

Yihalem Yimolal Tiruneh

M.S. Student · Vision & Learning Lab (UNIST), South Korea

✉ yihalemyimolal@unist.ac.kr | ☎ +82-10-6791-8592 | 🎓 [Google Scholar](#) | 🌐 [Homepage](#)
🌐 [LinkedIn](#) | 🏠 [GitHub](#) | UNIST, Ulsan, South Korea

RESEARCH SUMMARY

Master's researcher at UNIST working on 3D human avatar reconstruction, 3D Gaussian splatting, and vision–language reasoning for hand understanding. Recent first-author work (ECCV 2026, under review) proposes a visibility-aware 3D Gaussian avatar framework that reconstructs animatable avatars from monocular video across full-body, upper-body, and head-only settings within a single pipeline—integrating occlusion-robust SMPL-X tracking, part-specific residual refinement, and diffusion-based texture completion. Additional contributions span hand pose benchmarking (CVPR 2026), hand–object mesh generation (CVPR Findings 2026), real-time two-hand manipulation (AAAI 2025), and generative replay for continual detection (CVPR 2024 Highlight).

RESEARCH INTERESTS

3D Gaussian Splatting, 3D Human Avatar Reconstruction & Animation, Visibility-Aware Optimization, Diffusion Models, SMPL-X / FLAME Parametric Body Models, Hand Pose Estimation & 3D Hand–Object Interaction, Vision–Language Models

EDUCATION

Ulsan National Institute of Science & Technology (UNIST) <i>M.S. in Computer Science and Engineering</i> GPA: 4.1/4.3 (98/100)	Sep 2024 – Present (Expected Aug 2026) Ulsan, Korea
Ulsan National Institute of Science & Technology (UNIST) <i>B.S. in Computer Science and Engineering</i> Cum Laude	Sep 2020 – Jun 2024 Ulsan, Korea

SELECTED RESEARCH HIGHLIGHTS

- **First author, ECCV 2026** (under review): Visibility-aware 3D Gaussian avatar framework achieving state-of-the-art quality across full-body, upper-body, and head-only settings, with ~3% PSNR gain and up to 50% memory reduction.
- **Co-author, CVPR 2026**: HandVQA — 1.6M-scale benchmark for diagnosing spatial reasoning failures in vision–language models via hand pose question answering.
- **Co-author, CVPR Findings 2026**: THOM — text-conditioned generative framework for physically plausible hand–object mesh interactions.
- **Co-author, AAAI 2025**: QORT-Former — real-time 3D two-hand manipulation modeling (53.5 FPS; +27.2% H2O; +10.4% FPHA).
- **Co-author, CVPR 2024 Highlight (top 2.8%)**: SDDGR — Stable Diffusion-based generative replay for class-incremental object detection.

CONFERENCE PUBLICATIONS (* equal contribution)


- **[ECCV 2026, under review]** [Y. Y. Tiruneh](#), S. Baek. *Unified 3D Gaussian Human Avatars Under Arbitrary Body Visibility*.
 - Proposed a visibility-aware optimization framework that restricts Gaussian splatting supervision to observed body regions, eliminating hallucinated geometry and texture drift under partial-view inputs.
 - Achieved state-of-the-art on NeuMan, ZJU-MoCap, TalkShow, and INSTA; reduced memory by ~50% and improved FPS by ~34% for head-only avatars.
- **[CVPR 2026]** MD K. C. Sayem*, M. T. Chowdhury*, [Y. Y. Tiruneh](#), M. A. Khan, M. S. Ali, B. Bhattarai, S. Baek. *HandVQA: Diagnosing Fine-Grained Spatial Reasoning Failures in Vision-Language Models via Hand Pose Question Answering*.
Project Page: kcsayem.github.io/handvqa/
 - Proposed HandVQA, a 1.6M-scale benchmark derived deterministically from 3D hand pose annotations across FreiHAND, InterHand2.6M, and FPHA.

- **[CVPR Findings 2026]** U. Jeong, [Y. Y. Tiruneh](#), H. J. Chang, S. Baek, K. I. Kim. *THOM: Generating Physically Plausible Hand-Object Meshes From Text*.
Project Page: uyoung-jeong.github.io/THOM_Project/
 - Contributed to a text-conditioned generative framework for producing physically plausible hand-object mesh interactions.
- **[CVPR 2024 – Highlight, top 2.8%]** J. Kim, H. Cho, J. Kim, [Y. Y. Tiruneh](#), S. Baek. *SDDGR: Stable Diffusion-based Deep Generative Replay for Class Incremental Object Detection*. [\[PDF\]](#)
 - Proposed a generative replay strategy using Stable Diffusion to mitigate catastrophic forgetting in class-incremental object detection (324 / 11,532 submissions).
- **[AAAI 2025]** E. Ismayilzada*, MD K. C. Sayem*, [Y. Y. Tiruneh](#), M. T. Chowdhury, M. Boboev, S. Baek. *QORT-Former: Query-Optimized Real-time Transformer for Understanding Two Hands Manipulating Objects*.
Project Page: kcsayem.github.io/QORT-Former/
 - Achieved state-of-the-art accuracy with +27.2% (H2O) and +10.4% (FPHA) improvement at real-time speed (53.5 FPS).
- **[ICASSP 2024]** J. Kim, S. Hong, C. Kim, J. Kim, [Y. Y. Tiruneh](#), J. On, J. Song, S. Choi, S. Baek. *Class-Wise Buffer Management for Incremental Object Detection: An Effective Buffer Training Strategy*. [\[PDF\]](#)
 - Proposed a class-wise buffer management strategy to address data imbalance in continual object detection settings.
- **[IEIE 2023]** J. Kim, S. Hong, C. Kim, J. Kim, J. On, [Y. Y. Tiruneh](#), J. Song, S. Choi, S. Baek. *Reducing Data Imbalance for Object Detection*. IEIE Summer Conference, Jun. 2023.

SELECTED RESEARCH PROJECTS


- **Visibility-Aware 3D Gaussian Human Avatar Reconstruction.** Jan 2025 – Present
Vision & Learning Lab, UNIST ; Code: [GitHub](#)
 - Designed a unified 3D Gaussian splatting pipeline for animatable avatar reconstruction from monocular video across full-body, upper-body, and head-only inputs.
 - Developed visibility-aware optimization using Otsu’s method to prune unobserved Gaussians, reducing memory by up to 50% and improving rendering speed by ~34%.
 - Implemented occlusion-robust SMPL-X co-registration with FLAME-based facial initialization and part-specific residual MLPs for high-frequency face and hand refinement.
 - Integrated diffusion-based video generation to synthesize auxiliary 360° views for texture completion of unobserved regions.
- **Accelerating Inference Speed for 3D Face Reconstruction.** Aug 2023 – Aug 2024
Vision & Learning Lab, UNIST ; Code: [GitHub](#)
 - Implemented post-training sparsity-aware quantization for a 3D face reconstruction model to reduce inference overhead.
 - Adopted and optimized a Vision Transformer backbone for the face reconstruction task.
 - Designed lightweight student CNN networks via knowledge distillation to compress model complexity while preserving accuracy.
- **Advanced Mesh Reconstruction & Visualization on the ARCTIC Dataset.** Feb 2023 – Jul 2023
Vision & Learning Lab, UNIST ; Code: [GitHub](#)
 - Implemented the FastInst architecture on the ARCTIC dataset for efficient hand-object mesh visualization.
 - Deployed rendering pipelines to enable precise model evaluation on hand-object manipulation sequences.

RESEARCH EXPERIENCE

Vision & Learning Lab, UNIST  Jan 2023 – Present
Graduate Research Assistant (previously Research Assistant) Ulsan, Republic of Korea
 Advisor: *Prof. Seungryul Baek, Prof. Binod Bhattarai*

- Led development of a first-author visibility-aware 3D Gaussian avatar reconstruction framework (ECCV 2026, under review).

- Contributed to HandVQA (CVPR 2026) and THOM (CVPR Findings 2026) on 3D hand understanding and hand-object interaction generation.
- Co-authored SDDGR (CVPR 2024 Highlight), a Stable Diffusion-based generative replay method for class-incremental object detection, and QORT-Former (AAAI 2025), a real-time transformer for 3D two-hand manipulation understanding.
- Implemented transformer-based approaches for high-fidelity 3D facial texture refinement and designed Trimesh-based pipelines for hand-object interaction visualization.
- Optimized MobileNetV3-Small for 3D face reconstruction, achieving 50% faster inference and 25% accuracy improvement.

Machine Learning, Vision & Language Lab, UNIST 


Research Assistant

Mentor: Prof. Taehwan Kim

Sep 2022 – Dec 2022

Ulsan, Republic of Korea

- Led a computer vision research initiative on astronomical image clarity enhancement using GANs, improving image detail by 60%.
- Evaluated deep learning models using standard metrics including accuracy, sensitivity, specificity, and precision.

Bio-Optics & Computational Imaging Lab, UNIST 

Research Assistant

Mentor: Prof. Jung-Hoon Park

Sep 2021 – Dec 2021

Ulsan, Republic of Korea

- Conducted research on non-line-of-sight imaging using Ghost Imaging techniques.
- Applied machine learning algorithms to extract scattering resistance modes, achieving 95% accuracy.

TECHNICAL SKILLS

Core: PyTorch, CUDA, Distributed/Accelerated Training, Linux, Git, L^AT_EX

Generative & Multimodal Models: Diffusion Models, HuggingFace Transformers

3D Vision & Rendering: 3D Gaussian Splatting, NeRF, SMPL-X / FLAME, differentiable rendering, multi-view geometry, pose estimation, human/hand modeling

Data & Tooling: NumPy, Pandas, OpenCV, Trimesh, experiment scripting and evaluation pipelines

TEACHING EXPERIENCE

- **Teaching Assistant:** Introduction to AI Programming in Python (Spring 2025, Fall 2025, Spring 2026) — Instructor: Prof. Michael Jon Burrell
- **Teaching Assistant:** Discrete Mathematics (Fall 2024, Fall 2025) — Instructor: Prof. Michael Jon Burrell

HONORS & AWARDS

- **Graduate School Scholarship (Korean Government):** full tuition + stipend for M.S.
- **UNIST Dream Scholarship (UNIST):** full tuition + stipend for B.S.

REFERENCES

Professor Seungryul Baek

Supervisor — Masters

sites.google.com/site/bsrvision00

Associate Professor, Artificial Intelligence Graduate School (AIGS), UNIST, South Korea

Associate Professor, Department of Computer Science and Engineering, UNIST, South Korea

Email: srbaek@unist.ac.kr

Professor Binod Bhattarai

Supervisor — Masters

sites.google.com/view/bbinod/home

Lecturer, University of Aberdeen, Aberdeen, UK

Honorary Lecturer, University College London, UK

Email: b.bhattarai@ucl.ac.uk