CHUNSU PARK

CONTACT

AI-based Medical Imaging LAB,
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REFERENCES
(AVAILABLE UPON REQUEST)

Prof. MinWoo Kim
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Pusan National University, South Korea
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Prof. Chankue Park
Department of Radiology,
Research Institute for Convergence of Biomedical Science and Technology,
Pusan National University Yangsan Hospital, South Korea
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Prof. Sunyoung Kwon
Department of BioMedical Convergence Engineering,
Pusan National University, South Korea
(sy.kwon@pusan.ac.kr)

RESEARCH INTERESTS

Medical Image Analysis, Generative AI, Robustness, Generalization
Multi-task Learning, Multi-modal Learning

EDUCATION

M.S. in Information Convergence Engineering **Mar. 2021 – Feb. 2023**
Pusan National University, Busan, South Korea *GPA: 4.0 / 4.0*

B.S. in Industrial and Information Systems Engineering **Mar. 2010 – Feb. 2017**
Jeonbuk National University, Jeonju, South Korea *GPA: 3.64 / 4.0*

- ✓ Double Major: *Business Administration*
- ✓ Graduated as the *Salutatorian (Second highest graduate in the department)*

RESEARCH EXPERIENCE

Full-time Research Fellow **Mar. 2023 – Present**
AMI (AI-based Medical Imaging) LAB, Department of BioMedical Convergence Engineering, Yangsan, South Korea
(PI: Prof. MinWoo Kim)

Graduate Research Assistant **Mar. 2021 – Feb. 2023**
Department of Information Convergence Engineering, Center for Artificial Intelligence Research, Pusan National University, Yangsan, South Korea
(PI: Prof. MinWoo Kim)

TEACHING EXPERIENCE

PNU Graduate Students Mentoring Program **May. 2022 – Jul. 2022,**
Pusan National University **Sep. 2022 – Dec. 2022**

Teaching Assistant (Basic Computer Programming) **Mar. 2021 – Jul. 2021**
Department of BioMedical Convergence Engineering, School of Information and Bio Medical Engineering, Pusan National University, Yangsan, South Korea

AWARDS & HONORS

Best paper award (Oral Session) **May. 2024**
The Korean Society of Medical & Biological Engineering

Academic excellent student prize **Feb. 2023**
BK (Brain Korea) 21 FOUR, National Research Foundation of Korea (NRF)

Foundation Scholarship (Total amount: $9,500) **2021-2, 2021-2, 2022-1, 2022-2**
Pusan National University

Graduate Student-led research project, 1st place **Jul. 2022 - Dec. 2022**
Center for Artificial Intelligence Research, Pusan National University

PNU-Fellowship (Amount: $3,800) **May. 2022**
BK (Brain Korea) 21 FOUR, National Research Foundation of Korea (NRF)

Medical Image AI Challenge (Pathology division), 3rd place **Dec. 2021**
Seoul National University Hospital

Best paper award (Oral Session) **Nov. 2021**
International Biomedical Engineering Conference (IBEC 2021)

Academic Scholarship (Total amount: $1,287) **2010-2, 2011-2, 2015-1, 2015-2**
Work-Study Scholarship (Total amount: $3,114) **2014-1, 2015-1, 2015-2**
National Grant Scholarship (Total amount: $706) **2015-1, 2015-2**
Jeonbuk National University

PUBLICATIONS († : co-first author , *: corresponding author)

1. **Chunsu Park**, Jeong-Woon Kang, Dong-Eon Lee, Wookon Son, Sang-Min Lee, Chankue Park*, MinWoo Kim*, "W-DRAG: A joint framework of WGAN with data random augmentation optimized for generative networks for bone marrow edema detection in dual energy CT," ***Computerized Medical Imaging and Graphics (IF: 5.4, JCR 2023 < 9%)***, 2024, 115, 102387

2. Jeong-Woon Kang, **Chunsu Park**, Dong-Eon Lee, Jae-Heung Yoo, MinWoo Kim*, "Prediction of bone mineral density in CT using deep learning with explainability," ***Frontiers in Physiology (IF: 3.2, Q2)***, 2023, 13, 1061911

3. **Chunsu Park**†, MinWoo Kim†, Chankue Park*, Wookon Son, Sang-Min Lee, Hee Seok Jeong, Jeong-Woon Kang, Min-Hyeok Choi, "Diagnostic performance for detecting bone marrow edema of the hip on dual-energy CT: Deep learning model vs. musculoskeletal physicians and radiologists," ***European Journal of Radiology (IF: 3.2, Q1)***, 2022, 152, 110337

SELECTIVE CONFERENCE PRESENTATIONS

1. **Chunsu Park**, Seonho Kim, DongEon Lee, SiYeoul Lee, Ashok Kambaluru, Chankue Park, MinWoo Kim*, " A Conditional GAN Approach for Artifact Removal: Preserving Pathological Patterns in Dual-energy CT Imagin g," ***The 110th Radiological Society of North America (RSNA)***, 2024, Chicago, USA (Poster Session)

2. **Chunsu Park**, Seonho Kim, DongEon Lee, SiYeoul Lee, Ashok Kambaluru, Chankue Park, MinWoo Kim*, " CAPTURE-GAN: Conditional Attribute Preservation through Unveiling Realistic GAN for artifact removal in dual-energy CT imaging," ***The 27th Medical Image Computing and Computer Assisted Intervention (MICCAI)***, 2024, Marrakesh, Morocco (Poster Session)

3. DongEon Lee, **Chunsu Park**, SeonYeong Lee, SiYeoul Lee, MinWoo Kim*, "Convolutional Implicit Neural Representation of pathology whole-slide images," ***The 27th Medical Image Computing and Computer Assisted Intervention (MICCAI)***, 2024, Marrakesh, Morocco (Poster Session)

OTHER CONFERENCE PRESENTATIONS (1st AUTHOR)

1. **Chunsu Park**, Seonho Kim, DongEon Lee, SiYeoul Lee, MinWoo Kim*, "Conditional Attribute Preservation GAN for artifact removal in dual-energy CT imaging," ***The Spring Conference of The Korean Society of Medical & Biological Engineering***, 2024, Wonju, South Korea (Oral Session)

2. **Chunsu Park**, DongEon Lee, Seonho Kim, SiYeoul Lee, MinWoo Kim*, "Mask CycleGAN for removing artifacts in dual-energy CT," ***The 8th IEEE International Conference on Consumer Electronics-Asia (ICCE-Asia)***, 2023, Busan, South Korea (Oral Session)

3. **Chunsu Park**, Wookon Son, Hee-Seok Jeong, Sang-Min Lee, MinWoo Kim, Chankue Park*, "Diagnostic performance for detecting bone marrow edema on dual-energy CT with Deep learning networks," ***The 20th Asian Oceanian Congress of Radiology in conjunction with the 78th Annual Meeting of the Korean Society of Radiology (AOCR & KCR)***, 2022, Seoul, South Korea (Oral Session)

4. **Chunsu Park**, DongEon Lee, Chankue Park, MinWoo Kim*, "Deep learning-based bone marrow edema detection using dual-energy CT with multi-channel data fusion," ***International Biomedical Engineering Conference (IBEC)***, 2021, Virtual Conference, South Korea (Oral Session)

OTHER WORK & SERVICE EXPERIENCE

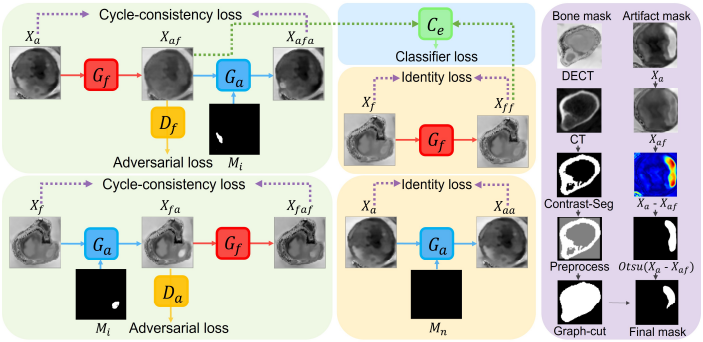
Insurance Product and System Manager & Broker, M Financial Service Inc. **Sep. 2018 – Sep. 2020**

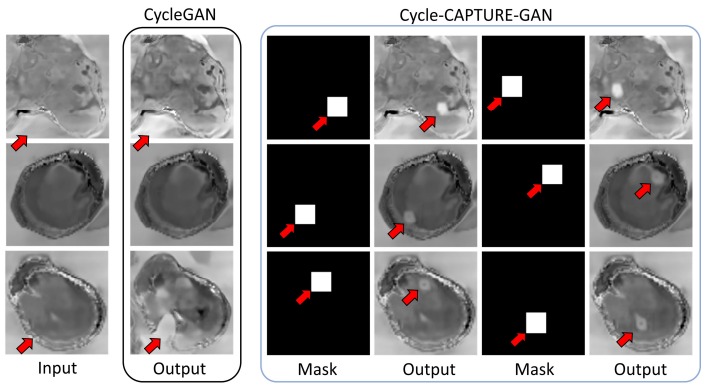
✓ *Customized product recommendation and information management*

International volunteer service in Vietnam, Jeonbuk National University **Jun. 2014 – Jul. 2014**

Military Service as a Signalman, Republic of Korea Army **Jul. 2011 – Apr. 2013**

RESEARCH SUMMARY



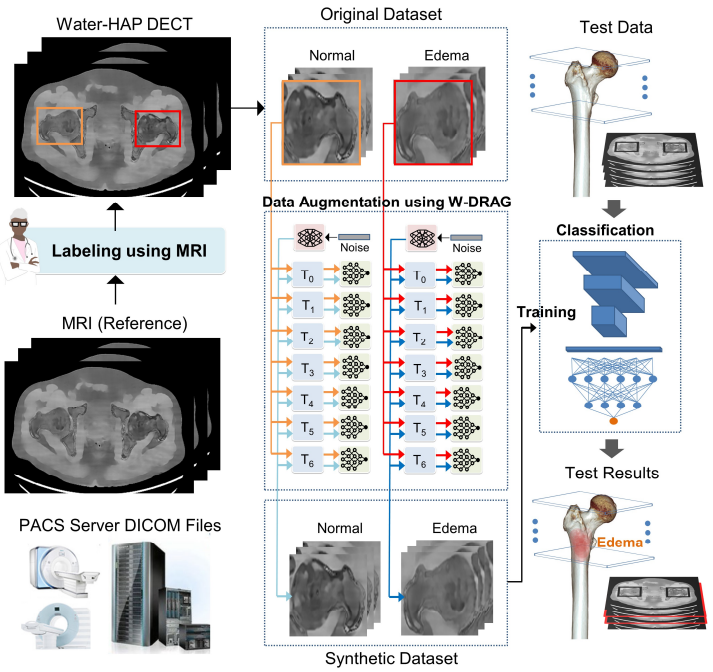


Removing artifacts while preserving pathological patterns in DECT

This study addresses the challenge of detecting bone marrow edema (BME) using dual-energy CT (DECT), which is complicated by lower contrast compared to MRI and artifacts inherent in DECT imaging. Although AI-based solutions have advanced image enhancement, removing artifacts in DECT is difficult due to the lack of paired ground-truth and artifact-laden images for supervised learning. To address this, we propose CAPTURE-GAN, an unsupervised generative model that integrates masking and classification models to reduce artifacts while preserving BME pathology and bone integrity. By incorporating bone priors and adding a disease classification network, CAPTURE-GAN significantly enhances the detection of BME in DECT, offering more artifact-free images and improving diagnostic accuracy.

Data augmentation with GAN (W-DRAG)

We constructed a framework based on deep learning techniques to screen for diseases from axial bone images and identify the local positions of bone lesions. To cope with the scarcity of labeled samples, we developed a generative adversarial network (GAN) beyond conventional augmentation (CA) methods based on geometric transformation to extend new expressions. We developed the concepts of data augmentation optimized for GAN to stably generate synthetic images and methods to train a classification model on real and synthetic samples. In addition, we developed an explainable AI technique that leverages principal component analysis to facilitate the visual analysis of the network's results.



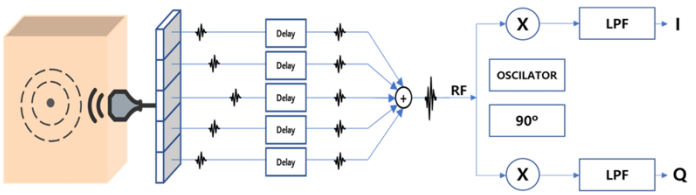


Fig. 1. Ultrasound Data Acquisition

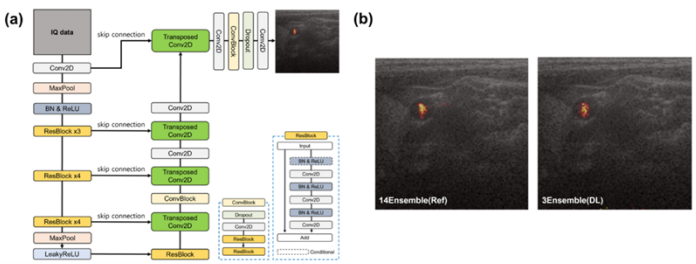


Fig. 2. (a) Deep Learning Reconstruction Model (b) Reference and DL reconstructed images

Ultrasound Vascular Imaging using Deep Learning

Ultrasound Doppler imaging is commonly used to display vascular structure and quantify the blood flow speed or blood volume. This process involves transmitting sequential pulses at a specific time interval to trace object motion, acquiring corresponding spatiotemporal data, and separating blood signals from tissue clutter. Currently, filtering methods based on singular value decomposition (SVD) has been widely adopted to facilitate the isolation of independent components. However, they significantly overlap on eigenspaces especially when a short acquisition time is required to obtain one image frame. In this study, we explore a deep learning framework to replace the SVD filtering process, with the aim of generating an enhanced vascular image given transmission numbers with a lower computation burden.