



# Hah Min Lew

PH.D. STUDENT · KOREA UNIVERSITY

Personal Website: [hahminlew.github.io](https://hahminlew.github.io)

□ (+82) 10-6876-3175 | □ hahmin.lew@gmail.com | □ hahminlew | □ hahminlew | □ Hah Min Lew

*"Bridging AI research and scalable solutions for measurable real-world impact."*

## Biography

Ph.D. student at the Visual & General Intelligence (VGI) Lab, Korea University, supervised by Prof. Gyeong-Moon Park. Current research focus lies in Vision-Language-Action (VLA) models, Vision-Language-Navigation (VLN) models, and multimodal generative models.

Prior to academia, professional experience includes over three years as an AI Researcher at Klleon AI Research. Key contributions involved photo-realistic 3D human generation, enabling lifelike avatar movements and lip-sync. Holds both M.S. and B.E. degrees from DGIST, with a strong foundation in Deep Learning and Signal Processing, advised by Prof. Jae Youn Hwang.

## Skills

**Programming** Python, Bash, MATLAB, C, Java

**Frameworks** PyTorch, TensorFlow, Keras, Scikit-learn, Pytorch3D

**DevOps** Docker, Containerd, Git

**Back-end Basics** Node.js

**Front-end Basics** HTML, CSS, JavaScript

**Languages** Korean, English

## Education

### Korea University

PH.D. IN ARTIFICIAL INTELLIGENCE

- Advisor: Prof. Gyeong-Moon Park

Seoul, South Korea

Mar. 2026 - present

### DGIST (Daegu Gyeongbuk Institute of Science and Technology)

M.S. IN ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

- Advisor: Prof. Jae Youn Hwang

Daegu, South Korea

Mar. 2019 - Aug. 2022

### DGIST (Daegu Gyeongbuk Institute of Science and Technology)

B.E. IN SCHOOL OF UNDERGRADUATE STUDIES

- Best Project Award

Daegu, South Korea

Mar. 2014 - Feb. 2019

## Experience

### Kleon AI Research

AI RESEARCHER

- Accelerated inference using a training-free diffusion sampler ( $\uparrow 4.11\times$ ).
- Developed audio-driven 3DMM generation for virtual avatars with natural human-like expressions and movements. ( $LVE \downarrow 27.5\%$ ,  $FDD \downarrow 28.9\%$ ,  $MEE \downarrow 27.1\%$ ,  $CE \downarrow 24.1\%$ ,  $Diversity \uparrow 17.7\%$ )
- Developed a photorealistic head rendering model using Gaussian Splatting, outperforming 5 state-of-the-art models. ( $MSE \downarrow 59.96\%$ ,  $PSNR \uparrow 4.41dB$ ,  $SSIM \uparrow 3.85\%$ ,  $LPIPS \downarrow 38.16\%$ )
- Developed a Head Swap AI model with 212.7x speedup, reducing annual GPU costs by 99.53% (from \$2.2M to \$10.5K).
- Built large-scale multimodal data pipelines (9.41M+ frames from in-the-wild videos).
- Integrated external APIs (NVIDIA Omniverse Audio2Face, OpenAI ChatGPT, TTS) into a streaming avatar system, achieving 25-28 FPS performance.

Seoul, South Korea

Aug. 2022 - Feb. 2026

### Multimodal Biomedical Imaging and System Lab, DGIST

GRADUATE RESEARCHER

- Achievements: 6 SCIE publications, 7 international conferences, 9 projects, 4 patents, and 2 awards.
- Designed machine learning-based anomaly detection systems and generative models for biomedical imaging, focusing on multimodal, class-imbalance, and multi-task learning.
- Developed hardware-software integrated systems for application-specific use cases.
- Collaborative research with medical doctors from hospitals, including SNUH, SNUDH, and Yonsei Severance.

Daegu, South Korea

Mar. 2019 - Aug. 2022

# Publications

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[C5] Personalized Audio-driven Whole-body Talking Avatars	Co-Author
S. LEE, S. MOON, HAH MIN LEW, J.-S. KANG, AND G.-M. PARK. CVPR 2026	Jun. 2026
[C4] Dynamic Texture Modeling of 3D Clothed Gaussian Avatars from a Single Video	Co-Author
S. LEE, S. MOON, HAH MIN LEW, J.-S. KANG, AND G.-M. PARK. ICLR 2026	Apr. 2026
[C3] GeoAvatar: Adaptive Geometrical Gaussian Splatting for 3D Head Avatar	First Author
S. MOON*, HAH MIN LEW*, S. LEE, J.-S. KANG, AND G.-M. PARK. ICCV 2025	Apr. 2026
[C2] Towards High-fidelity Head Blending with Chroma Keying for Industrial Applications	First Author
HAH MIN LEW*, S.-M. YOO*, H. KANG*, AND G.-M. PARK. WACV 2025	Feb. 2025
[C1] CSS-Net: Classification and Substitution for Segmentation of Rotator Cuff Tear	Co-Author
K. LEE, HAH MIN LEW, M. H. LEE, M. KANG, J. KIM, AND J. Y. HWANG. ACCV 2022	Dec. 2022
[J6] Deep Learning-based Framework for Fast and Accurate Acoustic Hologram Generation	Co-Author
M. H. LEE, HAH MIN LEW, S. YOUN, T. KIM, AND J. Y. HWANG. IEEE TUFFC (IF: 3.267)	Nov. 2022
[J5] Multi-task and Few-shot Learning-based Fully Automatic Deep Learning Platform for Mobile Diagnosis of Skin Diseases	Co-Author
K. LEE, T. C. CAVALCANTI, S. KIM, HAH MIN LEW, D. H. LEE, AND J. Y. HWANG. IEEE JBHI (IF: 7.021)	Jul. 2022
[J4] Speckle Reduction via Deep Content-Aware Image Prior for Precise Breast Tumor Segmentation in an Ultrasound Image	Co-Author
H. LEE, M. H. LEE, S. YOUN, K. LEE, HAH MIN LEW, AND J. Y. HWANG. IEEE TUFFC (IF: 3.267)	Jul. 2022
[J3] Intelligent Smartphone-based Multimode Imaging Otoscope for the Mobile Diagnosis of Otitis Media	Co-Author
T. C. CAVALCANTI, HAH MIN LEW, K. LEE, S. LEE, M. K. PARK, AND J. Y. HWANG. BIOMEDICAL OPTICS EXPRESS (IF: 3.562)	Nov. 2021
[J2] Ultrasonic Blood Flowmeter with a Novel Xero Algorithm for a Mechanical Circulatory Support System	First Author
HAH MIN LEW, H. SHIN, M. H. LEE, S. YOUN, H. C. KIM, AND J. Y. HWANG. ULTRASONICS (IF: 4.062)	Aug. 2021
[J1] Forward-Looking Multimodal Endoscopic System Based on Optical Multispectral and High-Frequency Ultrasound Imaging Techniques for Tumor Detection	Co-Author
J. KIM, HAH MIN LEW, J. KIM, S. YOUN, H. A. FARUQUE, A. N. SEO, S. Y. PARK, J. H. CHANG, E. KIM, AND J. Y. HWANG. IEEE TMI (IF: 11.037)	Oct. 2020

# Projects

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Audio-driven 3D Facial Animation for Realistic Facial Expressions and Motion	Seoul, South Korea
PROJECT LEAD	Dec. 2024 - Feb. 2026
<ul style="list-style-type: none"><li>Developed a 3D facial animation framework for lifelike facial expressions and motion driven by audio inputs.</li><li>Constructed a large-scale paired dataset of audio and 3DMM parameters (6.81M+ frames).</li><li>Achieved superior performances compared to the SOTA method (LVE ↓27.5%, FDD ↓28.9%, MEE ↓27.1%, CE ↓24.1%, Diversity ↑17.7%).</li><li>Accelerated diffusion sampling process 4.11x speed-up while preserving qualitative performances.</li><li>Used skills: Python, PyTorch, Git.</li></ul>	
Real-time Expressive 3D Chat Avatar System	Seoul, South Korea
PROJECT LEAD	Apr. 2024 - Dec. 2024
<ul style="list-style-type: none"><li>Integrated NVIDIA Omniverse Audio2Face, OpenAI ChatGPT, and TTS APIs into a streaming avatar dialogue system with 25-28 FPS performance.</li><li>Designed an emotion message queue protocol to enable natural emotional transitions and realistic facial expressions in avatars.</li><li>Optimized Numpy-to-Tensor conversion and computations for live streaming, achieving a 13.5% speed improvement.</li><li>Used skills: Python, PyTorch, Docker, Containerd, Git.</li></ul>	
High-performance Real-time Head Swapping System	Seoul, South Korea
PROJECT LEAD	Aug. 2022 - Apr. 2024
<ul style="list-style-type: none"><li>Led the development of a state-of-the-art head swapping framework, including data preprocessing pipelines, multi-GPU training, and efficient inference mechanisms.</li><li>Built a high-quality dataset from 15,354 videos of 3,592 identities, processing 2.6M frames.</li><li>Achieved a 212.7x inference speedup (from 10s/frame to 47ms/frame), reducing GPU resource requirements by 99.53%.<ul style="list-style-type: none"><li>Reduced annual GPU costs from \$2.2M+ (assuming 213 AWS EC2 g4dn.4xlarge instances) to approximately \$10.5K (using a single instance).</li></ul></li><li>Achieved significant performance improvements over the SOTA method:<ul style="list-style-type: none"><li>Metrics: PSNR ↑55.5%, LPIPS ↓91.8%, L1 ↓88.8%, SSIM ↑21.8%</li><li>Inference speed: 60.57 FPS (↑53.6%)</li><li>Computational efficiency: Parameters 8.92M (↓63.4%), MACs ↓33.0%</li></ul></li><li>Used skills: Python, PyTorch, Docker, Git, JavaScript, HTML, CSS.</li></ul>	

## ADDITIONAL PROJECTS

<b>Image-to-Image Translation for High-resolution Gastrointestinal Imaging</b>	PROJECT LEAD	Feb. 2021 - Sep. 2023
<b>Multitask Learning-based Network for Rotator Cuff Tear Segmentation</b>	PROJECT MEMBER	Dec. 2021 - Dec. 2022
<b>Low-voltage CMUT-based Ultrasound Imaging for Medibots</b>	PROJECT MEMBER	Sep. 2020 - Dec. 2022
<b>AI-powered Smartphone Imaging for Early Dental Caries Detection</b>	PROJECT LEAD	Apr. 2020 - Feb. 2022
<b>ML-based Smartphone Imaging for Otitis Media Diagnosis</b>	PROJECT MEMBER	Feb. 2020 - Jan. 2022
<b>2021 Laboratory-specialized Start-up Leader University Project</b>	PROJECT MEMBER	Aug. 2021 - Jan. 2022
<b>Smart Monitoring System for Hip Implants</b>	PROJECT MEMBER	Feb. 2019 - May. 2021
<b>Optimized Biomedical Monitoring System with a Time-efficient Algorithm</b>	PROJECT LEAD	Mar. 2019 - Mar. 2021
<b>Technical Commercialization Activity Support for Bio Society Leadership</b>	PROJECT MEMBER	May. 2020 - Dec. 2020
<b>Multimodal Data Registration and Analysis for Tumor Detection</b>	PROJECT MEMBER	Mar. 2019 - Oct. 2020
<b>Ultrasonic Capsule Endoscopy</b>	PROJECT MEMBER	Jun. 2019 - Jun. 2020

## Patents

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<b>COMPUTING DEVICE FOR HEAD SWAPPING</b>	<i>Application</i>
<b>HAH MIN LEW</b> , H. KANG, S.-M.Yoo, G.-M.PARK (WO2025042068A1, KR1020230154188A)	Feb. 2025
<b>MOBILE OTOSCOPE SYSTEM</b>	<i>Patent</i>
J. Y. HWANG, T. C. CAVALCANTI, <b>HAH MIN LEW</b> (KR102648059B1)	Mar. 2024
<b>ULTRASONIC BLOOD FLOW MEASURING APPARATUS AND METHOD THEREOF</b>	<i>Patent</i>
J. Y. HWANG, <b>HAH MIN LEW</b> , H. C. KIM (KR102514633B1)	Mar. 2023
<b>BLADDER MONITORING APPARATUS AND METHOD FOR CONTROLLING BLADDER MONITORING APPARATUS</b>	<i>Patent</i>
J. Y. HWANG, M. H. LEE, <b>HAH MIN LEW</b> (KR102460829B1)	Oct. 2022
<b>THREE-DIMENSIONAL DIAGNOSTIC SYSTEM</b>	<i>Patent</i>
J. Y. HWANG, J. KIM, <b>HAH MIN LEW</b> (KR102379481B1)	Mar. 2022

## Awards & Scholarships

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### AWARDS

2021	<b>Outstanding Poster Award</b> , 2021 Student Conference at DGIST	<i>Daegu, South Korea</i>
2021	<b>Best Paper Award</b> , 2021 Spring Conference at KOSOMBE	<i>Remote, South Korea</i>
2017	<b>Best Project Award</b> , 2016 Undergraduate Group Research Project (UGRP) Program at DGIST	<i>Daegu, South Korea</i>

### SCHOLARSHIPS

2014-2022	<b>Full Government Scholarships</b> , Full tuition exemptions and school expenses support	<i>Daegu, South Korea</i>
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## References

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### Gyeong-Moon Park

ASSOCIATE PROFESSOR

- Ph.D. in School of Electrical Engineering, KAIST, Seoul, South Korea. 2019.
- E-mail: gm-park@korea.ac.kr
- Office: Room #203B, Woo Jung Informatics Building

*Seoul, South Korea*

*Mar. 2025 - present*

### Jae Youn Hwang

PROFESSOR

- Ph.D. in Biomedical Engineering, University of Southern California, Los Angeles, USA. 2009.
- E-mail: jyhwang@dgist.ac.kr
- Office: Room #413, E3 building

*Daegu, South Korea*

*Sep. 2022 - present*