Jiwoon Lee

LinkedIn | GitHub | Google Scholar

Location: Seoul, Republic of Korea
jwlee@linux.com | jiwoonlee@kw.ac.kr

Education

Kwangwoon University — Sep 2024 – Present
Master of Science in Computer Engineering Student — *On-site – Seoul, Republic of Korea*
Advisor: Prof. Cheolsoo Park

- GPA: 4.21 / 4.5 (96.7%)

Kwangwoon University — Feb 2019 – Aug 2024
Bachelor of Science in Computer Engineering — *On-site – Seoul, Republic of Korea*
Advisor: Prof. Cheolsoo Park

- GPA: 3.67 / 4.5 (90.7%)

Research Interests

Computational neuroscience, signal processing, brain-computer interface, statistical machine learning

Journal Articles

- Y. Park†, **J. Lee**†, D. Sim, Y. Cho, C. Park. 2025. "Designing Spiking Neural Network-Based Reinforcement Learning for 3D Robotic Arm Applications." *Electronics* (**SCIE, Co-first author, IF = 2.6, JCR Top 45.2%**) [LINK]
- C. Lee†, Y. Park†, S. Yoon†, **J. Lee**†, Y. Cho, C. Park. 2024. "Brain-Inspired Learning Rules for Spiking Neural Network-based Control: A Tutorial." *Biomedical Engineering Letters* (**SCIE, Co-first author, IF = 3.2, JCR Top 45.9%**) [LINK]
- H. Yu†, S. Baek†, **J. Lee**†, I. Sohn, B. Hwang, C. Park. 2024. "Deep Neural Network-based Empirical Mode Decomposition for Motor Imagery EEG Classification." *IEEE Transactions on Neural Systems and Rehabilitation Engineering* (**SCIE, Co-first author: IF = 4.8, JCR Top 2.9%**) [LINK]
- J. Yang, J. Kim, H. Ryu, **J. Lee**, C. Park. 2024. "Predicting Car Rental Prices: A Comparative Analysis of Machine Learning Models." *Electronics* 13, no. 12: 2345 (SCIE, Co-author: IF = 2.6, JCR Top 45.2%) [LINK]
- **J. Lee**†, D. Kim†, Y. Park, J. Park, S. Park, C. Park. "Energy-Efficient Adaptation for Robotic Arm Control on a Neuromorphic Hardware." *Under Review* (**Co-first author**)
- J. Kim, **J. Lee**, C. Park. "Advances in Analog Circuit Design Automation using Reinforcement Learning: A Review." *Under Review* (Co-author)
- J. Lee†, M. Kim†, J. Won, **J. Lee**, H. Lee, Y. Cho, C. Park. "Event-Based Data Generation for Enhancing White Blood Cell Visibility and Counting Accuracy in Nailfold Capillary Videos." *Under Review* (Co-author)

International Conference Papers

- J. Yang, J. Kim, **J. Lee**, H. Ryu, S. Yeo, P. Kim, Y. Kim, J. Lim, H. Yoon, C. Park, "Metaverse: Research Based Prediction Model of the Car Price in view of the Machine-learning Method", In *2023 IEEE International Conference on Metaverse Computing* (IEEE MetaCom 2023), Jun 2023, Kyoto, Japan [LINK]
- **J. Lee**, C. Park, "Restoration of Time-Series Medical Data with Diffusion Model", In *2022 IEEE International Conference on Consumer Electronics-Asia* (ICCE-Asia), Oct 2022, Yeosu, South Korea [LINK]
- S. Baek, S. Han, **J. Lee**, C. Park, "Arrhythmia Classification Using 1D-2D Conversion", In *u-Healthcare 2019*, Dec 2019, Seoul, South Korea
- J. Won, H. Kim, **J. Lee**, J. Lee, C. Park, Velocity-Constrained Representation Learning for sEMG-Based Handwriting Recognition", *Under Review* (Co-author)

Domestic Conference Papers

- **J. Lee**, C. Park, “High-Efficiency Spiking Neural Network Image Classifier Mimicking Memory Mechanisms of Cerebral Cortex and Hippocampus", In *2025 Korean Institute of Broadcast and Media Engineers*, Dec 2025, Pyeongchang, South Korea
- **J. Lee**, Y. Park, H. Lee, J. Park, C. Park, “Neuromorphic Spike-based Reinforcement Learning for 2-DoF Robotic Arm Control", In *34th Korean Signal Processing Conference*, Oct 2024, Seoul, South Korea
- Y. Kang, **J. Lee**, C. Park, “Probabilistic Modeling for Multivariate Signal Restoration in PPG and ECG Using Denoising Diffusion", In *The Korean Society of Medical & Biological Engineering Spring Conference 2023*, May 2023, Daegu, South Korea
- **J. Lee**, C. Park, “Denoising Diffusion Probabilistic Model based Time-Series ECG data Interpolation”, In *2022 Korean Society of Medical & Biological Engineering Autumn Conference*, Nov 2022, Incheon, South Korea
- S. Baek, H. Yu, **J. Lee**, C. Park, “Design of Explainable AI Model with LIME for Single Channel Electroencephalogram”, In *2022 Summer Annual Conference of IEIE*, Jun 2022, Jeju, South Korea [LINK]

Honors and Awards

- **Merit-based Scholarship for AI Research**, AI Seoul Tech Graduate School Scholarship, Seoul Scholarship Foundation & Seoul Metropolitan Government, 2025
- Excellent Exhibition Center Award, "Human Brain Neuro-computing Platform Research Center", {2024, 2025} World IT Show, **Ministry of Science and ICT**, {2024, 2025}
- **Excellence Award**, "SNN-based arm motion imitation robot arm control algorithm using EMG and DVS", The World Embedded Software Contest 2023, Korea Electronics Technology Institute, 2023
- Merit-based Scholarship for Software Competence Excellence, Kwangwoon University, {2019, 2022, 2023}
- **Best Paper Award (Bronze)**, 2022 IEEE ICCE-Asia 2022, IEEE, 2022 [**LINK**]
- **Excellence Award**, “SWIM: Study WIth Me, a study stream service”, Ministry of National Defense Start-Up Challenge, **Ministry of National Defense**, 2021
- Scholarship for Academic Excellence, Kwangwoon University, 2019
- **Grand Prize**, “Text-To-Speech based on Generative Adversarial Network”, 2019 Chambit Design Semester Performance Presentation, Kwangwoon University, 2019
- **Microsoft Azure Prize**, "Mixed Reality Game", The 1st Welcome to the maker world, Microsoft Korea, 2017

Technical Skills

Expert Proficiency

Python, C/C++, CUDA, Deep Learning Frameworks

- **Python**: **PyTorch** (Custom Autograd/Extensions), TensorFlow, Scikit-learn, Bit-accurate RTL Verification
- **C / C++**: Hardware-Software Co-design, System-level Optimization, SIMD Intrinsics (AVX2/AVX512), Custom CUDA Kernel, HLS
- **Key Achievements**: Achieved **700%+ speedup** in circuit simulation (CUDA); Open-source maintainer of SNN Accelerator (FPGA) & Simulator (Python)

Advanced Proficiency

Verilog, FPGA, MATLAB, Assembly

- **FPGA & HDL**: Verilog, **Xilinx** (Zynq, Artix) with Vivado/Vitis, **Intel** (Cyclone V) with Quartus
- **Others**: MATLAB (Signal Processing), Assembly (AArch64/x86/AMD64), Docker, Git, SPICE (Circuit Simulation)

Work Experience

Research Assistant Jan 2022 – Present
Bio Computing and Machine Learning (BCML) Lab, Kwangwoon University *On-site – Seoul, Republic of Korea*
Advisor: Prof. Cheolsoo Park

- **Neural Network-Based Circuit Yield Enhancement (Corporate Project):** Conducting confidential research on circuit yield optimization (NDA).
- **GPGPU-Based High-Speed Circuit Simulation (Corporate Project):** Optimized sparse matrix solvers using CUDA (cuSOLVER, AMGX), achieving a **718.2% speedup** over CPU-based NGSPICE on ISCAS '85 benchmarks.
- **Neuromorphic Robot Arm Control:** Classified six arm movements using EMG/DVS; Developing quantized SNN and reward-modulated STDP for neuromorphic processors.
- **Open-Source SNN Accelerator for FPGA:** Implemented SNN/STDP on FPGA (Verilog/HLS); Integrated with AXI4-Lite/Stream interfaces on PYNQ-Z2; GitHub (100+ stars).
- **Time-Series Forecasting (Corporate Project):** Developed hybrid models (AR, MA, RNN) for industrial rental price prediction; Addressed data sparsity and non-linearity.
- **Generative Model for ECG Restoration:** Developed conditional DDPM for ECG interpolation; Achieved up to 70% restoration accuracy; **Best Paper Award** at IEEE ICCE-Asia 2022.
- **Motor Imagery EEG Classification:** Generalized multivariate EMD using Deep Neural Networks to solve mode mixing problems; Published in *IEEE TNSRE* (IF 4.8, JCR top 2.9%).

Research Intern Jul 2022 – Aug 2022
Qualcomm Institute, University of California, San Diego *On-site – San Diego, California, United States*
Advisor: Dr. Seokheon Cho

- **Project: Explainable AI (XAI) for Medical Diagnosis** – Reliability Analysis of Breast Tumor Classification [LINK]
- Investigated model interpretability of high-accuracy diagnostic models using LIME to address the 'Black Box' issue in clinical settings
- Identified key morphological features (concavity, texture) driving the classification, verifying the medical validity of the model's decisions

Co-Founder & Lead Developer Jun 2021 – Apr 2022
SWIM (Study Stream Service Startup) *Hybrid – Seoul, Republic of Korea*

- Designed real-time matchmaking system with Queue and the Nearest Neighbor algorithm
- Selected for **K-Startup Grand Challenge 2021 Finals**; Secured KRW 70 million (approx. USD 50,000) funding from KISED
- Received Excellence Award at Ministry of National Defence Start-Up Challenge

Fire Direction Specialist, Squad Leader, Sergeant Jun 2020 – Dec 2021
Capital Defense Command, Republic of Korea Army *On-site – Seoul, Republic of Korea*

- Mathematical computations to determine artillery firing angles
- Training new recruits in these mathematical calculations; Squad management tasks

Teaching Experience

Teaching Assistant Mar 2024 – Present
Kwangwoon University *On-site – Seoul, Republic of Korea*

- Mentoring 47 students in Artificial Intelligence (Fall 2025)
- Mentored 50 students in Digital Logic Circuits 1 (Spring 2025)
- Mentored 18 students in Computer Engineering Basic Experiment 1 (Spring 2025)
- Mentored 73 students in Assembly Language Programming (Fall 2024)
- Mentored 102 students in Computer Architecture (Spring 2024)

Student Mentor Jan 2022 – Present
BCML Lab, Kwangwoon University *Hybrid – Seoul, Republic of Korea*

- Mentored around 50 undergraduate students in BCML lab, in machine learning [LINK]

Test Scores

TOEFL iBT Jan 2026

Score: 90 (MyBest™ Score: 93)

- Total: 90/120 (Reading: 27, Listening: 18, Speaking: 22, Writing: 23)

Professional Memberships and Services

Organizer, Google Developer Student Clubs Kwangwoon University	Sep 2023 – Aug 2024
Student member, IEEE, Seoul Section	Sep 2022 – Feb 2024
Member, IEEE Consumer Technology Society	Sep 2022 – Feb 2024