Tianrui Zhang

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EDUCATION

Institute for Interdisciplinary Information Science, Tsinghua University, Beijing, China *Aug 2021-Present*

- Major: Computer Science, Major GPA: 3.82/4.0
- *Core Courses: Abstract Algebra (A), Artificial Intelligence: from Principle to Practice (A-), Algorithm Design (B+), Database Systems (B+), AI+X Computing Acceleration: From Algorithms Development, Analysis to Deployment (A-), Research Immersion Training (A)*

PUBLICATIONS

Tianrui Zhang, Haochong Xia, Qianfei Hu. "Chatbot Combined with Deep Convolutional Neural Network for Skin Cancer Detection", in Proceedings of the 2022 3rd International Conference on Artificial Intelligence and Education (IC-ICAIE 2022), pages 35-41.

RESEARCH EXPERIENCE

Transformer-based Human Object Interaction | Tsinghua University | Research Assistant *Oct 2024-Present*

Advisor: Li Yi, Assistant Professor in IIIS, Tsinghua University

- Researched the reconstruction of human-object interaction.
- Used SMPL as the human avatar backbone and DROID-SLAM to generate camera poses.
- Finetuned the existing VLM model HMR2.0 for per-frame features based on physics-align loss.
- Achieved SOTA over all existing work with the same settings, yielding a 17% improvement in mean per-joint error (MPJPE) and a 21% improvement in acceleration error (ACCEL).

Colmap-free Dynamic Reconstruction | UCSD | Research Assistant *Feb 2024-Present*

Advisor: Xiaolong Wang, Assistant Professor in ECE, UCSD

- Researched dynamic reconstruction without camera poses through 3DGS-based methods.
- Used a progressively growing strategy to incorporate frames to avoid blurring in long videos.
- Implemented a rendering function that passes the gradient to both 3DGS and camera poses in CUDA codes.
- Used local-to-global optimization for camera pose refinement.
- Achieved SOTA in dynamic reconstruction (13% PSNR improvement on Nvidia DynamicNeRF) and camera pose estimation (8.3% ATE reduction on MPI Sintel). Submitted work to CVPR2025.

Acoustic Synthesis | Tsinghua University | Research Assistant *Nov 2022-Dec 2023*

Advisor: Hang Zhao, Assistant Professor in IIIS, Tsinghua University

- Researched the synthesis of room impulse response under a fixed, but unknown source and arbitrary receivers.
- Identified similarities between optical fields and short-waval acoustic fields. Used this analogy to develop a manual separation facilitating the simulation of real acoustic fields.
- Built a geometric model similar to NeRF that simulates the short-waval portion through volumetric rendering. Constructed the diffused model based on Hugen's principle, which generally applies to waves.
- Achieved SOTA over previous methods in the same setting, yielding a 27% improvement in spectral loss and a 30% improvement in RT30 difference.

Neural Cancer Detection | Remote | Research Assistant *Jan 2022-Jun 2022*

Advisor: Mark Vogelsberger, Associate professor at MIT, 2012-2013Hubblefellow

- Studied the diagnosis of cancers, especially skin cancers, using neural networks.
- Implemented an encoder-decoder model (similar to transformer) and batch normalization.
- Combined the model with an interactive chatbot based on language models to achieve chat diagnosis.
- Achieved 95% accuracy on the dataset Skin Cancer MNIST: HAM10000.
- This paper was fully accepted by IC-ICAIE 2022.

HONOR

- Gold Medal, 37th Chinese Physics Olympiad（50/621） *Oct 2020*
- Scholarship for Freshmen (30/ 100) *Oct 2021*

SKILLS

Programming: C/C++, Python and AI packages (Torch, TensorFlow), MATLAB, Java, Typescript, CUDA