

Jiwoon Lee

[LinkedIn](#) | [GitHub](#) | [Google Scholar](#)

Location: Seoul, Republic of Korea

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EDUCATION

Kwangwoon University

Master of Engineering Student

Advisor: Prof. Cheolsoo Park

Sep 2024 – Present

On-site – Seoul, Republic of Korea

- GPA: NA / 4.5

Kwangwoon University

Bachelor of Science in Computer Engineering

Advisor: Prof. Cheolsoo Park

Feb 2019 – Aug 2024

On-site – Seoul, Republic of Korea

- GPA: 3.67 / 4.5

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. Yoont, **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)

PROJECTS

Neural Network-Based Approach for Circuit Yield Enhancement

Aug 2025 – Present

- Non-Disclosure Agreement

GPGPU-Based Approach for High-Speed Circuit Simulation

Aug 2025 – Present

- Non-Disclosure Agreement

EMG-based robotic arm control using neuromorphic processor

Mar 2023 – Present

- Classified of six arm movements and controlled robotic arm using electromyogram (EMG) signals and dynamic vision sensor (DVS)
- Received an Excellence Award at the world embedded software contest 2023
- Developing a quantized spiking neural network (SNN) and reward-modulated spike timing-dependent plasticity (STDP) algorithm for neuromorphic processors
- Developing an algorithm based on a reinforcement learning framework for continuous real-time robot arm control

Opensource SNN Accelerator for FPGA

Jan 2023 – Present

[GitHub](#)

- Implemented SNN and STDP-based on-chip learning on a FPGA in Verilog
- Implementing in high level synthesis (HLS) for scalability
- Development Environment: (Current) PYNQ-Z2, Xilinx Vivado, (Previous) Artix 7

Prediction of Car Rental Prices with Machine Learning approaches

Jan 2023 – Jun 2024

Publication

- Developed a vehicle rental price prediction model using time series prediction algorithms such as autoregressive and moving average, recurrent neural network, and foundation model

Analysis of an SVM-based breast tumor classification model using the LIME method

Jul 2022 – Aug 2022

Presentation

- Developed a support vector machine (SVM)-based breast tumor classification model with a classification accuracy of 98.2%
- Analyzed an SVM-based model with local interpretable model-agnostic explanation (LIME) method, which is an algorithm for explainable artificial intelligence
- The experimental results confirmed that the concave, area, perimeter, texture, and radius of the cell affected the classification of benign and malignant

Restoration and interpolation of ECG using generative model

Jun 2022 – Oct 2022

Proceedings

- Developed conditional denoising diffusion probabilistic model (DDPM) for ECG interpolation and restoration
- Experimental results show that up to 50% of random missing data can be restored, and interpolation after undersampling, successfully achieves up to 70% despite the Nyquist sampling theory
- Received a Best Paper Award (Bronze) at 2022 IEEE ICCE-Asia

Generalization of multivariate EMD using Neural Networks for Motor Imagery EEG

Oct 2021 – Oct 2023

Publication

- Generalized the model-free algorithm multivariate EMD using deep neural networks
- Effectively solved the mode mixing problem, which is a problem of existing EMD-based algorithms
- Our proposed method showed better motor imagery classification results than other EMD-based algorithms

Real-Time matchmaking system with Queue and the Nearest Neighbor algorithm

Jun 2021 – Apr 2022

- Designed real-time matchmaking system with Queue and the Nearest Neighbor algorithm for study stream service
- Received an Excellence Award at Ministry of National Defence Start-Up Challenge
- Qualified for the finals at K-Startup Grand Challenge 2021
- Received KRW 70 million (approximately USD 50,000) in support from the Pre-Startup Package of the Korea Institute of Startup & Entrepreneurship Development

Arrhythmia classification by using Signal to Image method

Nov 2019 – Dec 2019

GitHub

- Converted ECG signals into images to classify arrhythmias
- The experimental results showed good classification performance with small data compared to other algorithms

Unsupervised learning based measurement of video liveness

Aug 2019 – Sep 2019

GitHub 1, 2

- Analyzed the dynamics of the video using metrics such as pixel error and structural similarity for each frame
- Developed a program that edits videos in high-dynamic sections by dividing the dynamics into three stages

Text-To-Speech using a GAN

Jul 2019 – Sep 2019

- Developed a GAN that takes text as input and generates a mel spectrogram for voices
- Received a Grand Prize at 2019 Chambit Design Semester Performance Presentation in Kwangwoon University

Wi-Fi and Beacon based Augmented Reality Navigation System

Jan 2016 – Jun 2016

Patent (application)

- Developed an augmented reality navigation system based on Wi-Fi and Beacon
- Developed an indoor positioning system using the triangulation method between the device and sensor

WORK EXPERIENCE

Research Assistant

Bio Computing and Machine Learning (BCML) Lab, Kwangwoon University

Advisor: Prof. Cheolsoo Park

Jan 2022 – Present

On-site – Seoul, Republic of Korea

- Opensource SNN accelerator for FPGA
- Neuromorphic hardware-friendly reward-modulated STDP
- Robot arm control using EMG and SNN
- Reconstruction method for missing electrocardiogram (ECG) using DDPM
- Motor imagery classification via multivariate EMD
- Classification of arrhythmias via 1D-2D transformation
- Detection of abnormal walking based on sensor data

Research Intern

Jul 2022 – Aug 2022

Qualcomm Institute, University of California, San Diego

Advisor: Dr. Seokheon Cho

On-site – San Diego, California, United States

- Analysis of disease classification model using the LIME method
- Classification of breast tumors using an SVM

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 50 students in Digital Logic Circuits 1 (Spring 2025)
- Mentoring 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](#)]

HONORS AND AWARDS

- Excellent Exhibition Center Award, "Human Brain Neuro-computing Platform Research Center", 2025 World IT Show, Ministry of Science and ICT, 2025
- Excellent Exhibition Center Award, "Human Brain Neuro-computing Platform Research Center", 2024 World IT Show, Ministry of Science and ICT, 2024
- 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
- Software Competence Excellence Scholarship, 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 Challange, Ministry of National Defense Republic of Korea, 2021
- Academic Excellence Scholarship, 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

CERTIFICATIONS

- Introduction to Statistical Methods with MATLAB, MATLAB, Feb 2023
- Qualcomm Institute Artificial Intelligence (AI) Development Project, Qualcomm Institute, Aug 2022
- AI Framework Certificate(KNIME Certification: L1 Examination, KNIME, Aug 2022)
- Principles of Supercomputer and Supercomputing, Korea Institute of Science and Technology Information, Nov 2016

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

CONFERENCE PAPERS

- **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, Korea
- 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 [\[LINK\]](#)
- 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
- **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, 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 [\[LINK\]](#)
- S. Baek, S. Han, **J. Lee**, C. Park, "Arrhythmia Classification Using 1D-2D Conversion", In *u-Healthcare 2019*, Dec 2019, Seoul, South Korea

VOLUNTEERING

Colorful Happy Classroom After-School Program <i>Korea Foundation for the Advancement of Science and Creativity (KOFAC)</i>	Apr 2019 – Jul 2019
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- Programming class for elementary school students
- Scratch programming

2014 Korea Education Fair for Happiness <i>Korea Foundation for the Advancement of Science and Creativity (KOFAC)</i>	Sep 2014 – Sep 2014
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- Programming class
- Web programming, C programming