Jae Hyung Ju

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Education

Georgia Institute of Technology — Atlanta, United States
Ph.D. in Electrical and Computer Engineering — 2024 - Current

Seoul National University (SNU) — Seoul, Republic of Korea
B.S. in Electrical and Computer Engineering — 2018 - 2024
22 Months Mandatory Military Service
GPA: 4.24/4.30, Rank: 2/107, *Summa Cum Laude*

Seoul Science High School — Seoul, Republic of Korea
GPA: 4.24/4.30 — 2015 - 2018

Research Experience

Scalable Computer Architecture Lab, SNU (Advisor: Jung Ho Ahn) — Jan-Feb, Jul-Dec 2023

Optimization of CNN Inference Latency within FHE (Fully Homomorphic Encryption) [1]

- Proposed a state-of-the-art algorithm for evaluating CNN inference within FHE.
- Implemented using C++, CUDA, and the HEAAN library. Achieved x1.5–2.7 speedup for ResNet18/50.

GPU Acceleration of FHE

- Implemented using C++ and CUDA. Achieved x1.1 speedup for a single ciphertext multiplication.

Accelerated Intelligent Systems Lab, SNU (Advisor: Jinho Lee) — Mar-Jun 2023

DRAM PIM (Processing In Memory) Design and Evaluation [2]

- Accelerates random access workloads by internally gathering randomly scattered data.
- Evaluated by modifying and integrating gem5 and Ramulator.

Integrated Circuits and Systems Lab, SNU (Advisor: Woo-Seok Choi) — Jan-Mar, Jun-Sep 2022

Training and Evaluation of a Neural Network Based Wireline Equalizer

- Proposed data generation methods to support training across varying noise levels.

Neuromorphic Materials and Devices Lab, SNU (Advisor: Sangbum Kim) — Jun-Aug 2022

Troubleshooting a Spiking Neural Network Simulator

- 6T2R-based Spiking Restricted Boltzmann Machine chip proprietary simulator in C++.

Work Experience

Cryptolab Inc. — Apr-Jul 2024

- Using C++ and CUDA, designed and implemented the initial structure of a new FHE library, with a focus on enabling easy integration of existing/future optimizations.
- Optimized the latency of Llama2 and ResNet18 within FHE.

Foslab corp. — Jun-Jul 2019, Aug-Sep 2021

- Accelerated the execution of specific futures trade orders.
- Created a program that parses futures trading algorithms and analyzes their performance history.

Peer-Reviewed Publications

[1] **J. H. Ju***, J. Park*, J. Kim, M. Kang, D. Kim, J. H. Cheon, and J. H. Ahn, "Neujeans: Private neural network inference with joint optimization of convolution and FHE bootstrapping", *ACM Conference on Computer and Communications Security*, 2024 (to appear).

[2] C. Shin, T. Kwon, J. Song, **J. H. Ju**, F. Liu, Y. Choi, and J. Lee, "A case for in-memory random scatter-gather for fast graph processing", *IEEE Computer Architecture Letters*, 2024.

Scholarships and Awards

KOSAF Science Scholarship by the President of Korea 2018 - 2023
Korea Student Aid Foundation (KOSAF), Full tuition and stipend for eight semesters, total $44k

Relevant Coursework

- Digital Integrated Circuits, Computer Organization and Design, Digital Systems Design and Experiments, Operating Systems, Systems Programming, Machine Learning Fundamentals, Introduction to Data Communication Networks

Academic Projects

Linux Kernel Hacking: Custom Scheduler and Read/Write Lock Spring 2023
Project for SNU 4190.307 (Operating Systems)

- Implemented a WRR (Weighted Round-Robin) scheduler such that it completely replaces the CFS scheduler and performs periodic load balancing.
- Implemented a rotation range based read/write lock, with a fairness policy to prevent writer starvation.

FPGA CNN Accelerator Fall 2022
Project for SNU 430.315A (Digital Systems Design and Experiments)

- Using Verilog and Xilinx Vivado, implemented pool/fully-connected/convolution modules for a CNN accelerator on FPGA (Arty A7), capable of executing the complete inference process of CIFAR-10 with a VGGNet variant. Used a 2D systolic array for the convolution module.

16 bit Pipelined CPU with Cache and DMA Spring 2022
Project for SNU 430.322 (Computer Organization)

- Using Verilog and Xilinx Vivado, implemented a 16 bit pipelined CPU that supports a simplified MIPS ISA, with a write-back, write-allocate cache. Also implemented a simple DMA logic with cycle stealing.

Skills

- C++, C, Verilog, CUDA, Python, Pytorch, Matlab, Xilinx Vivado, Xschem, Ngspice, Magic VLSI, Qiskit

Test scores

- **TOEFL** 111/120 (R30 L30 W27 S24)
- **GRE** V164/170 Q170/170 W4.0/6.0

Extracurricular Activities

Community Education Outreach Program Winter 2021, Winter 2022
Volunteered in teaching math to underprivileged high school students

Nongnet Agricultural Commodity Price Prediction AI Competition Fall 2022
Achieved a top 13% ranking out of 69 participating teams.
Developed an AI model for price prediction utilizing a 10-year agricultural transaction database.

Phronesis Education Volunteer Club Winter 2018
Volunteered in teaching and counseling students at a rural high school.

Military Service

7th Airforce Communication Service Group, Republic of Korea Air Force Nov 2019 - Jun 2021
Crewman of the mobile TACAN (TACtical Air Navigation) system.