

# Zehua Wang

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## EDUCATION

- **Massachusetts Institute of Technology — GPA: 5.00/5.00** Cambridge, MA  
*B.S. in Physics/Artificial Intelligence and Decision Making* Aug 2025 – Present
- **Tsinghua University — GPA: 3.95/4.00** Beijing, China  
*Preparatory Program and Freshman Year in Institute for Interdisciplinary Information Sciences (IIIS)* Aug 2024 – July 2025

## HONORS & AWARDS

- **Gold Medal (1st in Theory)**, 54th International Physics Olympiad (IPhO) July 2024
- **Gold Medal (3rd Place)**, 9th Romanian Master of Physics (RMPH) March 2023
- **2nd Place Modal Prize**, HackMIT 2025 Sept 2025
- **1st Place**, MIT Informatics Tournament (MITIT) 2025 Winter Contest Beginner's Round Dec 2025
- **Xuetangban Scholarship & Freshman Scholarship**, Tsinghua University Dec 2024

## EXPERIENCE

- **Undergraduate Researcher, Diffusion Models & Molecular Dynamics** Cambridge, MA  
*MIT; Supervised by Prof. Tommi Jaakkola* Feb 2026 – Present
  - Researching the intersection of diffusion models and molecular dynamics.
- **Undergraduate Researcher, Reinforcement Learning & Embodied AI** Cambridge, MA  
*FortyFive AI Lab, MIT; Supervised by Dr. Ge Yang* Oct 2025 – Present
  - Developing RL and imitation learning pipelines for humanoid whole-body control; investigating scaling laws for policy performance and generalization.
  - Contributed to productionization of **Vuer** (3D visualization) and **ML-Dash** (experiment tracking & data storage).
- **Undergraduate Researcher, Learning-based Control** Beijing, China  
*Tsinghua University; Supervised by Prof. Huazhe Xu* Mar 2025 – Aug 2025
  - Investigated RIR (RL to Imitation to Real-world) framework for robot manipulation on Franka arm, leveraging PPO and DrQ-v2.
  - Designed multi-stage approach for specialist training and multitask generalization via imitation learning and sim-to-real transfer.

## PROJECTS

- **Fast Humanoid Loco-Manipulation via Flow Matching (MIT 6.4210)**: Compared DDPM and Flow Matching for humanoid control via trajectory synthesis, achieving faster inference with FM. At 5-NFE, FM achieves **820 vs. 280 survival steps**. Zero-shot loco-manipulation from walking-only data via test-time classifier guidance. [Code] [Video]
- **RL vs. SFT for Mathematical Reasoning in LLMs (MIT 6.4610)**: Compute-controlled comparison of PPO, GRPO, GMPO, RLOO against SFT on Qwen3-8B. GMPO achieves **74.2%** on GSM8K (vs. SFT 76.7%), demonstrating RL can match SFT without step-by-step supervision. [Code]
- **Enhancing Diffusion Models with RL and Adversarial Rewards**: Formulated reverse diffusion as MDP with adversarial discriminators, achieving **21.7% FID reduction** vs. baseline. Plug-and-play for existing models. [Code & Report]
- **PaperPlay: Hand-drawn Sketches to Playable Games (HackMIT 2025)**: Built system turning sketches into games using OpenCV, physics engine, and real-time AI commentary. [Demo] [Video]
- **Consistent Local Video Editing via Attention Manipulation (CLEVAM-DM)**: Training-free framework for local video editing using **BrushNet inpainting**, **DDIM inversion**, and **PerVFI** for temporal coherence. [Code & Report]
- **Daily Papers: Personalized ArXiv Research Digest**: Agentic LLM pipeline for autonomous paper discovery: multi-step relevance filtering, ranking, and summarization over arXiv/HuggingFace feeds with automated email delivery. [Code]
- **Algorithm Design for the Metric k-Center Problem**: Authored survey and evaluation framework. Proposed algorithms achieving empirical approximation ratio **1.049** (vs. SCR 1.064). [Code & Survey]

## RELEVANT COURSEWORK

**ML/AI**: Symmetry & Applications to ML (6.7970/8.750), Advances in Computer Vision (6.8300), Robotic Manipulation (6.4210), Natural Language Processing (6.4610), Computer Vision (6.4300), Deep Learning (Tsinghua), Intro to Inference (6.3800), Intro to Machine Learning (6.3900)

**Math/Theory**: Quantum Computation (18.435), Quantum Physics II (8.05), Design & Analysis of Algorithms (6.1220), Mathematics for CS and AI (Tsinghua)

## SKILLS

**Programming**: Python (PyTorch), C++

**Languages**: English (Fluent), Chinese (Native)