

Runfeng Li

Personal Webpage: ranrandy.github.io | Email: runfeng_li@brown.edu | Github: github.com/ranrandy

Research Summary

I am interested in mid-level vision, unconventional sensors, computational imaging/photography, and machine learning. Specifically, I am currently interested in precise and complete 3D/4D reconstruction of real-world scenes or objects for applications such as virtual object simulation and robotic manipulation.

I have recently studied on 3D/4D reconstruction: how to physically model raw continuous-wave time-of-flight (C-ToF) and RGB signals, to recover physical properties like geometry, appearance, motion, and elasticity.

Education

Brown University <i>Master of Science in Computer Science</i>	2023 - 2025 <i>Providence, RI</i>
University of Illinois Urbana-Champaign <i>Bachelor of Science in Mathematics and Computer Science with Highest Distinction and Cum Laude</i>	2021 - 2023 <i>Champaign, IL</i>
Tianjin University (Transferred out) <i>Bachelor of Science in Electrical Engineering - Qiushi Elite Class</i>	2018 - 2020 <i>Tianjin, China</i>

Preprints & Research Contributions

[1] *Time of the Flight of the Gaussians: Fast and Accurate Dynamic Time-of-Flight Radiance Fields*. Runfeng Li, Mikhail Okunev, Zixuan Guo, Anh Duong, Christian Richardt, Matthew O'Toole, James Tompkin. Under Review, 2024.

- Oral Presentation at New England Computer Vision Workshop (NECV), 2024.
- Integrated C-ToF imaging into 3D Gaussian splatting and detected catastrophic optimization failures
- Proposed two optimization heuristics that stabilized training and produced more accurate geometry
- Achieved 100x training and rendering speed and state-of-the-art monocular 4D ToF reconstruction

[2] *Monocular Dynamic Gaussian Splatting is Fast and Brittle but Smooth Motion Helps*. Yiqing Liang, Mikhail Okunev, Mikaela Angelina Uy, Runfeng Li, Leonidas J. Guibas, James Tompkin, Adam Harley. Under Review, 2024.

- Improved HyperNeRF and DyCheck camera poses using customized SAM-Track masks and COLMAP

Selected Projects

<i>3D Gaussian Physics Simulation and Material Property Reconstruction</i>	Mar 2024 - May 2024
<ul style="list-style-type: none">• Reimplemented PhysGaussian using Taichi to reproduce photorealistic physics simulation• Explored reconstructing elasticity fields through differentiable simulation of multi-view videos	
<i>Raw 3D Gaussian Splatting for High Dynamic Range (HDR) Reconstruction</i>	Oct 2023 - Dec 2023
<ul style="list-style-type: none">• Explored 3D Gaussian reconstruction from noisy raw RGB signals using RawNeRF scenes	
<i>Real-Time Gradient Domain HDR Compression</i>	Oct 2023 - Dec 2023
<ul style="list-style-type: none">• Implemented single and multi-grid Poisson PDE solvers for the HDRC method in CUDA/C++• Achieved real-time (100-200Hz) HDR tonemapping for 1k-2k resolution images	

Teaching Experience

Machine/Deep Learning Course Assistant

Aug 2022 – Dec 2022

CS 307 - *a New Machine Learning Course*

Champaign, IL

- Designed coding assignments covering ML topics: SGD, SVM, Naive Bayes, MLP, GMM, and EM
- Assisted labs, held office hours, and helped exam question preparation.

CS 446 - *Graduate/Upper Undergraduate Machine/Deep Learning*

- Graded homework and exams.

Awards

Dean's List, University of Illinois Urbana-Champaign

2021 - 2023

"Future 30" Originality and Innovation Contest

2019

Team Leader, Second Prize (¥5,000 CNY)

Tianjin, China

- Initiated research interest in VR/AR through literature review and defending a future XR proposal.

Talks

[Nov-2024] *Time of the Flight of the Gaussians: Fast and Accurate Dynamic Time-of-Flight Radiance Fields*. New England Computer Vision (NECV) Workshop 2024. 8 minutes.

[Sept-2024] *PhysDreamer: Physics-Based Interaction with 3D Objects via Video Generation, Dynamic 3D Gaussian Prediction for Motion Extrapolation and Free View Synthesis*. Brown Visual Computing Reading Group. 1 hour.

[June-2024] *Bilateral Guided Radiance Field Processing*. Brown Visual Computing Reading Group. 1 hour.

Technical Skills

Python, CUDA, C++ / PyTorch, Taichi