



# Hah Min Lew

AI RESEARCHER · KLEON

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

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“Bridging AI research and scalable solutions for measurable real-world impact.”

## Professional Summary

AI Researcher with 2+ years at Klleon, specializing in Generative AI for digital humans. M.S. in Electrical Engineering and Computer Science, with expertise in Machine/Deep Learning, Signal/Image Processing, and Multimodal Data Analysis.

Currently leading research in facial 3D avatar generation, enabling lifelike avatar movements and lip-sync. Exploring efficient 3DMM generation and leveraging Gaussian Splatting for photorealistic rendering.

Current Projects: 3D Avatar Generation • Photorealistic Human Head Rendering • Virtual Human Dialogue System

## Skills

<b>Programming</b>	Python, Bash, MATLAB, C, Java
<b>Frameworks</b>	PyTorch, TensorFlow, Keras, Scikit-learn, Pytorch3D
<b>CV &amp; Audio Tools</b>	OpenCV, FFmpeg, librosa
<b>DevOps</b>	Docker, Containerd, Git
<b>Back-end Basics</b>	Node.js
<b>Front-end Basics</b>	HTML, CSS, JavaScript
<b>Languages</b>	Korean, English

## Education

### 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

### Klleon AI Research

AI RESEARCHER

- Developing audio-driven 3DMM generation for virtual avatars with natural human-like expressions and movements. (LVE ↓27.5%, FDD ↓28.9%, MEE ↓27.1%, CE ↓24.1%, Diversity ↑17.7%)
- Developed photorealistic head rendering model using Gaussian Splatting, outperforming 5 state-of-the-art models. (MSE ↓59.96%, PSNR ↑4.41dB, SSIM ↑3.85%, LPIPS ↓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 Audio2Face, OpenAI ChatGPT, TTS) into a streaming avatar system, achieving 25-28 FPS performance.

Seoul, South Korea

Aug. 2022 - Present

### 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

### LANTERN

CO-FOUNDER

- Founded a data-driven personalized tutor matching service company in collaboration with Class101.
- Designed a matching database system and established tutor evaluation metrics for personalized recommendations.

Daegu, South Korea

Nov. 2016 - Jul. 2017

## Publications

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

## Projects

<b>Audio-driven 3D Facial Animation for Realistic Facial Expressions and Motion</b> PROJECT LEAD	<i>Seoul, South Korea</i> Dec. 2024 - Present
<ul style="list-style-type: none"><li>Developing 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>Used skills: Python, PyTorch, Git.</li></ul>	
<b>Real-time Expressive 3D Chat Avatar System</b> PROJECT LEAD	<i>Seoul, South Korea</i> Apr. 2024 - Dec. 2024
<ul style="list-style-type: none"><li>Integrated NVIDIA 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>	
<b>High-performance Real-time Head Swapping System</b> PROJECT LEAD	<i>Seoul, South Korea</i> 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>	
<b>Custom Dataset Creation and Text-to-Image Model Finetuning</b> PROJECT LEAD	<i>Seoul, South Korea</i> Oct. 2023 - Nov. 2023
<ul style="list-style-type: none"><li>Built an end-to-end pipeline for fashion product dataset creation, integrating ML-based image captioning and text-to-image model finetuning.</li><li>Open-sourced the pipeline on GitHub and the trained models and dataset on Hugging Face.<ul style="list-style-type: none"><li>Dataset: Total 27,484 downloads.</li><li>Models: Total 2,248 downloads.</li></ul></li><li>Used skills: Python, PyTorch, Git.</li><li>Repositories: [GitHub], [Dataset], [Model].</li></ul>	

## Optimized Biomedical Monitoring System with a Time-efficient Algorithm

Daegu, South Korea

PROJECT LEAD

Mar. 2019 - Mar. 2021

- Achieved an average error rate of  $\pm 1.77\%$ , outperforming commercial products with errors of  $\pm 1-5\%$ .
- Developed a cost-efficient time-series processing algorithm with a time complexity of  $O(N \log N)$ .
- Integrated hardware and software for real-time biomedical monitoring.
- Used skills: MATLAB, LabView, VHDL.

## AI-powered Smartphone Imaging for Early Dental Caries Detection

Daegu, South Korea

PROJECT LEAD

Apr. 2020 - Feb. 2022

- Developed an ML-based smartphone image analysis system achieving 0.952 recall and 0.953 precision in early dental caries detection.
- Utilized convolutional neural networks (CNNs) to optimize classification performance for multimodal imaging data.
- Used skills: Python, TensorFlow.

## ML-based Smartphone Imaging for Otitis Media Diagnosis

Daegu, South Korea

PROJECT MEMBER

Feb. 2020 - Jan. 2022

- Constructed multimodal human clinical datasets (4.98B+ pixels) and optimized image classification models for clinical validation.
- Enhanced diagnostic accuracy with a multi-layer perceptron (MLP) model achieving 80% accuracy, outperforming expert clinicians at 73%.
- Used skills: Python, TensorFlow, Scikit-learn.

### ADDITIONAL PROJECTS

#### Image-to-Image Translation for High-resolution Gastrointestinal Imaging PROJECT LEAD

Feb. 2021 - Sep. 2023

#### Multitask Learning-based Network for Rotator Cuff Tear Segmentation PROJECT MEMBER

Dec. 2021 - Dec. 2022

#### Low-voltage CMUT-based Ultrasound Imaging for Medibots PROJECT MEMBER

Sep. 2020 - Dec. 2022

#### 2021 Laboratory-specialized Start-up Leader University Project PROJECT MEMBER

Aug. 2021 - Jan. 2022

#### Smart Monitoring System for Hip Implants PROJECT MEMBER

Feb. 2019 - May. 2021

#### Technical Commercialization Activity Support for Bio Society Leadership PROJECT MEMBER

May. 2020 - Dec. 2020

#### Multimodal Data Registration and Analysis for Tumor Detection PROJECT MEMBER

Mar. 2019 - Oct. 2020

#### Ultrasonic Capsule Endoscopy PROJECT MEMBER

Jun. 2019 - Jun. 2020

## Patents

### BLADDER MONITORING APPARATUS AND METHOD FOR CONTROLLING BLADDER MONITORING APPARATUS

Application

J. Y. HWANG, M. H. LEE, **HAH MIN LEW** (US17-516850, KR10-0145463)

Nov. 2021

### ULTRASONIC BLOOD FLOW MEASURING APPARATUS AND METHOD THEREOF

Application

J. Y. HWANG, **HAH MIN LEW**, H. C. KIM (KR10-2021-0062321)

May 2021

### MOBILE OTOSCOPE SYSTEM

Application

J. Y. HWANG, T. C. CAVALCANTI, **HAH MIN LEW** (KR10-2021-0049885)

Apr. 2021

### THREE-DIMENSIONAL DIAGNOSTIC SYSTEM

Application

J. Y. HWANG, J. KIM, **HAH MIN LEW**, K. LEE (PCT-KR2020-015460, KR10-2019-0141198)

Nov. 2020

## Awards & Scholarships

### AWARDS

2021 **Outstanding Poster Award**, 2021 Student Conference at DGIST

Daegu, South Korea

2021 **Best Paper Award**, 2021 Spring Conference at KOSOMBE

Remote, South Korea

2017 **Best Project Award**, 2016 Undergraduate Group Research Project (UGRP) Program at DGIST

Daegu, South Korea

### SCHOLARSHIPS

2014-2022 **Full Government Scholarships**, Full tuition exemptions and school expenses support

Daegu, South Korea