Hyokeun Lee

Ph.D.
Assistant Professor
Department of Electrical and Computer Engineering
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Research Interests

- Disaggregated systems, memory security, memory reliability, non-volatile memory, computer architecture

Education

•Seoul National University, Seoul, South Korea *Sep. 2016-Aug. 2021*

Ph.D. Electrical and Computer Engineering

– Advisor: Dr. Hyuk-Jae Lee; Co-advisor: Dr. Hyun Kim
– Dissertation: Mitigating Disturbance Errors and Enhancing RMW Performance for PCM

•Seoul National University, Seoul, South Korea *Sep. 2011 - Aug. 2016*

B.S. Electrical and Computer Engineering

Work Experience

•Department of Electrical and Computer Engineering, Ajou University *Mar. 2024 - Present*

Assistant Professor Gyeonggi, South Korea

•Secure and Advanced Computer Architecture Group, North Carolina State University *Feb. 2023 - Jan. 2024*

Postdoctoral researcher Raleigh

– Mentor: Dr. Amro Awad

•Inter-university Research Center, Seoul National University *Sep. 2021 - Feb. 2023*

Postdoctoral researcher Seoul, South Korea

– Mentor: Dr. Hyuk-Jae Lee
– I also served the mandatory military service as a Technical Research Personnel.

Publications

#: co-first author; *: corresponding author(s)

•Conference

– Jihoon Jang, **Hyokeun Lee***, Hyun Kim*, "*EDeN: Enabling Low-Power CNN Inference on Edge Devices Using Prefetcher-Assisted NVM Systems*," ACM/IEEE International Symposium on Lower Power Electronics and Design (ISLPED), Aug. 2024. [KIISE top conference]
– Debpratim Adak, **Hyokeun Lee**, Ben Feinberg, Gwendolyn Voskuilen, Clayton Hughes, Huiyang Zhou, Amro Awad, "*SEFsim: A Statistically-Guided Fast DRAM Simulator*," IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS), May. 2024. [KIISE top conference, poster]
– Rahaf Abdullah, **Hyokeun Lee**, Huiyang Zhou, Amro Awad, "*Salus: Efficient Security Support for CXL-Expanded GPU Memory*," International Symposium on High-Performance Computer Architecture (HPCA), Mar. 2024. [KIISE top conference]
– Faiz Alam#, **Hyokeun Lee**#, Abhishek Bhattacharjee, Amro Awad, "*CryptoMMU: Enabling Scalable and Secure Access Control of Third-Party Accelerators*," IEEE/ACM International Symposium on Microarchitecture (MICRO), Oct-Nov. 2023 (**Best Paper Candidate**). [KIISE top conference]
– **Hyokeun Lee**, Kwanseok Choi, Hyuk-Jae Lee, Jaewoong Sim, "*SDM: Sharing-enabled Disaggregated Memory System with Cache Coherent Compute Express Link*," International Conference on Parallel Architectures and Compilation Techniques (PACT), Oct. 2023. [KIISE top conference]
– Shubham Nema, Shiva Kaushik Chunduru, Charan Kodigal, Gwendolyn Voskuilen, Scott Hmmert, **Hyokeun Lee**, Amro Awad, Clayton Hughes, "*ERAS: A Flexible and Scalable Framework for Seamless Integration of RTL models with Structural Simulation Toolkit*," IEEE International Symposium on Workload Characterization (IISWC), Oct. 2023. [KIISE top conference, poster]
– **Hyokeun Lee**, Hyungsuk Kim, Seokbo Shim, Seungyong Lee, Dosun Hong, Hyuk-Jae Lee, Hyun Kim, "*PCMCsim: An Accurate Phase-Change Memory Controller Simulator and its Performance Analysis*," IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS), May. 2022. [KIISE top conference]

– Hyeong Gi Seong, **Hyokeun Lee**, Hyun Kim, Hyuk-Jae Lee, "*Analysis of Hardware Prefetchers Suitable for CNN Applications*," IEEE/IEIE International Conference on Consumer Electronics-Asia (ICCE-Asia), Nov. 2021.
– **Hyokeun Lee**, Seungyong Lee, Moonsoo Kim, Hyun Kim, Hyuk-Jae Lee, "*IMDB: A Low-Cost In-Module Disturbance Barrier for Mitigating Write Disturbance Errors in Phase-Change Memory*," Design Automation Conference (DAC, *work-in-progress session*), July. 2020.
– **Hyokeun Lee**, Donghyeon Lee, Hyuk-Jae Lee, "*A Predictive Initialization of Hidden State Parameters in a Hidden Markov Model for Hand Gesture Recognition*," IEEE/IEIE International Conference on Consumer Electronics-Asia (ICCE-Asia), June. 2018.

•Journal

– Minseok Seo, Jungi Hyun, Seongho Jeong, Xuan Truong Nguyen, Hyuk-Jae Lee, **Hyokeun Lee***, "*OASIS: Outlier-Aware KV Cache Clustering for Scaling LLM Inference in CXL Memory Systems*," IEEE Computer Architecture Letters, May, 2025. [SCIE]
– **Hyokeun Lee**, Seungyong Lee, Byeongki Song, Moonsoo Kim, Seokbo Shim, Hyuk-Jae Lee, Hyun Kim, "*An In-Module Disturbance Barrier for Mitigating Write Disturbance in Phase-Change Memory*," IEEE Transactions on Computers, April. 2023. [SCIE]
– **Hyokeun Lee**, Hyuk-Jae Lee, Hyun Kim, "*A Read Disturbance Tolerant Phase Change Memory System for CNN Inference Workloads*," Journal of Semiconductor Technology and Science, Aug. 2022. [SCIE]
– Moonsoo Kim, **Hyokeun Lee**, Hyun Kim, Hyuk-Jae Lee, "*WL-WD: Wear-Leveling Solution to Mitigate Write Disturbance Errors for Phase-Change Memory*," IEEE Access, Feb. 2022. [SCIE]
– Seungyong Lee, **Hyokeun Lee**, Hyuk-Jae Lee, Hyun Kim, "*Evaluation of Various Workloads in Filebench Suitable for Phase-change Memory*," IEIE Transactions on Smart Processing & Computing, April. 2021.
– **Hyokeun Lee**, Hyunmin Jung, Hyuk-Jae Lee, Hyun Kim, "*Bit-width Reduction in Write Counters for Wear Leveling in a Phase-change Memory System*," IEIE Transactions on Smart Processing & Computing, Oct. 2020.
– Jinwoo Park, **Hyokeun Lee**, Boyeal Kim, Dong-Goo Kang, Seung Oh Jin, Hyun Kim, Hyuk-Jae Lee, "*A Low-Cost and High-Throughput FPGA Implementation of the Retinex Algorithm for Real-Time Video Enhancement*," IEEE Transactions on Very Large Scale Integration Systems, Jan. 2020. [SCIE]
– **Hyokeun Lee**, Moonsoo Kim, Hyunchul Kim, Hyun Kim, Hyuk-Jae Lee, "*Integration and Boost of a Read-Modify-Write Module in Phase Change Memory System*," IEEE Transactions on Computers, Dec. 2019. [SCIE]
– Sunwoong Kim, Hyunmin Jung, Woojae Shin, **Hyokeun Lee**, Hyuk-Jae Lee, "*HAD-TWL: Hot Address Detection-based Wear Leveling for Phase-Change Memory Systems with Low Latency*," IEEE Computer Architecture Letters, July. 2019. [SCIE]

•Patents

– "*Mitigating Write Disturbance Errors of Phase-Change Memory Module*," US Patent, No. 11462266, Oct. 2022. (Granted)
– "*Semiconductor Memory Device Performing Command Merging and Operating Method Thereof*," US Patent, No. 11055025, July. 2021. (Granted)
– "*Semiconductor Device for Managing Cold Addresses of Nonvolatile Memory Device*," US Patent, No. 10877698, Dec. 2020. (Granted)
– "*Semiconductor Device for Managing Wear Leveling Operation of a Nonvolatile Memory Device*," US Patent, No. 10713159, July. 2020. (Granted)

•Submitted (current research status)

– Minseok Seo, Seongho Jeong, Hyuk-Jae Lee, Hyokeun Lee*, IEEE International Symposium on High-Performance Computer Architecture (HPCA), 2026, *under review as double-blind*
– Younghoon Ko, Hyemin Park, Hyuk-Jae Lee, Hyokeun Lee*, IEEE International Symposium on High-Performance Computer Architecture (HPCA), 2026, *under review as double-blind*
– Hyokeun Lee, Rahaf Abdullah, Huiyang Zhou, Abbas Fairouz, Amro Awad, "An Efficient Unified Memory Security Model for CXL Memory-Expanded GPU Systems," IEEE Transactions on Computers, 2025, *under review*
– John McFarland, Hyokeun Lee, Aydin Aysu, Amro Awad, "Secure Integrity for Third-Party IOMMUs," IEEE Transactions on Computers, 2025, *under review*

Project Funding Grants

•Development of Secure, High-Performance, and High-Connectivity Chiplet-SoC Architecture

Sponsor: MOTIE, South Korea April. 2025 - Dec. 2027
– Role: *PI* as lead organization; Funded (own/total): ₩500M / ₩1,000M
– Development of secure chiplet architecture
– Reformulation of LLM data structures and development of supporting architectures for chiplet

•Development of Flash Memory-based AI Processing Unit for On-Device AI

Sponsor: IITP, South Korea April. 2025 - Dec. 2029
– Role: *PI* as joint research organization; Funded (own/total): ₩380M / ₩7,220M
– Development of data filtering architecture for efficient LLM near-storage processing

Professional Activities

•IEEE International Conference on Computer Design (ICCD)
– PC Member (2025, 2024, 2023, 2022)

•IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)
– Artifact Evaluation Co-Chair (2025)

•Great Lakes Symposium on VLSI (GLSVLSI)
– PC Member (2024)

•IEEE/IEIE International Conference on Consumer Electronics Asia (ICCE-ASIA)
– TPC Member (2025, 2021)

•IEEE Conference on Artificial Intelligence Circuits and Systems (AICAS)
– Reviewer (2023, 2022)

•International Conference on Electronics, Information and Communication (ICEIC)
– TPC Member (2024)

•ACM Transactions on Architecture and Code Optimization
– Reviewer (2025, 2024)

•IEEE Transactions on Computers
– Reviewer (2025, 2024)

•IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
– Reviewer (2025)

•IEEE Transactions on Dependable and Secure Computing
– Reviewer (2025)

•IEEE Computer Architecture Letters
– Reviewer (2025)

•Springer The Journal of Supercomputing
– Reviewer (2025, 2024)

•IEIE Transactions on Smart Processing and Computing
– Reviewer (2024, 2023, 2021)

•Elsevier Microelectronics Journal
– Reviewer (2022)

•Elsevier Materials Research Bulletin
– Reviewer (2021)

Awards/Mentions

– Best Paper Runner-Up, MICRO 2023 (Mentioned).
– First Prize in Haedong Best Paper Award (Academic Research Work), South Korea, Nov. 2021.

Invited Talks

– "*Towards Large-Scale Computing Systems via Resource Disaggregation*," Seoul National University of Science and Technology, South Korea, Dec. 2024
– "*Disaggregation and its Security for Large-Scale Computing Systems*," Korea University, South Korea, Aug. 2023.
– "*CXL-enabled Sharing in a Multi-Host Disaggregated Memory System*," Seoul National University GoGE Workshop: Future Generation Security Computing Systems, Aug. 2023.
– "*Introduction to Computer Architecture Simulators and Use of Gem5*," North Carolina State University (ECE 096), United States, Mar. 2023.
– "*Bitwidth Reduction of Write Counters of Wear Leveling in a Phase-Change Memory System*," KSPC, South Korea, Sep. 2022.
– "*Introduction to Computer Architecture Simulators and Examples*," University of Seoul, South Korea, Jun. 2022.

Teaching Lectures

•VLSI System Design
- Forth year undergraduate class
- Teaching years: 2024, 2025

•Digital System Design
- Third year undergraduate class
- Teaching years: 2024, 2025

•Computer Organization and Architecture
- Third year undergraduate class
- Teaching years: 2024, 2025

Technical Skills

Programming: C++, C, Verilog, Python
Architecture Simulators: NVMain, PCMCsim, DRAMsim3, McSimA+, MacSim, gem5, SST
Commercial Software: ModelSim, Vivado, Quartus
Hardware Interface (Transaction Level): AXI-Lite/-Full/-Stream, CXL, PCIe, I2C, JEDEC DDRx
Languages: English (Professional working proficiency), Korean (Native), Chinese (Bilingual)

Contacts of Reference (alphabetical order)

•Abhishek Bhattacharjee
- Professor, Department of Computer Science, Yale University
- Email: abhishek@cs.yale.edu
- Relationship: Recent Collaborator

•Amro Awad
- Associate Professor, Department of Engineering Science, University of Oxford
- Email: amro.awad@eng.ox.ac.uk
- Relationship: Postdoc Advisor

•Huiyang Zhou
- Professor, Department of Electrical and Computer Engineering, North Carolina State University
- Email: hzhou@ncsu.edu
- Relationship: Recent Collaborator

•Hyuk-Jae Lee
- Professor, Department of Electrical and Computer Engineering, Seoul National University
- Email: hjlee@capp.snu.ac.kr
- Relationship: Ph.D. Advisor

•Jaewoong Sim
- Associate Professor, Department of Electrical and Computer Engineering, Seoul National University
- Email: jaewoong@snu.ac.kr
- Relationship: Recent Collaborator