

YEONGHYEON PARK

Ph.D. candidate, ECE, Sungkyunkwan University, Rep. of Korea

Research engineer, SK Planet Co., Ltd., Rep. of Korea

CONTACT

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RESEARCH INTEREST

My research aims to develop effective on-device anomaly detection systems for edge computing in diverse environments. I focus on achieving high-performance anomaly detection on edge devices by leveraging neural network optimization techniques and pre-trained neural networks to address computational resource constraints. This involves exploring unsupervised and self-supervised learning strategies that employ attention mechanisms to improve detection accuracy. I have gained substantial experience in industrial anomaly detection in the manufacturing and safety sectors and have also worked with biomedical data analysis.

EDUCATION

Ph.D. Department of Electrical and Computer Engineering	Feb.2022 - on going
<i>Sungkyunkwan University</i>	GPA: 4.17/4.5

- Thesis topic: Effective Anomaly Detection Towards Edge Computing by Leveraging Pre-trained Attention Mechanisms

- Thesis advisor: Prof. Juneho Yi

M.S. Department of Computer and Electronic Systems Engineering	Mar.2018 - Feb.2020
<i>Hankuk University of Foreign Studies</i>	GPA: 4.43/4.5

- Thesis topic: Performance enhancement method for electrocardiogram analysis

- Thesis advisor: Prof. Il Dong Yun

B.S. Department of Digital Information Engineering	Feb.2012 - Feb.2018
<i>Hankuk University of Foreign Studies</i>	GPA: 4.21/4.5

EXPERIENCE

Graduate Research Assistant	Oct.2021 - on going
<i>Sungkyunkwan University</i>	Suwon, Korea

- Pre-trained attention mechanism-based anomaly detection strategy
 - Proposed a pre-trained attention-based deterministic masking method for output reliability
 - Design a self-supervised learning strategy based on the above deterministic masking method
 - Studied the generalization ability of the neural networks for proper anomaly detection models
- Solar panel anomaly detection model with a pre-trained attention mechanism
 - Proposed a way to reduce computational load and power consumption for edge computing
 - Designed defective feature emphasizing method through a pre-trained attention mechanism
 - Proposed a feature extraction method, more effective than an end-to-end deep learning model

Research Engineer

SK Planet Co.,Ltd.

Sep.2019 - on going

Pangyo Techno Valley, Korea

- Research and develop the anomaly detection systems
- Recognized as “**Key Talent**” for 3 consecutive years (2021, 2022, and 2023)
 - Awarded annually to one exceptional team member based on peer and leader evaluations
- GAN-based neural network for low-cost particulate matter sensor failure/malfunction detection
 - Proposed a multiple-hypothesis generator to enhance output reliability
 - Designed a feature map distance-based loss term for discriminator training
- ARHIS: Audio-based road hazard information system
 - Designed a neural network for on-device computing purpose
 - Created dataset via driving noise acquisition in various road conditions with Hankook Tire [\[Press Release\]](#) [\[Promotional Video\]](#)

Graduate Research Assistant

Hankuk University of Foreign Studies

Sep.2017 - Aug.2019

Yongin, Korea

- Research on biosignal analysis, medical image analysis, and anomaly detection
- Cardiac disease diagnosis through deep learning and ECG (w/ SNUBH)
 - Collaborated with Seoul National University Bundang Hospital (SNUBH)
 - Studied myocardial infarction and arrhythmia
 - Designed an ECG artifact-removing method for accurate diagnosis of myocardial infarction
 - Proposed signal processing method to emphasize the characteristics of arrhythmia
- Time-series anomaly detection model to complete training in a short time
 - Proposed a neural network structure that completes training in a short period
 - Designed to ease computational load by reducing the number of parameters
 - Studied time-series signal processing including Fourier transform with machine sound
- Small-scale tissue segmentation on neuroimage (w/ SNUBH)

- Investigated characteristics of the nigrosome of neuroimage for accurate segmentation
- Participated in initial segmentation label construction work

HONORS AND AWARDS

Key Talent Award	2021-2023
<i>SK Planet Co., Ltd.</i>	
- Recognized as an exceptional team member in annual evaluations based on peer and leader evaluations. Only one individual is selected per team each year.	
Best Conference Paper Award	Dec.2021
<i>IEEE International Conference on Architecture, Construction, Environment and Hydraulics</i>	
- December 24 - 26, 2021	
Graduate scholarship	2018-2020
<i>Department of Computer and Electronic Systems Engineering, Hankuk University of Foreign Studies</i>	
- Full-tuition scholarship for full semesters	
Excellence Undergraduate Thesis Award	Nov.2017
<i>Department of Digital Information Engineering, Hankuk University of Foreign Studies</i>	
Academic Excellence Scholarship	2013-2017
<i>Department of Digital Information Engineering, Hankuk University of Foreign Studies</i>	
- Full-tuition scholarship (Spring.2016, Fall.2016, and Spring.2017)	
- Half-tuition scholarship (Spring.2013)	

PUBLICATIONS

International Journal

- [J8] **YeongHyeon Park**, Sungho Kang, Myung Jin Kim, Yeonho Lee, Hyeong Seok Kim, and Juneho Yi “[Visual Defect Obfuscation Based Self-Supervised Anomaly Detection.](#)”, *Under review*
- [J7] **YeongHyeon Park**, Myung Jin Kim, Uju Gim, and Juneho Yi “[Boost-up Efficiency of Defective Solar Panel Detection with Pre-trained Attention Recycling](#)”, *IEEE Transactions on Industry Applications*, Mar.2023
- [J6] **YeongHyeon Park** and JongHee Jung “[Efficient Non-Compression Auto-Encoder for Driving Noise-Based Road Surface Anomaly Detection](#)”, *IEEE Transactions on Electrical and Electronic Engineering*, Jul.2022
- [J5] **YeongHyeon Park**, Won Seok Park, and Yeong Beom Kim “[Anomaly detection in particulate matter sensor using hypothesis pruning generative adversarial network](#)”, *ETRI Journal*, Dec.2020
- [J4] **YeongHyeon Park**, Il Dong Yun, and Si-Hyuck Kang, “[The CNN-based Coronary Occlusion Site Localization with Effective Preprocessing Method](#)”, *IEEE Transactions on Electrical and Electronic Engineering*, Vol.15, no.10, pp.1549-1551, Aug.2020

- [J3] **YeongHyeon Park**, Il Dong Yun, and Si-Hyuck Kang, “Preprocessing Method for Performance Enhancement in CNN-based STEMI Detection from 12-lead ECG”, *IEEE Access*, Vol.7, pp.99964-99977, Jul.2019
- [J2] **YeongHyeon Park** and Il Dong Yun, “Arrhythmia detection in electrocardiogram based on recurrent neural network encoder–decoder with Lyapunov exponent”, *IEEJ Transactions on Electrical and Electronic Engineering*, Vol.14, no.8, pp. 1273-1274, May.2019
- [J1] **YeongHyeon Park** and Il Dong Yun, “Fast Adaptive RNN Encoder-Decoder for Anomaly Detection in SMD Assembly Machine”, *Sensors*, Vol.18, no.10, pp.3573, Oct.2018

International Conference

- [C11] **YeongHyeon Park**, Sungho Kang, Myung Jin Kim, Hyeong Seok Kim, and Juneho Yi “Feature Attenuation of Defective Representation Can Resolve Incomplete Masking on Anomaly Detection.”, *Under review*
- [C10] **YeongHyeon Park**, Sungho Kang, Myung Jin Kim, Hyeonho Jeong, Hyunkyu Park, Hyeong Seok Kim, and Juneho Yi “Neural Network Training Strategy to Enhance Anomaly Detection Performance: A Perspective on Reconstruction Loss Amplification.”, *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2024*
- [C9] Hanbyul Lee*, **YeongHyeon Park***, and Juneho Yi “Enhancing Defective Solar Panel Detection with Attention-guided Statistical Features using Pre-trained Neural Networks”, *IEEE International Conference on Big Data and Smart Computing (BigComp) 2024* (* The first two authors equally contributed to this work.)
- [C8] **YeongHyeon Park**, Uju Gim, and Myung Jin Kim “Edge Storage Management Recipe with Zero-Shot Data Compression for Road Anomaly Detection”, *IEEE International Conference on Information and Communication Technology Convergence (ICTC) 2023*
- [C7] Sungho Kang, Hyunkyu Park, **YeongHyeon Park**, Yeonho Lee, Hanbyul Lee, Seho Bae, and Juneho Yi “Exploiting Monocular Depth Estimation for Style Harmonization in Landscape Painting.”, *IEEE International Conference on Knowledge Innovation and Invention (ICKII) 2023*
- [C6] Hyunkyu Park, Sungho Kang, **YeongHyeon Park**, Yeonho Lee, Hanbyul Lee, Seho Bae, and Juneho Yi “Edge Storage Management Recipe with Zero-Shot Data Compression for Road Anomaly Detection”, *IEEE International Conference on Knowledge Innovation and Invention (ICKII) 2023*
- [C5] **YeongHyeon Park**, Myoung Jin Kim, Won Seok Park, and Juneho Yi “Recycling for Recycling: RoI Cropping by Recycling a Pre-trained Attention Mechanism for Accurate Classification of Recyclables”, *IEEE International Conference on Smart Information Systems and Technologies (SIST) 2023*
- [C4] **YeongHyeon Park**, Myoung Jin Kim, and Won Seok Park “Frequency of Interest-based Noise

Attenuation Method to Improve Anomaly Detection Performance”, *IEEE International Conference on Big Data and Smart Computing (BigComp) 2023*

[C3] **YeongHyeon Park**, Myoung Jin Kim, and Uju Gim “Attention! Is Recycling Artificial Neural Network Effective for Maintaining Renewable Energy Efficiency?”, *IEEE Texas Power and Energy Conference (TPEC) 2022*

[C2] **YeongHyeon Park** and JongHee Jung “Non-Compression Auto-Encoder for Detecting Road Surface Abnormality via Vehicle Driving Noise”, *IEEE International Conference on Architecture, Construction, Environment and Hydraulics (ICACEH) 2021*

[C1] **YeongHyeon Park** and Myoung Jin Kim “Design of Cost-Effective Auto-Encoder for Electric Motor Anomaly Detection in Resource Constrained Edge Device”, *IEEE Eurasia Conference on IOT, Communication and Engineering (ECICE) 2021*

PATENTS

[P3] KR Patent 1024517510000, [ECG preprocessing method and STEMI detection method](#), Sep.2022.

[P2] KR Patent 1023465330000, [Road condition detection device and system, road condition detection method using the same](#), Dec.2021.

[P1] KR Patent 1021790400000, [Apparatus and Method for Anomaly Detection of SMD Assembly Device Operation based on Deeplearnig](#), Nov.2020.

CERTIFICATIONS

NVIDIA DLI Instructor Certificate [link] <i>NVIDIA</i>	Apr.2022
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NVIDIA University Ambassador Certificate [link] <i>NVIDIA</i>	Apr.2022
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Big Data Analysis Engineer <i>Korea Data Agency</i>	Jul.2021
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NVIDIA DLI Certificate - Applications of AI for Anomaly Detection [link] <i>NVIDIA</i>	May.2021
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Advanced Data Analytics Semi-Professional <i>Korea Data Agency</i>	Nov.2020
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Deep Learning Specialization (including 5 course certifications) [link] <i>Coursera</i>	Mar.2020
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