

Seok Young Kim

Contact Information

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Education

- Korea University**, Seoul, South Korea **Mar. 2020 ~ Present**
Integrated MS and Ph.D., Electrical and Computer Engineering
- Advisor: Professor Seon Wook Kim
 - Area of study: computer architecture, processing-in-memory, embedded systems, software/hardware co-optimization, memory systems, algorithm-oriented design
- Korea University**, Seoul, South Korea **Mar. 2013 ~ Feb. 2020**
B.S., Electrical Engineering
- Thesis: Implementation of Memory Trace Profiling System on FPGA
 - 2-year absence to fulfill military duty (9/2015 – 9/2017)

Professional Experience

- Korea University**, Seoul, South Korea **Nov. 2018 ~ Feb. 2020**
Research Intern
- Designed adder and multiplier according to the number system of posit, integer, bfloat16, and floating-point
 - Perform power and area analysis through a synthesis tool

Project Experience

- In-DRAM based PIM Cloud Platform Construction** **Sep. 2023 ~ Aug. 2026**
Funded by SK hynix
- TBA
- Development of PIM Computing Architecture based on Data-Flow** **Apr. 2022 ~ Dec. 2025**
Funded by Institute for Information & Communication Technology Planning & Evaluation (IITP)
- Developed an optimal model partitioning algorithm and DCG (Device-mapped Computation Graph) to minimize profiling cost on heterogeneous platform (CPU & PIM)
- Memory Centric Architecture Using the Reconfigurable PIM Devices** **Apr. 2022 ~ Dec. 2028**
Funded by Institute for Information & Communication Technology Planning & Evaluation (IITP)
- Expanded the applicability of PIM in various transformer workloads and implements full system architecture stacks of small/large-scale PIM
- Next Generation Memory Technology for Memory Computing Platform: Processing In Memory Platform for AI** **Feb. 2018 ~ Jan. 2023**
Funded by SK hynix
- Improved bfloat16 ALU's compute capability by adopting look-up table method, ported PIM library to ONNX Runtime framework, verified design PoC (Proof of Concept)
- System Software for DRAM-based In-Memory Computing** **Dec. 2020 ~ Nov. 2022**
Funded by Samsung Research Funding & Incubation Center of Samsung Electronics
- Conducted the application of tiling techniques to GeMM on DRAM-based PIM
- Development of Micro LED module for AR devices** **Jan. 2019 ~ Dec. 2022**
Funded by Ministry of Trade, Industry and Energy (MOTIE), Korea Government
- Simulated and verified behavioral modeling of MIPI DSI IP, optimized pixel converter

Scholarship & Awards

Awards

- International Conference on Electronics, Information, and Communication (ICEIC), Feb.2022
 - Best Paper Award: *Silver Prize*
- Summer Annual Conference of IEEE/IEIE, Jun. 2022
 - Best Paper Award: *LG Electronics Interest Prize*
- International Conference on Electronics, Information, and Communication (ICEIC) Feb.2021
 - Best Paper Award, *Silver Prize*
- Qualcomm Innovation Award Undergraduate ICT Engineering Contest, Sep. 2019
 - *Selected and Presented Poster*
- Samsung Future Display Contest, Dec. 2014
 - *Grand Prize*

Scholarship

- SK hynix (Mar. 2020 ~ Present)
 - *Full scholarship including tuition and living expenses*
- Korea University Techno Complex, Apr. 2023
 - *Awarding research excellence, \$10000 grant*

Publications & Patents

Conference

- [C1] [Seok Young Kim](#), Jaewook Lee, Chang Hyun Kim, Won Jun Lee, and Seon Wook Kim, "Extending the ONNX Runtime Framework for the Processing-in-Memory Execution," International Conference on Electronics, Information, and Communication (ICEIC), February 2022.
- [C2] [Seok Young Kim](#), Chang Hyun Kim and Seon Wook Kim, "Implementation of Pipelined Adder Tree for Long Short-Term Memory Cells," The 36th International Technical Conference on Circuits/Systems, Computers and Communications (ITC-CSCC), June 2021.
- [C3] [Seok Young Kim](#), Chang Hyun Kim and Seon Wook Kim, "Applying Piecewise Linear Approximation for DNN Non-Linear Activation Functions to Bfloat16 MACs," International Conference on Electronics, Information, and Communication (ICEIC), February 2021.
- [C4] Hyun Soo Kim, [Seok Young Kim](#) and Seon Wook Kim "Verification of Memory Behavior on ARM SoC with OS," Summer Annual Conference of IEEE/IEIE, June 2023.
- [C5] Ju Han Lee, [Seok Young Kim](#), Won Jun Lee and Seon Wook Kim, "DLRM Performance Analysis and PIM Applicability Examination," Summer Annual Conference of IEEE/IEIE, June 2022.
- [C6] Donghyeon Joo, [Seok Young Kim](#), and Seon Wook Kim, "Implementation of Block Matrix Multiplication and its Performance Analysis on CPU," Summer Annual Conference of IEEE/IEIE, June 2022.
- [C7] Seung Min Baek, [Seok Young Kim](#) and Seon Wook Kim, "Performance Analysis of PointPillars Model in Heterogeneous Platforms," Summer Annual Conference of IEEE/IEIE, June 2022.
- [C8] Tae Jun Kwon, Mun Seong Park, Seong Hee Hong, [Seok Young Kim](#) and Seon Wook Kim "Performance Analysis by Varying DRAM Memory Controller Policy," Summer Annual Conference of IEEE/IEIE, June 2022.

Journal

- [J1] [Seok Young Kim](#), Jaewook Lee, Yoonah Paik, Chan Hyun Kim, Won Jun Lee, and Seon Wook Kim, "Optimal Model Partitioning with Low-Overhead Profiling on the PIM-based Platform for Deep Learning Inference," ACM Transactions on Design Automation of Electronic Systems (ACM TODAES), Under Review.
- [J2] Chang Hyun Kim, Won Jun Lee, Yoonah Paik, [Seok Young Kim](#), and Seon Wook Kim, "BL-PIM: Varying the Burst Length to Realize the All-bank Performance and Minimize the Multi-Workload Interference for in-DRAM PIM," IEEE Access, vol. 11, doi: 10.1109/ACCESS.2023.3300893, August 2023.
- [J3] [Seok Young Kim](#), Chang Hyun Kim, Won Jun Lee, Il Park, and Seon Wook Kim, "Low-overhead Inverted LUT Design for Bounded DNN Activation Functions on Floating-point Vector ALUs," Microprocessors and Microsystems, vol. 93, doi: 10.1016/j.micpro.2022.104592, September 2022.
- [J4] Kiyong Kwon, Dongwon Kang, Geon-Woo Ko, [Seok Young Kim](#) and Seon Wook Kim, "Low-Cost Unified Pixel Converter from the MIPI DSI Packets into Arbitrary Pixel Sizes," MDPI Electronics, vol. 11, issue 8, Article no. 1221, April 2022.
- [J5] Chang Hyun Kim, Won Jun Lee, Yoonah Paik, Kiyong Kwon, [Seok Young Kim](#), Il Park, and Seon Wook Kim, "Silent-PIM: Realizing the Processing-in-Memory Computing with Standard Memory Requests," IEEE Transactions on Parallel and Distributed Systems (IEEE TPDS), doi: 10.1109/TPDS.2021.3065365, March 2021.

Patents

[P1] Method and apparatus for searching graph of deep learning model, KR 10-2023-0043576, June 2023.

[P2] Processing-in-memory device and method for performing indirect addressing in the same, KR 10-2023-0072180, April 2023.

[P3] Semiconductor device for computing non-linear function using a look-up table, US 17/469857, September 2021.

[P4] Semiconductor device for calculating non-linear function using a look-up table, KR 10-2021-0005215, January 2021.

Teaching Experience

Teaching Assistant

Digital System Design, KECE207

2022 Spring

Programming Language and Laboratory, EGRN151

2021 Fall

Computer System Architecture, KECE343

2021 Spring

*Outstanding Teaching Award

Data Structure and Algorithms, KECE208

2020 Fall

Digital System Design, KECE208

2020 Spring

Undergraduate Mentor

Co-worked with 13 undergraduate students

Hardware and Software Skills

Programming

- Languages: Python, Matlab, C/C++, (System)Verilog, VHDL, Assembly (RISC-V, MIPS)
- Scripts/Version: Bash Shell, GNU make/Cmake, git(lab), TortoiseHg, docker, QEMU
- Machine learning framework: PyTorch, TensorFlow, ONNX Runtime

Computer Architecture Simulators/Profilers

- Processor/Memory simulators: GPGPU-sim, DRAMSim, Ramulator, Gem5, ScaleSim
- Benchmarks: SPEC CPU2006/2017, MLPerf
- Profilers: Intel VTune, AMD uProf, NVIDIA Nsight

SoC and VLSI Design

- RTL simulation/synthesis/verification: VCS, ModelSim, Synopsys Design Compiler
- FPGA tools: Xilinx Vivado, Intel Quartus Prime, PetaLinux, Vitis, Familiar with various FPGAs and its SDKs