RUI ZHU

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RESEARCH INTERESTS

- **Inverse Rendering and Indoor Scene Understanding:** with a focus on physically-based material and lighting estimation of indoor scenes, for AR/VR applications (object insertion, scene editing, relighting, etc.).
- **Generative Modeling of Indoor Scenes:** generative methods for indoor scene generation and lighting estimation, and constructing large-scale datasets for photorealistic indoor inverse rendering.

EDUCATION

Ph.D. Candidate in Computer Science, UC San Diego   La Jolla, CA, USA *Sep.2018 - Present*
- Thesis Proposal: **Bridging Semantic, Geometric and Physical Reasoning in Indoor 3D Scenes**
- Qualcomm Innovation Fellowship   *2022 - 2023*
- Powell Fellow and Jacobs School of Engineering Fellowship at UCSD   *2019 - 2021*

M.S. in Robotics, Carnegie Mellon University   Pittsburgh, PA, USA *Aug.2015 - Aug.2017*
- Thesis: **Shape Prior Meets Geometry in Single and Multi-view Shape Reconstruction**

B.Eng. in Information Engineering, Southeast University Nanjing, Jiangsu, P.R.China *Aug.2011 - Jun.2015*

PUBLICATIONS

1. **Factorized Inverse Path Tracing for Efficient and Accurate Material-Lighting Estimation** Liwen Wu, **Rui Zhu** (equal contribution), Mustafa B. Yaldiz, Yinhao Zhu, Hong Cai, Janarbek Matai, Fatih Porikli, Tzu-Mao Li, Manmohan Chandraker, Ravi Ramamoorthi. *International Conference on Computer Vision* (**ICCV**), 2023 **(Oral)**

2. **IRISformer: Dense Vision Transformers for Single-Image Inverse Rendering in Indoor Scenes** **Rui Zhu**, Zhengqin Li, Janarbek Matai, Fatih Porikli, Manmohan Chandraker. *IEEE Conference on Computer Vision and Pattern Recognition* (**CVPR**), 2022 **(Oral)**

3. **Physically-based Editing of Indoor Scene Lighting from a Single Image** Zhengqin Li, Jia Shi, Sai Bi, **Rui Zhu**, Kalyan Sunkavalli, Milo Haan, Zexiang Xu, Ravi Ramamoorthi, Manmohan Chandraker. *European Conference on Computer Vision* (**ECCV**), 2022

4. **PhotoScene: Physically-Based Material and Lighting Transfer for Indoor Scenes** anonymous. *IEEE Conference on Computer Vision and Pattern Recognition* (**CVPR**), 2022 Yu-Ying Yeh, Zhengqin Li, Yannick Hold-Geoffroy, **Rui Zhu**, Zexiang Xu, Milo Haan, Kalyan Sunkavalli, Manmohan Chandraker.

5. **OpenRooms: An Open Framework for Photorealistic Indoor Scene Datasets** Zhengqin Li, Ting-Wei Yu, Shen Sang, Sarah Wang, Meng Song, Yuhan Liu, Yu-Ying Yeh, **Rui Zhu**, Nitesh Gundavarapu, Jia Shi, Sai Bi, Hong-Xing Yu, Zexiang Xu, Kalyan Sunkavalli, Milos Hasan, Ravi Ramamoorthi, Manmohan Chandraker. *IEEE Conference on Computer Vision and Pattern Recognition* (**CVPR**), 2021 **(Oral)**

6. **Single View Metrology in the Wild** **Rui Zhu**, Xingyi Yang, Yannick Hold-Geoffroy, Federico Perazzi, Jonathan Eisenmann, Kalyan Sunkavalli, Manmohan Chandraker. *European Conference on Computer Vision* (**ECCV**), 2020

7. **Deep Keypoint-Based Camera Pose Estimation with Geometric Constraints** **Rui Zhu***, You-Yi Jau*, Hao Su, Manmohan Chandraker. *International Conference on Intelligent Robots and Systems* (**IROS**), 2020

8. **ApolloCar3D: A Large 3D Car Instance Understanding Benchmark for Autonomous Driving** Xibin Song, Peng Wang, Dingfu Zhou, <u>**Rui Zhu**</u>, Yuchao Dai, Hao Su, Hongdong Li, Ruigang Yang. *IEEE Conference on Computer Vision and Pattern Recognition* (**CVPR**), 2019

9. **Learning Depth from Monocular Videos using Direct Methods** Chaoyang Wang, Jose Miguel Buenaposada, <u>**Rui Zhu**</u>, Simon Lucey. *IEEE Conference on Computer Vision and Pattern Recognition* (**CVPR**), 2018

10. **Object-Centric Photometric Bundle Adjustment with Deep Shape Prior** <u>**Rui Zhu**</u>, Chaoyang Wang, Chen-Hsuan Lin, Simon Lucey. *IEEE Winter Conference on Applications of Computer Vision* (**WACV**), 2018

11. **Rethinking Reprojection: Closing the Loop for Pose-aware Shape Reconstruction from a Single Image** <u>**Rui Zhu**</u>, Hamed Kiani, Chaoyang Wang, Simon Lucey. *International Conference on Computer Vision* (**ICCV**), 2017 (Spotlight)

12. **Semantic Photometric Bundle Adjustment on Natural Sequences** <u>**Rui Zhu**</u>, Chaoyang Wang, Ziyan Wang, Chen-Hsuan Lin, Simon Lucey. arXiv preprint, 2017

13. **The Conditional Lucas & Kanade Algorithm** Chen-Hsuan Lin, <u>**Rui Zhu**</u>, Simon Lucey. *European Conference on Computer Vision* (**ECCV**), 2016

14. **Structure from Category: A Generic and Prior-less Approach** Chen Kong, <u>**Rui Zhu**</u>, Hamed Kiani, Simon Lucey. *International Conference on 3D Vision* (**3DV**), 2016

RESEARCH & INDUSTRY EXPERIENCE

- **Rembrand**, Remote   *Sept. 2023 -*
  Methods and large-scale datasets for generative indoor lighting estimation
  3D indoor lighting estimation and scene reconstruction from single/sparse-view input images of an indoor scene, via embedding geometry and physics into training diffusion models, using in-house generated large-scale synthetic datasets.

- **Qualcomm AI Research**, San Diego, USA   *Jun. 2022 - Sep. 2022, Jun. 2023 - Sep. 2023*
  Material, lighting and semantic estimation for multi-view indoor inverse rendering and scene editing
  Research Intern - Yinhao Zhu, Hebert Cai, Fatih Porikli, et al.

- **Nvidia Research**, Santa Clara, USA   *Jun. 2021 - Sep. 2021*
  Non-patch-based dense transformers for efficient scene representation
  Research Intern - Chao Liu, Ben Eckart, Jan Kautz

- **Microsoft Vision MR Team**, Seattle, WA, USA   *Jun. 2020 - Sep. 2020*
  Semantic stereo estimation
  Research Intern - Sudipta Sinha, Victor Fragoso

- **Adobe Research**, San Jose, CA, USA   *Jun. 2019 - Sept. 2019*
  Scene scale estimation from a single image in the wild
  Research Intern - Kalyan Sunkavalli, Yannick Hold-Geoffroy, Federico Perazzi

- **Baidu Research**, Sunnyvale, CA, USA   *May. 2018 - Sept. 2018*
  6DOF dense object reconstruction for autonomous driving applications
  Research Intern - Prof. Ruigang Wang & Dr. Peng Wang

- **Argo AI**, Pittsburgh, PA, USA   *Feb. 2018 - May 2018*
  3D object detection from front-view LiDAR data
  Research Engineer in Computer Vision - Prof. Deva Ramanan & Prof. Simon Lucey