

Ziyue Peng

<https://bjxdw.github.io/> | bjxdw123@gmail.com | +1 737-296-3305

EDUCATION

The University of Texas at Austin
Ph.D. in Computer Science

Austin, United States
Aug.2026 - Jun.2031

Zhejiang University

B.Eng. in Robotic Engineering (Honors)

GPA: 4.18/4.3

Rank: 1/44

Hangzhou, China
Sept.2022 – Jun.2026

University of Toronto

Exchange Student, Electrical and Computer Engineering

GPA: 3.93/4.00

Toronto, Canada
Sept.2024 – Dec.2024

RESEARCH INTERESTS

I am broadly interested in Computer Vision and Graphics, with a particular focus on Physical Understanding. My research explores how AI systems can infer physical properties from video data, how to leverage this knowledge to equip visual foundation models with physical reasoning, how incorporating physical laws can enhance the realism and consistency of generative models, and how neural networks can accelerate physical simulation while narrowing the sim-to-real gap.

SELECTED AWARDS

- Chu Ko-Chen Scholarship (*Highest Honor at Zhejiang University, top 12 undergraduates*) 2025
- Zhejiang University First-Class Scholarship 2023 & 2024
- Zhejiang University Outstanding Student Award 2023 & 2024
- First Prize in National College Students Mathematics Competition 2023
- First Prize in Zhejiang Province College Students Physics Competition 2023
- First Prize in Zhejiang University Robot Competition 2024
- First Prize in the National Olympiad in Informatics 2020

PUBLICATIONS

- **Ziyue Peng**, Yanxi Hu, Etienne Vouga, Chandrajit Bajaj, William T. Freeman, Qixing Huang, Brandon Y. Feng, "Understanding Physics from Real-World Videos" in *SIGGRAPH 2026* (under review).
- Yi Yang, **Ziyue Peng**, Kang Zhang, Xincheng Tan, Fan Lu, Jingting Ding, Kecheng Zheng, Minfeng Zhu, Wei Chen, "HiTag: Hierarchical Image Tagging with Hyperbolic Vision-Language Modeling" in *ECCV 2026* (under review).
- Radian Gondokaryono, **Ziyue Peng**, Lueder A. Kahrs, "MI3D-NeRF: Metric Neural 3D Reconstruction for Minimally Invasive Surgery Scenes" in *T-RO 2026* (under review).

RESEARCH PROJECTS

Physical Understanding from Real-World Video

The University of Texas at Austin

Advisors: Qixing Huang, Brandon Y. Feng, Chandrajit Bajaj, Etienne Vouga

Jun.2025 – Jan.2026

- Leading a research project studying the understanding of dynamic objects from video that extends beyond geometry into physics. Unlike recent works focused on synthetic data, this project focuses on generalization to real-world data.
- Modified the Material Point Method (MPM) simulator for greater physical accuracy, and created a large-scale synthetic dataset of 200K video-physical parameter pairs of objects dropping to the ground.
- Established geometric representations (i.e., dense pixel depth and optical flow) that exhibit minimal domain gaps between real and simulated videos to make training on synthetic data generalizable; designed and fine-tuned the model from a pre-trained visual understanding network to leverage priors and significantly boost real-world performance.
- Captured and processed a real-world dataset of 100 videos (20 objects \times 5 trials) and established a benchmark to measure real-world prediction: reconstructing 3D scenes, simulating with predicted physical parameters, and comparing the rendered video with the real one; Experiments showed that our method outperforms all baselines on real-world predictions.

Hierarchical Image Tagging with Hyperbolic Vision-Language Modeling

Zhejiang University

Advisors: Wei Chen, Minfeng Zhu

Jan.2025 – Jun.2025

- Proposed HiTag, a novel hierarchical image tagging method and benchmark capable of explicitly capturing parent-child concept relationships (e.g., Shiba Inu \rightarrow Dog \rightarrow Animal) in in-the-wild images.
- Constructed a 10-level, 3,334-word hierarchy by integrating WordNet and YAGO; utilized large vision-language models to annotate 2.87M training images (CC3M) and manually verified 57K test images (OpenImages).
- Designed and trained a Hyperbolic Vision-Language Model that embeds images, captions, and hierarchical tags into hyperbolic space, leveraging its inherent geometric capacity to encode tree-structured data.
- Established comprehensive evaluation metrics (including Tree Edit Distance, Hierarchical Precision/Recall) and achieved SOTA performance in zero-shot hierarchical image tagging; Co-authored the paper submitted to CVPR 2026.

Sim2Real Style Transfer for Surgical Robot Rope Cutting

University of Toronto

Advisor: Lueder Kahrs

Nov.2024 – Dec.2024

- Developed a Sim2Real pipeline for autonomous rope-cutting tasks on the dVRK surgical robot; bridged the visual domain gap by integrating diffusion-based style transfer directly into the Reinforcement Learning (RL) training loop in Unity.
- Leveraged 16 parallel Unity environments (15 vanilla, 1 stylized) for PPO-based RL. At each decision step, replaced that 1 environment's visual observation with the stylized frame and pushed all 16 environments into the mlagents' buffer.
- To make style transfer stable and fast, implemented a modified Stable Diffusion pipeline by injecting Query Q and Key K features (extracted from real surgical images during DDIM inversion) into the simulation frames during DDIM reversion, effectively injecting realistic textures while strictly preserving semantic content.
- Applied domain randomization across lighting conditions, camera viewpoints, and cutting-target positions to enhance policy robustness; real-robot deployment and further modifications are currently being conducted by lab collaborators.

Multi-robot's Navigation and Exploration Based on Omnidirectional Control

Zhejiang University

National Innovation Program Advisor: Yuanchao Shu

Jun.2023 – May.2024

The project was recognized as a national-level outstanding project.

- Developed a modular and reusable software framework for Mecanum-wheeled robots, including control, mapping, localization, navigation, and exploration; this platform supports both single- and multi-robot systems to validate high-level planning algorithms in ROS simulations and real-world environments.
- Optimized omnidirectional control and navigation by implementing a recovery mechanism that dynamically reduces inflation layers in narrow passages, enhancing maneuverability while ensuring collision-free motion in constrained environments.
- Refined RRT-based exploration and frontier management by incorporating Busy Cost Weighting to avoid repeated assignments, Forward Exploration Weighting to mitigate radar blind spots, Frontier Width Filtering to exclude pseudo-frontiers in unreachable narrow gaps, and a TF Waiting Routine to prevent coordinate calculation errors caused by latency.

LEADERSHIP

Student Innovation and Entrepreneurship Center, Zhejiang University

Sep.2023 – Jun.2024

Vice President

- Led cross-sector collaboration among university administration, research laboratories, industry partners, and alumni networks to support student startups; managed the daily operations of the Innovation & Entrepreneurship Base.
- Organized the annual "Entrepreneurship Journey" competition, providing a platform for students to pitch innovative ideas to industry leaders and investors for professional mentorship and seed funding.

SERVICES

Orientation Program, Zhejiang University

Aug.2023 – Sep.2023

Student Mentor, Robotics Engineering Class of 2027

- Led a mentor team to host orientation events and alumni seminars, helping freshmen adapt to campus life; provided personal guidance on course selection and academic planning.
- Organized peer study groups for challenging core courses to help freshmen quickly adapt to college-level coursework.

The Hangzhou 19th Asian Games

Aug.2023 – Oct.2023

Technology Volunteer

- Managed the Results Printing and Distribution System (RPDS) for accurate and timely score dissemination.
- Served as an English interpreter connecting international basketball teams with local technical staff.

ACTIVITIES

Varsity Swimming Team, Zhejiang University

Oct.2023 – Jun.2024

Team Member

- Bronze Medal in Men's 50m Breaststroke at Zhejiang University Swimming Competition, 2023
- Gold Medal in "Speed Rescue" at Zhejiang University Swimming Competition, 2023

Piano Association, Zhejiang University

Sept.2022 – Jun.2024

Pianist and Tutor

- Organized the annual campus concert and provided piano tutoring to student enthusiasts.
- Invited by Steinway to perform Debussy's *Arabesque* for a Mother's Day recording special; served as the piano accompanist for the University Anthem at the Freshman Choir Competition.