

# Kaiwen TUO

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## EDUCATION

### Tongji University

*Bachelor of Computer Science and Technology (Elite Class)* **GPA: 4.90 / 5** **Rank: 1 / 52**

Shanghai, CN

2022 – 2026

### The Hong Kong University of Science and Technology

*Incoming Ph.D. at Computer Science and Engineering, advised by Prof. Jiaya Jia (IEEE Fellow)*

Hong Kong, CN

2026 – 2030

**Research Interest:** Multi-modal Large Language Model, Post-training, Model Compression

## SELECTED HONORS

**National Scholarship 2022 – 2023** (national-wide), Tang Zhongying Moral Scholarship (**top 0.5%**)

**National Scholarship 2023 – 2024** (national-wide), Outstanding Student Model (**top 0.1%**),

**National Scholarship 2024 – 2025** (national-wide), Inspirational Honorable Mention Award (**top 0.05%**)

## PUBLICATIONS (\*Equal contribution)

**SparseSSM: Efficient Selective Structured State Space Models Can Be Pruned in One-Shot**

**Kaiwen Tuo**, Huan Wang.

*Under Review, submitted to top-tier conference* [\[arXiv\]](#) | [\[Code\]](#) | [\[Webpage\]](#).

**RewardMap: Tackling Sparse Rewards in Fine-grained Visual Reasoning via Multi-Stage Reinforcement Learning**

Sicheng Feng\*, **Kaiwen Tuo\***, Song Wang, Lingdong Kong, Jianke Zhu, Huan Wang.

*Under Review, submitted to top-tier conference* [\[arXiv\]](#) | [\[Code\]](#) | [\[Webpage\]](#) | [\[Dataset\]](#) | [\[Reported by Jiqizhixin\]](#).

## RESEARCH EXPERIENCE

### Reinforcement Learning on Map-Centric Multimodal Data for Spatial Reasoning

Jul. 2025 – Oct. 2025

*Advisor: [Huan WANG](#)*

*Encode Lab, Westlake University*

- Expanded ReasonMap into ReasonMap-Plus: 30 cities, 4,018 high-resolution samples; annotated difficulty; 5 question types covering counting and verification.
- Designed a difficulty-aware fine-grained reward and multi-stage RL curriculum to tackle sparse-reward learning.
- Achieved state-of-the-art results on ReasonMap/ReasonMap-Plus, matching or surpassing top open-source and some closed-source MLLMs and delivered consistent gains across 6 external benchmarks. Paper was submitted to **top-tier AI conference**.

### Efficient Selective Structured State Space Models Can Be Pruned in One-Shot

Feb. 2025 – Jun. 2025

*Advisor: [Huan WANG](#)*

*Encode Lab, Westlake University*

- Developed a training-free OBS-based pruning strategy for Mamba-based LLMs, surpassing current SOTA in performance.
- Existing pruning methods primarily target Transformer architectures, cannot be directly transferred to Mamba.
- Implemented fast, unstructured pruning for Mamba-based LLMs using a single GPU, with no performance degradation at 50% sparsity. Paper was submitted to **top-tier AI conference**.

## SELECTED COMPETITIONS

### China International College Students' Innovation Competition (Top 0.2%)

Mar. 2024 – Sep. 2024

- Won Gold Prize of the Shanghai Provincial Competition as the **founder and leader** of the team.
- Led a startup team, developed a comprehensive business model for façade damage detection, designed the hardware layout, and deployed the detection algorithm, Planning to establish a company in the near future.

### National Mathematical Modeling Contest, Shanghai Second Prize (Team Leader)

Sep. 2024

- Served as **team leader**, responsible for paper writing and algorithm refinement.
- Integrated simulated annealing, SAT-based separating-axis collision detection, binary search, and BFGS optimization to conduct an in-depth study of the bench-dragon movement dynamics.

### Second Prize, 15th National College Student Mathematics Competition

Nov. 2023

### Top Prize, National AI Application Scenario Innovation Competition – Thematic Track

Nov. 2024

## LEADERSHIP

### President of Tongji Commercial and Investment Club

Oct. 2023 - Present

- Connected and maintained relationships with 300+ outstanding alumni in business and STEM fields.
- Led club operations and handled key responsibilities such as annual event planning, recruitment drives, and alumni-industry engagement. Manage multiple internship information-sharing groups.

### "TJeduTeens" Founder & Contact Person

Jan. 2023 - Mar. 2023

*Tongji University*

- Investigated the implementation of double reduction, integrated the strengths of universities and community.
- Liaised with the Guirenmao Community in Yan'an City, Shaanxi, and communicated with several staff members.

## TECHNICAL SKILLS

**Tech Stack (selected):** Python, Pytorch, C/C++, Latex, Linux, Git, Slides Design, Other essential tools for research

**Hobbies (selected):** Volunteer Service (**106h**), Quantitative trade (Attend J.P. Morgan's AWMC), Chinese characters