs*

Roknoddin Azizibarzoki 2021 – 2022
Masters Research, ETH Zürich
Topic: *Practical In-Flash Computation*

Yunxin Sun 2021 – 2022
Masters Research, ETH Zürich
Topic: *SSD I/O Scheduling for Deterministic Performance*

Jiantao Liu 2021 – 2022
Masters Research, ETH Zürich
Topic: *RowHammer Characterization*

Alaeddine Jendoubi 2020
Masters Thesis Internship, ETH Zürich & IMEC
Topic: *SSD Optimization Using Advance Features of Modern NAND Flash Memory*

Kalliopi Tzimi 2019 – 2020
Masters Thesis Internship, ETH Zürich & IMEC
Topic: *Hybrid Address Translation for Large-Capacity NAND Flash-based SSDs*

Professional Service

Guest Editor for Journals
- ◇ MDPI Electronics 2021

Program Committee
- ◇ Design Automation Conference (DAC) 2023
- ◇ NVRAMOS 2022

External Reviewer
- ◇ European Conference on Computer Systems (EuroSys) 2022

Technical Reviewer for Journals
- ◇ IEEE Transactions on Cloud Computing 2023
- ◇ IEEE Transactions on Computers 2019, 2020, 2023
- ◇ IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems 2017, 2021, 2022
- ◇ ACM Transactions on Design Automation of Electronic Systems 2021
- ◇ MDPI Electronics 2021
- ◇ MDPI Micromachines 2021
- ◇ ACM Transactions on Architecture and Code Optimization 2020
- ◇ ACM Computing Surveys 2020