

Research Overview

Although I am interested in anything that sparks AGI-level thoughts, my current research interests lie primarily in generative models, with a focus on diffusion models and large language models (LLMs). I aim to develop advanced generative frameworks for realistic virtual world simulation. My prior work includes applying diffusion models to medical imaging, addressing class imbalance in cardiac pathology data, and synthesizing virtual urban environments through diffusion-based layout generation, LLM-driven planning, and procedural modeling. Currently, I am leveraging reinforcement learning to enhance generative quality, particularly improving physical plausibility in diffusion-generated images and reasoning capabilities of LLMs.

Areas of Interest: Computer Vision, Generative AI, Reinforcement Learning

Education

M.S. ECE Signal Processing	Georgia Institute of Technology, Atlanta, GA 2021-2023, GPA: 4.00 / 4.00
M.S. ECE Signal Processing	University of Michigan, Ann Arbor, MI 2020-2021, GPA: 4.00 / 4.00 (Withdrew, enrolled at Gatech)
B.S. ECE Embedded System	University of Washington, Seattle, WA 2015-2019, GPA: 3.83 / 4.00 (Major), 3.93 / 4.00 (Math)

Research Experience

Research Assistant 2023-present	Zhejiang University, Hangzhou, China Research on: Virtual City Generation, LLM Reasoning
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Publications

Peer-Reviewed

- C1** Jie Deng, Wenhao Chai, Jianshu Guo, Gaoang Wang, and etc. "CityGen: Infinite and Controllable City Layout Generation." *Computer Vision and Pattern Recognition (CVPR) Workshop @ Urban Scene Modeling*, 2025.
- C2** Han Bao, Jie Deng, May D Wang, and etc. "Rare Heart Transplant Rejection Classification Using Diffusion-Based Synthetic Image Augmentation." *2023 IEEE EMBS International Conference on Biomedical and Health Informatics (BHI)*, 2023.

Under-Review(U) and Preprints(P)

- U1** Jie Deng, Wenhao Chai, Gaoang Wang, and etc. "CityCraft: A Diffusion and Large Language Model-Powered Framework for Automatic Comprehensive Virtual City Generation." Under Review at *Nature npj Urban Sustainability*.
- P1** Jianshu Guo, Wenhao Chai, Jie Deng, Gaoang Wang, and etc. "Versat2I: Improving Text-to-Image Models with Versatile Reward." arXiv, 2024.

Selected Course Projects

- **Diffusion-Based Rare Heart Transplant Rejection Image Augmentation**
 - Developed an automated classification pipeline for pediatric heart transplant rejection using histopathology images.
 - Used diffusion models to generate high-quality synthetic rejection images to address extreme data imbalance.
- **Image Denoising Through Anisotropic Diffusion**
 - Derived gradient descent PDE from image energy function.
 - Calculated Courant-Friedrichs-Lewy conditions through Von-Neumann analysis.
 - Discretized and implemented the gradient decent PDE.
- **Voice Controlled Game**
 - Designed a voice-controlled game that processes speech inputs as controls for an agent to catch targets.
 - Implemented speech recognition using GMM and SVM algorithms.
 - Established UART communication between MATLAB and Code Composer Studio.
 - Developed game console interface using MATLAB GUI and implemented FFT in TI assembly.
- **Creature with Leaderless Emergent Behavior**
 - Designed and programmed a multi-nodal mesh radio-controlled set of creatures which lives in a large public space and simulates the behavior of gregarious animals in natural environments.
 - Built with microprocessor, battery, speaker, RGB LED, OLED, PIR sensor and music maker board.
 - Creatures emit light, sound, communicate with each other through packet radio transmission and cumulatively produce emergent behavior of the group.

Relavant Courses

Math, ML	Calculus, Differential Equations, Linear Algebra, Multivariable Calculus Convex Optimization, Probability Theory, Random Processes, Math Foundations of ML, Statistical ML, Graphical Models in ML
CS	Computer Programming, Data Structure and Algorithms, Advanced Algorithms and Computational Complexity, Advanced Programming Techniques
EE	Continous/Discrete Linear Systems, Circuit Theory, Digital Circuits and Systems Embedded Systems, Computer Architecture, Digital Image System, Digital Signal Processing and Filtering, Machine Learning for Signal Processing Applications Digital Processing of Speech Signals
CV	PDEs in Image Processing and Computer Vision, Medical Image Processing, Computer Vision.

Skills

Technical	Python, PyTorch, C++, C, Java, Matlab, SystemVerilog
Language	Chinese, English