

Youngwoong Youn

Neural Dynamics | System Modeling | Brain-Computer Interfaces

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Research Interests

Interpretable neural state estimation, neural population dynamics, and closed-loop brain-computer interfaces, with an emphasis on hardware-software integration for adaptive neural interfaces.

Education

Hanyang University

Bachelor of Science in Mechanical Engineering

Seoul, South Korea

Mar. 2020 – Feb. 2027 (Expected)

Thesis: Reconstruction of Electrochemical Nyquist Plots via a Reinforcement Learning-Based Generative Model

Research and Professional Experience

Gbrain Inc. [\[Link\]](#)

Incheon & Seoul, South Korea

Research Intern

Apr. 2026 – Present

Device Development Team | Advisor: Kyu Il Lee, Ph.D. (CTO)

Project: Bayesian Estimation of Pathological Neural Dynamics from Clinical ECoG

- Formulated seizure-related electrocorticography (ECoG) analysis as a Bayesian inverse problem and implemented the Jansen-Rit neural mass model with Gaussian assumed-density filtering to estimate latent population states and physiological parameters.
- Characterized fitted models through equilibria, local stability, bifurcations, and oscillatory regimes, linking inferred parameter trajectories to seizure-state transitions.
- Designed a state- and uncertainty-aware closed-loop stimulation architecture and proposed its integration with an implantable neurostimulator for internal feasibility evaluation.

Project: Automated Impedance Quality Control for 64-Channel Neural Electrodes

- Developed an automated acquisition, channel-level analysis, visualization, and reporting interface for Sciospec ISX-series impedance instrumentation.
- Reduced quality-control time for 12 electrodes from approximately one day to 36 minutes while maintaining agreement with manual impedance measurements.

Fraunhofer IPT [\[Link\]](#)

Aachen, Germany

Visiting Scientist (Full-time)

Sep. 2025 – Feb. 2026

Interlinked Production Machines | Advisor: Sangwook Langenstück-Lee, M.Sc.

- Developed a noise-robust geometric feature-extraction algorithm for continuously scanned metallic bipolar-plate profiles using surface extension and Fourier-based slope and curvature estimation.
- Integrated real-time laser-profile acquisition and analysis with a progressive-die manufacturing press, enabling press-synchronized in-line inspection and manufacturing feedback.

Clean Energy Solution Lab [\[Link\]](#)

Seoul, South Korea

Undergraduate Researcher

Jun. 2023 – Jun. 2025

School of Mechanical Engineering | Advisor: Prof. Jiwoong Bae

- Developed an electrochemistry-informed framework combining a one-dimensional convolutional autoencoder with actor-critic reinforcement learning, demonstrating stable reconstruction of complete Nyquist plots with up to 85% missing impedance data.
- Implemented Monte Carlo equivalent-circuit fitting for interpretable parameter extraction and integrated Python-based instrument acquisition with ONNX deployment to MATLAB/Simulink for end-to-end validation.

Research Group of Automotive Control Engineering [\[Link\]](#)

Seoul, South Korea

Gearbox Designer

Jun. 2020 – Jul. 2021

Powertrain Department

- Designed and structurally validated a two-stage planetary gearbox for Hanyang University's Formula SAE electric powertrain and supported battery-management and motor-inverter integration.
- Performed finite element analysis and optimized gear ratios using MATLAB/Simulink to improve structural reliability and drivetrain efficiency.

Publications

Under Revision

Youn, Y. “From Signal Fidelity to Robotic Intent: Comparative EEG Channel Restoration for Low-Channel Motor-Imagery BCI,” Manuscript under revision at the *Journal of Medical and Biological Engineering*.

Conference Presentation

Youn, Y., and Bae, J. “Comparative Analysis of Grace Capacity in NMC and LFP Battery Cells for Electric Vehicle Applications,” in *KSAE 2024 Annual Autumn Conference & Exhibition*, p. 1917, 2024. [\[Poster\]](#)

Skills

- **Programming and Scientific Computing**
Python, C/C++, and MATLAB/Simulink; PyTorch, CUDA, MNE-Python, SciPy, and Scikit-learn
- **Signal Processing and Statistical Inference**
State-space modeling, Bayesian state estimation, nonlinear optimization, parameter estimation, spectral and time-frequency analysis, and EEG/ECOG processing
- **Machine Learning and Model Deployment**
Deep learning, reinforcement learning, physics-guided machine learning, and ONNX model deployment
- **Embedded and Real-Time Systems**
ROS 2, embedded systems programming, sensor and instrument interfacing, real-time data acquisition and processing, and hardware-software integration
- **Engineering Design and Manufacturing**
CATIA and ANSYS; mechanical design, finite element analysis, design optimization, CNC machining, and experimental validation

Honors

Korea–Germany Global Talent Development Program (NRF, MSIT) Sep. 2025 – Feb. 2026

- Selected for a funded visiting research fellowship at Fraunhofer IPT through a program supported by the National Research Foundation of Korea and the Ministry of Science and ICT.

Awards

Mechanical Engineering Capstone Design Competition 2025

- Honorable Mention, Poster Session

Eco-friendly Mobility System Control Design Festival 2025

- Grand Prize

KSAE Formula Student, EV Division 2021

- First Place, Altair Optimum Design Award
- Silver Prize, Technology Idea Award

Service & Activities

Meal Preparation Volunteer, Seongdong Senior Welfare Center Mar. 2024 – Jun. 2024

- Supported meal preparation and distribution for senior citizens.

Military Service, Republic of Korea Army Aug. 2021 – Feb. 2023

- Served as a Vehicle Maintenance & Administration Specialist in the 1st Logistics Support Command.