

Seoyoung Lee Ph.D.

MEDICAL IMAGING SCIENTIST

Education

MAR 2021
-FEB 2025

KAIST, Republic of Korea
Ph.D. Nuclear and Quantum Engineering

Dissertation: "Development of Advanced Digital Breast Tomosynthesis Imaging Techniques Utilizing Machine Learning"
Advisor: *Prof. Seungryong Cho*

MAR 2019
-FEB 2021

KAIST, Republic of Korea
M.S. Nuclear and Quantum Engineering

Thesis: "Development of Breast Thickness Correction Method and Shape Reconstruction Method in Digital Breast Tomosynthesis"
Advisor: *Prof. Seungryong Cho*

AUG 2017
-JAN 2018

University of Southampton, England
Exchange Student
Faculty of Engineering and Physical Sciences

MAR 2015
-FEB 2019

KAIST, Republic of Korea
B.S. Physics
B.S. Nuclear and Quantum Engineering (Dual Major)

Honors: *Magna Cum Laude* (GPA: 3.85/4.3)

Research interests

X-ray imaging
Tomographic image reconstruction
Breast imaging
Image processing
Deep learning
Radiomics

Journal publications

2025 **Lee, S.**, Hyun, S., Kim, D., Kim, H., Kim, H., Choi, I., Shin, C. & Cho, S. (2025). Can scout scan help choose scanning angle in digital breast tomosynthesis?. *Journal of Medical Imaging* [Under review]

Hyun, S., **Lee, S.** Choi, I., Shin, C. & Cho, S. (2025). Asymmetric scatter kernel estimation neural network for digital breast tomosynthesis. *Journal of Medical Imaging* [Under review]

- 2024 Yun, S., **Lee, S.** Choi, D., Lee, T., & Cho, S. (2024). TMAA-net: Tensor-domain Multi-planal Anti-Aliasing network for Sparse-view CT Image Reconstruction. *Physics in Medicine & Biology*, 69(22), 225012
DOI: [10.1088/1361-6560/ad8da2](https://doi.org/10.1088/1361-6560/ad8da2)
- Kim, H., Kim, H., Eom, H., Choi, W., Chae, E., Shin, H., ... **Lee, S.** & Cho, S. (2024). Optimizing angular range in digital breast tomosynthesis: A phantom study investigating lesion detection across varied breast density and thickness. *Physica Medica*, 124, 103419.
DOI: [10.1016/j.ejimp.2024.103419](https://doi.org/10.1016/j.ejimp.2024.103419)
- 2023 Kim, H.*, **Lee, S.***, ... & Cho, S. (2023). Homogenization of multi-institutional chest x-ray images in various data transformation schemes. *Journal of Medical Imaging*, 10(6), 061103.
DOI: [10.1117/1.JMI.10.6.061103](https://doi.org/10.1117/1.JMI.10.6.061103) (*: equal contributions)
- Kim, H.*, Lee, H.*, **Lee, S.** Choi, Y., ... & Cho, S. (2023). A feasibility study on deep-neural-network-based dose-neutral dual-energy digital breast tomosynthesis. *Medical Physics*, 50(2), 791-807.
DOI: [10.1002/mp.16071](https://doi.org/10.1002/mp.16071) (*: equal contributions)
- 2022 **Lee, S.**, Kim, H., Lee, H., & Cho, S. (2022). Deep-learning-based projection-domain breast thickness estimation for shape-prior iterative image reconstruction in digital breast tomosynthesis. *Medical Physics*, 49(6), 3670-3682.
DOI: [10.1002/mp.15612](https://doi.org/10.1002/mp.15612)
- 2021 Yun, S., Kim, Y., Kim, H., **Lee, S.**, Jeong, U., Lee, H., ... & Cho, S. (2021). Three-compartment-breast (3CB) prior-guided diffuse optical tomography based on dual-energy digital breast tomosynthesis (DBT). *Biomedical Optics Express*, 12(8), 4837-4851.
DOI: [10.1364/BOE.431244](https://doi.org/10.1364/BOE.431244)
- 2021 Cho, S., **Lee, S.**, Lee, J., Lee, D., Kim, H., Ryu, J. H., ... & Cho, S. (2021). A novel low-dose dual-energy imaging method for a fast-rotating gantry-type CT scanner. *IEEE Transactions on Medical Imaging*, 40(3), 1007-1020.
DOI: [10.1109/TMI.2020.3044357](https://doi.org/10.1109/TMI.2020.3044357)

Conference proceedings

- 2025 **Lee, S.**, Hyun, S., & Cho, S. (2025, February). Evaluation of deep learning-based scatter correction in X-ray breast imaging: Across image domains and downsampling ratios. In *SPIE 2025 Medical Imaging*. SPIE, the International society for optics and photonics. [Poster]
DOI: [10.1117/12.3048727](https://doi.org/10.1117/12.3048727)
- Hyun, S., Choi, D., Yun, S., **Lee, S.**, & Cho, S. (2025, February). A diffusion-model-based dual-domain approach for CT metal artifact reduction. In *SPIE 2025 Medical Imaging*. SPIE, the International society for optics and photonics. [Poster]
DOI: [10.1117/12.3046879](https://doi.org/10.1117/12.3046879)
- 2024 **Lee, S.**, Hyun, S., Kim, D., & Cho, S. (2024, May). A YOLO-based learning lesion classifier of pre-exposure scan in digital breast tomosynthesis. In *17th International Workshop on Breast Imaging (IWBI2024)*. SPIE, the International Society for Optics and Photonics. [Oral]
DOI: [10.1117/12.3025819](https://doi.org/10.1117/12.3025819)

- 2024 Hyun, S., **Lee, S.**, Jeong, U., & Cho, S. (2024, May). Asymmetric scatter kernel superposition-inspired deep learning approach to estimate scatter in breast tomosynthesis. In 17th International Workshop on Breast Imaging (IWBI2024). SPIE, the International Society for Optics and Photonics. [Oral]
DOI: [10.1117/12.3024774](https://doi.org/10.1117/12.3024774)
- Lee, S.**, Kim, H., Kim, H., & Cho, S. (2024, February). Predict Risk of Stereotactic Body Radiotherapy Induced Vertebral Compression Fracture Using Multi-Modal Deep Learning Network. In *SPIE 2024 Medical Imaging*. SPIE, the International society for optics and photonics. [Poster]
DOI: [10.1117/12.3006647](https://doi.org/10.1117/12.3006647)
- 2022 Kim, H.*, Lee, H.*, **Lee, S.** Choi, Y., ... & Cho, S. (2022). A feasibility study of dual-energy digital breast tomosynthesis for three-compartment-breast imaging. In *SPIE 2022 Medical Imaging*. SPIE, the International society for optics and photonics. [Oral]
DOI: [10.1117/12.2611606](https://doi.org/10.1117/12.2611606)
- 2020 **Lee, S.**, Kim, H., Lee, H., Jeong, U., & Cho, S. (2020, May). Convolutional-neural-network based breast thickness correction in digital breast tomosynthesis. In *15th International Workshop on Breast Imaging (IWBI2020)* (Vol. 11513, p. 115131E). SPIE, the International Society for Optics and Photonics. [Oral]
DOI: [10.1117/12.2560909](https://doi.org/10.1117/12.2560909)

Conference presentations (International)

- 2023 **Lee, S.**, Hyun, S., & Cho, S. (2023, July). Enhancing of Scout Scan Using Diffusion Denoising in Digital Breast Tomosynthesis. In *AAPM 2023 65th Annual Meeting & Exhibition*. American Association of Physicists in Medicine. [Poster]
- Choi, Y., **Lee, S.**, & Cho, S. (2023, July). Automatic Instant Teeth Segmentation of Panoramic Radiographs Using Multi-Frequency Processing. In *AAPM 2023 65th Annual Meeting & Exhibition*. American Association of Physicists in Medicine. [Oral, Presenter]
- Lee, S.**, Hyun, S., Kim, D., & Cho, S. (2023, January). Model observer analysis for suggestion of angular range in digital breast tomosynthesis based on patient breast type. In *International Forum on Medical Imaging in Asia (IFMIA) 2023*. IFMIA. [Oral]
- 2022 Hyun, S., **Lee, S.**, Kim, H., & Cho, S. (2022, July). Deep-Unfolding-Network-Based Non-Blind Deblurring for Fast-Rotating Wide-Angle Digital Breast Tomosynthesis. In *AAPM 2022 64th Annual Meeting & Exhibition*. American Association of Physicists in Medicine. [Oral]
- 2021 **Lee, S.**, Kim, H., Kim, H., & Cho, S. (2021, November). Multi-modal Deep-learning Based Prediction of Stereotactic Body Radiotherapy Induced Vertebral Compression Fracture. In *2021 RSNA*. Radiological Society of North America. [Oral]
- Lee, S.**, Kim, H. Sim, W., Cho, D., & Cho, S. (2021, September). Analysis of Deep Neural Network Performance Enhancement via Radiomic and Deep Feature Extraction. In *The 9th Korea-Japan Joint Meeting on Medical Physics*. KJMP. [Oral]
- Kim, H., **Lee, S.**, Kim, H., & Cho, S. (2021, September). Prediction of Vertebral Compression Fracture after Stereotactic Body Radiotherapy using Multi-modal Network. In *The 9th Korea-Japan Joint Meeting on Medical Physics*. KJMP. [Oral]

Lee, S., Kim, H., Lee, H., & Cho, S. (2021, July). Breast thickness map estimation and its associated correction in DBT imaging. In *AAPM 2021 63rd Annual Meeting & Exhibition*. American Association of Physicists in Medicine. [Poster]

Kim, H., **Lee, S.**, Sim, W., Cho, D., & Cho, S. (2021, July). Multi-frequency-based CXR data normalization for deep-neural-network classifier. In *AAPM 2021 63rd Annual Meeting & Exhibition*. American Association of Physicists in Medicine. [Poster]

2019 Cho, S., **Lee, S.**, Lee, J., & Cho, S. (2019, October). Beam-filter-based dual-energy CT imaging by use of sinogram streaking. In *IEEE Nuclear Science Symposium and Medical Imaging Conference*. IEEE NSS/MIC. [Poster]

Conference presentations (Domestic: Korea)

2024 **Lee, S.**, & Cho, S. (2024) Comparative Analysis of Deep Learning-Based Scatter Correction Across Various Domains and Downsampling Ratios, In *2024 Korean Society of Radiation Industry*. Korean Society of Radiation Industry. [Poster]

2023 **Lee, S.**, Hyun, S., Kim, D., & Cho, S. (2023) You Only Look Pre-shot: A YOLO-based lesion detection of pre-shot exposure data in tomosynthesis, In *2023 Korean Society of Radiation Industry*. Korean Society of Radiation Industry. [Poster]

Lee, S., Hyun, S., & Cho, S. (2023) Denoising of pre-shot images using the diffusion model for digital breast tomosynthesis. In *65th Korean Society of Medical Physics*. Korean Society of Medical Physics. [Poster]

2022 **Lee, S.**, Hyun, S., & Cho, S. (2022) Statistical evaluation of the computational reader in multi-angle digital breast tomosynthesis system for parameter suggestion. In *64th Korean Society of Medical Physics*. Korean Society of Medical Physics. [Oral]

2020 **Lee, S.**, Kim, H., & Cho, S. (2020) Breast shape reconstruction during digital breast tomosynthesis based on discrete algebraic reconstruction technique. In *60th Korean Society of Medical Physics*. Korean Society of Medical Physics. [Oral]

Involved projects

SEP 2020
- FEB 2025

RS-2020-KD000012

Collaboration with DRTech

- Participated in the implementation of the DBT reconstruction algorithm
- Developed analytic submodules: high-density object *artifact reduction* and *slab generation*
- Developed *deep-learning-based* methods: *Thickness estimation*, *scatter reduction* and *source motion blur reduction* algorithms

APR 2023
- DEC 2024

LG Electronics

- Set up the simulation environment for the tomosynthesis system
- Implemented dual-energy-based 3-compartment *material decomposition* technique

	APR 2020 - DEC 2020	Venture Research Program for Graduate and PhD students, KAIST - Collaborative research on applying <i>machine learning algorithms</i> to accelerate quantum mechanical first-principles simulations
	APR 2020 - DEC 2020	2020 KAIST End-Run Project Collaboration with <i>Samsung Medical Center</i> - Designed a <i>multi-modal deep learning network</i> to predict vertebral compression fracture after SBRT for metastatic spinal tumors
	MAR 2019 - DEC 2020	NRF-2016M3A9E994183722 Collaboration with <i>Wonkwang University</i> - Participated in the development of the reconstruction algorithm for a surgical helical CT system - Implement dictionary-learning-based denoising techniques in helical CT under the Qt framework
Honors and awards	JUL 2024	Best Presentation Award The 2024 Meeting for Emerging Researchers of the Korean Society of Radiation Industry
	OCT 2023	Curie Student Award Korea Nuclear Society
	JAN 2023	Best Presentation Award International Forum on Medical Imaging in Asia (IFMIA)
	SEP 2021	Young Investigator Award The 9 th Korea-Japan Joint Meeting on Medical Physics
	SEP 2020	Best Student Research Award Korean Society of Medical Physics
	MAR 2019	Lee Byong Whi Scholarship Top Incoming Student Scholarship Dept. of Nuclear and Quantum Eng., KAIST
Teaching experience	Spring 2023	Teaching Assistant NQe471 Experiments in Quantum Engineering, KAIST
	Summer 2022	Undergraduate Research Mentoring Mentoring Undergraduate Individual Research
	2022	Counselling Assistant Nuclear and Quantum Engineering Department, KAIST
	Spring 2021	Teaching Assistant NQe471 Experiments in Quantum Engineering, KAIST Special Lecturer (English) NQe503 Radiation Science, Technology, and Applications, KAIST
	Spring 2019	Teaching Assistant (English) NQe201 Fundamentals of Nuclear and Quantum Science, KAIST

Languages

Korean	Native
English	Fluent (TOEFL iBT: 101/120)
Japanese	Intermediate Listener and Speaker, Novice Reading and Writing

Computer skills

Programming	Python, C++, CUDA, JAVA
Applications	MATLAB, IDL/ENVI, MySQL
Platforms	MS Windows, Linux (Ubuntu, OpenSUSE, CentOS)

Miscellaneous

2023	Award-winning entry Nubzuki's Shinsegae Adventure Art Exhibition KAIST Art Museum https://art.kaist.ac.kr/doc/ko/pastExhibit.do?docSeq=2691
2018	Grand prize 'The KAIST I Loved, the KAIST That Loved Me' Writing Competition KAIST School of Digital Humanities and Computational Social Sciences ISBN 978-89-522-4000-2-43410
