Hyung Ju Terry Suh

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Research Statement

My research interest lies in enabling robots with human-like dexterity and intelligence in manipulation. Through this technology I aim to broaden the spectrum of capabilities we have on automating physical tasks in the real world. To achieve this capability, my research and career focuses on efficient Physical AI, where model-based tools and robot learning are elegantly combined to complement each other's strengths and weaknesses in order to achieve robust performance in the small-data regime.

Education

- **Massachusetts Institute of Technology** — Cambridge, USA
  Ph.D. Candidate in Electrical Engineering and Computer Science — Sep 2019 - June 2025 (Exp.)
  Advisor: Russell L. Tedrake
- **Massachusetts Institute of Technology** — Cambridge, USA
  S.M. in Electrical Engineering and Computer Science — Sep 2019 - June 2022
  Advisor: Russell L. Tedrake
  Thesis Title: Predictive Models for Visuomotor Feedback Control in Object Pile Manipulation
- **California Institute of Technology** — Pasadena, USA
  B.S. in Computer Science and Mechanical Engineering (Double Major) — Sep 2013 - June 2019
  GPA: 4.1/4.3, Thesis Advisor(s): Joel W. Burdick, Aaron D. Ames
  Thesis Title: Design and Planning of Flying-Driving Hybrid Robot
- **Korean Minjok Leadership Academy**

Industry Experience

- **CarbonSix** — Seoul, South Korea
  Chief Technology Officer (CTO) & Co-Founder — *Oct 2024 - Current*
  - Led R&D efforts of SigmaKit, the world's first industrial imitation learning kit for manufacturing.
- **The Robotics and AI Institute (RAI)** — Cambridge, USA
  Researcher, Dexterous Mobile Manipulation Team — *May 2023 - Aug 2023*
  - Developed multi-query algorithms for global planning through contact-rich dynamics.
  - Implemented a ellipsoidal calculus toolbox using Semi-Definite Programming (SDP).
- **Toyota Research Institute (TRI)** — Cambridge, USA
  Researcher, Robot Manipulation Team — *May 2021 - Sep 2021*
  - Developed algorithms for compliant feedback control of a visuotactile sensing mechanism.
  - Established theoretical characterization of visuotactile sensors as a generalization of series elastic actuators.
- **NASA Jet Propulsion Laboratory,** — La Canada Flintridge, USA
  Researcher, Robotic Systems, Estimation, Decision and Control Group — *Sep 2017 - Sep 2018*
  - Implemented SLAM and autonomous navigation using ROS with Kinect, IMU, GPS, and 3D Vision sensors.
  - Modified posture detection aglortihm to translate video motion to humanoid writing notation.
- **Republic of Korea Army, Intelligence** — Korea
  Sergeant, Analyst — *Sep 2014 - May 2016*
  - Software development for classified analysis.

Honors & Awards

- **Honorable Mention, IEEE Transactions of Robotics King-Sun Fu Memorial Best Paper Award, 2023**
  For work on "Global Planning for Contact-Rich Manipulation via Local Smoothing of Quasidynamic Contact Models"
- **Best Paper Award of the Year, IEEE RAS TC on Model-Based Optimization in Robotics, 2022**
  For work on "Do Differentiable Simulators Give Better Policy Gradients?"
- **Outstanding Paper Award, International Conference on Machine Learning (ICML), 2022**
  For work on "Do Differentiable Simulators Give Better Policy Gradients?"
- **Henry Ford II Scholar Award, Caltech, 2018**
  Awarded for highest academic record within major.
- **Jack E. Froelich Memorial Award, Caltech, 2018**
  Awarded for most outstanding promise for a creative professional career.
- **Kwanjeong Foundation Full Tuition Scholarship**
  Full scholarship of $55000 per year for the duration of undergraduate studies.

Journal Publications

* indicates equal contribution.

1. **Dexterous contact-rich manipulation via the contact trust region**
   H.J. Terry Suh, T. Pang*, T. Zhao, R. Tedrake*
   International Journal of Robotics Resesarch (IJRR), 2026
2. **Global Planning for Contact-Rich Manipulation via Local Smoothing of Quasidynamic Contact Models**
   T. Pang, H.J. Terry Suh*, L. Yang, R. Tedrake*
   Transactions of Robotics (T-RO), 2023, Honorable Mention for IEEE T-RO 2023 King-Sun Fu Memorial Best Paper Award
3. **Bundled Gradients through Contact via Randomized Smoothing**
   H.J. Terry Suh, T. Pang*, R. Tedrake*
   IEEE Robotics and Automation Letters (RA-L) 7(2), 4000-4007, 2022. Presented at ICRA.

Conference Publications

1. **Physics-driven data generation for contact-rich manipulation via trajectory optimization**
   L. Yang, H.J. Terry Suh, T. Zhao, B.P. Graesdal, T. Kelestemur, J. Wang, R. Tedrake
   Robotics: Science and Systems (RSS), 2025
2. **Is Linear Feedback on Smoothed Dynamics Sufficient for Stabilizing Contact-Rich Plans?**
   Y. Shirai, T. Zhao, H.J. Terry Suh, H. Zhu, X. Ni, J. Wang, M. Simchowitz, T. Pang
   International Conference on Robotics and Automation (ICRA), 2025
3. **Fighting Uncertainty with Gradients: Offline Reinforcement Learning via Diffusion Score Matching**
   H.J. Terry Suh, G. Chou, H. Dai, L. Yang, A. Gupta, R. Tedrake
   Conference on Robot Learning (CoRL), 2023
4. **SEED: Series Elastic End-Effectors in 6D for Visuotactile Tool Use**
   H.J. Terry Suh, N. Kuppuswamy, T. Pang, P. Mitiguy, A. Alspach, R. Tedrake
   International Conference on Intelligent Robots and Systems (IROS), 2022
5. **Do Differentiable Simulators Give Better Policy Gradients?**
   H.J. Terry Suh, M. Simchowitz, K. Zhang, R. Tedrake
   International Conference on Machine Learning (ICML), 2022, Long Talk, Outstanding Paper Award
6. **The Surprising Effectiveness of Linear Models for Visual Foresight in Object Pile Manipulation**
   H.J. Terry Suh, R. Tedrake
   Algorithmic Foundation of Robotics XIV (WAFR), 347-363, 2020
7. **Energy-Efficient Motion Planning for Multi-Modal Hybrid Locomotion**
   H.J. Terry Suh, X. Xiong, A. Singletary, A.D. Ames, J.W. Burdick
   IEEE International Conference on Intelligent Robots and Systems (IROS), 2020
8. **Towards a Humanoid-Oriented Movement Writing**
   A. Stoica, H.J. Terry Suh, S.M. Hewitt, S. Bechtle, A. Gruebler, Y. Iwashita
   IEEE International Conference on Systems, Man, and Cybernetics (SMC), 2017

Patents

1. **The Method and System for Automatic Control of Individual Robots Using A Universal Inference Model**
   H.J. Terry Suh, S. Lee
   South Korea, Ref. No. 1029076540000

Media Coverage & Invited Talks

1. **Exposing the Real Difficulties of Contact-Rich Manipulation**: UIUC Robotics Seminar, 2024
2. **Efficient Global Planning for Contact-Rich Manipulation**: KAIST IM^2 lab, 2024
3. **AI helps Robots Manipulate Objects with their whole bodies**: A. Zewe, MIT News, 2023
4. **Smoothing Techniques for Optimal Control of Highly Contact-Rich Systems**: WILLOW & Gepetto Team, 2023
5. **Do Differentiable Simulators Give Policy Gradients?**: AMBER Lab, Caltech, 2023
6. **A Model-Based Interpretation of RL for Contact-Rich Systems Through the Lens of Randomized Smoothing**: Machines in Motion Laboratory, NYU, 2022
7. **Optimization through Contact Dynamics: A Stochastic Perspective**: Hyundai Vision Conference, 2022
8. **Soft Robots that Grip with the Right Amount of Force**: R. Gordon, MIT News, 2022

Service

- **Co-Organizer**: Workshop on Learning Meets Model-Based Methods for Contact-Rich Manipulation, ICRA 2025
- **Lead Organizer**: Workshop on Leveraging Models for Contact-Rich Manipulation, IROS 2023
- **Co-Organizer**: MIT Embodied Intelligence Seminar, 2023-24
- **Reviewer, 50 manuscripts**: