

# Jiho Kim

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## EDUCATION

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### Georgia Institute of Technology

*Ph.D. in Electrical and Computer Engineering; GPA: (N/A)/4.0*

Atlanta, USA

Aug 2023 – Present

### Korea Aerospace University

*M.Sc. in Electrical and Information Engineering; GPA: 3.90/4.00*

Thesis: Design and implementation of artificial neural network inference system for time series data

Gyeonggi, Korea

Mar 2021 – Feb 2023

### Korea Aerospace University

*B.Sc. in Electrical and Information Engineering; GPA: 3.59/4.00 (Cum Laude)*

Thesis: Optimizing the resource usage of the recurrent neural network inference accelerator (in Korean)

Gyeonggi, Korea

Mar 2016 – Feb 2021

## RESEARCH INTERESTS

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**Computer architecture; High-level synthesis (HLS); Electronic design automation (EDA);**

Hardware and software co-design; Low-power and resource-efficient deep-neural-network inference processor

## PUBLICATIONS

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### [Journal]

[J3] **Jiho Kim** and Tae-Hwan Kim. “ROSETTA: A resource and energy-efficient inference processor for recurrent neural networks based on programmable data formats and fine activation pruning,” *IEEE Trans. on Emerging Topics in Computing (TETC)*, vol.11, no.3, pp.650-663, Sept. 2023

[J2] **Jiho Kim**, Jihoon Shin, and Taehwan Kim. “Low-latency bearing fault diagnosis based on convolutional LSTM model,” in *Jrnl. of the Korean Institute of Electronics and Information Engineers (IEIE)*, 59(1): 124-130, 2022 (Invited to write a paper after [C1], in Korean)

[J1] Jinwon Kim, **Jiho Kim**, and Tae-Hwan Kim. “AERO: A 1.28 MOP/s/LUT reconfigurable inference processor for recurrent neural networks in a resource-limited FPGA,” *Electronics*, 10(11), May 2021

### [Conference]

[C4] Yuchen Xia, **Jiho Kim**, Yuhan Chen, Haojie Ye, Souvik Kundu, Cong (Callie) Hao, and Nishil Talati. “Understanding the Performance and Estimating the Cost of LLM Fine-Tuning,” in *IEEE International Symposium on Workload Characterization (IISWC), 2024*

[C3] Seongjae Hong, **Jiho Kim**, and Taehwan Kim. “An integrated verification system for an RNN inference processor,” in *Summer Conf. of the Institute of Electronics and Information Engineers (Conf. of IEIE)*, pages 1274-1277, Aug 2022 (in Korean)

[C2] **Jiho Kim**, Kwoanyoung Park, and Tae-Hwan Kim. “A reconfigurable inference processor for recurrent neural networks based on programmable data format in a resource-limited FPGA,” In *Asia and South Pacific Design Automation Conf. (ASP-DAC)*, pages 94-95, January 2022 ([Video](#))

[C1] **Jiho Kim**, Jihoon Shin, and Taehwan Kim. “Low-latency bearing fault diagnosis based on convolutional long short-term memory,” in *Summer Conf. of the Institute of Electronics and Information Engineers (Conf. of IEIE)*, pages 1274-1277. *IEIE*, Aug 2021 (in Korean)

## PATENTS

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[P3] **Jiho Kim** and Taehwan Kim. 2022. Dynamic Pruning Apparatus and Method for Instruction-set Based Neural Network Inference Processor. Korean Patent, filed Jun 2022, pending

[P2] **Jiho Kim** and Taehwan Kim. 2021. Apparatus and Method for Hardware Implementation of Activation Function in Recurrent Neural Network. Korean Patent, filed Apr 2021, pending

[P1] **Jiho Kim** and Taehwan Kim. 2020. Apparatus and Method for Improving Inference Speed of Neural Network Model. Korean Patent No. 10-2020-0052268, filed Apr 2020, and issued Nov 2021

## RESEARCH EXPERIENCE

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### IBM Thomas J. Watson Research Center

Yorktown Heights, USA

*Research Internship in System Hardware Architecture*

*May 2024 – Aug 2024*

- **Project: Efficient Fine-Tuning for Edge Devices**

- Beyond Recovery: Fine-Tuning for Increased Compression Rate and Accuracy Gains

### Software/Hardware Co-Design Laboratory (SharC Lab)

Atlanta, USA

*Graduate Researcher (Advised by Prof. Cong (Callie) Hao)*

*Aug 2023 – Present*

### Circuits and Systems Laboratory

Gyeonggi, Korea

*Undergraduate & Graduate Researcher*

*Feb 2020 – Feb 2023*

- **Project: Intelligent Semiconductor Working for the Multi-Band Smart Radar [J1], [J3], [C2], [P3]**

- Designed and implemented recurrent neural network inference system for time series radar data

- Developed a method of dynamic pruning for instruction-set based neural network inference processor

- **Project: 3D spatial data processing and applied technology research [C3], [P2], [P1]**

- Developed a method for efficient implementation of activation function in hardware

- Devised a method for improving inference speed in neural networks

- **Project: Image and sound fusion technology [J2], [C1]**

- Developed a low-latency Convolutional-LSTM based fault diagnosis system for time-series data

### Electronics and Telecommunication Research Institute (ETRI)

Daejeon, Korea

*Leader of Undergraduate Researcher of Autonomous Driving System Research Group*

*Dec 2018 – Feb 2019*

- **Project: Development of Driving Computing System Supporting Real-time Sensor Fusion**

- Processing for Self-Driving Car**

- Involved in preprocessing data, feeding it to neural network, and running it through jetson board

- Supervised and assisted the undergraduate researchers for the entirety of the project

## SKILLS

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**Programming** (Advance): C, C++, Verilog HDL, Python, MATLAB, L<sup>A</sup>T<sub>E</sub>X

**Tools** (Advance): Xilinx Vitis HLS, Xilinx Vivado Design Suite, Intel Quartus Prime, Modelsim, Spyglass, VCS

**Hardware** (Advance): Altera Cyclone V FPGAs, Xilinx ZYNQ 7000 SoCs, Xilinx PYNQ-Z2

**Machine Learning Frameworks:** Pytorch, Pytorch Lightning, Tensorflow, Keras

## MAJOR COURSEWORK

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Microprocessor; Advanced Computer Architecture, Digital System Design; Advanced Digital System Design; Digital Logic Circuit; VLSI System; Parallel Computing; Advanced Programming Technique, Deep Learning; Recommendation System; AI Convergence Capstone Design; Electronic Hardware Design; Embedded System Design; Data Structures; Object Oriented Programming; Image Processing; Operating Systems; Design of Advanced Driving Assistance System

## AWARDS & SCHOLARSHIPS

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University Merit Scholarship for Academic Excellence of M.Sc. (2021-2022, 4 semesters)

Research Assistant & Teaching Assistant Scholarship (2021-2022, 4 semesters)

University Merit Scholarship for Academic Excellence of B.Sc. (2017-2020, 7 semesters)

Grand Prize (\$3000), Korean Government-Sponsored Smart City IT Make-a-thon (2018)

Volunteer Scholarship in Overseas Technical Fields & Education Service (2018)

## EXTRA-CURRICULAR EXPERIENCE

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### International University of Ulaanbaatar

Ulaanbaatar, Mongolia

*Team Leader of Drone Instructor in Technology Volunteer Program*

*Jun 2018 – Aug 2018*

- Instructed 200+ disadvantaged students about Unmanned Aerial Vehicles from theory to practice

### Female Student Council

Gyeonggi, Korea

*Representative of Planning Team*

*Feb 2016 – Present*