Xiangyu **CHEN**

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EDUCATION

The Hong Kong University of Science and Technology (Guangzhou) — *Guangzhou, China*
MPhil in ROAS Thrust, co-advised by **Prof. Renjing Xu** and **Prof. Haoang Li** — *Sep. 2025 – Jun. 2027*

Liverpool John Moores University — *Liverpool, UK*
BEng Electrical and Electronic Engineering (First Class Honours) — *Sep. 2019 – Jun. 2023*

RESEARCH INTERESTS

Embodied AI, Manipulation, UMI/EGO-style Data Collection, VLA, Tactile, Mapping and Navigation

PUBLICATIONS

- **Tacinf: A Unified Tactile Infrastructure for Robot Manipulation**
  Xiangyu Chen*, Qiwei Wu*, Xin Xiang*, Rui Zhang, Yihang Kang, Zikang Xie, Tao Wang, Xiangzheng Wang, Tianyi Bi, Zhiyan Zhang, Weiran Chen, Xianpeng Wang, Yangfan Li, Tao Li, Weihua Zhang, Renjing Xu, Junjie Lai
  NVIDIA Tech Report, T-RO Under Review
- **VTLA-RL: Learning Visuotactile Policies for Load-Adaptive Grasping**
  Qiwei Wu*, Qixuan LI*, Xin Xiang*, **Xiangyu Chen**, Xiang Xiao, Daochen Shi, Ruihua Zhang, Renjing Xu
  CVPR 2027 Under Review
- **HIVE: History-Initialized Visuomotor Evolution with a Compact Visual Bottleneck for Robotic Manipulation**
  Boyang Cai, Shihang Weng, Qiwei Liang, Zhengtu Liang, **Xiangyu Chen**, Wenjie Zhang, Yu Yan, Jiawei Li, Renjing Xu
  ICLR 2027 Under Review
- **UniVEP: Unifying Velocity and Endpoint Prediction for Robot Manipulation**
  Zhengtu Liang*, Qiwei Liang*, Tao Lin, Shihang Weng, Boyang Cai, **Xiangyu Chen**, Yikeng Chen, Jiaming Liang, Bohan Tan, Renjing Xu
  ICLR 2027 Under Review
- **LumiBench: Benchmarking Illumination Robustness in Robotic Manipulation Policies**
  Yiman Pang*, Haoming Gu*, Wenjie Zhang, Yu Yan, **Xiangyu Chen**, Mingqian Zhou, Zhengtu Liang, Boyang Cai, Tao Wang, Renjing Xu
  ICRA 2027 Under Review
- **DreamTrajectory: Trajectory-Guided Action Generation with World Model Alignment for Mobile Manipulation**
  Zheng Yang*, Wenjie Zhang*, **Xiangyu Chen**, Wenxuan Song, Xianpeng Wang, Yihang Kang, Wen Chen, Lujia Wang, Renjing Xu, Xiaowen Chu
  AAAI 2027 Under Review
- **Beyond Viewpoint Generalization: What Multi-View Demonstrations Offer and How to Synthesize Them for Robot Manipulation?**
  Boyang Cai*, Qiwei Liang*, Jiawei Li*, Shihang Weng*, Zhaoxin Zhang*, Tao Lin, **Xiangyu Chen**, Wenjie Zhang, Jiaqi Mao, Weisheng Xu, Bin Yang, Jiaming Liang, Junhao Cai, Renjing Xu
  ICRA 2027 Under Review
- **RoboGEM: Learning Language-guided Robotic Manipulation via Generalizable and Efficient Feature Distillation**
  Chunzheng Wang, Yuhang Zheng, **Xiangyu Chen**, Weize Li, Songen Gu, Yupeng Zheng
  ACM Multimedia, RoboSoft'25 Workshop (Oral) Best Paper Finalist, 2025
- **GaussianGrasper: 3D Language Gaussian Splatting for Open-vocabulary Robotic Grasping**
  Yuhang Zheng, **Xiangyu Chen**, Yupeng Zheng, Songen Gu, Runyi Yang, Bu Jin, Pengfei Li, Chengliang Zhong, Zengmao Wang, Lina Liu, Chao Yang, Dawei Wang, Zhen Chen, Xiaoxiao Long, Meiqing Wang
  RAL, 2024
- **Block-Map-Based Localization in Large-Scale Environment**
  Yixiao Feng, Zhou Jiang, Yongliang Shi, Yunlong Feng, **Xiangyu Chen**, Hao Zhao, Guyue Zhou
  ICRA, 2024

RESEARCH EXPERIENCE

Physical AI Startup — *Beijing, China*
Data Infra Leader — *Oct. 2026 – Present*

- **UMI Data Collection Infrastructure**

  Introduction: *Led UMI* data collection device development from concept to deployment and built a data management platform, equipping teams of *10–20 operators* to collect *60+ hours* of usable data per day. *Post-trained models* on the collected data, enabling precise, fine-grained manipulation for assembly tasks..

Humanoid Computing Lab(HCLab)

Guangdong, China

Advisor: Prof. Renjing Xu — *Dec. 2025 – Present*

- **The First Prize in ICRA 2026 WBCD(Vienna) Competition Track 4 Deformable Manipulation (Team Leader)**

  Introduction: The competition features real-world industrial *deformable manipulation* tasks, utilizing ARX robotic arms to tackle challenges like *T-shirt flattening*.

  Method: Our framework fine-tunes π_0*-five* using *1k / 10h* expert demonstrations at *45Hz*, integrating *Heuristic DAgger* for robust recovery. Deploying *5* inference steps with *exponential action-chunk smoothing* achieves an *90%+* success rate within *20s*.

- **Co-organizer in ICRA 2026 WBCD Competition Committee, Chief referee of Shanghai competition area**

  Role: *Team Leader*, Co-organizer in ICA 2026 WBCD Competition Committee, *Chief referee* of Shanghai competition area

  UMI Data leader: Defined competition-specific UMI data standards while managing and supervising overall UMI data quality.

BrainCo Technology Co., Ltd.

Shenzhen, China

Research Intern | Advisor: Jia Zuo — *Dec. 2025 – Present*

- **Dexterous Hand Exoskeleton Data Collection Development**

  Introduction: We propose a *DexUMI-based multi-modality data collection system* to bridge the *proprioceptive and cross-embodiment gaps* in dexterous manipulation. By shifting from traditional UMI interfaces to an *integrated exoskeleton system*, we streamline the collection of complex human-like demonstrations while ensuring *high-fidelity sensory-motor alignment*.

  Dexterous Hand Design: Developed a *DexUMI-based* multimodal data acquisition framework specifically tailored for *21-DoF dexterous hands*. This system implements a high-efficiency pipeline to synchronously capture *robot actions, dexterous hand states, RGB video streams, and tactile feedback*. By utilizing a *human-centric retargeting algorithm*, the platform translates intricate finger kinematics into robot action spaces in *real time*, enabling efficient data collection for complex manipulation tasks.

  6-DoF Pose Tracking: Conducted a comparative analysis of localization modalities (*Mocap, Infrared, and VIO*) to identify the optimal solution for *in-the-wild* applications. By benchmarking these methods against environmental constraints, we implemented a *self-contained VIO-based pipeline* to ensure robust, infrastructure-free tracking *in the wild*, effectively overcoming the limitations of external reference systems in unstructured settings.

TARS Technology (Shanghai) Co., LTD.

Shanghai, China

Research Intern | Advisor: **Prof. Yilun Chen** and **Prof. Wenchao Ding** — *Mar. 2025 – Dec. 2025*

- **SenseHub Human-Centric Multi-Modal Data Collection System Development**

  Introduction: SenseHub is a *human-centric multimodal data collection system* that provides the empirical foundation for the *WIYH* dataset and the *AWE* foundation model through *real-world data acquisition*.

  Teleoperation System: Engineered a comprehensive *teleoperation and data acquisition system* from the ground up, supporting *SpaceMouse, VR, and isomorphic arm* control to facilitate *large-scale, multimodal robotic data collection*.

  UMI-based Data Collection System: *Led* the development of the initial *UMI-based* hardware data collection framework, integrating *dexterous hands* and *grippers* with *multi-modal sensors* to capture high-quality *visual, tactile, and force feedback* for *Embodied AI* training.

  Tactile Sensors Survey: Conducted *comprehensive benchmarking and testing* across multiple tactile sensing modalities—including *vision-based, piezoresistive, capacitive, magnetic, and Hall-effect sensors*—to select the optimal hardware solution tailored for specific research objectives.

  Results: *Led* the development of *teleoperation, UMI-based data collection infra, and real-world robot infra*, providing the *foundational experimental platform* for several high-impact research papers, including *OmniVTA* and *World In Your Hands (WIYH)*

- **The First Prize in Google DeepMind & ICRA 2025 WBCD Challenge (Team Leader)**

  Introduction: This challenge is jointly organized by Google DeepMind and ICRA, aiming to propose efficient data collection strategies and exploring the benchmark of *bimanual manipulation* in real-world scenarios, with evaluation metrics including *execution speed, system reliability, and policy implementation*.

  Bimanual Manipulation System Implementation: Design a *mobile manipulation system* to efficiently collect real data and robustly perform *tabletop manipulation and mobile tasks*. *Dual-arm* can do tasks including unfold tablecloth, open the lid, place the pizza and close the lid tasks while mobile. Designed grippers can grasp cups and open boxes, etc.

  Data Collection: Benchmark data collection methods, such as *teleoperation* (e.g., VR and hand-held grippers) and *learning from videos* methods, propose methods suitable for collecting data in real scenarios.

  Design Hierarchical Bimanual Manipulation Policy for Dining Room Service: Propose *Bimanual Manipulation Models (VLA)* to execute *long-horizon*, complex and fine mobile manipulation tasks in real-world dining room service scenarios, with focus on designing models that can mitigate *compounding errors* and improve robustness against *dynamic interference*.

- **Champion in ManiSkill-ViTac 2025 Track 2**

  Introduction: The competition evaluated robots manipulation capabilities in complex environments, requiring them to deter-

mine object shapes and select correct insertion slots by integrating *tactile and visual sensory inputs*.
Methods: The solution combined *tactile encoders* with *3D point cloud encoding*, enhanced by *positional embeddings*, and employed a *conditional diffusion policy* for robust multi-modal action planning.
Contribution: Implement *sim-to-real transfer* in real-world experiments, process *tactile sensor data*.

GAIRLAB, City University of Hong Kong
Hong Kong, China

Research Intern | Advisors: **Prof. Peng Yin** *Mar. 2024 – Jun. 2024*

- **Mobile Manipulation Policy based on Imitation Learning**

  Learning-based Mobile Manipulation System Design: Proposed robot policies based on the *ACT network* for *mobile manipulation* to improve the robustness in performing *long-horizon and fine manipulation tasks*.
  Data Collection: Data collection by using *whole-body teleoperation system*.
  Method Design: Increase the degrees of freedom of whole-body control to *17 DoF* and optimize the control strategy through position control and *object-centered coordinate relationships* to address the high task failure rate.
  Navigation Module Design: Focus on *learning-based navigation* method and how to leverage *VLMs* to improve the *indoor visual navigation* efficiency and localization accuracy.

AIR, Tsinghua University & ARXRobotics
Beijing, China

Research Intern @ **DISCOVER Lab** | Advisor: **Prof. Guyue Zhou**, **Dr. Yongliang Shi** and **Prof. Jiangtao Gong** *Sep. 2021 – Nov. 2023*

- **Block-Map-Based Localization in Large-Scale Environment** *Sep. 2021 – Nov. 2023*

  Block Maps Localization System Design: Proposed a *subgraph localization system* based on generating *block maps* and corresponding *switching strategies*. The method can address the issue of easy loss of robot localization, improving *localization accuracy by at least 3 times* while increasing *computational speed by 150%*.
  Perception Module Design: Used *multi-line LiDAR* and *LIO-SAM* algorithms to create maps in large-scale scenes. Used *C++* and *PCL point cloud library* to downsample point clouds for removing ground points.
  Navigation Module Design: Using the *A* algorithm* and *TEB algorithm* as planners to enable robots to achieve *dynamic obstacle avoidance*. These planners assist robots in conducting localization experiments.
- **Multi-Agent Swarm Formation Navigation Algorithms** *May 2022 – Feb. 2023*

  Multi-Agent Navigation Strategies: Proposed a *multi-agent collaboration system* to improve work efficiency through cooperation of multiple robots.
  Method Design: Develop *Leader-follower*, *artificial potential field* and *pure pursuit* algorithms to enable robots to flexibly achieve *single-agent and multi-agent collaborative obstacle avoidance*.
  Sim2Real Pipeline: Use *Gazebo* and *Isaac Sim* simulators to test algorithms in simulation, then algorithms are fine-tuned and deployed to the *real robots* to ensure the desired instantaneity and robustness for multi-agent obstacle avoidance.
- **Obstacle Avoidance Algorithm for Indoor Racing Unmanned Vehicles** *May 2022 – Feb. 2023*

  Motivation and hardware: We aim to develop navigation system that can improve the robot's localization and real-time obstacle avoidance robustness in corridor and glass environments. The hardware includes *single-line Lidar, IMU and depth camera*, with *differential drive model* as the kinematic model.
  SLAM Experiment: We benchmark the performance of *Lidar-based SLAM* (*Gmapping, Cartographer*) algorithms and *vision-based SLAM* algorithms (*Rtabmap, ORB_SLAM*) and design a *multi-sensor fusion algorithm* utilizing *particle filtering, extended Kalman filtering and graph optimization* to improve real-time localization accuracy during motion.
  Navigation Experiment & Results: We benchmarked path planning algorithms based on *graph search and sampling methods*. Experiments revealed that using the *A* algorithm* and *TEB algorithm* as planners outperformed other methods in avoiding *static and dynamic obstacles* during long-horizon navigation, with robots successfully avoiding all tested obstacles
- **End-to-end Visual Navigation based on Reinforcement Learning** *Jun. 2021 – Sep. 2021*

  Motivation: We explored the performance of *end-to-end vision-based navigation* for robots, drawing inspiration from the end-to-end approach used in autonomous driving.
  Pipeline Design: We used a *CNN network* as the backbone for *feature extraction* and collected camera data and control data in a *simulator* to create the dataset. After fine-tuning, the system was deployed on a robot for *real-world experiments*. Results showed that the system successfully completed all obstacle avoidance tasks during the day, but many tasks failed at night due to factors such as low lighting.

HONORS & AWARDS

2026	**Champion**, ICRA 2026 What Bimanuals Can Do (WBCD) Challenge(Vienna)	*Vienna, Austria*
2025	**Champion**, ICRA 2025 What Bimanuals Can Do (WBCD) Challenge	*Atlanta, U.S.A*
2025	**Champion**, ManiSkill-ViTac 2025: Challenge on Manipulation Skill Learning With Vision and Tactile Sensing	*Beijing, China*

SKILLS

Robotics Technology	ROS1/2
Software Technology	C/C++, Python, MATLAB, OpenCV, Linux and Git, PyTorch
Hardware Technology	Embedded Development (STM32, ESP32), SolidWorks, PCB Design
Language Proficiency	Mandarin (Native), English (Working Proficiency)