

# Jisung Park

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

+82-54-279-2263 ♦ <http://jisungpark.kr> ♦ [jisung.park@postech.ac.kr](mailto:jisung.park@postech.ac.kr)

## Research Interests

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

## Education

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**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

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**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

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**Main areas of my research have been:**

- ◇ cross-layer optimization for NAND flash-based storage systems
- ◇ storage compression techniques to reduce system-management cost
- ◇ security enhancement techniques for NAND flash-based SSDs
- ◇ processing in memory and in-storage processing
- ◇ RowHammer characterization and mitigation
- ◇ architectural supports for improving main memory performance
- ◇ machine learning-based system optimizations
- ◇ system optimizations for bioinformatics
- ◇ energy-efficient system designs

**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

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[ISCA 2024] Nika Mansouri Ghiasi, Mohammad Sadrosadati, Harun Mustafa, Arvid Gollwitzer, Can Firtina, Julien Eudine, Haiyu Mao, Joël Lindegger, Meryem Banu Cavlak, Mohammed Alser, **Jisung Park**, and Onur Mutlu, “MegIS: High-Performance and Low-Cost Metagenomic Analysis with In-Storage Processing,” in *Proceedings of the 51st IEEE/ACM International Symposium on Computer Architecture*, Buenos Aires, Argentina, June 2024 (to appear).

[ASPLOS 2024] Sungjun Cho, Beomjun Kim, Hyunuk Cho, Gyeongseob Seo, Onur Mutlu, Myungsuk Kim, and **Jisung Park**, “AERO: Adaptive Erase Operation for Improving Lifetime and Performance of Modern NAND Flash-Based SSDs,” in *Proceedings of the 29th International Conference on Architectural Support for Programming Languages and Operating Systems*, San Diego, CA, USA, April 2024 (to appear).

[HPCA 2024] Myoungjun Chun\*, Jaeyong Lee\*, Myungsuk Kim, **Jisung Park** and Jihong Kim, “RiF: Improving Read Performance of Modern SSDs Using an On-Die Early-Retry Engine,” in *Proceedings of the 30th IEEE International Symposium on High-Performance Computer Architecture*, Edinburgh, Scotland, March 2024 (\*co-first authorship).

[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**, Mohammed 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 Bioinformatics*, 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 Ausavarungrun, Nandita Vijaykumar, Mohammed 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

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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

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### ***“In-Storage Processing: Opportunities and Challenges”***

- ◊ KIISE Computer System Society Winter Conference, Pyeongchang, Republic of Korea February 2023
- ◊ Electronics and Telecommunications Research Institute (ETRI), Daejeon, 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

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### Design of Next-Generation Large-Capacity NAND Flash-Based Storage Systems

#### Principal Investigator

Samsung Electronics

March 2023 – February 2026

Total Grant: 180,000,000 KRW

### POSTECH Start-Up Funding

#### Principal Investigator

Pohang University of Science and Technology

September 2022 – February 2025

Total Grant: 250,000,000 KRW

### Storage System Design for Machine Learning Applications

#### Principal Investigator

National Research Foundation of Korea

September 2020 – August 2021

Total Grant: 45,000,000 KRW

## Teaching Experience

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### POSTECH, Instructor

◇ Introduction to Computer Software Systems

Fall 2023

◇ Memory and Storage Systems

Fall 2022, Spring 2024

◇ Advanced Operating Systems

Spring 2023

### 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

## Professional Service

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### Program Committee

◇ International Symposium on Computer Architecture (ISCA)

2024

◇ Design Automation Conference (DAC)

2023, 2024

◇ NVRAMOS

2022, 2023

### External Reviewer

◇ International Symposium on High-Performance Computer Architecture (HPCA)

2024

◇ European Conference on Computer Systems (EuroSys)

2022

### Technical Reviewer for Journals

◇ ACM Transactions on Storage

2024

◇ IEEE Computer Architecture Letters

2023

◇ IEEE Transactions on Embedded Computing Systems

2023

◇ 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
◇ ACM Transactions on Architecture and Code Optimization	2020
◇ ACM Computing Surveys	2020