

# Tao Pang

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## Research Interests

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I aim to build generalist robots that can match and eventually surpass human-level 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 robot interaction experience by leveraging insights from contact mechanics, control, planning and optimization.

## Employment

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- **Robotician** 02/2023 - Present  
RAI Institute (formerly Boston Dynamics AI Institute).
  - Led a team to build efficient planning and learning algorithms and pipelines for contact-rich manipulation.

## Education

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- **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. 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

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- **IJRR Best Paper of the Season Award (Q2 2025)** 2025  
For the paper titled "Dexterous Contact-Rich Manipulation via the Contact Trust Region".
- **Honorable Mention for the IEEE TR-O King-Sun Fu Memorial Best Paper Award** 2023  
For the paper titled "Global Planning for Contact-Rich Manipulation via Local Smoothing of Quasi-dynamic Contact models".
- **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

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- **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

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- **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 \(Q2 2025\)](#)
- **Should We Learn Contact-Rich Manipulation Policies from Sampling-Based Planners?** 2025  
[\[pdf\]](#)  
*H. Zhu*, *T. Zhao*, *X. Ni*, *J. Wang*, *K. Fang*, *L. Righetti*, *T. Pang*  
IEEE Robotics and Automation Letters (RA-L).
- **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

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- **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?** 2025  
[\[pdf\]](#)  
*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 Manipulation** [\[pdf\]](#) 2024  
*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. Kuppaswamy*, *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

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- **Approximately Optimal Global Planning for Contact-Rich SE(2) Manipulation on a Graph of Reachable Sets** [pdf] 2025  
*S. Liu, T. Zhao, B.P. Graesdal, P. Werner, J. Wang, J. Dolan, C. Liu, T. Pang*

## Teaching Experience

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### 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

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### Efficient Planning and Learning for Contact-rich Manipulation via Structured Exploration

- UCSB ECE seminar 01/2026
- Caltech MCE seminar 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

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- **Tong Zhao** MIT M. Eng → Google Deepmind
- **Bo Ai** PhD candidate at UCSD.
- **Simin Liu** CMU PhD.
- **Lujie Yang** MIT PhD → Amazon FAR
- **Xuanlin Li** UCSD PhD → Hillbot
- **Huaijiang Zhu** NYU PhD.
- **Minkyung Kim** PhD candidate at UIUC
- **Xinpei Ni** PhD candidate at Georgia Tech
- **Yuki Shirai** UCLA PhD → Samsung Research

## Media Coverage

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- **Simulation-based pipeline tailors training data for dexterous robots:** A. Shippy, 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

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### 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.