Chenrui Zhou

Tel: (+86) 18851118236 | Email: chenruizhou00@gmail.com

Name: Chenrui Zhou

ACADEMIC INTEREST

I'm broadly interested in Computer Vision and its related applications, especially its application with computer graphics, robotics and beyond.

EDUCATION BACKGROUND

Kuang Yaming Honors School, Nanjing University **Nanjing, Jiangsu, China**

***Bachelor of Science* in Information and Computational Science(Mathematics)** *09/2019-06/2023*

- **Overall GPA:** 4.125/5.0; 83/100 **Major GPA：** 4.26/5.0; 85.2/100

STANDARD ENGLISH TEST SCORES

TOEFL： 103 （S22） **GRE:** 323+AW3.0

RESEARCH EXPERIENCE

Nanjing University **Nanjing, Jiangsu, China**

Project: Design and implementation of hierarchical model reconstruction method based on recursive neural network *Sep.2021~ June 2022*

Advisor: Prof. Yan Zhang

- Innovative Approach: Collaborated on pioneering a novel hierarchical 3D model reconstruction method using recursive neural networks and shape generation gradients, achieving significant gains in accuracy and efficiency.
- Literature Review: Conducted a thorough review, revealing a gap in existing methods, which predominantly focused on overall shape rather than semantic relationships among components.
- Semantic-Centric Design: Integral to designing and implementing a hierarchical reconstruction approach, utilizing recursive neural networks to initiate reconstruction from the semantic structure of each component, improving reconstruction quality.
- Network Optimization: Played a key role in optimizing neural network parameters, introducing novel mathematical optimizations, leading to enhanced model accuracy.
- Data Preparation: Prepared and preprocessed datasets for compatibility with the recursive neural network, ensuring consistent and reliable results.
- Comprehensive Evaluation: Conducted extensive experiments, including benchmark datasets and various data conditions, showcasing the method's ability to generate high-quality 3D models.
- Applications Exploration: Explored potential applications in computer graphics, virtual reality, and robotics.
- VGG16 Integration: Integrated and modified the VGG16 model, enhancing its performance for the specific task.

Project: AO-NeRF：Adaptive Octree-based Neural Radiance Fields *April.2022~ Dec.2022*

Advisor: Prof. Yan Zhang

- Adaptive Octree-Based Approach: Proposed an innovative volumetric neural rendering method called AO-NeRF (Adaptive Octree-based NeRF), designed to efficiently generate high-quality synthesized views. Distinguished from existing NeRF methods that uniformly partition space at the same resolution using points or octrees, AO-NeRF introduces adaptivity at multiple scales.
- Geometry Reconstruction: Integrated a deep multi-view stereo vision approach to rapidly reconstruct the geometric shape of scenes, obtaining foundational neural point cloud features.
- Adaptive Resource Allocation: Introduced an adaptive octree-based framework for allocating resources at varying scales, dynamically managing the complexity of the scene's geometry. This adaptability optimizes

memory usage and computation costs.

- Attention-Based Feature Aggregation: Implemented a rapid aggregation of neural point features near the scene's surface using attention mechanisms, enhancing scene representation.
- High-Quality Rendering: Achieved high-quality scene rendering through a ray marching-based rendering pipeline.
- Performance Advancements: As a general framework extending Point-NeRF, AO-NeRF significantly reduced memory and computational costs while delivering superior view synthesis capabilities compared to existing point-based methods.
- State-of-the-Art Results: Validated the proposed AO-NeRF on various datasets, demonstrating its ability to outperform existing methods in both rendering speed and quality, achieving state-of-the-art results.

Project: Exploring the Influence of Diverse Loss Functions on 3D-LMNet Network Performance

Dec.2022~ June.2023

Advisor: Prof. Yan Zhang

- Undergraduate Thesis: Conducted an in-depth undergraduate thesis delving into the impact of various loss functions on the efficacy of 3D-LMNet, a pivotal point cloud reconstruction model within the realm of computer vision.
- Contextualized Point Cloud Reconstruction: Explored the broader context and significance of point cloud reconstruction, highlighting its pivotal role in critical applications such as autonomous driving and immersive virtual reality experiences.
- 3D-LMNet Model Examination: Analyzed the intricacies of the 3D-LMNet model, elucidating its architectural framework and underlying principles. Proposed an innovative approach that harnesses diverse Minkowski distances as loss functions to bolster its adaptability across a spectrum of real-world application scenarios.
- Comparative Analysis of Loss Functions: Carried out an exhaustive comparative study, scrutinizing the model's performance when subjected to various loss functions, encompassing L1, L2, and Huber loss functions.
- Empirical Validation: Demonstrated the experimental findings unequivocally, with results showcasing that the implementation of L1 distance as the loss function notably elevated reconstruction accuracy. These empirical results underscore the crucial role of loss function selection in the efficacy of 3D-LMNet network.

PROFESSIONAL CONTESTS

Meritorious Winner - Mathematical Contest in Modeling (MCM) and Interdisciplinary Contest in Modeling (ICM) *Mar. 2021*

2021hematical Contest in Modeling / Interdisciplinary Contest in Modeling

- Developed and fine-tuned a neural network utilizing Python and MATLAB to accurately identify wasp images from a diverse dataset of over a thousand images.
- Applied Support Vector Machines (SVM) for precise image classification.
- Enhanced the TF-IDF model to perform comprehensive text analysis.
- Employed Latent Dirichlet Allocation (LDA) for data insights in the absence of labeled data.
- Conducted an extensive literature review and method optimization to yield optimal solutions for predicting wasp diffusion paths.

This project earned the esteemed distinction of 'Meritorious Winner' in the American Mathematical Contest in Modeling (MCM) and Interdisciplinary Contest in Modeling (ICM), underscoring my expertise in numerical modeling and interdisciplinary problem-solving.

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SKILLS

- **Programming Skills:** Python, C, C++, MATLAB, SQL, Java, etc.
- **Deep Learning Framework:** Familiar with Pytorch, OpenCV, Tensorflow, etc.

SELECTED COURSEWORKS

Use SQL to build a forum database *June 2020*

Coursework for Introduction to databases; Score: 4.0/4.0

- Successfully built a forum database using SQL server, and can complete basic functions such as registration, posting, replying, deletion, etc.

The Development of Drawing Program *Dec. 2021*

Coursework for Computer graphics; Score: 4.0/4.0

- Designed and used python to complete a drawing program that can draw basic graphics and straight lines and display them correctly on the screen.
- Learned about graphics algorithms and how to approximate graphics as a combination of pixels.

Deep Learning-Powered Sentiment Analysis *Dec. 2021*

Undergraduate Research Project; Score: 4.0/4.0

- Deployed cutting-edge Recurrent Neural Networks (RNNs) coupled with advanced word embeddings to conduct sentiment analysis on textual data.
- Performed rigorous data preprocessing, including the implementation of word embeddings through Word2Vec.
- Trained a state-of-the-art RNN model, such as Long Short-Term Memory (LSTM) or Gated Recurrent Unit (GRU), to expertly classify text sentiments.

Rigorously assessed the model's performance using a comprehensive array of metrics, including accuracy, precision, recall, and the F1-score.

Fundamental PyTorch Proficiency *Jan. 2022*

Undergraduate Research Project; Score: 4.0/4.0

- Mastered the essentials of the PyTorch environment, including navigating different layers and comprehending their functions.
- Gained a solid grasp of fundamental concepts such as Stochastic Gradient Descent (SGD), loss functions, and elementary neural network structures.

Demonstrated practical skills through partial code implementations, including ResNet, Seq2Seq, and Generative Adversarial Networks (GANs).

Designing the Ball-Pushing Game *Feb. 2022*

Undergraduate Research Project; Score: 4.0/4.0

- Acquired proficiency in foundational tools and technologies, including OpenGL, SolidWorks, and basic physics engine mechanics analysis.
- Executed the implementation of core mechanics for the ball-pushing game, ensuring smooth gameplay interactions.
- Showcased competence in creating basic lighting effects to enhance the game's visual appeal.

ADWARDS AND HONORS

- Honors of distinction, Kuang Yaming Honors School, Nanjing University *2023*
- Meritorious Winner, 2021 Mathematical Contest in Modeling (MCM/ICM) *2021*