CHUNSU PARK

CONTACT

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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-modal Learning, Multi-task Learning

EDUCATION

M.S. in Information Convergence Engineering **Mar. 2021 – Feb. 2023**
Pusan National University, Busan & Yangsan, 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*

- ✓ Graduated as the *Salutatorian (Second highest graduate in the department)*
- ✓ Double Major: *Business Administration*
- ✓ Military Service in Republic of Korea Army during 2011- 2013

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, 1st place (Amount: $755) **Feb. 2023**
BK (Brain Korea) 21 FOUR, National Research Foundation of Korea (NRF)

Foundation Scholarship (Total amount: $9,500) **S21, F21, S22, F22**
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) **F10, F11, S15, F15**
Work-Study Scholarship (Total amount: $3,114) **S14, S15, F15**
National Grant Scholarship (Total amount: $706) **S15, F15**
Jeonbuk National University

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

1. **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)

2. 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)

3. **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

4. 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

5. **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

CONFERENCE PRESENTATIONS (1st Author) (*: corresponding author)

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 Imaging," ***The 110th Radiological Society of North America (RSNA)***, 2024, Chicago, USA (Poster Session)

2. **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)

3. **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)

4. **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)

5. **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)

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**

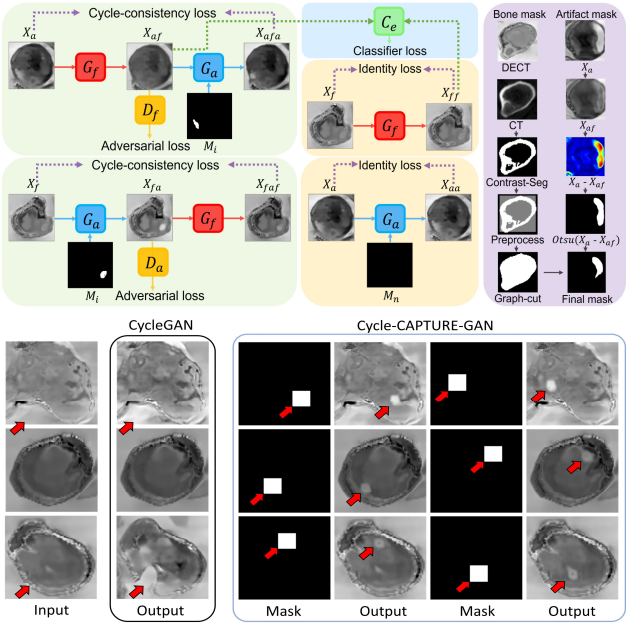
Military Service as a Signalman, Republic of Korea Army **Jul. 2011 – Apr. 2013**

✓ *Served as a squad leader during military service*

SKILLS

Programming Tools: Python, PyTorch, TensorFlow, LaTeX, MATLAB, MySQL

RESEARCH SUMMARY

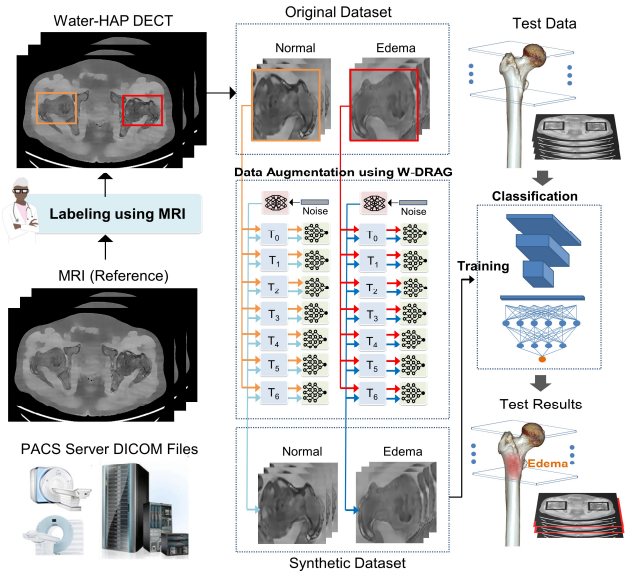


Removing artifacts while preserving pathological patterns in DECT

This study addresses the challenge of detecting bone marrow edema (BME) in dual-energy CT (DECT), which suffers from artifacts inherent in DECT imaging. Although AI-based solutions have advanced image enhancement, removing artifacts in DECT is difficult due to the challenge of not being able to obtain 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 w/ GAN (W-DRAG)

We developed a deep learning framework to screen diseases from axial bone images and pinpoint bone lesion locations. To address the lack of labeled data, we used a generative adversarial network (GAN) beyond conventional augmentation methods to generate synthetic images. We optimized data augmentation for GAN to ensure stable image generation and trained a classification model using both real and synthetic samples. Additionally, we introduced an explainable AI technique using principal component analysis to visually analyze the network's outputs.



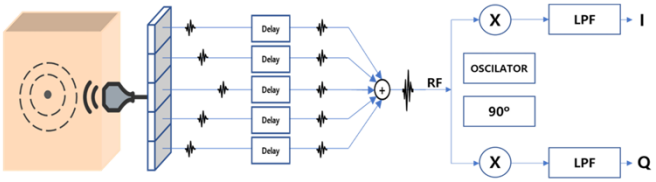


Fig. 1. Ultrasound Data Acquisition

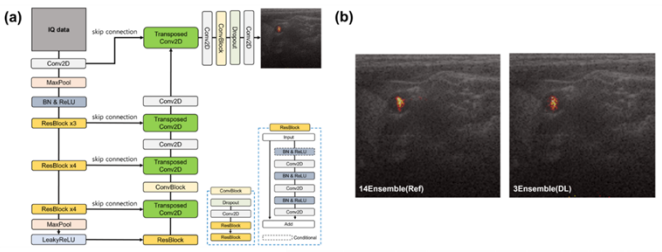


Fig. 2. (a) Deep Learning Reconstruction Model (b) Reference and DL reconstructed images

Ultrasound Vascular Imaging using Deep Learning

Ultrasound Doppler imaging is used to visualize vascular structures and measure blood flow speed or volume by transmitting sequential pulses and separating blood signals from tissue clutter. While singular value decomposition (SVD) filtering is commonly used to isolate independent components, it suffers from overlap in eigenspaces, especially with short acquisition times. This study proposes a deep learning framework to replace the SVD filtering process, aiming to generate enhanced vascular images with lower computational burden.

Bone mineral density prediction networks in CT with explainability

Bone mineral density (BMD) is vital for diagnosing bone diseases, but CT imaging lacks BMD data, requiring DXA and additional radiation. This study developed a deep learning model to estimate BMD from axial CT cuts of the L1 bone. Explainable AI techniques revealed the network focuses on tissues near the vertebral foramen. This approach can assist clinical practice and automatically screen CT databases for latent patients.