

# 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

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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. This involves exploring unsupervised and self-supervised learning strategies that employ pre-trained 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 on biomedical data analysis.

## EDUCATION

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**Ph.D. Department of Electrical and Computer Engineering** Feb.2022 - on going

*Sungkyunkwan University*

GPA: 4.17/4.5

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

- Thesis advisor: Prof. Junho Yi

**M.S. Department of Computer and Electronic Systems Engineering** Mar.2018 - Feb.2020

*Hankuk University of Foreign Studies*

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

*Hankuk University of Foreign Studies*

GPA: 4.21/4.5

## EXPERIENCE

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**Graduate Research Assistant**

*Sungkyunkwan University*

Oct.2021 - on going

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 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

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<b>Key Talent Award</b> <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.	2021, 2022, and 2023
<b>Excellence Award in Manufacturing Data Analysis Competition</b> <i>Korea AI Manufacturing Platform (KAMP)</i>	Nov.2023
<b>Best Conference Paper Award</b> <i>IEEE International Conference on Architecture, Construction, Environment and Hydraulics</i>	Dec.2021
<b>Graduate scholarship</b> <i>Department of Computer and Electronic Systems Engineering, Hankuk University of Foreign Studies</i> - Full-tuition scholarship for full semesters	2018 - 2020
<b>Excellence Undergraduate Thesis Award</b> <i>Department of Digital Information Engineering, Hankuk University of Foreign Studies</i>	Nov.2017
<b>Academic Excellence Scholarship</b> <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)	2013-2017

## PUBLICATIONS

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### 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](#)”, *IEEJ 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](#)”, *IEEJ 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

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[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

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