# Qiwei Wu

Curriculum Vitae

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## Research Interests & Goal

My primary research interests encompass the dextrous manipulation and multimodal perception of **robotics**, focusing on **reinforcement learning**, **imitation learning** and **visual-tactile perception**. I aim to enhance robotic perception diversity and enable the completion of more complex tasks, achieving **embodied AI**.

## Education

**Sichuan University** | **Bachelor** | **Automation** 09/2018 - 06/2022
College of Electrical Engineering Chengdu, China
**Comprehensive Ranking** 2/117
Overall GPA 3.6/4.0

**University of California, Berkeley** | **Summer School** 07/2019 - 08/2019
Artificial Intelligence and Business Analytics Berkeley, USA

**Harbin Institute of Technology, Shenzhen** | **Master** | **Control Engineering** 09/2022 - 01/2025
School of Mechanical Engineering and Automation Shenzhen, China

**Hong Kong University of Science and Technology** | **Ph.D** | **Robotic** 02/2025 -
Advisor: Renjing Xu

## Publications

**Rapid Tactile Transfer Framework for Contact-Rich Manipulation Tasks** 6/2024
Qiwei Wu, Xuanbing Peng, Jiayu Zhou, Zhuoran Sun, Xiaogang Xiong, Yunjiang Lou | **IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS** | *First Author*

**Tactile Affordance in Robot Synesthesia for Dextrous Manipulation** 7/2024
Qiwei Wu, Haidong Wang, Jiayu Zhou, Xiaogang Xiong, Yunjiang Lou
**IEEE Robotics and Automation Letters, RAL** | *First Author*

## Selected Competition Awards

**RoboMaster University Championship 2021** 8/2021
National Second Prize, Top 16

**RoboMaster University League 2021** 8/2021
Second Prize in Hero Robot

**The 16th National College Student Intelligent Car Competition** 7/2021
Second Prize in Baidu Intelligent Traffic Group, Top 20%

**2020 RoboCup China Open** 10/2020
Third Prize in Small Size Robot League, Obstacle Avoidance Challenge

## Work Experience

Sony R&D Center China Laboratory 5/2024-Present
*Research Intern*

**Reinforcement Learning for Robotic Manipulation**

- **Robotic Grasping System Design**
  **Contribution**:
  - Developed digital twins of robots in NVIDIA's IsaacLab simulation environment.
  - Designed robotic grasping environments and implemented reinforcement learning algorithms for training.
  - Developed and integrated the tactile sensor Tac3D into the system.

  **Outcome**:
  - Open-sourced the robotic reinforcement learning framework IsaacLab.manipulation.
  - Open-sourced ROS support for the Tac3D sensor.

## RESEARCH EXPERIENCE

Intelligent Perception and Control Lab, HITSZ 10/2022-Present
*Graduate Student*, advised by Prof. Xiaogang Xiong

**Tactile Perception for Robotic Manipulation** | ***Research Leader***

- **Designed and developed tactile sensors**
  **Contribution**:
  - Reproduced and redesigned the tactile sensor Tactip.
  - Reproduced and redesigned the tactile sensor Insight.
  - Installed tactile sensors on the UR5 robotic arm system and implemented tactile servo.
- **Sim2Real and policy transfer for tactile servo**
  **Contribution**:
  - Designed a unified tactile representation method based on the VAE-GAN framework.
  - Developed tactile servo manipulation policies using off-policy reinforcement learning methods.
  - Designed a teacher-student framework based on the Tactile Gym simulation environment to achieve Sim2Real for tactile servo.

  **Outcome**:
  - Completed pushing and surface following tasks on a real robotic system.
  - Accepted by **IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS**.

**Visual-Tactile Sensing and Learning for Robots** | ***Research Leader***

- **Designed and developed a robotic visual-tactile simulation environment**
  **Contribution**:
  - Decoupled tactile perception information and implemented tactile simulation.
  - Created digital twins of robotic systems in the IsaacGym simulation environment.
  - Completed the development of tactile sensors Gelsight Mini and Digit.

  **Outcome**:
  - Open-sourced the robotic visual-tactile simulation environment Visual-Tactile Gym.
- **Achieved Sim2Real transfer for dexterous manipulation policies**
  **Contribution**:
  - Designed an object affordance prediction module using the PointNet++ method.
  - Designed a mixed encoding method for visual and tactile features.
  - Trained a teacher policy for dextrous manipulation using parallel reinforcement learning.
  - Designed a point cloud-based imitation learning method to obtain the final student policy.

  **Outcome**:
  - Completed dexterous tasks such as lifting objects, opening doors, pick-and-place, and drawer pulling on a real robotic system.
  - Submitted a manuscript to **IEEE Robotics and Automation Letters**, currently under review.

## SKILLS

**Languages**: Mandarin (Native), English
**Classes**: Machine Learning, Deep Learning, Automatic Control Theory, Optimal estimation, Visual SLAM
**Programming**: Python, C, C++, Linux Shell, HTML, CSS, JavaScript
**Others**: Deep learning framework (Torch, Tensorflow, Paddlepadlle), robot simulation (IsaacLab, IsaacGym, Pybullet, Gazebo), ROS & ROS2, Embedded System Development, Photo & Video Editing