

Hyokeun Lee

Ph.D.

Assistant Professor

Department of Electrical and Computer Engineering

Ajou University, South Korea

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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.
- 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 (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.
- 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**).
- **Hyokeun Lee**, Kwansoek 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.
- Shubham Nema, Shiva Kaushik Chunduru, Charan Kodigal, Gwendolyn Voskuilen, Scott Himmert, **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 (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.

- 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.
- **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.
- **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.
- 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.
- 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.
- **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.
- 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.

•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*
- John McFarland, Hyokeun Lee, Aydin Aysu, Amro Awad, IACR Transactions on Cryptographic Hardware and Embedded Systems (TCHES), 2025, *under review as double-blind*

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

•2025

- Program Committee, The 43rd IEEE International Conference on Computer Design (ICCD)
- Artifact Eval. Chair, IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)
- Reviewer, IEEE Computer Architecture Letters
- Reviewer, IEEE Transactions on Dependable and Secure Computing
- Program Committee, IEEE International Parallel & Distributed Processing Symposium (IPDPS)

•2024

- Reviewer, IEEE Transactions on Computers
- Reviewer, ACM Transactions on Architecture and Code Optimization
- Reviewer, Springer The Journal of Supercomputing
- Program Committee, The 42nd IEEE International Conference on Computer Design (ICCD)
- Program Committee, Great Lakes Symposium on VLSI (GLSVLSI)
- Reviewer, International Conference on Electronics, Information, and Communication (ICEIC)

•2023

- Program Committee, The 41st IEEE International Conference on Computer Design (ICCD)
- Reviewer, IEEE Conference on Artificial Intelligence Circuits and Systems (AICAS)
- Reviewer, IEIE Transactions on Smart Processing and Computing

•2022

- Program Committee, The 40th IEEE International Conference on Computer Design (ICCD)
- Reviewer, Elsevier Microelectronics Journal
- Reviewer, IEEE Conference on Artificial Intelligence Circuits and Systems (AICAS)

•2021

- Reviewer, Material Research Bulletin, Journal, Elsevier
- Technical Program Committee, IEEE /IEIE International Conference on Consumer Electronics Asia (ICCE-ASIA)
- Reviewer, IEIE Transactions on Smart Processing and Computing

AWARDS

- Best Paper Runner-Up, MICRO 2023.
- 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)