Hanbyel Cho

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Research Focus

- I am an AI robotics researcher at Samsung Electronics, working on learning-based humanoid control and manipulation. 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
  - Human data-driven robot learning
  - Whole-body loco-manipulation and dexterous manipulation
  - Reinforcement learning, imitation learning, and sim-to-real transfer

  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 three-stage safety gate for robust execution under out-of-distribution text commands
  - Developed a factorized policy adaptation framework (SplitAdapter) for humanoid loco-manipulation, disentangling payload and dynamics contexts to improve real-world task success from 59.3% to 96.3%
  - Developed a human video-to-robot learning pipeline combining motion extraction and retargeting to train RL-based humanoid whole-body loco-manipulation policies
  - Implemented an RL-based whole-body general motion tracking controller for teleoperation and downstream policy execution on real humanoids, and co-developed foot contact-aware policy adaptation (CA-GMT)
  - Conducting research on dexterous manipulation and autonomous whole-body loco-manipulation, with a focus on demonstration-based learning, reinforcement learning, and hierarchical visuomotor policies

- **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 temporal alignment method for high-density multi-camera capture systems, enabling frame-accurate synchronization for photorealistic neural avatars 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

- 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
- SplitAdapter: Load-Aware Humanoid Loco-Manipulation via Factorized Adaptation
  Jeonguk Kang, **Hanbyel Cho**, Sanghyun Kang, Donghan Koo
  arXiv Preprint, 2026
- CA-GMT: Contact-Aware Low-Rank Adaptation of Motion Tracking for Whole-Body Teleoperation
  Sang-Hun Kim, **Hanbyel Cho**, Sunkyum Yoo, Donghan Koo
  Conference on Robot Learning ***(CoRL)***, 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:** Reinforcement Learning; Imitation Learning; Humanoid Whole-body Control; Loco-Manipulation; Hierarchical Policy Learning; Teacher-Student Distillation; 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; MANUS; Unitree G1

Academic Service

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

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