BENRAN HU

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EDUCATION

Carnegie Mellon University *Dec 2024*
Master of Science in Computer Science | GPA: 4.2/4.3 *Pittsburgh, PA*

The Hong Kong University of Science and Technology *Jun 2023*
Bachelor of Science in Data Science and Technology, and in Computer Science | GPA: 4.14/4.3 *Hong Kong SAR*

- Major GPA: 4.19/4.3. First Class Honors. Recipient of the Academic Achievement Medal.

PUBLICATIONS

Yichen Liu, **Benran Hu**, Chi-Keung Tang, and Yu-Wing Tai. SANeRF-HQ: Segment Anything for NeRF in High Quality. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2024. |

Yichen Liu*, **Benran Hu***, Junkai Huang*, Yu-Wing Tai, and Chi-Keung Tang. Instance Neural Radiance Field. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, October 2023. |

Benran Hu*, Junkai Huang*, Yichen Liu*, Yu-Wing Tai, and Chi-Keung Tang. NeRF-RPN: A general framework for object detection in NeRFs. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2023. |

RESEARCH EXPERIENCE

Transfomer-based Autoencoder for Video Generation *Jun 2024 - Present*
Advisors: *Ivan Skorokhodov*, *Aliaksandr Siarohin*, and *Sergey Tulyakov* *Creative Vision Group, Snap Research*

- Designed a transformer-based video autoencoder tailored for video latent diffusion models and capable of efficient extrapolation, with competitive reconstruction quality, video generation quality, and latent compression rates.

Uncertainty Quantification in Differentiable Rendering | *Sep 2023 - Present*
Advisor: *Prof. Ioannis Gkioulekas* *CMU Imaging and Rendering Lab*

- Proposed a general and efficient method to quantify the aleatoric and epistemic uncertainty in both parameter space and image space for various inverse rendering tasks via uncertainty propagation.

Segment Anything for NeRF [CVPR'24] | *Apr 2023 - Nov 2023*
Advisors: *Prof. Yu-Wing Tai* and *Prof. Chi-Keung Tang* *HKUST*

- Proposed a novel method combining Segment Anything Model and Neural Radiance Field to perform high-quality interactive 3D object segmentation with state-of-the-art performance.
- Experimented different large vision models, distillation methods, and losses to improve NeRF 3D segmentation.

NeRF 3D Instance Segmentation [ICCV'23] | *Dec 2022 - Jul 2023*
Advisors: *Prof. Chi-Keung Tang* and *Prof. Yu-Wing Tai* *HKUST*

- Proposed one the first 3D instance segmentation methods in NeRFs by optimizing a Neural Instance Field.
- Trained an end-to-end 3D segmentation model on voxel representations based on Mask R-CNN.

Temporally Adaptive Shading Scheduling *Sep 2022 - May 2024*
Advisor: *Prof. Pedro Sander* *HKUST*

- Maximized rendering quality under frametime or bandwidth constraints by adjusting local temporal shading rates with cost and error-aware reprojection.

3D Object Detection in NeRF [CVPR'23] | *May 2022 - Nov 2022*
Advisors: *Prof. Chi-Keung Tang* and *Prof. Yu-Wing Tai* *HKUST*

- Proposed the first significant 3D object detection method in Neural Radiance Fields using only multi-view RGB.
- Created the first large synthetic indoor dataset for NeRF 3D object detection using Blender and public assets.

WORK EXPERIENCE

Research Intern *Jun 2024 - Aug 2024*
Snap Inc. *Santa Monica, CA*

- Improved transformer-based video autoencoders and latent diffusion models for better video and image generation.
- Boost the post-training performance of the large-scale video generation model at Snap with checkpoint aggregation.

TECHNICAL PROJECTS

Point-based 3D Gaussian Manipulation with Diffusion *3D Gaussian Splatting, Diffusion, Scene Editing*

- Developed a 3D Gaussian manipulation method based on point-guided image editing with diffusion models.

Specular Manifold Sampling *Path Tracing, Caustics Rendering*

- Integrated single-scattering Specular Manifold Sampling into a custom path tracer to support efficient rendering of caustics from specular-diffuse-specular paths.

Wavefront Path Tracing *CUDA, GPU Programming, Path Tracing*

- Implemented a CUDA path tracer with wavefront design and wide BVH which achieves a maximum speedup of 1.79x compared to megakernel implementation, and 8.20x compared to multi-thread CPU implementation.

Vulkan Mesh Shading and Culling *Vulkan, Mesh Shading, Culling*

- Built a highly efficient meshlet shading and culling pipeline in Vulkan utilizing mesh shaders and task shaders.

DEPARTMENTAL SERVICE

Student Helper of Honors Object-Oriented Programming and Data Structures

- Designed lab exercises and a programming assignment on implementing a Git-like version control system.

HONORS & AWARDS

HKUST Academic Achievement Medal *2023*
Tse Cheuk Ng Tai Scholarship for students with research achievement in computer vision and graphics *2022*
Lee Hysan Foundation Exchange Scholarship *2021*
Chiaphua Industries Limited Scholarship for Chinese Mainland Undergraduate Students *2021 - 2022*
The Joseph Lau Luen Hung Charitable Trust Scholarship *2020*
University's Scholarship Scheme for Continuing Undergraduate Students *2020 - 2022*
Dean's List *2019 - 2022*