

Hanbyel Cho

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Research Focus

- I am an AI robotics researcher at Samsung Electronics, working on AI-driven humanoid whole-body control and interaction. My research builds upon my background in computer vision and human motion understanding, extending toward enabling humanoid robots to learn and adapt in real-world environments. I am broadly interested in reinforcement learning, generative AI, and robotics, with a focus on:

- Humanoid whole-body motion generation and control
- Vision-based imitation learning for humanoid behaviors
- Humanoid-object interaction and manipulation
- Sim-to-real transfer for humanoid systems

My long-term goal is to build generalizable humanoid agents capable of perceiving human environments and performing complex physical interactions in the real world.

Work Experience

- **Samsung Electronics, Physical AI Lab** **Seoul, South Korea**
Staff Engineer (Manager: Donghan Koo) Aug 2025 - Present
 - Proposed a real-time text-driven humanoid whole-body control framework (SafeFlow) combining physics-guided flow matching with a 3-Stage Safety Gate for robust execution under out-of-distribution text commands
 - Designed a factorized adaptation framework for humanoid loco-manipulation (SplitAdapter) that decouples load and dynamics context via separate encoders with GRL-based cross-adversarial regularization, improving robustness under heavy-load conditions
 - Built a vision-based pipeline for learning agile humanoid whole-body behaviors from human videos, including object interaction and manipulation, to acquire diverse motor skills from in-the-wild demonstrations
 - Implemented a general-purpose RL-based motion tracking controller for whole-body teleoperation and downstream policy execution on real humanoid hardware
- **Meta Reality Labs, XR Input Perception** **Redmond, WA, USA**
Research Scientist Intern (Manager: Cem Keskin) Jun 2024 - Dec 2024
 - Developed a cross-device generalization method for multi-view egocentric (inside-out) body tracking, enabling robust performance across varying camera extrinsics without device-specific calibration
- **Meta Reality Labs, Codec Avatars Lab** **Pittsburgh, PA, USA**
Research Scientist Intern (Manager: Wei Pu) Dec 2023 - Feb 2024
 - Developed a custom detector for temporal alignment in a high-density multi-camera capture system, enabling frame-accurate synchronization for photorealistic neural avatar and 3D human reconstruction

Education

- **Korea Advanced Institute of Science and Technology (KAIST)** **Daejeon, Korea**
PhD in Electrical Engineering (Advisor: Prof. Junmo Kim) Mar 2020 - Feb 2025
Dissertation: High-Fidelity Human Body Model Reconstruction in Unconstrained Situations
- **Korea Advanced Institute of Science and Technology (KAIST)** **Daejeon, Korea**
MS in Electrical Engineering (Advisor: Prof. Junmo Kim) Mar 2018 - Feb 2020
Thesis: Improving Performance of Face Super-Resolution with Stochastic Attributes Modeling
- **Korea Advanced Institute of Science and Technology (KAIST)** **Daejeon, Korea**
BS in Electrical Engineering Mar 2013 - Feb 2018

Publications

- SplitAdapter: Load-Aware Humanoid Loco-Manipulation via Factorized Adaptation
Jeonguk Kang, **Hanbyel Cho**, Sanghyun Kang, Donghan Koo
arXiv Preprint, 2026
- SafeFlow: Real-Time Text-Driven Humanoid Whole-Body Control via Physics-Guided Rectified Flow and Selective Safety Gating
Hanbyel Cho, Sang-Hun Kim, Jeonguk Kang, Donghan Koo
arXiv Preprint, 2026
- Controllable Feature Whitening for Hyperparameter-Free Bias Mitigation
Yooshin Cho, **Hanbyel Cho**, Janghyeon Lee, Hyeong Gwon Hong, Jaesung Ahn, Junmo Kim
IEEE/CVF International Conference on Computer Vision (ICCV), 2025
- Efficient Dynamic Scene Editing via 4D Gaussian-based Static-Dynamic Separation
Joohyun Kwon*, **Hanbyel Cho***, Junmo Kim (*Equal contribution)
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2025
- Foreseeing Reconstruction Quality of Gradient Inversion: An Optimization Perspective
Hyeong Gwon Hong, Yooshin Cho, **Hanbyel Cho**, Jaesung Ahn, Junmo Kim
The 38th Annual AAAI Conference on Artificial Intelligence (AAAI), 2024
- Generative Approach for Probabilistic Human Mesh Recovery using Diffusion Models
Hanbyel Cho, Junmo Kim
IEEE/CVF International Conference on Computer Vision (ICCV), 2023, *CV4Metaverse Workshop*
- Implicit 3D Human Mesh Recovery using Consistency with Pose and Shape from Unseen-view
Hanbyel Cho, Yooshin Cho, Jaesung Ahn, Junmo Kim
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2023
- Video Inference for Human Mesh Recovery with Vision Transformer
Hanbyel Cho, Jaesung Ahn, Yooshin Cho, Junmo Kim
IEEE International Conference on Automatic Face and Gesture Recognition (IEEE FG), 2023
- Localization using Multi-Focal Spatial Attention for Masked Face Recognition
Yooshin Cho, **Hanbyel Cho**, Hyeong Gwon Hong, Jaesung Ahn, Dongmin Cho, Junmo Kim
IEEE International Conference on Automatic Face and Gesture Recognition (IEEE FG), 2023
- Rethinking Efficacy of Softmax for Lightweight Non-Local Neural Networks
Yooshin Cho, Youngsoo Kim, **Hanbyel Cho**, Jaesung Ahn, Hyeong Gwon Hong, Junmo Kim
IEEE International Conference on Image Processing (ICIP), 2022
- Camera Distortion-aware 3D Human Pose Estimation in Video with Optimization-based Meta-Learning
Hanbyel Cho, Yooshin Cho, Jaemyung Yu, Junmo Kim
IEEE/CVF International Conference on Computer Vision (ICCV), 2021
- Improving Generalization of Batch Whitening by Convolutional Unit Optimization
Yooshin Cho, **Hanbyel Cho**, Youngsoo Kim, Junmo Kim
IEEE/CVF International Conference on Computer Vision (ICCV), 2021
- Stochastic Attribute Modeling for Face Super-Resolution
Hanbyel Cho, Yekang Lee, Jaemyung Yu, Junmo Kim
arXiv Preprint, 2020

Skills

- **Robotics & Control:** Humanoid Whole-body Control; Deep RL (PPO); Imitation Learning; Sim-to-Real Transfer; Diffusion Policy; Motion Tracking
- **Generative Models:** Diffusion Models; Flow Matching; LLMs; VLMs
- **Computer Vision:** 3D Human Pose Estimation; 3D Human Mesh Reconstruction; Gaussian Splatting; NeRF; Egocentric Vision; Transformers; ConvNets
- **Programming:** Python, C++, PyTorch, ONNX, NumPy, LaTeX
- **Simulation & Hardware:** Isaac Gym; Isaac Sim/Lab; MuJoCo; ROS2; OptiTrack MoCap; Unitree G1

Academic Service

- **Conference Reviewer:** CVPR, ICCV, ECCV, NeurIPS, BMVC, ACM-MM, ACCV, WACV
- **Journal Reviewer:** TIP, JVCI

Awards & Scholarships

- **Finalist, Qualcomm Innovation Fellowship Korea** Nov. 2023
Hosted by Qualcomm Korea, Inc.
Recognized for the first-authored paper titled: Implicit 3D Human Mesh Recovery using Consistency with Pose and Shape from Unseen-view (CVPR, 2023)
- **Excellent Presentation Award, CARAI Academic Workshop** Oct. 2023
Hosted by Center for Applied Research in Artificial Intelligence (CARAI)
- **Finalist, Qualcomm Innovation Fellowship Korea** Nov. 2022
Hosted by Qualcomm Korea, Inc.
Recognized for the first-authored paper titled: Camera Distortion-aware 3D Human Pose Estimation in Video with Optimization-based Meta-Learning (ICCV, 2021)
- **Governmental Scholarship for KAIST Graduate Students** 2018 - 2024
- **Governmental Scholarship for KAIST Undergraduate Students** 2013 - 2017

References

- **Intern Manager:** Cem Keskin, Principal Research Scientist, Meta
- **Intern Manager:** Wei Pu, Engineering Manager, Meta
- **MS/PhD Advisor:** Junmo Kim, Professor, School of Electrical Engineering, KAIST