Chen Mu

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Research Profile

Physics undergraduate studying generative models through dynamics, ODE/SDE-based probability transport, numerical integration, and control. Interested in diffusion and flow matching, controllable generation, scientific machine learning, and reliable AI-assisted research workflows.

Education

Sun Yat-sen University *Sept. 2024–Present*
B.S. in Physics Expected June 2028

- Relevant coursework: Mathematical Modeling I & II (6 credits), Advanced Mathematics I & II, Linear Algebra, Mechanics, and Electromagnetism.

Selected Research & Technical Experience

Diffusion, Flow Matching, and Controllable Generation *Spring 2026–Present*
Independent study and research extension GitHub

- Independently completed the publicly available coursework and assignments from CMU 10-799, *Diffusion and Flow Matching*; using the course starter code, implemented DDPM, straight-path Flow Matching, DDIM, Euler/Heun sampling, and conditional CFG on CelebA 64×64, trained on a Modal L40S GPU.
- An independent ResNet-18 evaluator measured joint smiling/no-bangs/blond adherence rising from 3.1% at $w = 0$ to 94.5% at $w = 2$, treated as adherence rather than image-quality evidence.
- Matched-NFE tests found no Heun quality–compute gain; CRH-CFG with 1,000 paired seeds yielded only a 0.4-point descriptive gain, without demonstrated preservation or quality benefit. Codex assisted engineering; I retained research design, interpretation, and validation.
- Produced a project poster and manuscript, available on my personal homepage.

Mathematical Modeling Projects *2025–2026*
Sun Yat-sen University Wolfram Mathematica

- Modeled drug injection and transport in a tumor microenvironment using a Darcy-coupled convection–diffusion–reaction system; solved the coupled PDEs with finite-element methods and examined boundary conditions, stability, and physical interpretation.
- Processed bird-vocalization recordings through large-scale data cleaning, multi-window time–frequency analysis, Fourier-domain features, and Mel spectrograms; studied how preprocessing choices affected feature stability.

Scientific Agent and Modeling Workflows *Private project*
Independent development Wolfram Mathematica / Python

- Built a Mathematica-based agent harness with tool calling, checkpoint/resume, structured documentation, and explicit boundary-condition controls to accelerate physics-model prototyping and consistency checks.

Technical Skills

Programming: Python, C++, C, Wolfram Language/Mathematica • **ML:** PyTorch, DDPM, Flow Matching, CFG, conditional generation, independent evaluation
Numerics & Research Engineering: ODE/PDE modeling, Euler/Heun integration, finite elements, spectral analysis, Git/GitHub, Modal, cloud GPU training, checkpoint/resume, experiment orchestration, reproducibility testing
Systems & Typesetting: Server administration, Unix-like systems, Docker, LaTeX, BibTeX • **English:** TOEFL iBT 104; CET-6 596

Awards & Science Communication

- **First Prize**, 2nd "Illuminating the Future" Optics Science Communication Writing Competition, organized by the University of Chinese Academy of Sciences Education Foundation and Wiley. Article: *"Chirped Pulse Amplification: Born from Playing with Fire,"* explaining temporal focusing, optical-damage thresholds, and CPA applications in femtosecond surgery, precision manufacturing, and strong-field physics.
- **USACO Gold Division**, Spring 2026.

Availability

Immediate; 25–30 hrs/week during vacations and 20–25 hrs/week during semesters; at least six months; remote preferred.