# Haoyu Dong

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## Education

**Columbia University**          Sep 2024 – Dec 2025 (Expected)
*MS in Electrical Engineering*          GPA: 4.07/4.0

- **Awards:** 2025 Spring MS Honors Students as top 10% of the program.

**Xi'an Jiaotong University**          Sep 2020 – Jul 2024
*BE in Automation*          GPA: 3.51/4.3

- **Awards:** Excellent Student Scholarship, XJTU, Academic Year 2022-2023

## Research Interest

**Focus:** Efficient use of **data** and **training** to build trustworthy **multimodal** intelligent systems for complex real-world tasks.
**Keywords:** Multimodal LLMs; Self-supervised/RL Post-training; Trustworthy Reasoning

## Publications

Zhang, Z., **Dong, H.**, Pei, K. & Mao, C. (2025). *Cross-Modal Cycle Consistency Rewards Improve Multimodal Reasoning* ↗. (Under review; preprint available online.)

Zang, C., **Dong, H.**, Turkcan, M. K., Ghaderi, J., Zussman, G., & Kostic, Z. (2025). *Adaptive Data Collection for Robust LLM Post-training.* (Manuscript in Preparation.)

## Research Experience

**Cross Modality Self-play for Data-Free Training**          New York, NY
*Research Assistant* | Advisor: Prof. Chengzhi Mao          Aug 2025 – Now

- Proposed $R-C^2$, a cycle-consistency reward framework that resolves the modality gap in multimodal LLMs by replacing unstable majority-vote self-improvement with cross-modal self-verification.
- Designed four-path answer–query–answer cycles (T→T, T→I, I→T, I→I) to generate dense, label-free RL signals that correct cross-modal conflicts and stabilize multimodal reasoning.
- Achieved up to +7.6 pp accuracy and +10 pp consistency gains over Qwen-VL baselines and voting-based methods across six multimodal benchmarks including ScienceQA, ChartQA, MathVista, and VWA.
- Submitted as a full paper to CVPR 2026 and currently under review.

**Adaptive Data Sampling in LLM Post-training**          New York, NY
*Research Assistant* | AIDL Lab, Columbia University | Advisor: Prof. Zoran Kostic          Feb 2025 – Aug 2025

- Introduced a source-aware adaptive sampler for LLM that optimizes LLM post-training efficiency in online scenario.
- Formulated sampling as an adversarial multi-armed bandit; estimate per-source utility from training dynamics; update via UCB/EXP3 bandit under a fixed sampling budget; evaluate on GSM8K math reasoning against uniform sampling baselines.
- Obtained +5 pp accuracy on math reasoning and reached baseline performance with 10% fewer sampling budgets.

**Enhanced Visual Reasoning Framework for Verifiable Language Model VQA**          New York, NY
*Leader* | Advisor: Prof. Zoran Kostic          Jan 2025 – Apr 2025

- Designed a visual reasoning framework with agentic consensus to reduce hallucination & inconsistency in knowledge-based VQA.
- Evidence-dense captioning (multi-view signals distilled into a single, entity/attribute-grounded scene description) + K-agent self-consistency (majority vote with rationale-consistency checks); evaluated on A-OKVQA / OK-VQA against strong CoT baselines.
- Achieved +13 pp overall accuracy improvement over vanilla CoT baselines; ablation shows +9 pp from evidence-dense captioning and +4 pp from agentic voting.

**Linear-Time Rotary-Positional Attention for Efficient Vision Transformers**          New York, NY
*Leader* | Advisor: Prof. Krzysztof Choromanski          Sep 2024 – Mar 2025

- Introduced RoPerformer, a ViT with rotary-linear attention to remove the quadratic attention bottleneck in high-resolution image classification while preserving relative positional bias.
- RoPerformer-ViT on ImageNet-1K; ablate projection rank r and 1D vs 2D RoPE; baselines: vanilla ViT under identical training.
- Cut step-time by 30–40% and peak VRAM by 25–35% at 384–512 px, holds Top-1 parity at 224 ($\pm$0.2 pp), and yields

$+0.6$–$1.0$ pp Top-1 at higher resolutions; enables $1.6$–$2.0\times$ larger batch under the same memory.

## Academic Service

**Conference Reviewer** — *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*     2026
- ○ Reviewer for CVPR 2026.

## Teaching & Academic Engagement

**Research Assistant** — *CM Lab, Rutgers University*     Aug 2025 – Jan 2026
- ○ Led WebGuard Arena for adversarial self-play Web agent safety, and contributed to $C^3R$ cross-modal self-play with cycle-consistency rewards for label-free multimodal post-training.

**Teaching Assistant** — *Electrical Engineering, Columbia University*     Sep 2025 – Dec 2025
- ○ Contributed to a graduate-level Deep Learning course. Assisted with assignments design & final coding projects assistance.

**Research Assistant** — *AIDL Lab, Columbia University*     Jan 2025 – Aug 2025
- ○ Contributed to the project on data collection for LLM post-training. Worked under NSF traffic project.

## Skills

**Languages:** Python, MATLAB, Shell, C, LaTeX, Markdown, HTML
**Libraries & Tools:** PyTorch, TensorFlow, Hugging Face Transformers, Verl, Git, LLM APIs.