Jeonguk Kang

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Research Focus

Robotics researcher focused on humanoid whole-body control, sim-to-real transfer and adaptation, and real-hardware deployment of learned policies. My work combines reinforcement learning for high-DoF legged robots with model predictive control, state estimation, and physics-based control to enable robust locomotion, disturbance recovery, and loco-manipulation.
Focus Areas: Humanoid Whole-Body Control; Legged Locomotion; Loco-Manipulation; Sim-to-Real Transfer and Adaptation; Real-Hardware Policy Deployment

Education

Korea Advanced Institute of Science and Technology (KAIST) Daejeon, South Korea
Ph.D. in Mechanical Engineering *Mar. 2020 – Feb. 2024*
- Dissertation: Robust Locomotion Control of Legged Robots via Graph Optimization-Based Disturbance Estimation

Korea Advanced Institute of Science and Technology (KAIST) Daejeon, South Korea
M.S. in Mechanical Engineering *Mar. 2018 – Feb. 2020*

Korea Advanced Institute of Science and Technology (KAIST) Daejeon, South Korea
B.S. in Mechanical Engineering *Mar. 2013 – Feb. 2018*

Karlsruher Institut für Technologie (KIT) Karlsruhe, Germany
Exchange-Program, Mechanical Engineering *Sep. 2016 – Feb. 2017*

Experience

Staff Engineer Mar. 2025 – Present
Samsung Electronics, Samsung Research *Seoul, South Korea*
- Developed learning-based humanoid whole-body motion policies for walking, running, and heavy-payload loco-manipulation on high-DOF humanoid systems.
- Designed history-based residual adaptation networks to reduce the sim-to-real gap in humanoid locomotion policies under actuator wear, model mismatch, and real-hardware disturbances.
- Built a factorized adaptation framework for robust humanoid loco-manipulation under varying object loads, heavy-payload handling, and physical interaction conditions.
- Developed autonomous breast ultrasound scanning with a robotic manipulator, including visuomotor manipulation planning and control for real-world robotic interaction.

Post-doctoral Researcher Mar. 2024 – Feb. 2025
Korea Institute of Science and Technology (KIST) *Seoul, South Korea*
- Developed visual-inertial leg kinematics based foot position estimation methods for wearable robotic systems.
- Applied CMA-ES-based optimization for wearable assistance strategies and improve gait asymmetry in hemiplegic patients.
- Developed deep learning-based sarcopenia identification methods from real-time gait assessment signals collected on wearable robot hardware.

Publications

ADP: Adversarial Dynamics Priors for Physically Grounded Humanoid Locomotion
Seokju Lee, Jeongtae Lee, Jeonghyeok Lim, **Jeonguk Kang**, Byungwook Lee, Seungho Han, Keun Ha Choi, Dongil Park, Kyung-Soo Kim
2026 (arXiv Preprint)

SplitAdapter: Load-Aware Humanoid Loco-Manipulation via Factorized Adaptation
Jeonguk Kang, Hanbyel Cho, Sanghyun Kang, Donghan Koo
2026 (arXiv Preprint)

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
2026 (arXiv Preprint)

RAY-TOLD: Ray-Based Latent Dynamics for Dense Dynamic Obstacle Avoidance with TDMPC
Seungho Han, Seokju Lee, **Jeonguk Kang*** (*Corresponding author)
2026 (arXiv Preprint)

(Accepted) Optimal Load Distribution Strategy via Knee-Hip Coordinated Control for Heavy Load Lifting Assistance in Wearable Robots
Byungwook Lee, **Jeonguk Kang**, Seokju Lee, Kwang-Woo Jeon, Tae-Hwan Kim, Hyun-Joon Chung, Man bok Hong, Jangsik Park, Kyung-Soo Kim
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2026

(Under Review) Toward Daily-Life Sarcopenia Identification via Real-Time Gait Assessment Using a Wearable Hip Assistive Robot
Sangdo Kim, Sunwoo Kim, **Jeonguk Kang**, Robin Inho Kee, Kyung-Ryoul Mun, Yisoo Lee, KangGeon Kim, Youngsu Cha, Jongwon Lee*
IEEE Robotics and Automation Letters, 2026

(Accepted) 4D Radar-Camera Based Vector Map SLAM Using Dynamic Object Removal Mask
Minseong Choi, Seungho Han, **Jeonguk Kang**, Seunghoon Yang, Minyoung Lee, Keun Ha Choi, Kyung-Soo Kim
IEEE Transactions on Instrumentation and Measurement, 2026

Dual-MPC Footstep Planning for Robust Quadruped Locomotion
Byeong-Il Ham, Hyun-Bin Kim, **Jeonguk Kang**, Keun Ha Choi, Kyung-Soo Kim
IEEE/ASME Transactions on Mechatronics, 2026

Adaptive Gait Pattern Switching under External Disturbances Using Multi-Modal MPC
Jeonguk Kang, Byeong-Il Ham, Seungho Han, Hyun-Bin Kim, Kyung-Soo Kim
IEEE International Workshop on Robot and Human Communication (RO-MAN), 2025

External Force Adaptive Control in Legged Robots Through Footstep Optimization and Disturbance Feedback
Jeonguk Kang, Hyunbin Kim, Byeong-Il Ham, Kyung-Soo Kim
IEEE Access, 2024

Development of Dual-Mode Locomotion Quadruped Robot for Pipe Inspection
Hyun-Bin Kim, Chanseok Kim, Byeong-Il Ham, **Jeonguk Kang**, Minseong Choi, Keun-Ha Choi, Kyung-Soo Kim
IEEE International Conference on Robot Intelligence Technology and Applications (RITA), 2024 (Best System Paper Award)

VIEW: Visual-Inertial External Wrench Estimator for Legged Robot
Jeonguk Kang, Hyunbin Kim, Kyung-Soo Kim
IEEE Robotics and Automation Letters, 2023

Whole-body Control Based Lifting Assistance Simulation for Exoskeletons
Jeonguk Kang*, Donghyun Kim*, Hyun-Joon Chung, Kwang-Woo Jeon, Kyung-Soo Kim (*Co-first authors)
International Journal of Control, Automation and Systems, 2023

External Force Estimation of Legged Robots via a Factor Graph Framework with a Disturbance Observer
Jeonguk Kang, Hyun-Bin Kim, Keun Ha Choi, Kyung-Soo Kim
IEEE International Conference on Robotics and Automation (ICRA), 2023

Academic Service

Journal Reviewer: T-RO, RA-L
Conference Reviewer: IROS, CoRL, ICRA, RO-MAN

Honors & Awards

2025 – 1st Place, IEEE IROS 2025 Workshop: Wheeled-Legged Robot Competition
2020 – 2024 – KAIST Scholarship, full scholarship support for doctoral study
2013 – 2019 – Governmental Scholarship, full scholarship support for undergraduate and graduate study

Technical Skills

Robot Learning & Control: Deep Reinforcement Learning; AMP-Based Policy Learning; Whole-Body Control; Model Predictive Control; Impedance/Admittance Control; Adaptive Control; Force Control
State Estimation: Visual-Inertial Leg Odometry; Factor Graph Optimization; Disturbance Observer; External Disturbance Estimation
Programming & Tools: Python; PyTorch; NumPy; C++; MATLAB/Simulink; ROS/ROS2; Isaac Gym; Isaac Sim/Lab; MuJoCo