

ISMAEL ESPINOZA JARAMILLO

Robot Learning Researcher | Sim-to-Real Policy Deployment | Vision-Based Dexterous Manipulation | Reinforcement Learning

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Gyeonggi-do, South Korea; open to relocation | Google Scholar: scholar.google.com/citations?user=3S9BoVAAAAAJ

Summary

Robot learning researcher (Ph.D. expected Feb 2027, Kyung Hee University) working on sim-to-real reinforcement learning, imitation learning, and visuomotor distillation for 44-DoF bimanual dexterous manipulation. Policies trained only in an Isaac Lab digital twin completed four long-horizon tasks on table-mounted and upper-humanoid hardware in 18–30 of 35 trials, and four tasks from two RGB cameras alone at 72–84% success. 4 journal articles (incl. IEEE RA-L), 7 international conference papers (ICRA, HRI, EMBC, UR), 1 granted patent and 2 pending.

Experience

Graduate Researcher (Ph.D.), Robot Learning

Mar 2022 – Present

Kyung Hee University, Yongin, South Korea | Advisor: Prof. Tae-Seong Kim

- Completed four long-horizon tasks on table-mounted and upper-humanoid hardware in 18–30 of 35 trials each (behavior cloning alone: 2–13) with no real-robot training data, by designing and building a Real2Sim2Real system from glove teleoperation to ROS 2 deployment with FoundationPose 6D tracking.
- Reached 72–84% real-robot success on four tasks from two RGB cameras alone (no pose estimator, object model, or camera extrinsics), 44–60 points above a single-agent DextrAH-RGB-style student on three, by co-developing TMAD online teacher-student distillation (second author; patent pending).
- Held the success drop from digital twin to real robot to 5–11 points (behavior cloning alone: up to 23) by calibrating Isaac Lab drive gains on recorded hardware motion, scanning task objects, and training with domain randomization in up to 500 parallel GPU environments.
- Trained each hardware task from only 30 teleoperated demonstrations, stitched into 300 twin-validated ones, by building a glove teleoperation rig (Manus, VIVE, GeoRT retargeting) and a pipeline that recombines subtask segments and keeps only successful replays.
- Raised mean success on five simulated long-horizon tasks to 89.9% (best baselines: 59.0% transformer, 26.6% PPO) by co-developing TC-TRL, a temporal-context multi-agent transformer trained by behavior cloning, then PPO (IEEE RA-L 2024, co-first author; granted patent).
- Earlier: recognized 8 activities in real time at 97.35% accuracy on a Jetson Nano from exoskeleton IMU and encoder signals (Sensors 2022, co-first author), and forecast activity from IMU signals with sequence-to-sequence networks (Sensors 2023, first author); 120+ citations combined.

Research Assistant, Mobile Robotics

May 2021 – Feb 2022

Universidad de las Fuerzas Armadas (ESPE), Quito, Ecuador

- Delivered a social-navigation and telepresence mobile robot that runs deep-learning perception and navigation in real time on board, by building its ROS software stack (Python, C++), BLE indoor localization, low-level electronics, and PID wheel control.

Project Development Assistant, Industrial Automation

Nov 2020 – May 2021

Robotron S.A., Quito, Ecuador

- Delivered a forklift navigation and pallet-verification system for a sub-zero food warehouse, from control-panel design to on-site installation, by building LiDAR and QR-marker navigation and C++/Python bridges between Siemens PLCs (TIA Portal, OPC) and a Microsoft Azure database.

Earlier: Electrical Design Intern, SEIUS S.A. (2020); Teaching Assistant, Electronics II, ESPE (2018).

Selected Projects (open source)

Dexterous Pick-and-Place with Grasp Synthesis – github.com/ismael-esp/dexterous-pick-and-place

2026

- Achieved 94 of 100 executed real-robot pick-and-place trials across 10 objects (180 of 200 in simulation, both arms) by combining force-closure grasp synthesis (BODex on cuRobo) with FoundationPose perception on a UR3 with an Allegro Hand.

FoldingACT, IROS 2026 Robotic Origami Challenge – github.com/ismael-esp/robotic-origami-challenge

2026

- Root-caused the zero folds of the organizers' real-robot runs to causal confusion (the policy followed its joint state in 94% of state/vision conflicts) and retrained v10 so vision wins 97% (not yet run on hardware), by building an ACT-style vision-tactile policy (DINOv3, Sparsh) trained with PyTorch DDP on a 398 GB LeRobot dataset.

Dual-Arm Allegro ROS 2 Drivers – github.com/ismael-esp/dual-arm-allegro-ros2

2026

- Brought all 44 joints of the two-arm, two-hand robot under one ROS 2 interface at 100 Hz, the configuration the lab's robot runs daily, by building its ROS 2 Jazzy workspace in C++ and Python: a customized Allegro Hand CAN driver, `ros2_control` for the UR3/UR3e arms, bridge nodes for policies and teleoperation, and the URDF of the cell.

Also on GitHub: real-time Manus-to-Allegro glove retargeting (0.7 ms per hand); zero-shot 6D tracking in ROS 2 (YOLO-World, SAM 2, FoundationPose, ported to Blackwell GPUs); Meta Quest 3 hand-tracking teleoperation in Isaac Lab.

Patents

- T.-S. Kim, **I. Espinoza Jaramillo**, J.-H. Oh. System and method for long-horizon task execution of a dual-arm robot using temporal-context transformer network-based reinforcement learning. Korean Patent 10-2943203, granted Mar 2026.
- T.-S. Kim, S.-H. Park, G.-B. Kim, **I. Espinoza Jaramillo**. Vision-based learning method for long-horizon bimanual robot manipulation via temporal multi-agent distillation, and robot system using the same. Korean patent application pending, 2026.
- J.-H. Oh, **I. Espinoza Jaramillo**, T.-S. Kim. Transformer reinforcement learning system with temporal context planning for bimanual long-horizon tasks. Korean patent application pending, 2025.

Selected Publications

- J.-H. Oh*, **I. Espinoza***, D. Jung, T.-S. Kim. Bimanual long-horizon manipulation via temporal-context transformer RL. *IEEE Robotics and Automation Letters*, 9(12), 2024. Presented as a poster at IROS 2025. (*equal contribution)
- I. Espinoza**, Y.-H. Choi, K. Lee, J.-H. Oh, K. J. Pahk, T.-S. Kim. A Real2Sim2Real transformer policy system for bimanual R2R2H tasks. *ACM/IEEE HRI 2026 Companion*, pp. 716–720.
- Y.-H. Choi, **I. Espinoza**, K. Lee, S. Park, J. Y. Kim, J.-H. Oh, W. H. Lee, T.-S. Kim. A semi-humanoid Real2Sim2Real system for bimanual long-horizon manipulation. *Int. Conf. on Ubiquitous Robots (UR)*, 2026, in press.
- S. Park, **I. Espinoza**, G. Kim, J. Y. Kim, K. Lee, T.-S. Kim. TMAD: Temporal multi-agent distillation for bimanual long-horizon manipulation. Under review, 2026.
- J.-H. Oh, D. Jung, **I. Espinoza**, et al. Multi-modal affordance planner with temporal-context action policy for long-horizon bimanual robot manipulation. *IEEE ICRA*, 2026.
- J.-H. Oh*, **I. Espinoza***, et al. Bimanual long-horizon lifecare robotics with temporal context LLM planner and transformer RL. *IEEE EMBC*, 2025. (*equal contribution)
- I. Espinoza Jaramillo***, J. G. Jeong*, et al. Real-time human activity recognition with IMU and encoder sensors in wearable exoskeleton robot via deep learning networks. *Sensors*, 22(24), 2022. (*equal contribution)

Also 2 journal articles, 3 international conference papers, 1 symposium poster, and 6 domestic conference papers; full list on Google Scholar.

Skills

Robot learning: reinforcement learning (PPO, multi-agent RL), imitation learning and behavior cloning, action-chunking policies (ACT), VLA policies (SmolVLA, in progress), transformer policies, teacher-student policy distillation, sim-to-real transfer, automatic domain randomization, teleoperation data collection

Perception: 6D object pose estimation and tracking (FoundationPose), open-vocabulary detection and segmentation (YOLO-World, SAM 2), RGB visuomotor policies, multi-camera RGB-D (Intel RealSense)

Simulation: NVIDIA Isaac Lab, Isaac Sim, Isaac Gym, digital twins, massively parallel GPU training

Software: Python, C++, PyTorch (incl. DDP), CUDA, ROS 2, Docker, Linux, Git, LeRobot, cuRobo

Hardware: UR3 and UR3e arms, Allegro Hand V4, Manus gloves, VIVE trackers, Siemens PLCs, LiDAR

Education

Ph.D., Electronics and Information Convergence Engineering Mar 2022 – Feb 2027 (expected)

Integrated M.S.–Ph.D. program, major: Biomedical Engineering | Kyung Hee University, South Korea | GPA 4.27/4.30

Dissertation: A Real2Sim2Real System for Bimanual Long-Horizon Dexterous Manipulation via Temporal-Context Transformer Reinforcement Learning

B.Sc., Electronics, Automation and Control Engineering

Sep 2015 – Feb 2021

Universidad de las Fuerzas Armadas (ESPE), Ecuador | GPA 17.15/20

Honors

President's Scholarship, Kyung Hee University, all 6 semesters (2022–2024) | BK21 FOUR Scholarship (2023–2024) and Fellowship (2025) | Journal Publication Scholarship, Kyung Hee University (2023)

Languages

Spanish (native) | English (fluent) | Korean (basic)