Ruihao Xi

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Shanghai, China

EDUCATION

- **Tongji University** *Sep. 2022 Jul. 2026*
  B.S. in Computer Science and Technology Shanghai, China
  - **GPA**: 4.84/5.00 | **Grade**: 93.37/100 | **Rank**: 2/52
  - **Relevant Coursework**:
    - Research Focus: Principles and Techniques of Artificial Intelligence; Pattern Recognition; Neural Network and Deep Learning;
    - Advanced Computer Science Foundations: Advanced Programming Languages; Principles of Compiler Design; Computer System Architecture
    - CS 188 Introduction to Artificial Intelligence (UC Berkeley); CS 15-445: Database Systems (CMU)
  - **Major Accomplishments**:
    - **National Scholarship for Undergraduate Students (2022-2023)**: Top 0.2 % nationwide; Chinas highest undergraduate government scholarship.
    - **Shanghai Municipal Government Scholarship for Undergraduate Students (2023-2024)**: Awarded to 1-2 students per college annually; provincial-level recognition.
    - **Joyce M. Kuok Foundation Excellent Scholarship (2024-2025)**: Awarded to 1-2 students per college annually;
    - **Outstanding Student | Tongji University (2022-2023; 2023-2024)** : Top 5% of students annually; awarded based on academic and extracurricular excellence.

RESEARCH INTERESTS

Multimodal learning with a focus on vision as a foundation for reasoning and knowledge acquisition; Developing **unified models** for integrating vision, language, and other modalities; Exploring **visual understanding** for complex reasoning, causality, and **cross-modal learning**.

PROJECTS EXPERIENCE

- **Real-Time Vision System for Robotics** *October 2024 -- Current*
  C++, OpenVino, YOLO, MPC **[(400+ Stars, 100 + Forks)]**
  - Designed and implemented automated targeting and shooting mechanisms for robotic vehicles, focusing on real-time object detection and tracking to enhance operational performance.
  - Developed and deployed a YOLO-based image recognition model on a custom dataset of armored plates, utilizing C++ and OpenVino for deployment.
  - Addressed environmental challenges (lighting variations, observer movement, motion control errors) through ROI optimization, yaw adjustment, and bitmap-based firing logic.
  - Led cross-functional collaboration: reduced rotational inertia with mechanical team, implemented latency command compensation with electrical team.
  - Enhanced real-time decision-making capabilities by integrating feedback loops and adaptive algorithms, ensuring robust performance in dynamic environments.
  - Achieved multiple top-tier awards, including:
    - RoboMaster 2025 Super Confrontation:
      - Champion (Eastern Region); National Top 8 (National Final)
      - Ranked #1 in overall auto-aim accuracy (Eastern Region).
      - Team robots (Sentry & Standard) earned 10+ MVP awards for performance.
    - RoboMaster 2025 University League:
      - 2nd Runner-up (3rd Place) (Shanghai Regional)

- **Real-Time 3D LiDAR SLAM and Relocalization System** *October 2025 -- Current*
  C++, ROS 2, Point-LIO, GICP

- Developed a robust 3D localization framework in ROS 2 integrating Point-LIO with wheel odometry for high-frequency state estimation, utilizing tight sensor fusion of IMU, wheel kinematics, and multi-model LiDARs.
- Engineered a global relocalization pipeline based on Generalized ICP for fast and precise point cloud registration, ensuring reliable recovery from tracking loss in complex dynamic environments.
- Implemented dynamic point cloud processing modules, including moving object detection and ROI optimization using PCL, to maintain map consistency and enhance downstream obstacle avoidance.
- Engineered a real-time perception-to-action pipeline by transmitting map-frame state estimates and target coordinates to the targeting node, facilitating ballistic trajectory computation and precise gimbal actuation.

- **Text-Driven 2D Motion Generation** *Jul. 2024 -- Jul. 2025*

Python

- Developed a model to generate 2D skeletal animations from textual descriptions, focusing on enhancing motion realism and adaptability across diverse input scenarios.
- Proposed a novel dataset for two-person interaction scenarios, addressing the gap in existing text-driven motion generation research that primarily focuses on single-person 3D motion.
- Curated and preprocessed the dataset by combining publicly available datasets with web-scraped data, followed by annotation using RTMPose and Owl3. Conducted rigorous data cleaning to remove inaccuracies, misidentified frames, and incomplete skeletal data.
- Designed and implemented a Transformer-based model with a custom attention mechanism to improve motion generation quality. Integrated deep reinforcement learning strategies to further optimize the models performance.
- Contributed to advancing research in text-driven motion generation by addressing limitations in existing datasets and methodologies, paving the way for more realistic and interactive motion synthesis.
- Authored a co-first author manuscript, "Toward Rich Video Human-Motion2D Generation" detailing this work, currently under review.

- **Mandelbrot Fractal Antenna Design** *Feb. 2023 -- Apr. 2024*

Python, MatLab

- Led automation modeling and simulation programming for antenna design, leveraging a combination of MATLAB, Visual Basic, and Python to enhance traditional algorithms and optimize design parameters.
- Developed a tile-based strategy in MATLAB to improve the escape-time algorithm, enabling high-precision generation of fractal structures and multi-connected fractal geometries.
- Automated simulation workflows by integrating Python with HFSS for parametric optimization and design validation, streamlining the antenna design process.
- Explored advanced design methodologies for high-profile Mandelbrot fractal antennas, contributing to innovative research in the field.
- Published two first-authored research papers:
  - A Multiband Microstrip Patch Antenna with Mandelbrot Fractal Structure at <conf>
  - An Automatized Simulation Method for Design of Mandelbrot Fractal Antenna at <conf>
- Secured a patent for the developed antenna design (Patent Application No.: 202311796896.4).

PROFESSIONAL EXPERIENCE

- **Zhijing Technology [🌐]** *September 2025 - November 2025*

Generative AI Intern Shanghai, China

- Developed a semantic-aware ranking model to address the copy-paste (data memorization) issue in the generative model, achieving 96% accuracy on the validation set.
- Integrated this model as a core reward function within an RL framework to optimize the generative model's output diversity and quality.
- Optimized the FlowGRPO algorithm by innovating its RL reward logic, inspired by Direct Preference Optimization (DPO).
- Redefined the 'lose-win' case classification, enabling the model to reach target performance 3x faster.

- **Oxford Suzhou Centre for Advanced Research [🌐]** *August 2025 - August 2025*
  Summer Research Intern Suzhou, China
  - Developed an AI-based image recognition solution to classify cells from microscope images, outputting statistical results while rejecting debris, overlapping, and partial cells.
  - Authored high-reliability, well-commented Python code and a step-by-step user guide; the solution is still actively used by team members.
  - Conceptualized a distributed hardware and software architecture for simultaneous control and monitoring of multiple automated cell bioreactors, focusing on reliability, stability, and scalability.

PATENTS AND PUBLICATIONS

UR=UNDER REVIEW, C=CONFERENCE, J=JOURNAL, P=PATENT, S=IN SUBMISSION, T=THESIS

[UR] Ruihao Xi, et al. (2025). **Toward Rich Video Human-Motion2D Generation**. *arXiv preprint arXiv:2506.14428*.

[C.2] Ruihao Xi, et al. (2024).**An Automatized Simulation Method for Design of Mandelbrot Fractal Antenna**. In *International Conference on Microwaves, Communications, Antennas and Electronic Systems* (IEEE COMCAS 2024). DOI: 10.1109/COMCAS58210.2024.10666225

[C.1] Ruihao Xi, et al. (2023).**A Multiband Microstrip Patch Antenna with Mandelbrot Fractal Structure**. In *PhotonIcs and Electromagnetics Research Symposium* (PIERS 2023). DOI: 10.1109/PIERS59004.2023.10221535

[P.1] Ruihao Xi, et al. (2023). **Mandelbrot Fractal Antenna Design**. Patent Office. Patent Application No. 202311796896.4. Status: Patent Pending.

AWARDS AND COMPETITIONS

- **Gold Award (0.02% - state level)**,China International College Students Innovation and Entrepreneurship Competition 2024
- **Second Prize (approx. 10% - state level)**, The Contemporary Undergraduate Mathematical Contest in Modeling 2024
- **Honorable Mention (approx. 21% - international)**, 2024 Mathematical Contest in Modeling (MCM/ICM, USA) 2024
- **Science & Technology Rising Star Award**, 22nd Shanghai International Youth Science & Technology Competition Innovation Contest 2024
- **"My Favorite Project" Award**, The 2024 National Undergraduate Innovation Conference 2023
- **First Prize**,The 18th Challenge Cup National College Students Extracurricular Academic Science and Technology Contest (High-Tech Track) 2023
- **First Prize (< 8%)**, 15th Shanghai Municipal College Student Mathematics Contest (Higher Education Press Cup) 2023
- **First Prize (< 8%)**, 15th National College Student Mathematics Contest 2023

SKILLS

- **Programming Languages:** Python(Expert), C++(Expert), Java(Intermediate), MATLAB(Intermediate)
- **AI/ML Frameworks:** PyTorch(Expert), related deep learning libraries(Advanced)
- **Robotics & 3D Perception:** ROS 2(Intermediate), Point Cloud Library(Intermediate), SLAM(Intermediate)
- **Tools & Environments:** Git/GitHub(Advanced), VSCode(Advanced), Linux(Advanced), Anaconda(Advanced)
- **Other:** MySQL(Intermediate), FPGA development(Intermediate), web deployment(Intermediate), network configuration(Intermediate)