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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Personal Page: **https://yeonghyeon.github.io**

Google Scholar: **scholar.google.com/citations?user=cZq6j0MAAAAJ**

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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. 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

Ph.D. Department of Electrical and Computer Engineering Feb.2022 - Feb.2025

Sungkyunkwan University GPA: 4.17/4.5

- Dissertation: Effective Anomaly Detection Towards Edge Computing by Leveraging Pre-trained Attention Mechanisms
- Advisor: Prof. Juneho 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: Performance enhancement method for electrocardiogram analysis
- 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

Graduate Research Assistant Oct.2021 - on going

Sungkyunkwan University 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 Sep.2019 - on going

SK Planet Co.,Ltd. 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
- Wafer imaging with line scan camera (w/ SK Hynix Inc.)
  - Wafer imaging with a line-scanning device while the robotic arm moved the wafer
  - Developed a real-time algorithm to reconstruct the distorted images into a circle shape
  - Addressed the challenge of unpredictable robotic arm trajectories during reconstruction
- 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 Sep.2017 - Aug.2019

Hankuk University of Foreign Studies 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

Research Intern Jan.2017 - Feb.2017

StoryAnt Inc. Yongin, Korea

- Research and develop the intelligent archive
  - Developed a prototype web service that features national treasure document classification

HONORS AND AWARDS

Key Talent Award 2021, 2022, and 2023

SK Planet Co., Ltd.

- Recognized as an exceptional team member in annual evaluations based on peer and leader evaluations. Only one individual is selected per team each year.

Excellence Award in Manufacturing Data Analysis Competition Nov.2023

Korea AI Manufacturing Platform (KAMP)

Best Conference Paper Award Dec.2021

IEEE International Conference on Architecture, Construction, Environment and Hydraulics

Graduate Scholarship 2018 - 2020

Department of Computer and Electronic Systems Engineering, Hankuk University of Foreign Studies

- Full-tuition scholarship for full semesters

Excellence Undergraduate Thesis Award Nov.2017

Department of Digital Information Engineering, Hankuk University of Foreign Studies

Academic Excellence Scholarship 2013-2017

Department of Digital Information Engineering, Hankuk University of Foreign Studies

- Full-tuition scholarship (Spring.2016, Fall.2016, and Spring.2017)
- Half-tuition scholarship (Spring.2013)

PUBLICATIONS

Journals

[J8] **YeongHyeon Park**, Sungho Kang, Myung Jin Kim, Yeonho Lee, Hyeong Seok Kim, and Juneho Yi "Visual Defect Obfuscation Based Self-Supervised Anomaly Detection.", *Scientific Reports, Aug.2024*

[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*

Conferences

[C11] **YeongHyeon Park***, Sungho Kang*, Myung Jin Kim, Yeonho Lee, and Juneho Yi "Exploiting Connection-Switching U-Net for Enhancing Surface Anomaly Detection", *IEEE International Conference on Electrical, Control and Instrumentation engineering (ICECIE) 2024* (* Equal contribution)

[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* (* Equal contribution)

[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

[P5] KR Patent 1027374770000, Management Method of Foreign Matter for Liquid Products based on a Graph and an Device Supporting the Same, Nov.2024.

[P4] KR Patent 1027374760000, Management Method of Foreign Matter for Liquid Products and an Device Supporting the Same, Nov.2024.

[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.

PROFESSIONAL ACTIVITIES

Journal Reviewer

- *Multimedia Systems* 2024.12 -
- *Discover Artificial Intelligence* 2024.10 -
- *IEEE Transactions on Circuits and Systems for Video Technology (T-CSVT)* 2024.09 -
- *IEEE Signal Processing Letters* 2024.08 -
- *Journal of Nondestructive Evaluation* 2024.03 -
- *Electronics Letters* 2024.01 -
- *Signal, Image and Video Processing* 2024.01 -
- *Scientific Reports* 2023.09 -
- *The Journal of Supercomputing* 2023.08 -
- *IEEE Access* 2021.06 -

Conference Reviewer

- IEEE International Joint Conference on Neural Networks (IJCNN) 2025
- IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2025
- IEEE International Conference on Big Data and Smart Computing (BigComp) 2025

CERTIFICATIONS

NVIDIA DLI Instructor Certificate [**link**] Apr.2022
NVIDIA

NVIDIA University Ambassador Certificate [**link**] Apr.2022
NVIDIA

Big Data Analysis Engineer Jul.2021
Korea Data Agency

NVIDIA DLI Certificate - Applications of AI for Anomaly Detection [**link**] May.2021
NVIDIA

Advanced Data Analytics Semi-Professional Nov.2020
Korea Data Agency

Deep Learning Specialization (including 5 course certifications) [**link**] Mar.2020
Coursera