

Wanhao Liu

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RESEARCH INTERESTS

Vision-Language-Action Models, World Action Models, Robot Learning, Embodied Intelligence, Visuomotor Control, Surgical Robotics, and Medical Robot Autonomy.

EDUCATION

Guangdong University of Technology (GDUT)

Sep 2023-Jul 2027

B.Eng. in Electronic Science and Technology

GPA: 88.20/100 | Rank: **9/221**

PUBLICATIONS

JOURNAL

- Luo, L., **Liu, W.**, Yuan, L., Cai, Q., & Li, P. Prescribed-time fault-tolerant attitude control for tiltrotor UAV with input saturation and mismatched disturbances. *Control Engineering Practice*, 164, 106526. doi: 10.1016/j.conengprac.2025.106526. **(2025 JCR Q1)**
- Zhou, R*, **Liu, W***, Ma, G., Shao, L., Song, Q., Wang, Y., Wang, G., Chen, T., Bai, L., Zhou, L., & Ren, H.† “Surg-UniWorld: A Unified Surgical World Model with Multimodal Control Experts.” *IEEE Transactions on Medical Imaging*, *under review*. **(2026 JCR Q1)**
- Zhou, R*, Song, Q*, Ma, Y*, Wang, A., **Liu, W.**, Ma, G., Wang, Y., Wang, G., Diao, X., Wang, J., Zhu, C., Lu, X., & Ren, H.† “SurgLAT: Surgical Latent Attention Tracking for Depth-Aware Robotic Laparoscope Control.” *IEEE Transactions on Medical Imaging*, *under review*. **(2026 JCR Q1)**

CONFERENCE

- **Liu, W***, Lin, J*, Zhou, R*, Ng, C. K.*, Pan, W., Tang, Z., Li, D., Luo, L., Wu, Y., Li, P., Xiong, Z., Gao, H., Haidegger, T., & Ren, H.† “CrossScope: A Role-Asymmetric World Model for Joint Dual-Scope Surgical Video Prediction.” *AAAI 2027*, *under review*. **(CCF-A)**
- Pan, W*, **Liu, W***, Luo, L., Li, P., Xu, Y., & Lu, R.† “NCGR: Noise-Conditional Gated Rectification for Camera Extrinsic Perturbations in BEV 3D Object Detection.” *AAAI 2027*, *under review*. **(CCF-A)**
- Lin, J*, Pan, Z*, **Liu, W***, Ng, C. K.*, Shao, L., Yu, Z., Wang, Z., Wang, Y., Wang, J., Teoh, J. Y.-C., Xiong, Z., Gao, H., & Ren, H.† “EndoWAM: A Grounded World-Action Model for Generalizable Endoscopic Navigation.” *AAAI 2027*, *under review*. **(CCF-A)**
- **Liu, W.**, Dai, J., Zhang, Y., Yin, S., & Li, P. (2026). AC-MASAC: An attentive curriculum learning framework for heterogeneous UAV swarm coordination. *AAMAS*, Paphos, Cyprus. **[CCF B Oral]**. doi:10.65109/VJGN3439.
- Dai, J., Cui, Y., **Liu, W.**, & Li, P. (2025). Conflict prioritized-based experience replay soft actor-critic algorithm for unsignalized intersections coordination. *CVCI 2025*, Qingdao. doi:10.1109/CVCI66304.2025.11348538.
- Zhang, Y., **Liu, W.**, & Liu, L. (2024). Improved heuristic JPS algorithm for path planning in intelligent warehouse robot. *ICEMCE 2024*, Xi'an. doi:10.1109/ICEMCE64157.2024.10862580.

PATENTS

- Li, P., **Liu, W.**, Yin, S., Tian, X., Dai, J., & Lu, R. Path planning method and system for heterogeneous UAV swarms. Chinese patent application, CN121835804A. Filed on November 6, 2025.

RESEARCH EXPERIENCE

Executable World-Action Modeling for Robot-Assisted Endoscopic Intervention

Research Assistant | Advised by [Prof. Hongliang Ren](#), CUHK Jan 2026-Present

- Formulated ERCP robot control as a hierarchical world-action modeling problem under dual-endoscope observations for precise entry, lumen traversal, and calculus localization
- Designed a command-guided World Action Model that conditions future-state prediction and Action DiT generation on high-level surgical intent tokens
- Introduced actuator-centric action tokenization and multi-level ERCP data organization over ~910K annotated frames for structured motor coordination and quality-aware training

Attentive Curriculum Learning Framework for Heterogeneous UAV Swarm Coordination [\[Code\]](#)

Research Assistant | Advised by [Prof. Panshuo Li](#), GDUT Mar 2025-Oct 2025

- Proposed a Multi-Agent Reinforcement Learning (MARL) framework for heterogeneous UAV swarm coordination to address asymmetric agent dependencies and unstable policy convergence
- Designed and implemented AC-MASAC, a novel MARL framework with role-aware attention (Leader-Follower modeling) and curriculum learning to mitigate sparse rewards and catastrophic forgetting
- Outperformed MASAC, MADDPG, and RRT* in SR, FKR, and SMT within a custom 700 × 600 m simulation, improving FKR by over 15% and final average reward by approximately 82% in ablation studies

Prescribed-Time Fault-Tolerant Control for Tiltrotor UAVs

Research Assistant | Advised by [Prof. Panshuo Li](#), GDUT Nov 2024-Jun 2025

- Investigated attitude control for tiltrotor UAVs (TRUAVs) under composite mismatched disturbances, actuator faults, and input saturation
- Developed OPAFAC, a novel control strategy integrating a disturbance observer, an adaptive sliding mode controller, and an anti-saturation system to guarantee error convergence within a prescribed time
- Validated the strategy via Hardware-In-the-Loop (HIL) experiments, achieving prescribed-time convergence and demonstrating superior fault tolerance and robustness over existing methods

SCIENTIFIC COMPETITION

National University Students Smart Car Competition

Jun 2025-Sep 2025

Project Leader | **National Second Prize (Top5% out of 200+teams)** [\[Code\]](#)

- Used CNN and PP-YOLOE models for lane line and target detection, which supported robotic arm kinematic modeling and trajectory planning
- Utilized a hierarchical control framework with a high-level planner for dual infrared sensor fusion and task decision-making, and a low-level controller for accurate trajectory tracking during multi-task execution
- Deployed the system on the Jetson Orin Nano platform with a coprocessor and ROS-based real-time control, achieving remarkable stability and task completion performance in the final testing

AWARDS & HONORS

First-Class Scholarship (Top 3%), Guangdong University of Technology	Sep 2024-Sep 2025
Third Prize, National University Student Smart Car Competition, South China Division	Jul 2024-Aug 2024
Advanced Individual Award, Guangdong University of Technology	Sep 2023-Sep 2024

LEADERSHIP & SERVICES

Counselor Assistant, School of Physics & Optoelectronic Engineering, GDUT

Oct 2023-Present

Class Leader of 51 Undergraduates, GDUT

Sep 2023-Present

TECHNICAL SKILLS

Programming: Python, C++, LaTeX, MATLAB, Linux

Frameworks: Tensorflow, NumPy, Git, PyTorch, Anaconda, ROS1/ROS2 (proficient)