Zhihan Zhu

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Education

Southern University of Science and Technology (SUSTech) Aug. 2023 – Present
B.S. in Information Engineering; Expected Graduation: June 2027.
GPA: **3.87/4.00**; Weighted Average Score: **92.44**; Academic-year GPA Rank: **3/48**.

Relevant coursework: Linear Algebra, Probability and Statistics, Engineering Mathematics, AI and Machine Learning, Statistical Learning for Data Science.

Northeast Yucai School (NEYC) Sept. 2020 – June 2023
High school education, Shenyang, China.

Research Interests

Generative AI, Multimodal Learning, LLM Agents, and Video Understanding.

Research Experience

Southern University of Science and Technology (SUSTech) Sept. 2024 – Present
Undergraduate Researcher, Artificial Intelligence Lab; Advisor: Prof. Zhihai He (IEEE Fellow).
Research on image reconstruction, editing, and compression with generative models.

University of Illinois Urbana-Champaign (UIUC) Mar. 2026 – June 2026
Research Intern, U Lab; Advisor: Prof. Jiaxuan You.
Research on scientific hypothesis discovery using LLM agents and structured evidence.

Northwestern University Mar. 2026 – Present
Research Intern, MLL Lab; Advisor: Prof. Manling Li.
Research on language-conditioned visual memory for multimodal models.

Research Projects

Image Reconstruction and Editing with Generative Models SUSTech

- Led method design and early implementation of image inversion and attention-based editing, conducted major ablation and comparison experiments, and contributed to manuscript preparation. [P1]
- Implemented and evaluated a group of diffusion-inversion variants, analyzed results, and contributed to manuscript preparation. [P3]

Generative Models for Efficient Visual Communication SUSTech

- Contributed to methodological discussions and experimental design; implemented parts of the framework, evaluated image reconstruction and downstream visual analysis, and helped prepare the manuscript. [P2]

LLM Agents for Scientific Hypothesis Discovery UIUC

- Built the evidence retrieval pipeline and contributed to agent prompts and decision flows; conducted the main experiments and approximately half of the baselines, and helped prepare the manuscript. [P4]

Language-Conditioned Visual Memory Northwestern University

- Built visual representation and compression pipelines; explored separating language-covered semantics from complementary visual information to reduce redundancy in multimodal memory.

Publications

[P1] **Runge-Kutta Approximation and Decoupled Attention for Rectified Flow Inversion and Semantic Editing.**
Weiming Chen, **Zhihan Zhu**, Yijia Wang, Zhihai He.
IEEE Transactions on Image Processing (TIP); **major revision submitted**.
https://doi.org/10.48550/arXiv.2509.12888

[P2] **Generative Semantic Coding for Ultra-Low Bitrate Visual Communication and Analysis.**
Weiming Chen, Yijia Wang, **Zhihan Zhu**, Zhihai He.
IEEE Transactions on Image Processing (TIP); **minor English-language revisions required before acceptance**.
https://doi.org/10.48550/arXiv.2510.27324

[P3] **Latent Bias Alignment for High-Fidelity Diffusion Inversion in Real-World Image Reconstruction and Manipulation.**
Weiming Chen, Qifan Liu, Siyi Liu, Yijia Wang, **Zhihan Zhu**, Zhihai He.
Pattern Recognition; under review.
https://doi.org/10.48550/arXiv.2603.23903

[P4] **HyGRAIL: Cost-Aware and Evidence-Grounded Scientific Hypothesis Discovery over Knowledge Graphs.**
Yihang Sun, **Zhihan Zhu**, Zhiyuan Jiang, Jingyi Ge, Zixuan Li, Jiaxuan You.
EMNLP 2026; under review.
https://doi.org/10.48550/arXiv.2609.02056

[P5] **Direction-Aware Spectral Artifact Modeling for Generalizable AI-Generated Image Detection.**
Bingyan Wu, Weiming Chen, Youming Li, Zhiwei Hu, **Zhihan Zhu**, Zhihai He.
Asian Conference on Computer Vision (ACCV), 2026; **accepted**.

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, Application Number: CN 2025112816451. **Pending**.
- Zhihai He, Weiming Chen, Yijia Wang, **Zhihan Zhu**. *Ultra-Low-Bitrate Image Compression and Reconstruction Method, System and Storage Medium.* Chinese Invention Patent, Application Number: CN 202511281423X. **Pending**.

Awards & Honors

- Gold Award (Guangdong Provincial Level, Top 0.02%), "Yunjing Zhiyu" – Intelligent Aquaculture System, China International College Students' Innovation Competition, 2025.
- Outstanding Student (Top 10%), Southern University of Science and Technology, 2025 and 2024.
- Second-Class Scholarship for Academic Excellence (Top 5%), SUSTech, 2024–2025.

Technical Skills

Languages: English (TOEFL iBT 5.0, IELTS 7.0, CET-6 545).

Programming: Python, C/C++, Java, MATLAB; STM32, FPGA, and embedded systems development.

AI Tools: 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.