

# Jiarui Li

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## EDUCATION

**Peking University (PKU)**

Beijing, China

**B.E. in Robotics Engineering**

Sep 2019 (change major to robotics in 2020) – Jul 2024

- **2023 Rank 1/19, GPA 3.7 / 4.0 (87 / 100), Last Year (2023) GPA 3.9 / 4.0 (92.6 / 100), Total Rank 2/19**  
**GPA increases monotonically each semester.**
- **Language:** TOEFL 107 / 120 (28 Reading, 26 Listening, 29 Writing, 24 Speaking)
- **Relevant Curriculum:** Introduction to Machine Learning (94), Swarm Intelligence (99), Principles of Automatic Control (90), Computer Vision (91.2), Robotics Experiments (III) (93), Set Theory and Graph Theory (91), Practice of Programming in C and C++ (93), Robotics Experiments (I) (91), Introduction to Computation (A) (91), Theoretical Mechanics (91), Electromagnetism (96), Social Statistics (91)
- **Technical Skills:**
  - Programming Skills: Python, C/C++, MATLAB & Simulink, Embedded System (Arduino, STM32)
  - AI & Robotics: PyTorch, ROS, Gazebo, PyBullet, Webots, SolidWorks, Moveit!, OpenCV, Crazyflie, UR, Kinova and Franka Manipulator Programming

## RESEARCH APPOINTMENTS

**Computational Robotics Lab, SEAS, Harvard University**

Boston, MA

Undergraduate Visiting Researcher, Advisor: [Prof. Heng Yang](#)

Jul 2023 - present

**State Key Laboratory for Cross-Media AGI (BIGAI)**

Beijing, China

Research Assistant in Robotics Lab, Advisors: [Dr. Yao Su](#), [Dr. Hangxin Liu](#)

Jan 2022 - Jun 2023

## HONORS & AWARDS SELECTION

- **Best Paper Award Finalist on Mobile Manipulation** from *IEEE IROS* (**top 0.5%**) 2023
- **National Scholarship** from *PKU* (**top 0.2%**, Highest Scholarship for Chinese Students) 2023
- **Pacemaker to University Merit Student** from *Peking University* 2023
- **Intern Outstanding Contribution Award** from *BIGAI* 2023
- **University Merit Student** from *Peking University* 2022
- **Schneider Scholarship** from *College of Engineering, Peking University* 2022

## PUBLICATIONS (\*indicates co-first authors, red indicates representative papers)

- [C3] Yao Su\*, **Jiarui Li\***, Ziyuan Jiao\*, Meng Wang, Chi Chu, Yixin Zhu, Hangxin Liu, “Planning Sequential Aerial Manipulation for Over-actuated UAMs”, in *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.
- [J2] - **Extended version submitted to *Transactions on Robotics (T-RO)*, under review**  
- **Best Paper Award Finalist on Mobile Manipulation at IROS 2023**, Oral & Poster Present at IROS  
- Also Poster Presented at Northeast Robotics Colloquium (NERC) 2023
- [C2] Meng Wang\*, Yao Su\*, Hang Li, **Jiarui Li**, Jixiang Liang, Hangxin Liu, “Aggregating Single-wheeled Mobile Robots for Omnidirectional Movements”, in *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.
- [C1] Yao Su\*, Chi Chu\*, Meng Wang, **Jiarui Li**, Yang Liu, Yixin Zhu, Hangxin Liu, “Downwash-aware Control Allocation for Over-actuated UAV Platforms”, in *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022.
- [J1] Wanlin Li\*, Meng Wang\*, **Jiarui Li**, Yao Su, Devsh K. Jha, Xinyuan Qian, Kaspar Althoefer, Hangxin Liu, “ $L^3$  F-TOUCH: A Light-weight, Low-cost and WireLess GelSight Sensor with Extended Three-axis Force Sensing”, *IEEE Robotics and Automation Letters (RA-L)*, 2023.

## RESEARCH EXPERIENCES & SELECTIVE PROJECTS

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### **Theory-Based Data-Driven Optimal Control for Non-linear Systems**

*Computational Robotics Lab, SEAS, Harvard University*

Boston, MA

Supervisor: [Prof. Heng Yang](#)

Jul 2023 – present

- Explored theory-based data-driven optimal control. Used multi-layer-perceptron to represent the value function of non-linear systems as the solution to continuous time and state, action (control) space infinite horizon Hamilton-Jacobi-Bellman (HJB) Equation. Synthesize real-time optimal controller and test the performance.
- Despite challenges such as lack of boundary conditions and underlying non-smoothness, progressing towards combining data-driven methods with numerical solving methods for more precise solutions and combining continuous-time HJB training with discrete-time fitted value iteration to seek guarantee of convergence.
- Explored other novel data-driven methods like *Diffuser* with the application of classical control problems.
- Accumulated experience in PyTorch and deep learning, theoretical optimal control, and corresponding mathematics theory (such as functional analysis and differential equation analysis)

### **Aerial Robotics: Overactuated unmanned aerial manipulator for sequential manipulation**

*Beijing Institute for General Artificial Intelligence (BIGAI)*

Beijing, China

Supervisors: [Dr. Yao Su](#), [Dr. Hangxin Liu](#)

Jan 2022 – Jun 2023

- Led the project of developing an over-actuated unmanned aerial manipulator (UAM) platform for sequential manipulation tasks; designed and built all the mechanical structures from scratch with 3D printing; implemented an optimization-based hierarchical controller to avoid the downwash disturbance during flipping motion; Leverage Virtual-Kinematic-Chain-based motion planning framework to yield and track coordinate trajectories for sequential manipulations. Demonstrated the results in simulation and real-world experiments.
- Accumulated rich hands-on experience in developing aerial robots, especially in mechanical and mechatronic design and build, and the implementation of control and planning algorithms. Obtained valuable practical experience in control and planning in the real world.
- The results of these works have been concluded in a few papers in *IROS 2022* and *IROS 2023*. The whole project won the *best paper finalist on mobile manipulation award at IROS 2023*.

### **Modular Ground Vehicle: Aggregating Single-wheeled Robots for Omnidirectional Movements**

*Beijing Institute for General Artificial Intelligence (BIGAI)*

Beijing, China

Supervisors: [Dr. Meng Wang](#), [Dr. Yao Su](#), [Dr. Hangxin Liu](#)

Jan 2022 – Jun 2023

- Develop a modular single-wheeled mobile robot (WMR) system that could self-reconfigure to perform omni-directional movement and collaborative object transportation.
- Addressed hardware design and implementation of the WMRs. Designed mechanical structure of WMRs for precisely and solidly docking and omni-directional moving collaboratively with transported objects.
- Accumulated rich hands-on experience in developing ground vehicles, including mechanical and mechatronic design, build and test, and the implementation of control algorithms. Obtained valuable practical experience in control and planning in the real world.
- The results of these works have been concluded in one paper at *IROS 2023*.

### **Collective Intelligence: Evolutionary Game Theory, Game & Cooperation on Complex Network**

*College of Engineering, Peking University (PKU)*

Beijing, China

Supervisor: [Prof. Aming Li](#), [Dr. Lecheng Ruan](#), [Prof. Long Wang](#)

Sep 2022 – Jun 2023

- Used Monte Carlo Simulation to explore game strategy's evolution on complex networks, including Scale-Free network and Erdős-Rényi network, aimed to explain the emergence of cooperation in the sizeable structured group. Compared the effects of different parameters and try to explain this phenomenon clearly.

### **Force Sensor with Gelsight: Novel Sensor Design and Application with Manipulator**

*Beijing Institute for General Artificial Intelligence (BIGAI)*

Beijing, China

Supervisor: [Dr. Wanlin Li](#), [Dr. Meng Wang](#), [Dr. Hangxin Liu](#)

Jun 2022 – Feb 2023

- Designed and built the L3 F-TOUCH GelSight sensor to acquire a much better three-axis force sensing capability while being lightweight, low-cost, and wireless for easy replication and deployment.
- Accumulated rich hands-on experience in using and developing manipulators, especially in designing and carrying out illustrative experiments. Practiced hardware design and programming with Moveit! and ROS.
- The results of this work have been concluded in one paper in *RA-L 2023*.

### **Computer Vision: Image Processing, Classification, Object Detection, Segmentation, etc.**

*EECS, Peking University (PKU), Supervisor: Prof. Yixin Zhu, Dr. Siyuan Huang*

Beijing, China

Sep 2022 – Jan 2023