

# XIAOKANG SUN

Department of Automation, Tsinghua University, P.R.China  
☎ +86 18810129132 ✉ [xiaokangs25fall@gmail.com](mailto:xiaokangs25fall@gmail.com) 🌐 [My Homepage](#)

## EDUCATION

### Tsinghua University

September 2021 – July 2025

*B.Eng. in Automation*

*Beijing, P.R.China*

- Major GPA: 3.68/4.0, Overall GPA: 3.60/4.0, TOFEL iBT: 102/120, GRE: 323/340
- Award: Tsinghua University Second Prize Scholarship for 2021 Freshmen
- Research keywords: Robot Manipulation, Robot Locomotion, Task and Motion Planning, safe control, IL, RL, etc.

## RELEVANT COURSES

Theory of Automatic Control, Smart Robot Manipulation, Operations Research, Signals and System Analysis, Smart Sensing and Measuring, Pattern Recognition and Machine Learning, Digital and Analog Electronics, etc.

## PUBLICATIONS & MANUSCRIPTS

Zhixu Li\*, **Xiaokang Sun\***, Mingyu Cai, Jiachen Li. "Good Data Matters: STL-Enhanced Data-Efficient Imitation Learning for Long-Horizon Manipulation." Accepted for presentation at *the 2024 Southern California Robotics Symposium (SCR)*. Under submission to *IEEE Robotics and Automation Letters*. (co-first authorship)

## RESEARCH EXPERIENCE

### STL-Enhanced Data-Efficient IL for Long-Horizon Manipulation

July 2024 – October 2024

*Research Assistant, Advisor: Prof. Jiachen Li*

*University of California, Riverside (TASL)*

- Co-led the project with a Ph.D. student, responsible for algorithm design and low-level implementation.
- Developed an LLM-based task planner using STL for long-horizon manipulation and automatic data annotation.
- Introduced a task difficulty rating module for low-level active imitation learning, optimizing data distribution to enhance the data efficiency of skill acquisition.

### Visual-Tactile Fusion-Based Regrasping Policy Learning

July 2024 – Present

*Research Assistant, Advisor: Prof. Yao Jiang*

*Tsinghua University (ME)*

- Co-led the project with a Ph.D. student, focusing on algorithm design and conducting simulations.
- Integrated visual and tactile perception to enable regrasping after grasp failures on objects with varying surface textures and mass distributions.
- Applied reinforcement learning for grasping skill acquisition and validated the approach in simulated environments.

### Wearable Fingertip Tactile Rendering Devices Based on Parallel Mechanisms

October 2023 – Present

*Research Assistant, Advisor: Prof. Yao Jiang*

*Tsinghua University (ME)*

- Co-developed fingertip haptic rendering devices with another undergraduate and a Ph.D. student, focused on improving flexibility and rendering capabilities for enhanced user experience.
- Completed the mechanism design, 3D modeling, and 3D printing, while actively developing test software to evaluate device performance.
- Aiming for future integration with advanced tactile sensors to enhance robotic tactile perception for remote manipulation and similar applications.

### Fine-tuned Sim-to-sim Framework for Mitigating Sim-to-real Problem

February 2024 – June 2024

*Research Assistant, Advisor: Prof. Jianyu Chen*

*Tsinghua University (IIIS)*

- Collaborated on validating policies with real humanoid robots to ensure robustness across different environments.
- Fine-tuned learned policies in a sim-to-sim framework to address sim-to-real transfer challenges.
- Conducted simulations in MuJoCo and Isaac Gym, refining models for better real-world performance.

### Brain-Machine Integrated Intelligent Animal Experiment Platform

August 2022 – January 2023

*Research Assistant, Advisor: Prof. Mingjun Zhang*

*Tsinghua University (BME)*

- Developed a brain-machine hybrid intelligence platform for experiments with mice and miniature pigs, expanding applications in brain-computer interfaces.
- Designed the structure and completed 3D printing of a mini-vehicle platform, supporting the experimental setup.
- Gained significant skills in mechanical design and hardware programming, which are essential for robotics research.

## SELECTED PROJECTS

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### **Blocks Classification and Stacking with UR-5** | *Smart Robot Manipulation, Perception, Planning, Control* **June 2024**

- Performed block detection, classification, and stacking, ensuring task completeness, safety, and speed of execution.
- Implemented a full pipeline grasping task on UR-5 using ROS, MoveIt, OpenCV, and other frameworks and tools.

### **Image Classification by Head Features** | *Principles of AI, Machine Learning, Image Classification* **December 2023**

- Applied ML methods to solve binary and five-class head feature classification problems.
- Strengthened foundational knowledge in image classification and practiced the application of PyTorch and NumPy.

### **Bipedal Robot Walking Based on PDW** | *Research and Practice Humanoid Robot, PDW, MATLAB* **December 2023**

- Developed a walking model based on Passive Dynamic Walking (PDW), powered by center of mass (COM) movement.
- Proposed and verified a passive walking solution, including literature review, simulation, and reporting.

### **Optical Field Imaging and Digital Refocusing Experiment** | *Smart Sensing and Measuring, Refocus* **December 2023**

- Gained deep understanding of light field imaging and digital refocusing algorithms.
- Conducted experiments using a light field camera, captured images, implemented digital refocusing algorithms.

### **Escape Tower of the Sorcerer: Search Algorithms Application** | *Principles of AI, Search Algorithms* **October 2023**

- Built a simplified Tower of the Sorcerer scenario and implemented a search algorithm for character escape.
- Implemented algorithms to solve high-complexity search problems and developed a visual interface to display.

### **Remote-controlled Robotic Arm & Small Vehicle Based on PSoC** | *Modern Electronics, PSoC, FPGA* **August 2023**

- Designed motion unit functions, UART communication and controllers for the remote-controlled robotic arm.
- Cultivated the ability to debug hardware programs and troubleshoot circuit faults.

### **Holiday Management Software Development** | *Object Oriented Programming (OOP), C++* **July 2023**

- Independently completed the design of a holiday management software and wrote several thousand lines of code.
- Conformed to MVC pattern and OOP principles, developed a good coding style.

## TECHNICAL SKILLS

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**Languages & Tools:** C, C++, Python, PyTorch, NumPy, MATLAB, Simulink, Linux (Ubuntu), ROS, MuJoCo, PyBullet  
**Hardware Experience:** FPGA, PSoC, EDA, Arduino Uno, Analog & Digital Circuits, Servo Motors, 3D Modeling & Print  
**Operation Experience with Robot Platforms:** UR-5 (sim & real), Franka (sim & real), ALOHA (real), XBot-S (sim)

## LEADERSHIP / EXTRACURRICULAR

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### **Cantare Sempre (Tsinghua University Yongheng Choir)** **August 2023 – August 2024**

*Tenor Section Leader & Publicity director*

*Tsinghua University*

- Created and published 20+ press releases and designed 10+ sets of promotional materials for choir events and performances.
- Managed tenor section of 30+ members, responsible for organizing daily rehearsals and team-building activities. Led the section in 10+ performances of varying sizes, contributing to the choir's success.

### **Humanities and Social Sciences Library** **September 2022 – January 2023**

*Library Assistant*

*Tsinghua University*

- Participated in daily library maintenance, including book sorting, cataloging, and shelving new arrivals.

### **Summer Work and Study Program, Wuyuan, Jiangxi Province Team** **July 2022 - August 2022**

*Program Participant*

*Wuyuan, Jiangxi*

- Traveled to Jiangxi to experience factory and rural labor, gaining insight into Chinese social life and issues.
- Gained an understanding of how technology affects workers' rights, as well as the struggles faced by rural populations.
- Combined study with hands-on labor, integrating theory and practice, and completed two reports.

### **Student Association of Educational Poverty Alleviation (SAEPA)** **February 2022 – July 2022**

*Member of Dream Class Section*

*Tsinghua University*

- Served as one of the managers and volunteer teachers of SAEPA2022 Spring Cloud Teaching Program.
- One-on-One Tutoring for a Middle School Student in a Remote Area of Xinjiang for a Semester.

### **Publicity Department of Xinya College Student Union** **September 2021 – July 2023**

*Core Member*

*Tsinghua University*

- Actively participated in cultural and creative design, contributing to the promotion of four large-scale events.
- Designed various items such as postcards and phone cases as part of the creative projects for event promotions.