# Tao Pang

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## Research Interests

I aim to build generalist robots that can match and eventually surpass human-level dexterous manipulation capabilities by continuously learning from their experience and with minimal human supervision. In pursuit of that goal, I focus on building efficient and scalable representations of a robot's experience by leveraging insights from contact mechanics, control, planning, optimization, and most recently the ever-growing reasoning power of LLMs.

## Employment

- **Staff Robotics Research Scientist** 10/2026 - Present
  Multiply Labs.
  - Dexterous manipulation from ego-centric videos for advanced pharmaceutical manufacturing.
- **Roboticist** 02/2023 - 08/2026
  RAI Institute (formerly Boston Dynamics AI Institute).
  - Led a team to build efficient planning and learning algorithms and pipelines for contact-rich manipulation.

## Education

- **Massachusetts Institute of Technology** 09/2016 - 01/2023
  PhD in Mechanical Engineering.
  - Thesis: Planning, Sensing, and Control for Contact-rich Robotic Manipulation with Quasi-static Contact Models.
  - Advisor: Prof. Russ Tedrake.
- **National University of Singapore**
  M.Eng., Electrical and Computer Engineering. Advisor: Prof. Ben M. Chen. 08/2014 - 05/2016
  B.Eng (First Class Honors), Mechanical Engineering. 08/2008 - 05/2012
  - GPA: 4.89/5, with second major in mathematics.

## Selected Awards & Honors

- **IEEE RA-L Best Paper Award** 2025
  For the paper "Should We Learn Contact-Rich Manipulation Policies from Sampling-Based Planners?".
- **IJRR Best Paper of the Season Award (Q2 2025)** 2025
  For the paper "Dexterous Contact-Rich Manipulation via the Contact Trust Region".
- **Honorable Mention for the IEEE T-RO King-Sun Fu Memorial Best Paper Award** 2023
  For the paper "Global Planning for Contact-Rich Manipulation via Local Smoothing of Quasi-dynamic Contact models".
- **First Prize in the** International Micro Air Vehicle (IMAV) Competition. 2014
  Autonomous navigation of drones in an outdoor disaster-relief scenario.
- **Lee Kuan Yew Gold Medal, IES Gold Medal, Exxonmobil Medal**. 2012

National University of Singapore.
- Student with the highest GPA in Mechanical Engineering during their period of study.

## Additional Research Experience

- **Associate Scientist** 04/2013 - 08/2016
  Unmanned Systems Research Group, National University of Singapore.
  - Designed and built a 10kg gasoline-powered variable-pitch quadrotor which can fly for up to 3 hours.
- **Summer Research Undergraduate Fellowship (SURF)** 05/2010 - 08/2010
  California Institute of Technology.
  - Designed and implemented a path planning algorithm for Axel, a tethered Mars rover prototype.
  - Advisor: Prof. Joel W. Burdick.

## Journal Publications

- **Dexterous Contact-Rich Manipulation via the Contact Trust Region** [website] 2025
  *H.J.T. Suh*, T. Pang*, T. Zhao, R. Tedrake*
  The International Journal of Robotics Research.
  IJRR Best Paper of the Season Award
- **Should We Learn Contact-Rich Manipulation Policies from Sampling-Based Planners?**[pdf] 2025
  *H. Zhu, T. Zhao, X. Ni, J. Wang, K. Fang, L. Righetti, T. Pang*
  IEEE Robotics and Automation Letters (RA-L).
  IEEE RA-L Best Paer Award
- **Global Planning for Contact-Rich Manipulation via Local Smoothing of Quasi-dynamic Contact Models** [pdf] [MIT News] 2023
  *T. Pang*, H.J.T. Suh*, L. Yang, R. Tedrake*
  IEEE Transactions on Robotics (TR-O).
  Honorable Mention for the IEEE TR-O King-Sun Fu Memorial Best Paper Award.
- **Bundled Gradients through Contact via Randomized Smoothing** [pdf] 2022
  *H.J.T. Suh*, T. Pang*, R. Tedrake*
  IEEE Robotics and Automation Letters (RA-L).

## Selected Conference Publications

- **PRIME: Physically-consistent Robotic Inertial and Motion Estimation for Legged and Humanoid Robots** 2026
  *J. Kang, K. Ren, T. Pang, X. Xiong*
  Robotics: Science and Systems (RSS).
- **Physics-Driven Data Generation for Contact-Rich Manipulation via Trajectory Optimization** [website] [MIT News] 2025
  *L. Yang, H.J.T. Suh*, T. Zhao*, B. Grasdal, T. Kelestemur, J. Wang, T. Pang, R. Tedrake*
  Robotics: Science and Systems (RSS).
- **Is Linear Feedback on Smoothed Dynamics Sufficient for Stabilizing Contact-Rich Plans?** [pdf] 2025
  *Y. Shirai, T. Zhao, H.J.T. Suh, H. Zhu, X. Ni, J. Wang, M. Simchowitz, T. Pang*
  IEEE International Conference on Robotics and Automation (ICRA).
- **Planning-Guided Diffusion Policy Learning for Generalizable Contact-Rich Bimanual** 2024

**Manipulation** [pdf]
*X. Li, T. Zhao, X. Zhu, J. Wang, T. Pang, K. Fang*
Under Review.

- **SEED: Series Elastic End Effectors in 6D for Visuotactile Tool Use** [pdf] [MIT News] 2022
  *H.J.T. Suh, N. Kuppuswamy, T. Pang, P. Mitiguy, A. Alspach, R. Tedrake*
  IEEE International Conference on Intelligent Robots and Systems (IROS).
- **Easing Reliance on Collision-free Planning with Contact-aware Control** [pdf] 2022
  *T. Pang, R. Tedrake*
  IEEE International Conference on Robotics and Automation (ICRA).
- **A Convex Quasistatic Time-stepping Scheme for Rigid Multibody Systems with Contact and Friction** [pdf] 2021
  *T. Pang, R. Tedrake*
  IEEE International Conference on Robotics and Automation (ICRA).
- **Identifying External Contacts from Joint Torque Measurements on Serial Robotic Arms and Its Limitations** [pdf] 2021
  *T. Pang, J. Umenberger, R. Tedrake*
  IEEE International Conference on Robotics and Automation (ICRA).
- **A Robust Time-Stepping Scheme for Quasistatic Rigid Multibody Systems** [pdf] 2018
  *T. Pang, R. Tedrake*
  IEEE International Conference on Intelligent Robots and Systems (IROS).
- **Design and Implementation of a Variable-pitch Long-endurance Gasoline-engine Quadrotor** [pdf]
  2016
  *T. Pang, F. Lin, K. Peng and B.M. Chen*
  IEEE International Conference on Control and Automation (ICCA).

## Preprints

- **KinoGen: Customizable Humanoid Loco-Manipulation References via Kinematically Grounded Video Generation** [pdf] 2026
  *Q. Wu, L. Zhao, S. Hahn, R. Yennu, E. Yang, D. Zhang, T. Pang, J, Wang, K. Fang*
- **Turning Video Models into Generalist Robot Policies** [pdf] 2026
  *S.L. Li, E. Kim, X. Bai, T. Zhao, T. Pang, M. Simchowitz, V. Sitzmann*
- **Approximately Optimal Global Planning for Contact-Rich SE(2) Manipulation on a Graph of Reachable Sets** [pdf] 2026
  *S. Liu, T. Zhao, B.P. Graesdal, P. Werner, J. Wang, J. Dolan, C. Liu, T. Pang*

## Teaching Experience

**Teaching Assistant**

- First & second offerings of MIT 6.800/6.843, Robotic Manipulation. Fall 2018 & 2019
  - Designed from scratch programming problem sets for basic topics in robotics, including kinematics, point cloud registration, force control and sampling-based motion planning.
  - Designed and supervised robot labs where students are asked to open a cabinet door, pick up a rubber brick and place it on a shelf using the Kuka iiwa robot arm.

**Guest Lecturer**

- *Efficient Planning and Learning for Contact-rich Manipulation via Structured Exploration* Fall 2025
  - ME 601 Advanced Robotics, taught by Xiaobin Xiong at the University of Wisconsin, Madison.

- 6.2410/2, Robotic Manipulation, taught by Tomas Lozano-Perez at MIT.

## Invited Talks

**How can we efficiently leverage coding agents for dexterous manipulation?**
- Workshop on Open Problems in Contact-Rich Loco-Manipulation @ CoRL2026 — 11/2026

**Efficient Planning and Learning for Contact-rich Manipulation via Structured Exploration**
- UCSB ECE seminar — 01/2026
- Caltech MCE seminar — 01/2026
- ETH Zurich (Computational Robotics Lab) — 01/2026
- Purdue University, ICON (Institute for Control, Optimization and Networks) Seminar — 11/2025

**Accelerating the Data Flywheel via Model-based Reasoning**
- University of Pennsylvania (DAIR Lab) — 7/2025
- New York University (Machines in Motion Lab) — 5/2025
- Cornell University (Robotics Seminar) — 4/2025
- Harvard University (Computational Robotics Group) — 4/2025
- University of Wisconsin, Madison (Wisconsin Expeditious LeggedAI Lab) — 3/2025

**Planning and Control for Contact-rich Manipulation**
- Stanford University (Robotic Exploration Lab) — 10/2022

## Mentoring

- **Wei-Cheng Huang** PhD candidate at UIUC
- **Tong Zhao** MIT M. Eng → Google Deepmind
- **Bo Ai** PhD candidate at UCSD → Stanford
- **Simin Liu** CMU PhD → Bosch Center for AI
- **Lujie Yang** MIT PhD → Amazon FAR
- **Xuanlin Li** UCSD PhD → Hillbot
- **Huaijiang Zhu** NYU PhD → Stealth startup
- **Minkyung Kim** PhD candidate at UIUC
- **Xinpei Ni** PhD candidate at Georgia Tech
- **Yuki Shirai** UCLA PhD → Samsung Researh

## Media Coverage

- **Simulation-based pipeline tailors training data for dexterous robots**: A. Shipps, MIT News. — 2025
- **AI helps robots manipulate objects with their whole bodies**: A. Zewe, MIT News. — 2023
- **Soft robots that grip with the right amount of force**: R. Gordan, MIT News. — 2022

## Service

**Workshop Organization**
- Organizer for Workshop on Leveraging Models for Contact-Rich Manipulation, IROS — 2023

**Thesis Committee**
- Served together with Dr. Changliu Liu, Dr. John Dolan and Dr. Max Likhachev on the thesis committee of Dr. Simin Liu — 2025

**Program Committee**
- World Symposium on the Algorithmic Foundations of Robotics (WAFR) — 2026

**Reviewer**
- T-RO, IJRR, RA-L, RSS, ICRA, IROS, L4DC, CoRL.

## References


- Russ Tedrake (russt@mit.edu)
- Tomas Lozano-Perez (tlp@csail.mit.edu)
- Ludovic Righetti (ludovic.righetti@nyu.edu)
- Kuan Fang (kuanfang@cornell.edu)
- Max Simchowitz (msimchow@andrew.cmu.edu)