Guangyan Cai

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Education

University of California, Irvine **Irvine, CA**
Ph.D Candidate in Computer Science *2020–Present*
- Advisor: Shuang Zhao

University of California, San Diego **La Jolla, CA**
B.S. in Computer Science *2016–2020*
- Advisor: Ravi Ramamoorthi
- Cumulative GPA: 3.6 / 4.0 (Major GPA: 3.9 / 4.0)
- Undergraduate Awards for Excellence in Research: 2020
- Provost's Honors: 2016-2020

Experience

Adobe Research **San Jose, CA**
Research Scientist Intern, Graphics *Jun 2023 - Sep 2023*
- Proposed a light-weight lighting representation suitable for representing both distant and non-distant illumination.
- Designed a pipeline to jointly reconstruct the shape and material of glossy objects as well as their surrounding lighting using physics-based based differentiable rendering and the proposed light representation.
- Submitted to arXiv [1].

Meta Reality Labs **Redmond, WA**
Research Scientist Intern, Graphics *Jun 2022 - Sep 2022*
- Investigated the baking artifacts in material reconstruction with inverse rendering and proposed a method to mitigate them.
- Participated in building a hybrid pipeline that combines NeuS and physics-based differentiable rendering to do high quality 3D reconstruction.
- Showcased our reconstruction results at Meta Connect 2022 (starting at 1:13:20).
- Co-authored a paper [2] and it is accepted to ICCV 2023.

Publications

[1] **Guangyan Cai**, Fujun Luan, Miloš Hašan, Kai Zhang, Sai Bi, Zexiang Xu, Iliyan Georgiev, and Shuang Zhao. 2024. PBIR-NIE: Glossy Object Capture under Non-Distant Lighting. (August 2024).

[2] Cheng Sun*, **Guangyan Cai***, Zhengqin Li, Kai Yan, Cheng Zhang, Carl Marshall, Jia-Bin Huang, Shuang Zhao, and Zhao Dong. 2023. Neural-PBIR Reconstruction of Shape, Material, and Illumination. In *2023 IEEE/CVF International Conference on Computer Vision (ICCV)*. * equal contribution. (October 2023), 18000–18010.

[3] **Guangyan Cai**, Kai Yan, Zhao Dong, Ioannis Gkioulekas, and Shuang Zhao. 2022. Physics-Based Inverse Rendering using Combined Implicit and Explicit Geometries. *Computer Graphics Forum*, 41, 4, (July 2022).

[4] Lifan Wu*, **Guangyan Cai***, Ravi Ramamoorthi, and Shuang Zhao. 2021. Differentiable time-gated rendering. *ACM Transactions on Graphics*, 40, 6, (December 2021), 287:1–287:16. * equal contribution.

[5] Lifan Wu, **Guangyan Cai**, Shuang Zhao, and Ravi Ramamoorthi. 2020. Analytic spherical harmonic gradients for real-time rendering with many polygonal area lights. *ACM Transactions on Graphics*, 39, 4, (August 2020).

Projects

irtk:

- Inverse Rendering Toolkit (`irtk`) is a `Python` library built upon `PyTorch` that facilitates building inverse rendering pipelines.
- Supports multiple (non-neural) differentiable renderers with a unified front end.
- Applied to several research projects and significantly eased the development process.
- Link to the project: https://uci-rendering.github.io/irtk/

isoext:

- A `Python/C++` library that provides efficient implementations of isosurface extraction algorithms, such as Marching Cubes, on GPU.
- Uses `Thrust` for GPU acceleration and `nanobind` for `Python` binding.
- Link to the project: https://github.com/GuangyanCai/isoext

psdr-jit:

- Made significant contribution to `psdr-jit`, a physics-based differentiable renderer written in `C++` with a `Python` interface.
- Link to the project: https://github.com/andyyankai/psdr-jit

Reviewer

Eurographics: 2022

The Visual Computer: 2024

Teaching

CS112 Introduction to Computer Graphics: TA — *2021 Fall, UCI*

CS143A Principles of Operating Systems: TA — *2021 Spring, UCI*

CS143B Project in Operating System Organization: TA — *2021 Winter, UCI*

CS143B Project in Operating System Organization: Reader — *2020 Fall, UCI*

CSE168 Computer Graphics II - Rendering: Tutor — *2020 Spring, UCSD*

CSE167 Computer Graphics: Tutor — *2019 Fall & 2020 Winter, UCSD*