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Research Interests

Operating Systems, System Software, Storage Systems, Nonvolatile Memory, and AI Systems

Academic Employment

Sep 2021 - present	<i>Associate Professor</i>
Jul 2017 - Aug 2021	<i>Assistant Professor</i> Department of Electrical Engineering and Computer Science (EECS) Daegu Gyeongbuk Institute of Science and Technology (DGIST)
Mar 2016 - Jun 2017	<i>Assistant Professor</i> Department of Computer Science and Engineering (CSE) Inha University

Education

Sep 2013 - Feb 2016	<i>Postdoctoral Associate</i> Computer Science and Artificial Intelligence Laboratory (CSAIL) Massachusetts Institute of Technology (MIT) Advisor: Professor Arvind
Sep 2007 - Aug 2013	<i>Ph.D.</i> , CSE, Seoul National University Dissertation: <i>Performance and Lifetime Improvement Techniques for Flash-Based Storage Devices</i> Advisor: Professor Jihong Kim
Sep 2005 - Aug 2007	<i>M.S.</i> , CSE, Seoul National University Dissertation: <i>A Locality-Based Log Buffer Management Technique for Large-Scale Flash-Memory Storage</i> Advisor: Professor Jihong Kim
Mar 1997 - Feb 2005	<i>B.E.</i> , EE, Korea University

Publications

- ‘1’ denotes the first author; ‘†’ denotes the corresponding author.
- Top-tier conferences (from CSRankings) are highlighted in [blue](#).
- Students supervised by me are underlined.

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1. [[EuroSys’25](#)] [Junsu Im](#), [Jeonggyun Kim](#), [Seonggyun Oh](#), [Jinhyung Koo](#), [Juhyung Park](#), [Hoon Sung Chwa](#), [Sam H. Noh](#), [Sungjin Lee](#)[†], “Solid State Drive Targeted Memory-Efficient Indexing for Universal I/O Patterns and Fragmentation Degrees,” *In Proceedings of the European Conference on Computer Systems (EuroSys’25)*, March 30 – April 03, 2025.
 2. [[ACM TOS](#)] [Xiangqun Zhang](#), [Janki Bhimani](#), [Shuyi Pei](#), [Eunji Lee](#), [Sungjin Lee](#), [Yoon Jae Seong](#), [Eui Jin Kim](#), [Changho Choi](#), [Eeye Hyun Nam](#), [Jongmoo Choi](#), [Bryan S. Kim](#), “Storage Abstractions for SSDs: The Past, Present, and Future,” *ACM Transactions on Storage*, 2025.
 3. [[Elsevier FGCS](#)] [Xiaochang Li](#), [Minjae Kim](#), [Sungjin Lee](#)[†], [Zhengjun Zhai](#), [Jihong Kim](#)[†], “Program Context-assisted Address Translation for High-capacity SSDs,” *Future Generation Computer Systems*, 2024.
 4. [[ASPLOS’24](#)] [Jungwoo Kim](#)¹, [Seonggyun Oh](#)¹, [Jaeha Kung](#), [Yeseong Kim](#), [Sungjin Lee](#)[†], “NDPipe: Exploiting Near-data Processing for Scalable Inference and Continuous Training in Photo Storage,” *In Proceedings of the ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS’24)*, May 1, 2024.
 5. [[EuroSys’24](#)] [Kiet Tuan Pham](#), [Seokjoo Cho](#), [Sang Jin Lee](#), [Lan Anh Nguyen](#), [Ipoom Jeong](#), [Sungjin Lee](#), [Nam Sung Kim](#), and [Yongseok Son](#), “ScaleCache: A Scalable Page Cache for Multiple Solid-State Drives,” *In Proceedings of the European Conference on Computer Systems (EuroSys’24)*, April 24, 2024.
 6. [[FAST’24](#)] [Seonggyun Oh](#)¹, [Jeeyun Kim](#)¹, [Soyoung Han](#), [Jaeho Kim](#), [Sungjin Lee](#)[†], [Sam H. Noh](#), “MIDAS: Minimizing Write Amplification in Log-Structured Systems through Adaptive Group Number and Size Configuration,” *In Proceedings of the USENIX Conference on File and Storage Technologies (USENIX FAST ’24)*, Feb. 27–29, 2024.
 7. [[ATC’23](#)] [Shao-Peng Yang](#), [Minjae Kim](#), [Sanghyun Nam](#), [Juhyung Park](#), [Jin-yong Choi](#), [Eeye Hyun Nam](#), [Eunji Lee](#), [Sungjin Lee](#), and [Bryan S. Kim](#), “Overcoming the Memory Wall with CXL-Enabled SSDs,” *In Proceedings of the USENIX Annual Technical Conference (USENIX ATC ’23)*, pp. 601–617, July 2023.
 8. [[HotStorage’23](#)] [Dusol Lee](#), [Inhyuk Choi](#), [Chanyoung Lee](#), [Sungjin Lee](#), and [Jihong Kim](#), “P2Cache: An Application-Directed Page Cache for Improving Performance of Data-Intensive Applications,” *In Proceedings of the ACM Workshop on Hot Topics in Storage and File Systems (HotStorage ’23)*, pp. 31–36, July 2023.
 9. [[EuroSys’23](#)] [Jinhyung Koo](#), [Jinwook Bae](#), [Minjeong Yuk](#), [Seonggyun Oh](#), [Jungwoo Kim](#), [Jung-Soo Park](#), [Eunji Lee](#), [Bryan S. Kim](#), [Sungjin Lee](#)[†], “All-Flash Array Key-Value Cache for Large Objects,” *In Proceedings of the European Conference on Computer Systems (EuroSys’23)*, pp. 784–799, May 2023.
 10. [[FAST’23](#)] [Yoona Kim](#), [Inhyuk Choi](#), [Juhyung Park](#), [Jaeheon Lee](#), [Sungjin Lee](#)[†], and [Jihong Kim](#)[†], “Integrated Host-SSD Mapping Table Management for Improving User Experience of Smartphones,” *In Proceedings of the USENIX Conference on File and Storage Technologies (USENIX FAST ’23)*, 2023.
 11. [[IEEE CAL](#)] [Sejin Kim](#), [Jungwoo Kim](#), [Yongjoo Jang](#), [Jaeha Kung](#), and [Sungjin Lee](#)[†], “SEMS: Scalable Embedding Memory System for Accelerating Embedding-based DNNs,” *IEEE Computer Architecture Letters*, Vol. 21, Issue 2, pp. 157–160, 2023.
 12. [[IEEE CAL](#)] [Minjae Kim](#), [Bryan S. Kim](#), [Eunji Lee](#), [Sungjin Lee](#)[†], “A Case Study of a DRAM-NVM Hybrid Memory Allocator for Key-Value Stores,” *IEEE Computer Architecture Letters*, Vol. 21, Issue 2, pp. 81–84, 2022.
 13. [[Front. Neuro.](#)] [Changjoo Park](#), [Jawon Gim](#), [Sungjin Lee](#), [Kea Joo Lee](#), and [Jinseop S. Kim](#), “Automated Synapse Detection Method for Cerebellar Connectomics,” *Frontiers in Neuroanatomy*, Vol. 16, Article 760279, 2022.
 14. [[IEEE TIFS](#)] [Donghyun Yu](#), [Ruei-Hau Hsu](#), [Jemin Lee](#), and [Sungjin Lee](#), “EC-SVC: Secure CAN Bus In-Vehicle Communications with Fine-grained Access Control Based on Edge Computing,” *IEEE Transactions on Information Forensics and Security*, Vol. 17, pp. 1388–1403, 2022.

15. [IEEE LWC] Hyeonjun Sung, Minsu Kim, **Sungjin Lee**, and Jemin Lee, “Age of Information Analysis for Finite Blocklength Regime in Downlink Cellular Networks,” *IEEE Wireless Communications Letters*, Vol. 11, Issue 4, pp. 683–687, 2022.
16. [FAST’22] Jisung Park¹, Jeonggyun Kim¹, Yeseong Kim, **Sungjin Lee**[†], and Onur Mutlu[†], “A New Machine Learning-Based Reference Search Technique for Post-Deduplication Delta Compression,” In *Proceedings of the USENIX Conference on File and Storage Technologies* (USENIX FAST’22), pp. 247–264, Feb. 22–24, 2022.
17. [DAC’21] Gyeongtaek Kim, **Sungjin Lee**, and Hoon Sung Chwa, “Dynamic Chip Clustering and Task Allocation for Real-time Flash,” In *Proceedings of the Design Automation Conference* (DAC’21), 2021.
18. [IEEE CAL’21] Hyeon Gyu Lee, Minwook Kim, Juwon Lee, Eunji Lee, Bryan Sukjoon Kim, **Sungjin Lee**, Yeseong Kim, Sang Lyul Min, and Jin-Soo Kim, “Learned Performance Model for SSD,” *IEEE Computer Architecture Letters*, Vol. 20, Issue 2, pp. 154–157, 2021.
19. [IEEE TC’21] Sungha Baek¹, Youngdon Jung¹, Aziz Mohaisen, **Sungjin Lee**[†], and Daehun Nyang[†], “SSD-assisted Ransomware Detection and Data Recovery Techniques,” *IEEE Transactions on Computers*, Vol. 70, Issue 10, pp. 1762–1776, 2021.
20. [ACM TOS’21] Duwon Hong, Keonsoo Ha, Myoungjun Chun, Yoona Kim, **Sungjin Lee**, and Jihong Kim, “Reparo: A Fast RAID Recovery Scheme for Ultra-Large SSDs,” *ACM Transactions on Storage*, Vol. 17, Issue 3, Article No. 21, 2021.
21. [ISLPED’21] Hyungyu Lee, Juwon Lee, Minwook Kim, Donghwa Shin, **Sungjin Lee**, Bryan Kim, Eunji Lee; Sang Lyul Min “SpartanSSD: a Reliable SSD under Capacitance Constraints,” In *Proceedings of the International Symposium on Low Power Electronics and Design* (ISLPED’21), pp. 1–6, Jul. 26, 2021.
22. [OSDI’21] Jinhyung Koo, Junsu Im, Jooyoung Song, Joohyung Park, Eunji Lee, Bryan S. Kim, and **Sungjin Lee**[†], “Modernizing File System through In-Storage Indexing,” In *Proceedings of the USENIX Symposium on Operating Systems Design and Implementation* (OSDI’21), pp. 75–92, Jul. 14, 2021.
23. [IEEE CAL’21] Yongjoo Jang, Sejin Kim, Daehoon Kim, **Sungjin Lee**, and Jaeha Kung, “Deep Partitioned Training from Near-Storage Computing to DNN Accelerators,” *IEEE Computer Architecture Letters*, Vol. 20, Issue 1, pp. 70–73, 2021.
24. [ACM TOS’21] Junsu Im, Jinwook Bae, Chanwoo Chung, Arvind, and **Sungjin Lee**[†], “Design of LSM-tree-based Key-value SSDs with Bounded Tails,” *ACM Transactions on Storage*, Vol. 17, Issue 2, Article No. 10, 2021.
25. [IEEE TC’21] Jinhyung Koo, Chanwoo Chung, Arvind, and **Sungjin Lee**[†], “A Case for Application-managed Flash”, *IEEE Transactions on Computers*, Vol. 70, Issue 2, pp. 240–254, 2021 [**Selected as a Featured Paper of the Month**].
26. [MICRO’20] Shuotao Xu, Thomas Bourgeat, Tianhao Huang, Hojun Kim, **Sungjin Lee**, and Arvind, “AQUOMAN: An Analytic-Query Offloading Machine”, In *Proceedings of the IEEE/ACM International Symposium on Microarchitecture* (MICRO ’20), pp. 386–399, Oct. 17–21, 2020.
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30. [IEEE CAL’20] Minsub Kim, Jaeha Kung, and **Sungjin Lee**[†], “Towards Scalable Analytics with Inference-enabled Solid-state Drives”, *IEEE Computer Architecture Letters*, Vol. 19, Issue 1, pp. 13–17, 2020.
31. [Springer MMSJ’19] Jungwoo Lee, Hwangje Han, **Sungjin Lee**, and Minseok Song, “Lifetime-aware Solid-state Disk (SSD) Cache Management for Video Servers,” *Springer Multimedia Systems*, Vol. 25, Issue 6, pp. 695–708, 2019.

32. [IEEE TMC'19] Cheng Ji, Li-Pin Chang, Sangwook Shane Hahn, **Sungjin Lee**, Riwei Pan, Liang Shi, Jihong Kim; Chun Jason Xue, "File Fragmentation in Mobile Devices: Measurement, Evaluation, and Treatment," *IEEE Transactions on Mobile Computing*, Vol. 18, Issue 9, pp. 2062-2076, 2019.
33. [APSys'19] Myoungjun Chun, Taejin Kim, **Sungjin Lee**, Jihong Kim, "PCDedup: I/O-Activity Centric Deduplication for Improving the SSD Lifetime", In *Proceedings of the ACM SIGOPS Asia-Pacific Workshop on Systems* (APSys'19), Aug. 20, 2019.
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38. [ASPLOS'19] Chanwoo Chung, Jinhyung Koo, Junsu Im, Arvind, **Sungjin Lee**[†], "LightStore: Software-defined Network-attached Key-value Drives," In *Proceedings of the ACM International Conference on Architectural Support for Programming Languages and Operating Systems* (ASPLOS'19), pp. 939-953, April 17, 2019.
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40. [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 *Proceeding of the IEEE Non-Volatile Memory Systems and Applications Symposium* (NVMSA '18), Aug. 30, 2018.
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45. [ISPASS'18] Young Tack Jin, Sungjoon Ahn, and **Sungjin Lee**[†], "Performance Analysis of NVMe SSD-based All-flash Array Systems," In *Proceeding of the International Symposium on Performance Analysis of Systems and Software* (ISPASS '18), pp. 12-21, April 1-3, 2018. [Best Paper Award Nomination]
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47. [JSTS'17] Taejin Kim, **Sungjin Lee**[†], and Jihong Kim, "FineDedup: A Fine-grained Deduplication Technique for Extending Lifetime of Flash-based SSDs," *Journal of Semiconductor Technology and Science*, Vol. 17, Issue 5, pp. 648-659, 2017.

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64. [DAC'15] Sangwook Hahn, **Sungjin Lee**, and Jihong Kim, "To Collect or Not to Collect: Just-in-Time Garbage Collection for High-Performance SSDs with Long Lifetimes," In *Proceedings of the Design Automation Conference* (DAC'15), pp. 191:1-191:6, June 7-11, 2015.

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Patents

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3. Jinhyung Koo, Jinwook Bae, and **Sungjin Lee**, “Sharding-based Key-value Caching System and Method,” *PCT Application No. KR2023-017789* and *Korea Application No. 10-2022-0159513*, Nov. 7, 2023
4. Jeonggyun Kim and Sungjin Lee, “Method and Apparatus for Compressing Data based on Deep Learning,” *Korea Patent No. 10-2500904*, Feb. 14, 2023
5. **Sungjin Lee**, Jeoungkyun Kim, Junsu Im, and Minsoo Kim, “SSD Device and Operating Method of the Same using FTL based on LSM-Tree and Approximate Indexing,” *PCT Application No. KR2022-021055* and *Korea Application No. 10-2021-0185775* Dec. 22, 2022
6. Minsoo Kim, Jemin Lee, **Sungjin Lee**, and Junghoon Park, “Beamforming Scheduling Apparatus and Method,” *Korea Application No. 10-2022-0163129*, Nov. 29, 2022
7. Minsoo Kim, **Sungjin Lee**, and Yoon-Min Nam, Method and Apparatus for Processing Query using N-ary Join Operators,” *U.S. Patent No. 11409746*, Aug. 09, 2022
8. **Sungjin Lee**, Jinhyung Koo, Junsu Im, and Juhung Park “Key-Value Storage Device, Host, and Host-Storage System,” *US. Application No. 17-807933*, *China Application No. 202210688337.0*, and *Korea Application No. 10-2022-0034937*, Jun. 16, 2022
9. Minjae Kim and **Sungjin Lee**, “Apparatus and Method for Controlling Hybrid Memory,” *Korea Patent No. 10-2480944*, Dec. 20, 2022
10. Jinwook Bae, Junsu Im, and Sungjin Lee, “Method for Demand-based FTL Cache Partitioning of SSDs,” *Korea Patent No. 10-2416880*, Jun. 30, 2022
11. Minsoo Kim, **Sungjin Lee**, and Donghyung Hahn, “Method and Apparatus for Processing Large-scale Distributed Matrix Product,” *Korea Patent No. 10-2326586*, Nov. 09, 2021
12. Minsoo Kim, **Sungjin Lee**, and Donghyung Hahn, “Method and Apparatus for Processing Large-scale Distributed Matrix Product,” *US. Application No. 17-093718*, Nov. 11, 2020
13. Minsoo Kim, **Sungjin Lee**, and Yoon-Min Nam, “System and Method for Fast Processing of Complex Relational Queries using N-ary Join Operators,” *Korea Patent No. 10-2177064*, Nov. 4, 2020
14. **Sungjin Lee**, Jihong Kim, Kyung Ho Kim, Sangmok Kim, Hyunchul Park, Otae Bae, Jeonghoon Jeong, and Donggi Lee, “Method for Adjusting Storage Performance and Semiconductor Storage Device Therefore,” *Korea Patent No. 10-1861184*, May 05, 2018
15. Jeonghoon Jeong, Jihong Kim, **Sungjin Lee**, Kyung Ho Kim, Sangmok Kim, Hyunchul Park, Otae Bae, and Donggi Lee, “Method for Adjusting Performance of a Storage Device and a Semiconductor Storage Device Therefore,” *U.S. Patent No. 9,015,403*, Apr. 21, 2015
16. **Sungjin Lee**, Dongkun Shin, Jihong Kim, “Method for Performing Garbage Collection and Flash Memory Apparatus using the Method,” *Korea Patent No. 10-1067018*, Sept. 22, 2011
17. **Sungjin Lee**, Jihong Kim, “Locality-Aware Garbage Collection Technique for NAND Flash Memory-Based Storage Systems,” *Korea Patent No. 10-1017067*, Feb. 25, 2011

Awards, Fellowships, and Grants

Oct 2024	Test of Time Paper Award, SIGFAST, KIISE
Jul 2020	Best Paper Award, USENIX Annual Technical Conference (USENIX ATC'20)
Apr 2018	Best Paper Award Nomination, IEEE ISPASS'18
Jun 2016	Best Paper Award Nomination, Design Automation Conference (DAC'16)
Nov 2013–Oct 2014	Post-Doctoral Research Fellowship, National Research Foundation of Korea (NRF)
Oct 2010	Microsoft Research Asia (MSRA) Fellowship, Microsoft
Mar 2011–Aug 2013	Samsung Electronics Fellowship, Samsung Electronics
Sep 2009–Aug 2010	Korea Student Aid Foundation (KOSAF) Fellowship, Korea Government
Nov 2009	Best Paper Award, Institute of Embedded Engineering of Korea (IEMEK)
Sep 2004, Sep 2003	Best Honors Scholarships, Korea University
Mar 2004, Mar 1998	Honors Scholarships, Korea University

Major Research Funding

2024.05–2028.04	High-performance, Cost-efficient, and Retargetable E2E MLOps Platform <i>National Research Foundation of Korea (₩978,148,000)</i>
2024.07–2028.03	Development of Navigation Technology Utilizing Visual Information <i>Korea Planning & Evaluation Institute of Industrial Technology (KEIT) (₩400,000,000)</i>
2024.07–2027.12	Development of High-efficiency Parallel Storage SW Technology <i>Institute for Information & Communication Technology Planning & Evaluation (IITP) (₩350,000,000)</i>
2024.09–2027.08	High-performance Memory Caching and Database for LLM Serving Systems <i>SK Hynix Inc. (₩300,000,000)</i>
2023.04–2027.03	Rack-scale Computing with CXL-enabled Flash <i>FADU Co., Ltd. (₩1,440,000,000)</i>
2023.04–2026.12	MPU/Connectivity/TinyML SoC Solution for IoT Intelligence with Foundry-based eFLASH <i>Institute for Information & Communication Technology Planning & Evaluation (IITP) (₩5,256,075,000)</i>
2018.08–2025.02	Extreme Exploitation of Dark Data Research Center <i>National Research Foundation of Korea (₩10,862,500,000)</i>
2022.04–2024.12	A Development of an SSD Controller for File Systems in Data Centers <i>Ministry of Commerce Industry and Energy (₩308,000,000)</i>
2021.09–2024.08	A Study on Key-value I/O Subsystem <i>SK Hynix Inc. (₩450,000,000)</i>
2022.04–2023.03	Toward Petabyte-scale Memory through CXL-enabled Flash <i>FADU Co., Ltd. (₩300,000,000)</i>
2019.12–2023.11	AutoFit: Platform-centric Autotune of Deep Learning Models Accelerated by Deep Partitioned Training over the Memory Hierarchy <i>Samsung Science & Technology Foundation (₩1,800,000,000)</i>
2019.01–2021.12	An Open Platform for All-flash Array in Data Centers <i>Samsung Electronics Co., Ltd (₩180,000,000)</i>
2017.11–2020.10	Hostless Distributed Store for Big Data <i>National Research Foundation of Korea (₩300,000,000)</i>
2017.07–2020.05	AutoBox: Real-Time High-capacity Flash Storage System for Smart Cars <i>Samsung Science & Technology Foundation (₩211,106,370)</i>

Academic Activities

Program Committee	(TPC) USENIX Conference on File and Storage Technologies, 2017, 2019, 2020, 2024 (Publication Chair) Non-Volatile Memory Systems and Applications Symposium (NVMSA), 2024 (Publication Chair) ACM SIGOPS Asia-Pacific Workshop on Systems (APSys), 2023 (TPC) Non-Volatile Memories Workshop (NVMW), 2022 (TPC) IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing, 2021 (Publicity Chair) IEEE Non-Volatile Memory Systems and Applications Symposium (NVMSA), 2020 (Organizing Committee) Operating System Support for Next Generation Large Scale NVRAM, 2017-2023 (Publicity Chair) International Workshop on File and Storage Systems, 2019
Editorial Member	The Journal of Systems Research, 2020-2021 Communications of the KIISE, 2021 IEMEK Journal of Embedded Systems and Applications, 2018-2020
Technical Referee	IEEE Transactions on Computers IEEE Transactions on Very Large Scale Integration (VLSI) Systems IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems IEEE Transactions on Multi-Scale Computing IEEE Transactions on Parallel and Distributed Systems IEEE Computer Architecture Letters IEEE Journal of the Electron Devices Society ACM Transactions on Storage Elsevier Microelectronics Journal IEICE Electronics Express Design Automation for Embedded Systems

Teaching

SP21-24	Introduction to Data Science (BE202), DGIST
SP18-20, FA21-23	Operating System (SE370/SE370a/CSE304), DGIST
FA17, 20, 22, 24	Advanced System Programming (Linux Kernel) (IC619a), DGIST
FA19, SP21, SP23	Special Topics in Computer Systems (Modern Storage Systems) (IC820-01), DGIST
FA17	Computer Algorithms (SE380), DGIST
SP16-17	System Programming (CSE3201-002), Inha University
SP16-17	Operating Systems (CSE3206-003/004), Inha University
FA16	Capstone Project (CSE4203-009), Inha University
FA16	UNIX Programming (CSE3303-001), Inha University