

Chenghan Xie

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Education

Stanford University

Ph.D. in Operations Research - Advisor: Jose Blanchet, Renyuan Xu

United States

September 2024 - 2029 June (expected)

- **Research Interests:** Efficient Employment of Generative AI, Reasoning, Multimodal Alignment.

Fudan University

Bachelor of Mathematics

China

September 2020 - 2024 June

- **GPA:** Overall 3.85/4.00, Major GPA 3.92/4.00, **Ranking 2/152**

Skills Set

Python Libraries PyTorch, vLLM, Pandas, Matplotlib, XGBoost, Cvxpy

Knowledges of Diffusion Models, Large Language Model Training, Stochastic Analysis.

Work/Intern Experience

Multimodal Interaction & World Model & Unified Model Intern | Bytedance Seed

June 2025 – September 2025

- The goal was to accelerate diffusion model training by leveraging advances in representation learning. Reproduced several baseline models in Pytorch, including SIT, SIT with Diffuse, Contrastive Flow Matching.
- Motivated by the idea that comparison should be performed between images at the same noise level, I incorporated timestep scaling as a temperature factor during contrastive learning steps and tested several variants. The best form improves the FID from 15 to 13.
- Tested new training signals and regularizers beyond regression-based objectives, including GaN loss, KoLeo regularization, spectrum separation and additional layers. While some methods proved effective, they were not consistently robust across varying distributions.

Algorithm Intern | Shanghai Artificial Intelligence Laboratory

Spring 2024 – Summer 2024

- Built optics-domain benchmarks by collecting and organizing relevant papers, textbooks, and datasets; integrated large models such as GPT-4o and LLaMA-3 to enhance automatic focusing and data augmentation.
- Evaluated mainstream LLMs on domain-specific tasks: Assessed models such as LLaMA 3, Qwen, and book-trained models on benchmarks through zero-shot, few-shot, and fine-tuned settings, focusing on their reasoning and public science outreach capabilities.
- Optimizing and adapting open-source models: Fine-tuned models like LLaMA 3 using techniques such as QLoRA and PEFT for lightweight adaptation, aiming to improve their performance on optics-related scientific Q&A, experimental data analysis, and academic tasks.

Research Experience

Estimating the Score Difference via Sobolev Regularization and Its Application on Diffusion Models

Supervisor: Jose & Renyuan

Stanford University

June 2025 - Current

- Proposed a **Sobolev-regularized** classification framework for score difference estimation, resolving the gradient divergence issue in standard transfer learning for diffusion models.
- Applied the method to real-world ECG generation tasks (PTB-XL to ICBE2018); achieved **SOTA performance** with an **FID of 8.097** (vs. 11.087 baseline) and improved downstream classification **AUC to 0.915**.
- Established the estimator's **minimax optimality** and proved convergence rates of $n^{-\frac{s-1}{d+2s-2}}$, demonstrating superior robustness in **small-sample regimes** (> 50% error reduction vs. baselines).

ChartWalker: Learning a Visual Agent to Navigate Chart Knowledge Graphs

Research Intern

Stanford University

Oct. 2025 - Current

- Developed **ChartWalker**, an agentic RAG framework that navigates hierarchical Knowledge Graphs to solve complex cross-chart reasoning tasks, addressing the "retrieval granularity" trade-off in standard GraphRAG systems.
- Designed a novel **graph-sampling data generation pipeline** to synthesize high-quality, multi-hop QA pairs with explicit reasoning trajectories; constructed a robust **Agentic Benchmark** that eliminates the "subject mismatch" issues found in existing datasets.
- Implemented a **Visual Search Agent** with adaptive navigation strategies (e.g., deep traversal vs. breadth aggregation), enabling precise evidence retrieval across heterogeneous chart data sources.

Publication

Trust Region Methods For Nonconvex Stochastic Optimization Beyond Lipschitz Smoothness

C Xie, C Li, C Zhang, Q Deng, D Ge, Y Ye **AAAI 2024**

- **paper link:** <https://arxiv.org/abs/2310.17319>

Protein language model powers accurate and fast sequence search for remote homology

W Liu, Z Wang, R You, C Xie, H Wei, Y Xiong, J Yang, S Zhu **Nature Communications**

- **paper link:** <https://www.nature.com/articles/s41467-024-46808-5>

Sketched Newton Value Iteration for Large-scale Markov Decision Processes

J Liu, C Xie, Q Deng, D Ge, Y Ye **AAAI 2024**

- **paper link:** <https://ojs.aaai.org/index.php/AAAI/article/view/29301>