

GAOTIAN WANG

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RESEARCH INTERESTS

- ◇ Robot Robust Manipulation under Uncertainties, Motion Planning and Control
- ◇ Machine Learning, Deep Learning, Reinforcement Learning, Multi-modal Learning
- ◇ LLMs Applications, Embodied AI, Generative AI, 3D Computer Vision

PROFESSIONAL EXPERIENCE

SEP 2022 - PRESENT

RobotII Lab at Rice University, Houston, TX

Graduate Student, Advisor: Dr. Kaiyu Hang

- ◇ **Unified Nonprehensile Object Pushing via Non-Parametric Estimation and Model Predictive Control (UNO Push):** A unified framework that achieves precise pushing on random objects with continuously updated system models using in-task experiences.
- ◇ **Caging in Time for Robust Object Manipulation:** A novel framework for robust manipulation, enabling open-loop control without detailed object knowledge or real-time feedback, validated through extensive experiments in challenging quasi-static and dynamic tasks.

NOV 2021 - JUN 2022

AloT Lab at USTC, Hefei, China

Undergraduate Researcher, Advisor: Dr. Nikolaos M. Freris

- ◇ **Modeling and Control of Soft Arm via Piecewise Universal Joint Model:** Developed a new modeling method for soft robot arms under a piecewise universal joint (PUJ) assumption for improved interaction and dynamics with validated kinematic and dynamic models and a configuration space and a task space controller for dynamic trajectory tracking.

APR 2021 - SEP 2021

Reconfigurable Robotics Lab at EPFL, Lausanne, Switzerland

Guest Researcher, Supervisor: Dr. Fabio Zuliani and Dr. Jamie Paik

- ◇ **Origami Structures Stiffness Modeling:** An efficient origami simulator using Taichi GPU platform, incorporating stiffness modeling and testing methodologies, validated on an origami joystick with less than 10% error under linear spring assumption.

AUG 2020 - OCT 2021

USTC Soft Robotics Lab at USTC, Hefei, China

Undergraduate Researcher, Dr. Hao Jiang and Dr. Xiaoping Chen

- ◇ **Sim to Real Transfer of the Soft Robotics Arm via Q-learning:** Proposed a scalable 3D model for soft manipulator with realistic actuation and workspace. Also, proposed a Q-learning controller for a physical soft robot using pre-trained models from this rough simulator.

SKILLS

Programming Capabilities:	ROS, ROS2, C, C++, Matlab, Python, Arduino
Simulation Environments:	PyBullet, Isaac Gym/Sim, MuJoCo, Taichi, Sapien
Deep Learning Frameworks:	PyTorch, Tensorflow
Others:	Ollama, 3D modeling and printing, Solidworks, Mathematica, COMSOL Multiphysics, OMPL, RViz, Blender

EDUCATION

SEP 2022 - PRESENT

Rice University, Houston, TX

Ph.D. in COMPUTER SCIENCE

Advisor: Dr. Kaiyu Hang

SEP 2018 - JUN 2022

University of Science and Technology of China, Hefei, China

B.S. in OPTICAL ENGINEERING and COMPUTER SCIENCE

Advisor: Dr. Nikolaos M. Freris

PROFESSIONAL SERVICE

Referee: ◇ IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023
◇ IEEE International Conference on Robotics and Automation (ICRA), 2024
◇ IEEE Robotics and Automation Letters (RAL), 2024

PUBLICATIONS

Preprints under review

P1. **Gaotian Wang**[†], Kejia Ren[†], Andrew S. Morgan, and Kaiyu Hang. “Caging in Time: A Framework for Robust Object Manipulation under Large Uncertainties.” *The International Journal of Robotics Research (IJRR)*. [†] Equal Contribution. Under Review

Peer-Reviewed Journal Papers

J1. Yinghao Gan, Peijin Li, Hao Jiang, **Gaotian Wang**, Yusong Jin, Xiaoping Chen, and Jianmin Ji. 2022. “A Reinforcement Learning Method for Motion Control With Constraints on an HPN Arm.” *IEEE Robotics and Automation Letters (RAL)*

Peer-Reviewed Conference Papers

C5. **Gaotian Wang**, Kejia Ren, and Kaiyu Hang. “UNO Push: Unified Nonprehensile Object Pushing via Non-Parametric Estimation and Model Predictive Control.” In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024*.

C4. Howard Qian, Yangxiao Lu, Kejia Ren, **Gaotian Wang**, Ninad Khargonkar, Yu Xiang, and Kaiyu Hang. 2024 “RISeg: Robot Interactive Object Segmentation via Body Frame-Invariant Features.” In *IEEE International Conference on Robotics and Automation (ICRA) 2024*

C3. Zhanchi Wang, **Gaotian Wang**, Xiaoping Chen, and Nikolaos M Freris. 2024 “Kinematic Modeling and Control of a Soft Robotic Arm with Non-constant Curvature Deformation.” In *IEEE International Conference on Robotics and Automation (ICRA) 2024*

C2. Zhanchi Wang, **Gaotian Wang**, Xiaoping Chen, and Nikolaos M. Freris. 2023. “Dynamic Modeling and Control of a Soft Robotic Arm Using a Piecewise Universal Joint Model.” In *IEEE International Conference on Robotics and Biomimetics (ROBIO) 2023*

C1. Peijin Li, **Gaotian Wang**, Hao Jiang, Yusong Jin, Yinghao Gan, Xiaoping Chen, and Jianmin Ji. 2021. “A Q-Learning Control Method for a Soft Robotic Arm Utilizing Training Data from a Rough Simulator.” In *IEEE International Conference on Robotics and Biomimetics (ROBIO) 2021*

Theses

T1. **Gaotian Wang**. A Randomized Kinodynamic Planner for Soft Robots based on Piecewise Universal Joint Model. Bachelor’s thesis, USTC, Hefei, China, 2022

SCHOLARSHIPS AND CERTIFICATES

2022 Mengzhilan (Dream Of Blue) China Aerospace Foundation Scholarship, USTC
2020 Outstanding Student Scholarship, *Gold* (Top 3%), USTC
2019 Endeavor Student Scholarship, USTC
2018 Yan Jici Talent Program Scholarship (Top 10%), USTC

TEACHING

FALL 2023	Teaching Assistant for Algorithmic Robotics COMP/ELEC/MECH 450/550 at Rice University
SPRING 2023	Teaching Assistant for Deep Learning for Vision & Language COMP 646 at Rice University
FALL 2020-2022	In-lab Teaching Assistant for College Physics-Comprehensive Experimentation at University of Science and Technology of China