Podshara Chanrungmaneekul

Reinforcement Learning | Sim-to-Real Transfer | Contact-Rich Manipulation | Interactive Estimation & Calibration

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Summary

Ph.D. candidate in Computer Science at Rice University (expected Fall 2027) building robots that resolve their own uncertainty in contact-rich manipulation through reinforcement learning, interactive estimation, and self-calibration. Leading OmniState: an RL policy, trained only in simulation on 20,480 parallel Isaac Lab robots, that inserts pegs zero-shot on a real Franka at a 0.02 mm tolerance (5× tighter than training) with joint-torque-only sensing. 9 peer-reviewed papers at RSS, ICRA, and IROS; 4 first-author works (IROS 2023, 2024, 2025; T-RO submission). Seeking robot learning research internships and full-time Research Scientist / Engineer roles after graduation.

Education

Rice University — Houston, TX
Ph.D. Candidate, Computer Science • Advisor: Prof. Kaiyu Hang — *Aug. 2022 – Fall 2027 (expected)*

University of Washington — Seattle, WA
B.S., Computer Science • Personal Robotics Lab, Advisor: Prof. Siddhartha S. Srinivasa — *Sept. 2016 – June 2020*

Research Experience

Rice University, Robot π Lab — Houston, TX
Graduate Researcher, advised by Prof. Kaiyu Hang — *Aug. 2022 – Present*

OmniState: Zero-Shot Sim-to-Real Reinforcement Learning for Precision Insertion [video] — 2025 – Present

- Lead the project end to end; the policy inserts pegs zero-shot on a real Franka FR3 at the 0.02 mm tolerance (trained only to 0.1 mm), with a loose board, an unknown grasp, and joint-torque-only contact sensing.
- Trained recurrent 6-D pose and impedance policies with multi-objective MPO and privileged critics on 20,480 parallel Isaac Lab robots across five GPUs, using a competence-gated curriculum.
- Built the ROS / libfranka deployment stack: 500 Hz joint-torque contact detection (19 of 20 held-out touches), multi-view board localization, and 1 kHz impedance control.

UniARC-Calib and ARC-Calib: Autonomous Markerless Robot Calibration [video] — 2024 – Present

- Created ARC-Calib (IROS 2025), a fully autonomous camera-to-robot calibration framework in which exploratory robot motions generate trackable image trajectories, removing fiducial markers, CAD models, and learned detectors.
- Generalized it in UniARC-Calib to one geometric solver for both eye-in-hand and eye-to-hand setups, with a closed-loop active-exploration strategy that selects informative joint sweeps and stops when a confidence test passes.
- On a Franka Research 3, reached 6.01 px median held-out reprojection error eye-to-hand, the lowest of 10 marker-based and markerless methods, and 3.66 px eye-in-hand, within 1.1 px of the best marker-based method and 6× lower than the best markerless baseline. First-author manuscript submitted to IEEE T-RO.

Interactive Robot-Environment Self-Calibration (IROS 2024) — 2023 – 2024

- Compliant exploratory actions that self-calibrate the robot to its workspace using only built-in force/torque sensing.

Online Self-Identification and MPC for Dexterous In-Hand Manipulation (IROS 2023) [video] — 2022 – 2023

- Online non-parametric self-identification and MPC for an underactuated Yale Model O hand from as few as 15 samples.

University of Washington, Personal Robotics Lab — Seattle, WA
Undergraduate Researcher, continued after graduation (Prof. S. S. Srinivasa): multi-agent coordination, MuSHR — *2020 – 2021*

Publications

Journal submissions and manuscripts

[1] **P. Chanrungmaneekul**, Y. Chen, K. Hang. "OmniState: A Shared-Action State Representation for Contact-Rich Manipulation under Uncertainty." *Manuscript in preparation*, 2026.

[2] **P. Chanrungmaneekul**, Y. Chen, J. T. Grace, A. M. Dollar, K. Hang. "UniARC-Calib: Unifying Autonomous Markerless Robot Calibration for Eye-in-Hand and Eye-to-Hand Setups." *Submitted to IEEE Transactions on Robotics (T-RO)*, 2026.

Conference papers

[3] **P. Chanrungmaneekul**, Y. Chen, J. T. Grace, A. M. Dollar, K. Hang. "ARC-Calib: Autonomous Markerless Camera-to-Robot Calibration via Exploratory Robot Motions." *IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*, 2025.

[4] Y. Chen, K. Kimble, H. H. Qian, **P. Chanrungmaneekul**, R. Seney, K. Hang. "Robust Peg-in-Hole Assembly under Uncertainties via Compliant and Interactive Contact-Rich Manipulation." *Robotics: Science and Systems (RSS)*, 2025.

[5] H. H. Qian, Y. Chen, G. Wang, **P. Chanrungmaneekul**, K. Hang. "rt-RISeg: Real-Time Model-Free Robot Interactive Segmentation for Active Instance-Level Object Understanding." *IROS*, 2025.

[6] J. T. Grace, **P. Chanrungmaneekul**, K. Hang, A. M. Dollar. "On the Role of Jacobians in Robust Manipulation." *IROS*, 2025.

[7] H. Webb, **P. Chanrungmaneekul**, S. Yuan, K. Hang. "Wearable Roller Rings to Enable Robot Dexterous In-Hand Manipulation through Active Surfaces." *IROS*, 2025.

[8] **P. Chanrungmaneekul**, K. Ren, J. T. Grace, A. M. Dollar, K. Hang. "Interactive Robot-Environment Self-Calibration via Compliant Exploratory Actions." *IROS*, 2024.

[9] J. T. Grace, **P. Chanrungmaneekul**, K. Hang, A. M. Dollar. "Direct Self-Identification of Inverse Jacobians for Dexterous Manipulation Through Particle Filtering." *IEEE Int. Conf. on Robotics and Automation (ICRA)*, 2024.

[10] **P. Chanrungmaneekul**, K. Ren, J. T. Grace, A. M. Dollar, K. Hang. "Non-Parametric Self-Identification and Model Predictive Control of Dexterous In-Hand Manipulation." *IROS*, 2023.

[11] K. Ren, **P. Chanrungmaneekul**, L. E. Kavraki, K. Hang. "Kinodynamic Rapidly-Exploring Random Forest for Rearrangement-Based Nonprehensile Manipulation." *ICRA*, 2023.

Preprints

[12] H. Qian, Y. Chen, Y. Xie, K. Ren, **P. Chanrungmaneekul**, G. Wang, B. Wen, C. Wei, K. Hang. "RoboTok: A Scalable Data Engine for Internet Demonstration Video Retrieval and Dexterous Manipulation Learning." *arXiv:2609.03199*, 2026.

[13] G. Wang, K. Ren, A. S. Morgan, Y. Chen, H. H. Qian, **P. Chanrungmaneekul**, K. Hang. "EgoInfinity: A Web-Scale 4D Hand-Object Interaction Data Engine for Any-View Robot Retargeting and Video-to-Action Robot Learning." *arXiv:2606.17385*, 2026.

[14] Y. Chen, K. Kimble, E. H. Adelson, T. Asfour, **P. Chanrungmaneekul**, et al. (23 authors). "ManipulationNet: An Infrastructure for Benchmarking Real-World Robot Manipulation with Physical Skill Challenges and Embodied Multimodal Reasoning." *arXiv:2603.04363*, 2026. Under review at *Science Robotics*.

Technical Skills

Robot learning	Reinforcement learning (multi-objective and constrained RL; MPO, SAC, PPO), behavior cloning and imitation learning, Robust Active Learning (RoAL), vision-language-action (VLA) model deployment and evaluation, sim-to-real transfer, domain randomization, curriculum learning, recurrent policies, privileged critics, set encoders
Robotics & control	Contact-rich and dexterous manipulation, Cartesian impedance control, force and joint-torque sensing, state estimation, system identification, model predictive control, hand-eye calibration
Programming & ML	Python, C++, MATLAB, Bash; PyTorch, NumPy, SciPy, CuPy, Eigen, OpenCV, Open3D
Simulation & systems	NVIDIA Isaac Lab, PhysX, Isaac Gym, MuJoCo, PyBullet, Gazebo, ROS / ROS 2, libfranka, multi-GPU cluster training, Linux, Docker, CMake, Git

Robotics Leadership and Service

ManipulationNet, Founding Developer Team 2025 – Present

- Co-developed standardized physical-skill protocols for block arrangement and tabletop management in a global benchmark launched with NIST, supporting reproducible real-world evaluation across heterogeneous robot platforms.

Robotic Grasping and Manipulation Competition (RGMC), In-Hand Manipulation Organizer 2024 – 2025

- Organized the in-hand manipulation subtrack of the 9th and 10th competitions at ICRA; defined task specifications and objective evaluation metrics for robotic dexterity.

Industry Experience

Starbucks, Application Developer (2020 – 2021) and Cloud Service Engineer Intern (2019): production data pipelines (Azure, Databricks, Hive, Oracle) and a cloud query API with CI/CD. **Agoda**, SWE Intern (2017).

Teaching and Honors

- **Teaching Assistant**, Rice University: Senior Design in a Robotized World; Probabilistic Algorithms and Data Structures; Operating Systems and Concurrent Programming.
- **Royal Thai Government Scholarship** (2015): full tuition and living allowance for the B.S.; book allowance for the Ph.D.
- **Competitive programming**: ACM-ICPC UW qualifier 1st-place team and Pacific Northwest Regional 16th-place team (2016); Thailand Olympiad in Informatics Gold Medal (2014).