Junchao Huang

Senior Bachelor students, Tianjin University, Tianjin, China

junchaohuang@tju.edu.cn —huangjunchao@cuhk.edu.cn — +86 13020030210 — Shenzhen, China

RESEARCH INTERESTS

Computer Vision & Deep Learning: Generative Model (Especially Diffusion Model), Multimodal, ...

EDUCATION

Tianjin University, Tianjin, China   August 2021 — Present
Bachelor of Science: Mathematics and Applied Mathematics   GPA: 3.82/4.00 (90.74/100)
Elite Program: "Qiushi" Class of the Mathematics Department   Ranking: 3/55

I have received more than 40 courses with scores of 90 or above, and my weighted average score in core professional courses such as mathematics and computer science is over 94.

RESEARCH EXPERIENCE

School of Data Science   CUHK(Shenzhen)
Research: Edit360: 2D Image Edits to 3D Assets from Any Angle   June 2024 — Present
Supervisor: Assistant Prof. Li Jiang
Research Summary:
- We present Edit360, a novel 3D editing pipeline that facilitates precise and flexible customization of 3D assets. By applying user-specified edits to an optimal view and propagating them seamlessly across all perspectives, Edit360 simplifies complex 3D editing tasks into efficient, image-level operations. This approach enhances user control and editing flexibility while ensuring the generation of high-quality 3D models.
- At the core of Edit360, we propose the Spatial Frame Fusion (SFF) algorithm, a video-diffusion-based framework that integrates information from the identity-preserving front view and user-edited anchor views. By dynamically integrating image-level and feature-level data at each sampling step, SFF achieves spatially consistent fusion, enabling coherent, high-fidelity 360-degree reconstructions of edited 3D assets.
- Edit360 supports a wide range of 3D editing tasks, from precise local detail modifications to comprehensive style transformations. Its user-friendly interface and ability to handle diverse scenarios make it a powerful tool for applications in animation, gaming, virtual reality, and related domains.

Research Progress: A paper is under review.

Department of Computer Science and Engineering   HKUST
Research: Enhanced Regression Visualization with Kernel Density Estimation   April 2024 — September 2024
Supervisor: Assistant Prof. Wei Zeng
Research Summary:
- We propose a Parametric-Generalized-Kernel Boosted dimensionality reduction method, which can enhance the 2D Gaussian kernel estimation map on projection by different DR methods in accuracy of value estimation (measured by point-wise mean absolute error and distribution-wise KL-divergence).
- We perform three case studies to demonstrate the effectiveness of our methods on diverse DR plot kernel estimation tasks ranging from high-dimensional density estimation, statistical multivariate regression, and deep-learning performance metric visualization.
- We perform extensive quantitative experiments comparing PGKB with traditional Gaussian kernel estimation with different bandwidth selection techniques on five dimensionality reduction methods to provide further evidence for the strengths of our methods.

Research Progress: The paper has been accepted to ICML 2025

Department of Intelligence and Computing   Tianjin University
Research: Conditional Controllable Image Fusion   September 2023 — July 2024
Supervisor: Prof. Qinghua Hu, Associate Prof. Bing Cao
Research Summary:
- We present a pioneering Conditional Controllable Fusion (CCF) framework that achieves dynamically controllable image fusion by utilizing various constructed conditions. This new dynamic conditional paradigm for general fusion tasks leverages the denoising diffusion model (DDPM) to inject specific constraints, progressively reducing bias during the reverse diffusion process for step-by-step calibration of fused images.
- We established a condition bank for the diffusion-based CCF framework, enabling controllability of various image fusion scenarios on the fly without additional training, ensuring robust fusion results. Furthermore, we propose a Sampling-adaptive Condition Selection (SCS) algorithm that facilitates the dynamic selection of conditions during sampling.

- Extensive experiments on various fusion tasks have confirmed our superior fusion performance against the competing methods. Furthermore, our approach qualifies for interactive manipulation of the fusion results, demonstrating our applicability and efficacy.

PUBLICATIONS

Conference papers
Published

- Ye, Y., **Huang, J.**, Zeng, X., Xia, J., & Zeng, W. (2025). AKRMap: Adaptive Kernel Regression for Trustworthy Visualization of Cross-Modal Embeddings. In *Proceedings of the 42nd International Conference on Machine Learning (ICML 2025).* `https://arxiv.org/abs/2505.14664`

PROJECTS

Center for Applied Mathematics Tianjin University
Project: Anomaly Detection on Attributed Graph with Diffusion Model April 2023 — May 2024
Project Support: National Student Innovation and Entrepreneurship Program
Supervisor: Assistant Prof. Yingjun Deng
Project Description:
- We propose a novel approach for anomaly detection on attribute networks, addressing computational challenges prevalent in existing methods by leveraging diffusion models to handle large-scale anomalous graph data effectively.
- Our approach learns anomalous patterns on the graph using an interpretable and stably-trained diffusion model, and efficiently reconstructs the graph by sampling with an ODE method.
- It detects anomalies by diffusing an anomalous scoring function to identify the top-k anomalous nodes, ensuring accurate and efficient anomaly detection.

COURSES & SKILLS

Bachelor's Courses

- Mathematical Analysis C: 97
- Advanced Algebra A and B: 95 & 92
- Ordinary Differential Equations: 95
- Partial Differential Equations: 90
- Theory of Probability: 98
- Topology: 98
- Real Variable Function: 90
- Functional Analysis: 97
- Topics in Advanced Algebra A and B: 96 & 96

- Programming Language C: 97
- Practice of Computer Language: 98
- Data Structure: 92
- Mathematical Model: 97
- College Physics: 96
- Experiment of Physics: 91
- Experiment of Mathematics (Mathematica): 99
- Internship of Statistical Computing: 100
  (The R Programming Language)

- **IELTS (Academic):** 6.5/9 (Reading: 8.5 & Speaking: 6.0 & Writing: 6.5)   **CET-4:** 584
- **Programming:** Python, C++, Pytorch, The R Programming Language, Latex, Visual Basic
- **Software:** Pycharm, Visual Studio Code, Mathematica, Matlab, MS Office Suite
- **Interests:** Piano(Since the age of four), Table Tennis, Cycling

AWARDS

Merit Fellowship (Ph.D. Scholarships at CUHK(Shenzhen)) 2025 - 2030
First Class Scholarship (Scholarships from Tianjin University) School year 2024
Student Role Models (Honorary Title from Tianjin University) School year 2023
PetroChina Scholarship (Scholarships from Tianjin University) School year 2022
Pacemaker to Merit Student (Honorary Title from Tianjin University) School year 2022
Zhe-Beiyang Scholarship (Entrance Scholarship from Tianjin University) School year 2021