

Wooju Lee

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SUMMARY

Researcher at Field Robotics Research Section, ETRI, with a Ph.D. in Electrical Engineering from KAIST. Conducting full-stack research on vision-language navigation (VLN), spanning photorealistic digital twins, synthetic data generation, vision-language-action models, and real-robot deployment. Developed cross-view geo-localization and object detection models to improve localization accuracy under domain shifts. Research interests include, but are not limited to:

- **Vision-language navigation (VLN):** Digital twins, synthetic data generation, vision-language-action models, diffusion-based path planning
- **Geo-localization:** Cross-view pose optimization, cross-view image retrieval, and visual place recognition
- **Domain robustness:** Domain generalization, sensor fusion, and adversarial training

PROFESSIONAL EXPERIENCE

- **Electronics and Telecommunications Research Institute (ETRI)** Sep. 2025 – Present
Researcher, Field Robotics Research Section Daejeon, Republic of Korea
 - Lead full-stack R&D on vision-language-action (VLA) models, digital twin simulation, and on-device robotic deployment for field robotics.
 - Co-authored and secured multi-year government research grants for multi-embodiment navigation foundation models (OmniMove, ~\$4.5M/yr) and on-device VLM mobility (OnVLM, ~\$750K/yr).
 - Co-authored and secured high-performance multi-node GPU computing infrastructure (NVIDIA H200 clusters) via national research grant programs, leveraging the infrastructure to win **1st place in the ECCV'26 VLNVerse EMR Challenge**.

PROJECTS

- **Development of On-Device VLM and Real-Time Mobility for Autonomous Agents** Mar. 2026 – Present
Supported by IITP, which is a government-affiliated organization
 - Reconstructed photorealistic digital twins of real-world environments using 3D Gaussian Splatting (3DGS) and integrated them into Isaac Sim.
 - Designed synthetic data generation pipelines within digital twins for vision-language navigation (VLN).
 - Scaled distributed VLN model training across a 4-node NVIDIA H200 cluster managed with Kubernetes.
 - Integrated and deployed real-time VLN policies onto physical robot platforms.
- **Development of Autonomous Driving Technology for Unstructured Environments** Jul. 2023 – Aug. 2025
Supported by Hanwha Aerospace
 - Led team to develop a robust geo-localization framework in GPS-denied environments, integrating cross-view image retrieval, cross-view pose optimization, and local odometry.
 - Inspired by a PID controller, the method accurately estimates global pose by incorporating diverse contexts.
 - Achieved SOTA performance with mean position error of 0.43m in the real world, validated in both mobile robots and autonomous vehicles.
- **Development of Robust AI Technology for Dynamic Real-World Situations** Mar. 2022 – Dec. 2023
Supported by IITP, which is a government-affiliated organization [🔗]
 - Led team to develop a domain generalization for object detection, improving robustness to out-of-distribution data.
 - Proposed object-based data augmentation and contrastive learning for domain generalization in object detection.
 - Achieved SOTA performance with a 21.8mAP on the KITTI-C dataset, which includes adverse weather and blur.
 - Validated the object detection model for autonomous vehicles in the real world.

PUBLICATIONS

C=CONFERENCE, J=JOURNAL, *=EQUAL CONTRIBUTION

- [C.1] A. J. Choi, W. Kim, T. Kim, D. Hong, **W. Lee**, and H. Myung, “[NeuDonatello: Uncertainty-aware framework for accurate neural SDF learning](#),” accepted to BMVC, 2026.
- [C.2] J. Park, **W. Lee**, D. Hong, C. Sung, Y. Seo, D. Kang, and H. Myung, “[VIRD: View-invariant representation through dual-axis transformation for cross-view pose estimation](#),” in CVPR, 2026, **Highlight**.
- [C.3] **W. Lee**, J. Park, D. Hong, C. Sung, Y. Seo, D. Kang, and H. Myung, “[PIDLoc: Cross-view pose optimization network inspired by PID controllers](#),” in CVPR, 2025.
- [C.4] D. Hong, **W. Lee**, and H. Myung, “[CoCoA-Mix: Confusion-and-confidence-aware mixture model for context optimization](#),” in ICML, 2025.
- [C.5] **W. Lee***, D. Hong*, H. Lim, and H. Myung, “[Object-aware domain generalization for object detection](#),” in AAAI, 2024, **Oral**, [Pull requests], [🔗].
- [C.6] I. Lee, **W. Lee**, and H. Myung, “[Domain generalization with vital phase augmentation](#),” in AAAI, 2024, [🔗].
- [C.7] C. Sung, W. Kim, J. An, **W. Lee**, H. Lim, H. Myung, “[Contextrast: Contextual contrastive learning for semantic segmentation](#),” in CVPR, 2024, [🔗].
- [C.8] **W. Lee** and H. Myung, “[Adversarial attack for asynchronous event-based data](#),” in AAAI, 2022.
- [J.1] S. Noh, **W. Lee**, and H. Myung, “[Sample-efficient and occlusion-robust reinforcement learning for robotic manipulation via multimodal fusion dualization and representation normalization](#),” in Neural Networks, 2025.
- [J.2] A. J. Lee, S. Song, H. Lim, **W. Lee**, and H. Myung, “[\(LC\)²: LiDAR-camera loop constraints for cross-modal place recognition](#),” in IEEE RA-L, 2023, [🔗].
- [J.3] D. Noh, C. Sung, T. Uhm, **W. Lee**, H. Lim, and H. Myung, “[X-MAS: Extremely large-scale multi-modal sensor dataset for outdoor surveillance in real environments](#),” in IEEE RA-L, 2023.

EDUCATION

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| • Korea Advanced Institute of Science and Technology (KAIST)
<i>Ph.D. in Electrical Engineering, Advisor: Prof. Hyun Myung</i> | <i>Mar. 2021 – Aug. 2025</i>
Daejeon, Republic of Korea |
| • Korea Advanced Institute of Science and Technology (KAIST)
<i>M.S. in Robotics Program, Advisor: Prof. Hyun Myung</i> | <i>Mar. 2019 – Feb. 2021</i>
Daejeon, Republic of Korea |
| • Korea University
<i>B.S. in Mechanical Engineering</i> | <i>Mar. 2013 – Feb. 2019</i>
Seoul, Republic of Korea |

HONORS AND AWARDS

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| • ECCV’26 VLNVerse EMR Challenge (1st Place)
<i>European Computer Vision Association (ECVA)</i> | <i>Sep. 2026</i> |
| • AFCV’21 Best Paper Award
<i>Asian Federation of Computer Vision (AFCV)</i>
◦ W. Lee and H. Myung, “ Surround modulation-inspired neural network for robust image classification ,” in KROC, 2021. | <i>May 2021</i> |

SKILLS

- **Embedded & Edge Platforms:** NVIDIA Jetson (Thor, AGX Orin, Orin NX, Xavier), On-Device Edge Deployment
- **Robotics & Simulation:** ROS/ROS2, Isaac Sim, Isaac ROS, TensorRT, ONNX
- **Languages & Frameworks:** Python, PyTorch, Docker, Kubernetes, AWS, Git