Minseon Gwak

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RESEARCH INTEREST

Artificial intelligence powered by *signal processing* and *control theory*

- Sequence foundation models
- Deep state space models
- Language, DNA sequence, Time series

EDUCATION

02/2021 - Present **Pohang University of Science and Technology (POSTECH)** Pohang, Republic of Korea
Ph.D student in Electrical Engineering, advised by Prof. PooGyeon Park

02/2019 - 02/2021 **Pohang University of Science and Technology (POSTECH)** Pohang, Republic of Korea
M.S. in Electrical Engineering, advised by Prof. PooGyeon Park

03/2015 - 02/2019 **Pohang University of Science and Technology (POSTECH)** Pohang, Republic of Korea
B.S. in Electrical Engineering

PUBLICATIONS

[1] **Minseon Gwak**, Seongrok Moon, Joohwan Ko, and PooGyeon Park. "Layer-Adaptive State Pruning for Deep State Space Models". In: *Neural Information Processing Systems (NeurIPS)*. Dec. 2024.

[2] **Minseon Gwak**, Kyung Soo Kim, and PooGyeon Park. "Explainable AI Framework with Multi-Source Data-Driven Anomaly Detection for Injection Molding Machines". In: *2024 14th Asian Control Conference (ASCC)*. IEEE. July 2024, pp. 1–5.

[3] **Minseon Gwak***, Jong Pil Yun*, Jiyun Lee, Sang Sun Han, PooGyeon Park, and Chena Lee. "Attention Guided Jaw Bone Lesion Diagnosis in Panoramic Radiography Using Minimal Labeling Effort". In: *Scientific Reports* (Feb. 2024).

[4] Younkyung Jwa*, **Minseon Gwak***, Jiin Kwak*, Chang Wook Ahn, and PooGyeon Park. "Scalable Robust Multi-Agent Reinforcement Learning for Model Uncertainty". In: *2023 62nd IEEE Conference on Decision and Control (CDC)*. IEEE. Dec. 2023, pp. 3402–3407.

[5] **Minseon Gwak***, Min Su Kim*, Jong Pil Yun, and PooGyeon Park. "Robust and explainable fault diagnosis with power-perturbation-based decision boundary analysis of deep learning models". In: *IEEE Transactions on Industrial Informatics* (May 2023).

[6] **Minseon Gwak**, Seunghyun Ryu, Yongbeom Park, Hyeon-Woo Na, and PooGyeon Park. "Frequency-Domain Data Augmentation of Vibration Data for Fault Diagnosis using Deep Neural Networks". In: *2022 22nd International Conference on Control, Automation and Systems (ICCAS)*. IEEE. 2022, pp. 1588–1591.

[7] Taesu Park, **Minseon Gwak**, and PooGyeon Park. "A filtered-x scheduled step-size active noise cancellation algorithm considering implementation". In: *2021 21st International Conference on Control, Automation and Systems (ICCAS)*. IEEE. 2021, pp. 1016–1020.

[8] Taesu Park, Minsu Kim, **Minseon Gwak**, Taesung Cho, and PooGyeon Park. "Active noise control algorithm robust to noisy inputs and measurement impulsive noises". In: *2020 20th International Conference on Control, Automation and Systems (ICCAS)*. IEEE. 2020, pp. 622–626.

PROJECTS

PHM Platform using Explainable AI.
The Ministry of SMEs and Startups, Republic of Korea.
Explainable fault detection and diagnosis for die casting process.

Explainable AI for Fault Diagnosis using Vibration Data.
The Korea Institute of Industrial Technology.
Decision boundary visualization for deep fault diagnosis models to improve its explainability.

Label Noise Correction on Sensor Data for Anomaly Detection.
Samsung Electronics.
Identification of mislabeled data.

High-Resolution Vision-Based Surface Mounter Technology System.
K&P Company, Republic of Korea.
Manufacturing-misalignment-adjusting system using high-resolution image processing and geometric algorithm.

Distributed Dynamic State Estimation using Kalman Filters.
The Korea Electric Power Corporation.
Mathematical modeling of a distributed power system for distributed Kalman filtering.

EXPERIENCE

08/2022 - 02/2023	**Carnegie Mellon University** Visiting scholar in the Institute for Software Research.	Pittsburgh, USA
06/2018 - 08/2018	**SK Telecom** Internship. Answer retriever for smart speakers.	Seoul, Republic of Korea
07/2017 - 11/2017	**University of New South Wales** Exchange student in Electrical Engineering.	Sydney, Australia

TALK

07/2024	Invited seminar Title: From State Space Models to Deep State Space Models	Kyungpook National University

TEACHING

Fall, 2024	Teaching Assistant, EECE 695: Deep State-Space Model	POSTECH
Spring, 2023	Teaching Assistant, EECE 663: Estimation Theory	POSTECH
Fall, 2021	Teaching Assistant, EECE 320: Introduction to Automatic Control	POSTECH
Spring, 2019	Teaching Assistant, EECE 331: Electric Circuits	POSTECH

HONORS AND AWARDS

12/2024	NeurIPS 2024 Financial Aid Award.
11/2024	POSTECHIAN Fellowship - Innovation.
10/2024	Bronze Prize, The Second Koh Young AI Competition.
01/2024	Best Research Award, Department of Electrical Engineering, POSTECH.
09/2020	Excellent Paper Award, KIEE 2020 Conference.
02/2020	Scholarship, Korea Electric Power Corporation.
02/2019	Best Design Project Award, Department of Electrical Engineering, POSTECH.

SKILLS

Language	Korean, English.
Programming	Linux, Python, PyTorch, JAX/Flax, Bash/Shell, MATLAB, C/C++.
Tool	Git, Docker, W&B, Notion, Obsidian.