

Zhihan Zhu

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Education

Southern University of Science and Technology (SUSTech), B.S. in Information Engineering Sept. 2023 – Present

- GPA: 3.87/4.00; Weighted Average Score: 92.44; Ranking: 10/48; Expected Graduation: June 2027.
- Relevant coursework: Linear Algebra, Probability and Statistics, Engineering Mathematics, AI and Machine Learning, Statistical Learning for Data Science.

Research Interests

Generative AI, with a focus on Diffusion Models and Flow Matching, Rectified Flow Inversion and Semantic Editing, Multimodal Large Language Models, LLM Agents, Long-Video Understanding, and Visual Memory.

Selected Papers

HyGRAIL: Cost-Aware and Evidence-Grounded Scientific Hypothesis Discovery over Knowledge Graphs Under Review, 2026

Yihang Sun, **Zhihan Zhu**, Zhiyuan Jiang, Jingyi Ge, Zixuan Li, Jiaxuan You. *EMNLP 2026*, under review.

- Developed the knowledge-graph evidence retrieval component and contributed to LLM Agent design, main experiments, baseline evaluation, and manuscript preparation.

Runge-Kutta Approximation and Decoupled Attention for Rectified Flow Inversion and Semantic Editing Under Review, 2025

Weiming Chen, **Zhihan Zhu**, Yijia Wang, Zhihai He. *arXiv:2509.12888 [cs.CV]*. *IEEE Transactions on Image Processing (TIP)*, under review. doi.org/10.48550/arXiv.2509.12888

- Led the design and early implementation of Runge–Kutta-based high-order inversion and DDTA; conducted major ablation and comparison experiments and contributed to manuscript preparation.

Generative Semantic Coding for Ultra-Low Bitrate Visual Communication and Analysis Under Review, 2025

Weiming Chen, Yijia Wang, **Zhihan Zhu**, Zhihai He. *IEEE Transactions on Image Processing (TIP)*, under review. *arXiv:2510.27324 [cs.CV]*. doi.org/10.48550/arXiv.2510.27324

- Contributed to framework implementation, visual reconstruction and downstream analysis experiments, experimental analysis, and manuscript preparation.

Latent Bias Alignment for High-Fidelity Diffusion Inversion in Real-World Image Reconstruction and Manipulation Under Review, 2026

Weiming Chen, Qifan Liu, Siyi Liu, Yijia Wang, **Zhihan Zhu**, Zhihai He. *IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)*, under review. *arXiv:2603.23903 [cs.CV]*. doi.org/10.48550/arXiv.2603.23903

- Implemented and evaluated one group of method variants for real-image diffusion inversion, analyzed experimental results, and contributed to manuscript preparation.

Research Experience

Undergraduate Researcher, Artificial Intelligence Lab, SUSTech Sept. 2024 – Present
Advisor: Prof. Zhihai He (IEEE Fellow)

- Led method design and early implementation for Rectified Flow inversion and semantic editing, including Runge–Kutta-based high-order inversion and Decoupled Diffusion Transformer Attention.
- Contributed to generative semantic coding for ultra-low-bitrate visual communication, including reconstruction and downstream visual analysis experiments.
- Built one-step diffusion super-resolution pipelines using MeanFlow and SDXL-Turbo and explored retrieval-based references for local texture restoration.

Research Intern, Northwestern University Mar. 2026 – Present
MLL Lab; Project: Language-Conditioned Visual Memory for MLLMs

- Built visual representation and compression pipelines using visual encoders and studied text-conditioned compact

visual memory for multimodal models.

- Explored separating language-covered semantics from complementary visual information to reduce redundancy in visual memory.

Research Intern, University of Illinois Urbana-Champaign (UIUC)

Mar. 2026 – June 2026

U Lab; Project: HyGRAIL – Scientific Hypothesis Discovery over Knowledge Graphs

- Built a knowledge-graph evidence retrieval pipeline that extracts node information and multi-hop paths from GNN candidate predictions for LLM-based review.
- Contributed to LLM Agent prompt and decision-flow design, conducted the main experiments and approximately half of the baseline experiments, and participated in manuscript preparation.

Patents

- Zhihai He, Weiming Chen, **Zhihan Zhu**, Yijia Wang, Jian Ouyang. *Image Editing Method Based on Attention Decoupling, Device, Terminal and Storage Medium*. Chinese Invention Patent, App. No.: CN 2025112816451, under examination.
- Zhihai He, Weiming Chen, Yijia Wang, **Zhihan Zhu**. *Ultra-Low-Bitrate Image Compression and Reconstruction Method, System and Storage Medium*. Chinese Invention Patent, App. No.: CN 202511281423X, under examination.

Awards & Honors

- Gold Award (Guangdong Provincial Level, Top 0.02%), “Yunjing Zhiyu” - Intelligent Aquaculture System, China International College Students’ Innovation Competition, 2025.
- Outstanding Student, Southern University of Science and Technology, 2025 and 2024.
- Second-Class Scholarship for Academic Excellence, SUSTech, 2024–2025; Third-Class Scholarship for Academic Excellence, SUSTech, 2023–2024.
- 6th Place, Men’s 400m, 9th SUSTech Athletics Games.

Technical Skills

Programming: Python, C/C++ , Java, MATLAB.

Deep Learning: PyTorch, Hugging Face Diffusers, Stable Diffusion, FLUX, SDXL, DiT, ControlNet, VAE, GNNs, vLLM, verl, and LLM/MLLM pipelines.

Systems: Linux, Git, CUDA, HPC/LSF, multi-GPU training, LaTeX.

Languages: Chinese (native), English (IELTS 7.0, CET-6 545).