# Ruiyang Zhang

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Ruiyang-061X | Ruiyang Zhang

## Introduction

Ruiyang Zhang is a Ph.D. candidate at the University of Macau. He receives his B.S. in Computer Science and Technology from Fudan University.

His research focuses on enhancing the **reasoning** and **tool use capabilities** of **multimodal agents** through reinforcement learning. He previously worked on exploring the uncertainty of large multimodal models and on 3D object detection in unsupervised settings.

## Education

**University of Macau** *Aug. 2024 -*
Ph.D. in Faculty of Science and Technology Macau SAR
Advisor: **Prof. Zhedong Zheng**

**Fudan University** *Sept. 2017 - Jun. 2021*
B.S. in Computer Science and Technology Shanghai, China

## Research Experience

**Research Intern @ IDEA** *Octo. 2025 -*
Mentor: Dr. Yiyan Qi Shenzhen, China

- Topics: Developing long-horizon multimodal search agent via reinforcement learning (RL)
- Responsibilities: (1) Build the RL infrastructure required to develop multi-turn tool-using multimodal search agent, including tool implementation, caching mechanism, and RL framework adaptation. (2) Build long-horizon, multi-turn multimodal search agent in real-world web environment via reinforcement learning. Propose a systematic post-training framework for multimodal search agents, including Iterative Injection-based Data Synthesis, Rejection Sampling Fine-tuning, and RL.

**Research Intern @ Shanghai AI Lab** *May 2025 - Sept. 2025*
Mentor: Dr. Dongzhan Zhou Shanghai, China

- Topics: Leveraging RL to incentivize sketch-style reasoning in large multimodal models
- Project: SketchThinker-R1
- Responsibilities: (i) Devise Sketch-Mode Cold Start to instill initial sketch-style reasoning into base multimodal model; train SketchJudge reward model to pose supervision on thinking style during the RL stage; conduct Sketch-Thinking Reinforcement Learning to further generalize sketch-style reasoning. (ii) Evaluation on benchmarks across various domains, showing that SketchThinker-R1 achieves over 64% reduction in thinking cost without compromising answer accuracy.

## Selected Award

- Second Prize, China Undergraduate Mathematical Contest in Modeling (CUMCM) 2019
- Third Class Scholarship for Outstanding Students, Fudan University 2018 & 2019
- First Prize, Chinese Mathematical Olympiad in Jiangsu Province (CMO) 2016
- First Prize, National Olympiad in Informatics in Jiangsu Province (NOIP) 2014 & 2015

## Publication

1. **[ICCV 2025] Harnessing Uncertainty-aware Bounding Boxes for Unsupervised 3D Object Detection**
   Ruiyang Zhang, Hu Zhang, Hang Yu, Zhedong Zheng
   [Paper] | [Code]
   - Aim to mitigate the negative impact of noisy pseudo boxes.

2. **[ECCV 2024] Approaching Outside: Scaling Unsupervised 3D Object Detection from 2D Scene** [30+ Github Stars]
   Ruiyang Zhang, Hu Zhang, Hang Yu, Zhedong Zheng
   [Paper] | [Code]
   - Enhance detection of far and small objects via LiDAR and 2D data fusion.

## Preprint

1. **[Preprint] SketchThinker-R1: Towards Efficient Sketch-Style Reasoning in Large Multimodal Models**
   Ruiyang Zhang*, Dongzhan Zhou*, Zhedong Zheng
   [Paper] | [Code]
   - Incentivize sketch-style reasoning in large multimodal models to improve reasoning efficiency.

2. **[Preprint] Uncertainty-o: One Model-agnostic Framework for Unveiling Epistemic Uncertainty in Large Multimodal Models**
   Ruiyang Zhang, Hu Zhang, Hao Fei, Zhedong Zheng
   [Paper] | [Code] | [Website]
   - Applicable to both large comprehension model and large generation model.

3. **[Preprint] VL-Uncertainty: Detecting Hallucination in Large Vision-Language Model via Uncertainty Estimation** [30+ Citations]
   Ruiyang Zhang, Hu Zhang, Zhedong Zheng
   [Paper] | [Code] | [Website]
   - Preliminary attempt for understanding uncertainty in LVLM.

## Skill

**Programming**: Python (Pytorch), C/C++, Java, MATLAB
**Language**: English (IELTS 7.0/9.0), Chinese (Native)

## Work Experience

**Meituan** *Jul. 2021 - Jun. 2023*
Backend Development Engineer Shanghai, China

## Open Source

1. **[Awesome List] Awesome-MLLM-Uncertainty** [50+ Github Stars] [Code]
   - Curated list of papers on the uncertainty in multi-modal large language model (MLLM).

2. **[Awesome List] Awesome-MLLM-Reasoning** [Code]
   - Curated list about reasoning abilitiy of MLLM, including OpenAI o1, OpenAI o3-mini, and Slow-Thinking.