

Junsu Kim

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Research Interests

Computer Architecture, Memory Systems, Systems for ML & ML for Systems

Education

Korea University, Seoul, Korea Sep. 2023 - Current
M.S. in Electrical Engineering (Advisor: Prof. Yunho Oh)
Cumulative GPA: 4.0/4.0

Hanyang University, Seoul, Korea Mar. 2014 - Feb. 2021
B.S. in Electronic Engineering (Advisor: Prof. Ki-Seok Chung)
Cumulative GPA: 3.81/4.0 (Graduating with Honors - Summa Cum Laude)

Publications

[C1] Kwangrae Kim, Jeonghyun Woo, **Junsu Kim**, and Ki-Seok Chung. “HammerFilter: Robust Protection and Low Hardware Overhead Method for RowHammer”. The 39th IEEE International Conference on Computer Design (ICCD), 2021

[Poster] Kwangrae Kim, **Junsu Kim**, Jeonghyun Woo, and Ki-Seok Chung. “HammerFilter: Robust Protection and Low Hardware Overhead Method for Row-Hammering”. The 58th IEEE Design Automation Conference (DAC) Work-in-Progress, 2021

Work Experience

Korea University, Seoul, Korea Sep. 2022 - Present
Research Assistant at Computer Architecture and System Software Lab (ComSys) Advisor: Prof. Yunho Oh

Korea Institute of Science and Technology, Seoul, Korea Jul. 2022 - Aug. 2023
Research Assistant at Korea Data Science Team (KDST) Supervisor: Dr. Suhyun Kim

Hanyang University, Seoul, Korea Dec. 2019 - Mar. 2020, Aug. 2020 - Nov. 2020
Research Assistant at Embedded System on Chip Laboratory (ESOC Lab) Advisor: Prof. Ki-Seok Chung
Research Assistant at Computer Architecture and System SW Lab (CASS Lab) Advisor: Prof. Yongjun Park

School for the Blind, Chuncheon, Korea Mar. 2017 - Feb. 2019
Assistant Teacher (Alternative Military Service)

Research Projects

Training Emerging AI Algorithms via GPU Unified Memory-Storage Architecture Jan. 2024 - Current
Advisor: Prof. Yunho Oh, Korea University
◊ To be appeared
◊ Tools: UVASim, GPGPUsim, C++, Python

VitBit: Enhancing Embedded GPU Performance for AI Workloads through Register Operand Packing Jan. 2024 - Current
Advisor: Prof. Yunho Oh, Korea University
◊ To be appeared
◊ Tools: C++, CUDA, Python, Pytorch

Exploring Datacenter Workloads: A Behavioral Analysis of CXL Memory Systems Jan. 2024 - Current
Advisor: Prof. Yunho Oh, Korea University
◊ To be appeared
◊ Tools: C, C++, Java, Python (CloudSuite 4.0), Perf, HMSDK

Saliency-Aware Exemplar Compression for Budgeted Online Continual Learning Jan. 2023 - Nov. 2023
Supervisor: Dr. Suhyun Kim, Korea Institute of Science and Technology
◊ To be appeared
◊ Tools: Pytorch, Python

Integrative Solution for Catastrophic Forgetting in Data-Free Class Incremental Learning

Supervisor: Dr. Suhyun Kim, Korea Institute of Science and Technology

May. 2022 - Present

- ◇ Data-Free Class Incremental Learning (DFCIL) scenario enables a model to continuously learn without violating privacy
- ◇ Observed previous methods and their synthetic data caused bias in classification head, which exacerbated catastrophic forgetting
- ◇ Developed a weight-balancing method to correct the bias in the classification head and a hybrid knowledge distillation approach
- ◇ As the third author, proposed the feature distillation scheme, produced the main results, and actively participated in paper writing
- ◇ Passed the first phase of AAAI'23, submitted to ICML'23
- ◇ Tools: Pytorch, Python

HammerFilter: Robust Protection and Low Hardware Overhead Method for RowHammer

Advisor: Prof. Ki-Seok Chung, Hanyang University

Aug. 2020 - Nov. 2020

- ◇ A recent study showed newer chips are more vulnerable to Rowhammer (i.e., Rowhammer threshold decreased from 139K to 10K)
- ◇ Prior solutions incurred significant area overhead and/or showed imperfect protection
- ◇ Proposed a robust and low overhead RowHammer protection scheme by modifying counting bloom filter
- ◇ As the third author, participated in implementing related works, experiments, and paper writing
- ◇ Tools: DRAMSim2, Gem5, C++, Shell script

Energy-efficient Auto-refresh Skipping Weak Rows

Personal Project

Jul. 2020 - Aug. 2020

- ◇ The auto-refresh scheme guarantees all DRAM cells not to lose data with a refresh interval of 64ms
- ◇ RAIDR(ISCA'12) showed fewer than 1000 DRAM cells out of 10^{11} cells required a refresh interval shorter than 256ms
- ◇ Applied the refresh rate for robust DRAM cells to all DRAM cells based on the assumption modifying OS not to use weak rows.
- ◇ Proposed method averaged 30% improvement of refresh energy over Retention time-aware Intelligent DRAM Refresh (RAIDR)
- ◇ Tools: DRAMSim2, Gem5, C++, Shell script

Optimize Deep Learning Computation on Edge Devices via Compiler

Advisor: Prof. Yongjun Park, Hanyang University

Dec. 2019 - Mar. 2020

- ◇ Observed the low performance of TASO (SOSP'19) when using CPU
- ◇ First learned the way to think critically, got familiar with research environments (e.g., ubuntu, docker, git)

Coursework Projects

CAPTCHA Project: Building a Machine Reads Distorted Text

Intro to Artificial Intelligence

Hanyang University

May. 2019 - Jun. 2019

- ◇ Built a framework that classified distorted text with small training data (dataset from Wilhelmy, Rodrigo Rosas, Horacio)
- ◇ Built pre-processing pipeline that detected each letter and applied data augmentation to the training dataset
- ◇ Exploited transfer learning approach to overcome over-fitting
- ◇ Achieved 3rd highest score in the class Kaggle competition and the honor of the best presentation

Implementing HDL Programs on FPGA

SoC design

Hanyang University

May. 2019 - Jun. 2019

- ◇ Implemented FIR Filter, LED, seven segments, and VGA controller on Altera DE1-SoC FPGA using Quartus

Embedded System Software Design

Embedded System Design

Hanyang University

May. 2019 - Jun. 2019

- ◇ Cross-compiled bootloader and kernel for Achro 210T board
- ◇ Built LED controller for Achro 210T board, and modified the display system

Skills

C/C++, Python, Tensorflow, Pytorch, Pennylane, Qiskit, Git, Shell script, ARM assembly, Verilog