Hui Ren

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EDUCATION

ShanghaiTech University   **Shanghai, China**
B.Eng. Candidate, Computer Science   *Sept. 2021 – Present*

- Overall GPA: 3.92/4.0 (rank 2/230 in school)
- Major GPA: 4.0/4.0
- Selected coursework: Deep Learning(A+), Artificial Intelligence(A+), Computer Graphics(A+), Computer Architecture(A+), Algorithms and Data Structures(A+), Numerical Optimization(A+), Probability and Statistics(A+)

Massachusetts Institute of Technology (MIT)   **Cambridge, MA**
Undergraduate Exchange Student, Computer Science   *Feb. 2024 – Present*

RESEARCH INTERESTS

I am interested in **Computer Vision** and **Machine Learning**. My current research work focuses on generative models, especially the editing of text-to-image diffusion models. Previously, I studied optimal transport, especially its application in deep clustering and 3D unsupervised segmentation in imbalanced scenarios.

PUBLICATION (* Equal contribution)

- **P^{2}OT: Progressive Partial Optimal Transport for Deep Imbalanced Clustering**
  Chuyu Zhang, **Hui Ren***, Xuming He*   ***ICLR, 2024***
  [Paper][Code]

- **SP^{2}OT: Semantic-Regularized Progressive Partial Optimal Transport for Imbalanced Clustering**
  *Chuyu Zhang, **Hui Ren**, Xuming He*   ***Under Review***
  [Paper][Code]

- **Dual-level Adaptive Self-Labeling for Novel Class Discovery in Point Cloud Segmentation**
  Ruijie Xu, Chuyu Zhang*, **Hui Ren**, Xuming He*   ***Under Review***

- **Cascade Sparse Feature Propagation Network for Interactive Segmentation**
  Chuyu Zhang, Chuanyang Hu*, **Hui Ren**, Yongfei Liu, Xuming He*   ***BMVC, 2023***
  [Paper][Code]

RESEARCH EXPERIENCE

MIT CSAIL, Vision Group   **Cambridge, MA**
Undergraduate Research Assistant, advised by Prof. Antonio Torralba and Prof. David Bau   *Feb. 2024 - Present*

- **Text-to-Image generative model editing and artistic copyright protection**

ShanghaiTech Visual & Data Intelligence Center, PLUS Lab   **Shanghai, China**
Undergraduate Research Assistant, advised by Prof. Xuming He   *Feb. 2023 - Jan. 2024*

- **Deep Clustering in Imbalanced Scenarios**
  * Proposed to generalize deep clustering problem to more realistic and challenging imbalanced scenarios and established a new benchmark
  * Proposed a novel progressive OT formulation for pseudo-labeling generation in the imbalanced scenarios, surpassing SOTA methods by 2%
  * Proposed introducing semantic information from feature space to guide pseudo label generation.
  * Performed comprehensive analysis and comparisons of the proposed method against various baselines on the challenging imbalanced datasets

- **Novel Class Discovery in Point Cloud**
  * Proposed an adaptive regulation strategy for self-labeling, making the algorithm more flexible and capable of better modeling imbalanced novel classes, which improved results by more than 10% compared to SOTA methods
  * Investigated the development and role of optimal transport problem in NCD problems

- **Cascade Sparse Feature Propagation Network for Interactive Segmentation**
  * Investigated and analyzed the performance difference between the proposed method and SAM(Segment Anything Model) across various challenging datasets at different numbers of user-click input
  * Analyzed the performance of various components in the proposed method.

COURSE PROJECTS

Business War Policy Exploration [code]
Shanghai, China
ShanghaiTech CS181: Artificial Intelligence
Apr. 2023 – Jun. 2023
- Proposed a business war model in which restaurants must balance attracting customers and making profits to maximize revenue and even defeat competitors
- Implemented and compared various AI strategies, including Expectimax search, Neural-Network prediction, and Reinforcement learning algorithms to explore the optimal policy

Sokoban Game on Longan Nano [code]
Shanghai, China
ShanghaiTech CS110: Computer Architecture I
May 2023 – Jun. 2023
- Implemented Sokoban pixel game with Minecraft textures on a Longan Nano development board with RISC-V and C
- Designed software-hardware interfaces to utilize integrated and external board buttons for game control

Lattice Boltzmann Methods Program Acceleration [code]
Shanghai, China
ShanghaiTech CS110: Computer Architecture I
May 2023
- Utilized multiple optimization techniques, including SIMD, OMP, thread blocking elimination, and memory access optimization to accelerate the LBM program
- Achieved top 3 performance in the class

Ray tracing based multi-resolution iso-surface rendering [code]
Shanghai, China
ShanghaiTech CS171: Computer Graphics I
Dec. 2022 – Jan. 2023
- Rendered the iso-surface of vortices in a multi-resolution fluid velocity field based on ExaBricks data structure
- Implemented a bitmap accelerated KD-tree and BVH for multi-resolution data to support fast ray marching
- Proposed an advanced adaptive sampling strategy to solve the problem of rendering surface discontinuity, improving the rendering speed by more than 50x at the same precision
- Created a UI for conveniently adjusting the parameters and rendering

Direction of arrival (DoA) estimation [code] [demo]
Shanghai, China
ShanghaiTech SI100B: Introduction to Information Science and Technology
Nov. 2021 – Dec. 2021
- Implemented a DoA estimation algorithm to locate the source of sounds in Matlab based on MUSIC algorithm
- Created a UI for real-time localization and visualization of sound sources using a microphone array

Awards and Honors

- **Outstanding Student**, ShanghaiTech University (Ranked top 2% in school) **Dec. 2023**
- **Third prize**, The 14th Chinese Mathematics Competition **Jan. 2023**
- **Merit Student**, ShanghaiTech University (Ranked top 3%-7% in school) **Dec. 2022**
- **First prize**, The 5th Annual International Mathematical Modeling Challenge **Jan. 2019**

Skills

- **Programming Languages**: Python, C, C++, MATLAB, RISC-V, AMPL

- **Tools & Frameworks**: PyTorch, OpenGL, git, LaTeX, Markdown

Language

- **Chinese**: Native

- **English**: Fluent
    * TOEFL: 97 with R26/L25/S20/W26