Tianhang Cheng

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EDUCATION

Zhejiang University Zhejiang, China
Bachelor of Science, Opto-Electronics Information Science and Engineering *09/2017-06/2022*

- Overall GPA: 3.96/4.0(89.3/100), Major GPA: 3.94(89.6/100), Ranking: 6/116(Top 5%)
- Chu Kochen Honors College, Zhejiang University

University of Illinois Urbana-Champaign
Master of Science, Computer Science *08/2022-now*

- Advisor: Prof. Shenlong Wang in CS department and Prof. Kaiyu Guan in NRES department.

PUBLICATION

1. **Tianhang Cheng**, Wei-Chiu Ma, Kaiyu Guan, Antonio Torralba, Shenlong Wang, "Structure from Duplicates: Neural Inverse Graphics from a Single Image", *Conference on Neural Information Processing Systems* (**NeurIPS**), 2023. (Poster)

RESEARCH

Inverse Rendering for Single Image with Multiple Duplicate Instances
University of Illinois Urbana-Champaign *10/2022-09/2023,* Advisor: Shenlong Wang

- *Idea*: different instances share the same geometry and BRDF material in canonical space.
- *Pipeline*: estimate relative object poses by pretrained Super-Point and Super-Glue model from instance segmentations with in-plane rotation augmentation. Then train geometry, global visibility field and object material in a 3-stage pipeline.
- *Result*: we achieve a better disentanglement between geometry, texture, and environment light than baseline models.

Quantifying Top-View Crop Cover from Street-view Video by geometric digital twins and vision-based deep learning (Interdisciplinary Project)
University of Illinois Urbana-Champaign *8/2022-now,* Advisor: Kaiyu Guan

- *Idea*: quantify top-view residue fraction by explicitly modeling the occlusion effect of straws
- *Pipeline*: Use SfM to recover camera pose and ground geometry, then either (1) build a 3D digital twin model in Blender or (2) use mathematical analysis to predict top-view residue fraction.
- *Result*: we are the first one to explicitly predict residue fraction only from street-view video, and the performance is better than several simple baselines. We will submit our manuscript to IEEE Transactions on Geoscience and Remote Sensing recently.

An SDF-based 3D GAN
UC-Merced *05/2021-08/2021,* Advisor: Ming-Hsuan Yang

- *Idea*: Use singed distance field (SDF) to generate 3D-consistent feature and 3D shape.
- *Pipeline*: Passed the features through a style-based convolution upsampler and generated high-frequency detail of the image.
- *Result*: Model can generate with higher image quality and better shape quality than naïve NeRF.

Parameter-Efficient Group Equivariant Neural Network
Zhejiang University *07/2020-11/2020,* Advisor: Kaiwei Wang

- *Idea*: decompose dense bases into sparse bases, which can speed-up group convolution while

keeping group equivariance and receptive field unchanged.

- *Pipeline*: Decomposed the group convolution kernel into N orthogonal bases, then only selected K different bases to form the group convolution kernel.
- *Result*: Obtained a Model with only 1/4 the parameter and 4x faster convolution speed compared with the existing regular representation group equivariance neural network

SKILLS

Language	Fluent English, Native Mandarin
Programming	MATLAB, C, Python3 (Pytorch & TF2)
Software	Zemax / SolidWorks / FDTD solution / COMSOL / Lingo / Latex, MS office

HONORS AND AWARDS

2018 National Scholarships, Zhejiang University (top 1% of 327 students)
2018 First-class academic scholarship, Zhejiang University (top 3% of 327 students)
2019 Provincial scholarship (top 2% of 145 students)
2019 Third-class academic scholarship, Zhejiang University (top 15% of 145 students)
2020 Second-class academic scholarship, Zhejiang University (top 10% of 145 students)