Rongqi Lu

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RESEARCH INTERESTS

Keyword: Multi-robots, Reinforcement Learning, Vision-Language Navigation, Embedded System

EDUCATION

- **Xidian University** *Sep. 2023 - Jun. 2026*
  Master of Engineering in Control Engineering | 3-year Full-time Xi'an, China
  ◦ Grade: 83.41%   Rank: 13/137 (Top 10%)

  ◦ Core Courses: Matrix Theory, Stochastic Processes, Optimal Control, Mathematical Foundation of Reinforcement Learning, Cooperative Control of Multi-Agent Systems
- **Sichuan Normal University** *Sep. 2019 - Jun. 2023*
  Honour Bachelor of Engineering in Electronic Information Engineering Chengdu, China
  ◦ Grade: 87.71%   GPA: 3.61/4.00   Rank: 1/223 (Top 1%)

  ◦ Core Courses: Microprocessor and Interface Technology, Data Acquisition and Processing, Signals and Systems, Computer Communication Networks and Applications

PUBLICATIONS AND PATENTS C=CONFERENCE, J=JOURNAL, P=PATENT, S=IN SUBMISSION, T=THESIS

[S.1] **Rongqi Lu**, et al. (2025). "Cooperative Exploration and Control in Pursuit-Evasion games with Reinforcement Learning". Manuscript submitted for publication in *Neurocomputing*.

[C.1] Wei W. Xing, Zheng Xing, **Rongqi Lu**(1st Student), et al. "TOTAL: Multi-Corners Timing Optimization Based on Transfer and Active Learning." In *Proceedings of the 60th ACM/IEEE Design Automation Conference (DAC)* (**CCF-A**), San Francisco, USA, July 2023, pp. 1-6. DOI: 10.1109/DAC56929.2023.10247914.

[P.1] Yuanshi Zheng, **Rongqi Lu**(1st Student), et al. "An Intelligent Cooperative Pursuit Method and System Under Incomplete Information Conditions". China National Patent, No. 202510738071.X. Filed: Jun. 4, 2025.

[P.2] Yuanshi Zheng, **Rongqi Lu**(1st Student), et al. "A Method and System for Cooperative Pursuit Planning of Heterogeneous UAVs Under Local Observation". China National Patent, No.202511338072.1 . Filed: Sep. 2025.

RESEARCH EXPERIENCE

- **Multi-agent Reinforcement Learning for Multi-Robots Pursuit-Evasion games** *Aug. 2024 - present*
  Core Member | Advised by Prof. Zheng Yuanshi | Funded by National Science Foundation of China (NSFC) [O]
  ◦ **Publishing Work**: Manuscript [S.1] under review in *Neurocomputing*.
  Contribution: Designed the Phase-Adaptive Communication and Exploration (PACE) framework enabling dynamic switching between distributed exploration and communication-driven coordinated pursuit under partial observability. Achieved 91% pursuit success rate vs. 78% for MADDPG baseline in 4v1 pursuit-evasion simulations.

  ◦ **Patent Applications**: Two China National Patents under application, closely tied to the project's core technologies:
  Patent [P. 1]: Focus on the *general multi-robot system*
  Contribution: Proposed the core technical scheme, solving application pain points like low coordination efficiency (perception limitation) and low exploration efficiency (sparse rewards). It enhances the system's adaptability and pursuit stability in complex practical scenarios via SimHash.
  Patent [P.2]: Focus on *heterogeneous UAV platforms*
  Contribution: Proposed a cooperative pursuit planning scheme for heterogeneous UAVs under local observation, which uses RND to solve sparse reward-induced low exploration efficiency and MATD3 architecture for centralized training/distributed execution, optimizing UAVs' decision-making.
- **Autonomous UAV Ground Vehicle Navigation & Control System Development** *Apr. 2025 - present*
  Core Member | Funded by Meituan Academy of Robotics Shenzhen (MARS)
  ◦ Developed an autonomous navigation system for UAV-ground vehicles, integrating RGB camera, LiDAR point cloud, and odometry data to enable environmental perception and motion control.

  ◦ Implemented dual control modes (pose control & velocity control) based on ROS framework, achieving stable movement with compliance to constraints and collision avoidance in dynamic scenarios.

  ◦ Designed a path planning and decision-making module that parses environmental information and task instructions, enabling the vehicle to autonomously navigate to target positions with 10cm arrival accuracy.
- **SLAM-Based Autonomous Navigation for UAVs** *Oct. 2022 - Apr. 2023*
  Team Leader | Advised by Associate Prof. Li Jun
  ◦ Implemented a visual-inertial SLAM system on a simulated UAV in Gazebo, integrating IMU data to improve localization accuracy in dynamic environments.

- Achieved 0.3m RMSE for position estimation and 0.2rad RMSE for orientation estimation in 10-minute flight tests.
- Developed a path planning module using A* algorithm, enabling the UAV to autonomously navigate through obstacle-rich environments (e.g., indoor warehouses).
- **Multi-Corners Timing Optimization with Guassian Process Regression** *Jun. 2022 - Sep. 2022*
  Research Assistant in Beihang University | Advised by Assistant Prof. Wei W. Xing
  - Contributed experimental data and validation results to paper [C.1], supporting the model's industrial applicability for advanced-node chip tape-outs.
  - Participated in the development of TOTAL, a machine learning framework for multi-corner Static Timing Analysis (STA) in 15nm technology node, contributing to data preprocessing and model validation. The framework achieved 100% LESS30 prediction accuracy across 5 timing optimization iterations and outperformed SOTA methods by 1.7x in efficiency.
  - Assisted in designing transfer learning strategies to enhance prediction reliability, supporting the team in achieving 100% correction coverage of timing errors while maintaining an 85% reduction in EDA computation costs.
  - Supported experimental validation by executing tests on benchmarks (b17/b18/b19), including data collection and result analysis. This work demonstrated the model's scalability, critical path prediction accuracy improved from an initial 78.5-86.7% to 100% as iterative data was incorporated.
- **Embedded Control System for Agricultural UAV (Texas Instruments Electronic Design Cup)** *Jul. 2021 - Oct. 2021*
  Team Leader | Advised by Associate Prof. Li Jun
  - Led the team to win the 6th place (Provincial Second Prize) in Sichuan Province.
  - Designed a PID-based flight control system using the MSP432 microcontroller, enabling autonomous hovering with an error margin of less than 10 cm and linear flight with a deviation of less than 5%.
  - Integrated a Optical Flow module for waypoint navigation, allowing the UAV to simulate autonomous pesticide spraying in agricultural fields via pre-programmed routes.
  - Hardware assemble and debug, reducing the system weight by 15% through optimized circuit design (e.g., adopting surface-mount components to minimize bulk).

INTERNSHIP

- **HUAWEI Technologies Co., Ltd.** *Jun. 2025 - Aug. 2025*
  AI Software Development Engineer, MAE-M Development Department III Xi'an, China
  - Optimized Network Element (NE) log processing module, improving log synchronization efficiency and system stability by 15%.
  - Reengineered NELog handling requirements to align with current NElog synchronization tasks, reducing query latency by 30% and enhancing user response performance.
  - Developed and integrated new sub-tasks for the NEM platform workflow, standardizing task execution logic and ensuring web-to-server process continuity.
  - Conducted comprehensive analysis and modular restructuring of the CMAS log synchronization pipeline, reducing coupling between components and improving system maintainability.
- **Xi'an Jutong Magnetic Technology Co., Ltd.** *Jun. 2023 - Sep. 2023*
  Embedded Software Engineer, Research & Design Center Xi'an, China
  - Participated in the embedded system project implementation based on STM32 and C8051 chips, developed SPI communication algorithms and integrated transceiver functions.
  - Optimized the motor control system, reducing response time from 15ms to 3ms and improving control accuracy to 95%.
  - Conducted comprehensive edge device testing, achieving 89% pass rate in field trials (the only intern in the team to achieve this result).

HONORS AND AWARDS

Outstanding Graduate of Sichuan Province, *Awarded by Sichuan Provincial Department of Education.* 2023
National Scholarship, *Highest Scholarship awarded by Ministry of Education of the People's Republic of China.* 2022
National Scholarship for Encouragement, *Awarded by Ministry of Education of the People's Republic of China.* 2021
The First Prize of Undergraduate Scholarship, *Awarded by Sichuan Normal University.* 2020,2021

SKILLS

Programming Languages: Python, C, C++, Matlab, VerilogHDL, Javascript, Web3

Machine Learning Frameworks: PyTorch, TensorFlow, Scikit-learn

Embedded Systems & Hardware Design: STM32 Series (Cortex-M), TI MSP430/432 Microcontrollers, C8051-Based MCUs, PCB Design(EasyEDA), Hardware-Software Co-development

Languages: English (fluent), Chinese (native)