



**SIGGRAPH 2023**  
LOS ANGELES+ 6-10 AUG

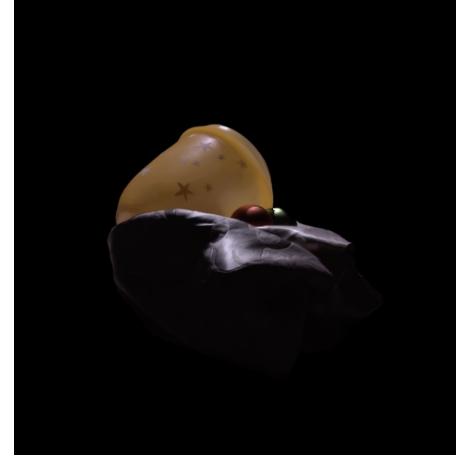
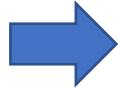
# Relighting Neural Radiance Fields with Shadow and Highlight Hints

**Chong Zeng, Guojun Chen, Yue Dong, Pieter Peers, Hongzhi Wu, Xin Tong**

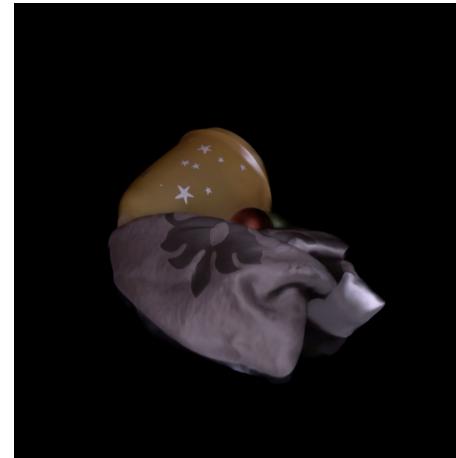
# Our Goal: Relighting from Unstructured Photographs



Unstructured Input Images

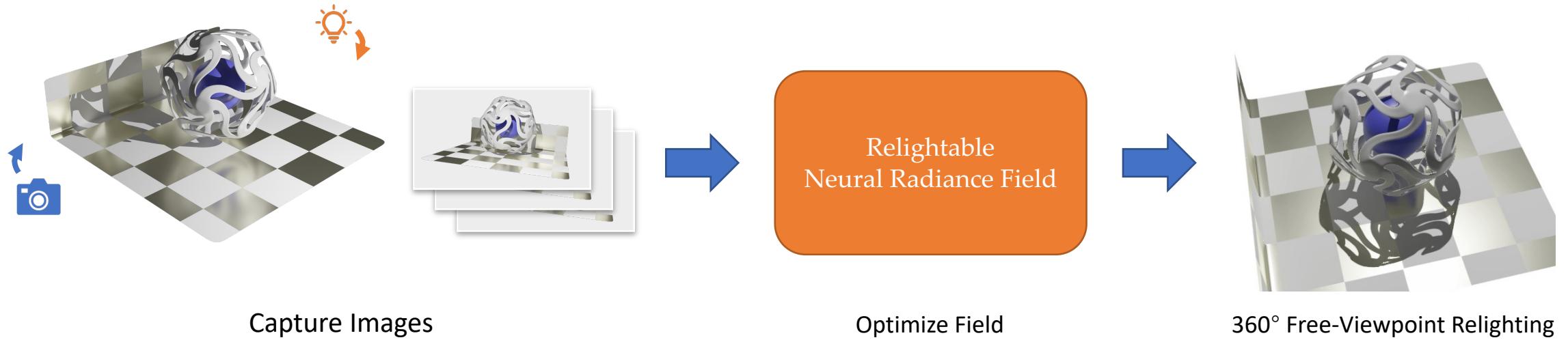


Novel Viewpoint



Novel Lighting

# Our Contribution



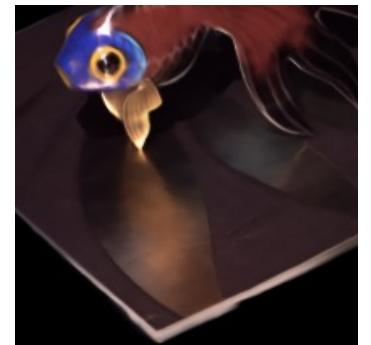
Limited Input



Arbitrary Shape

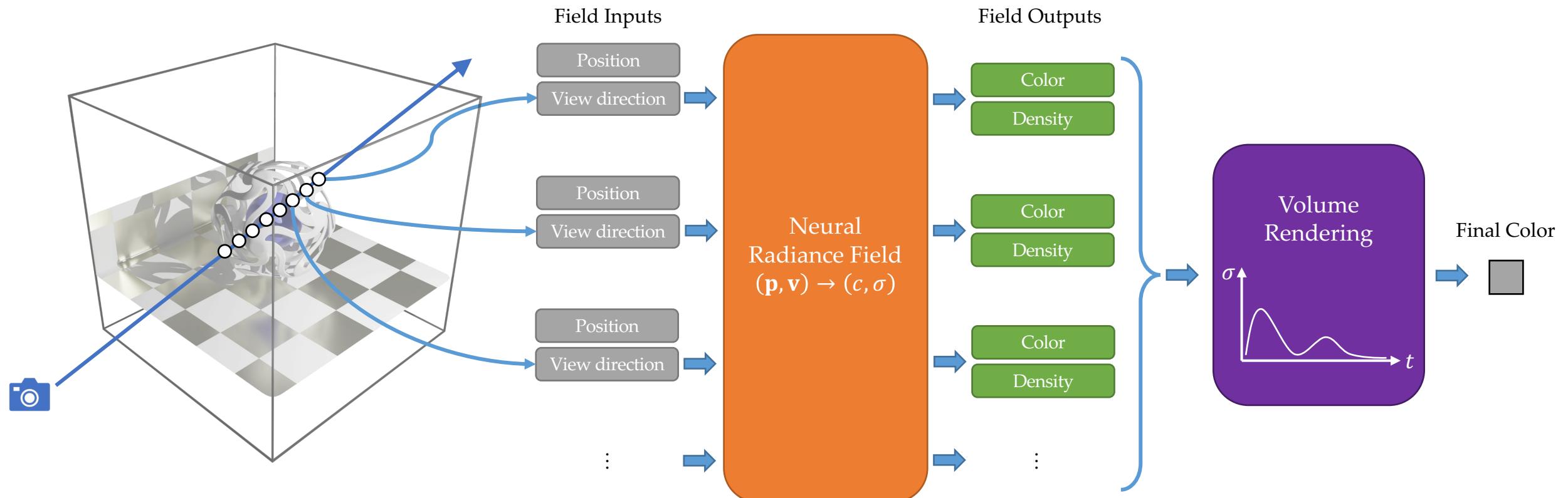


Arbitrary Material

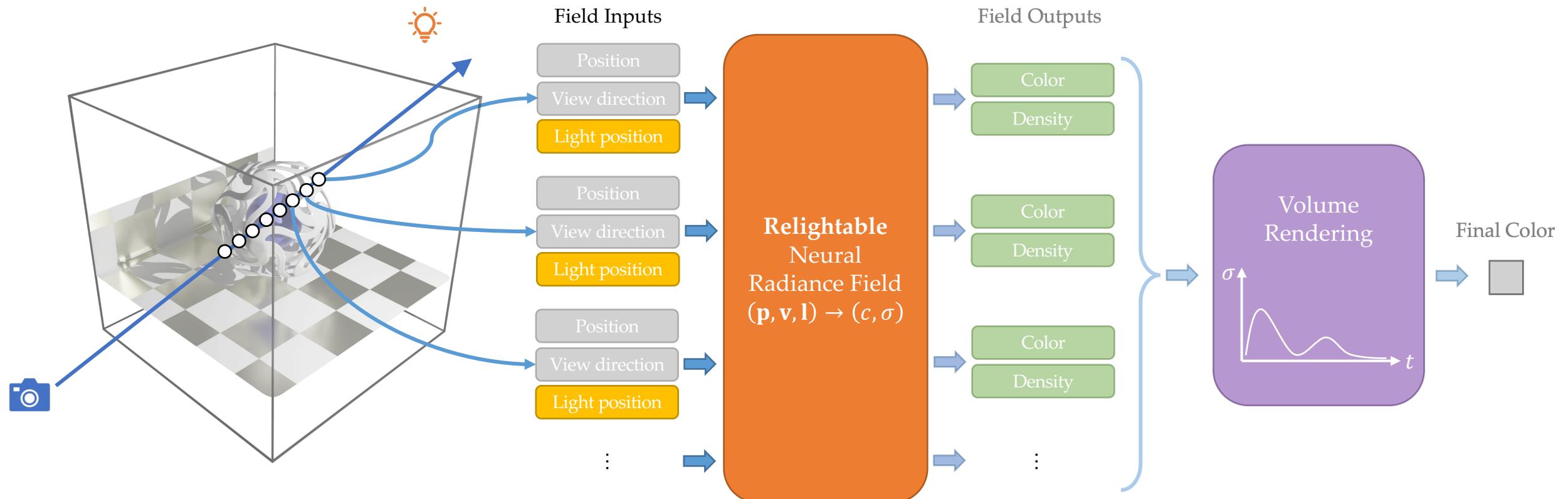


All Light Transport

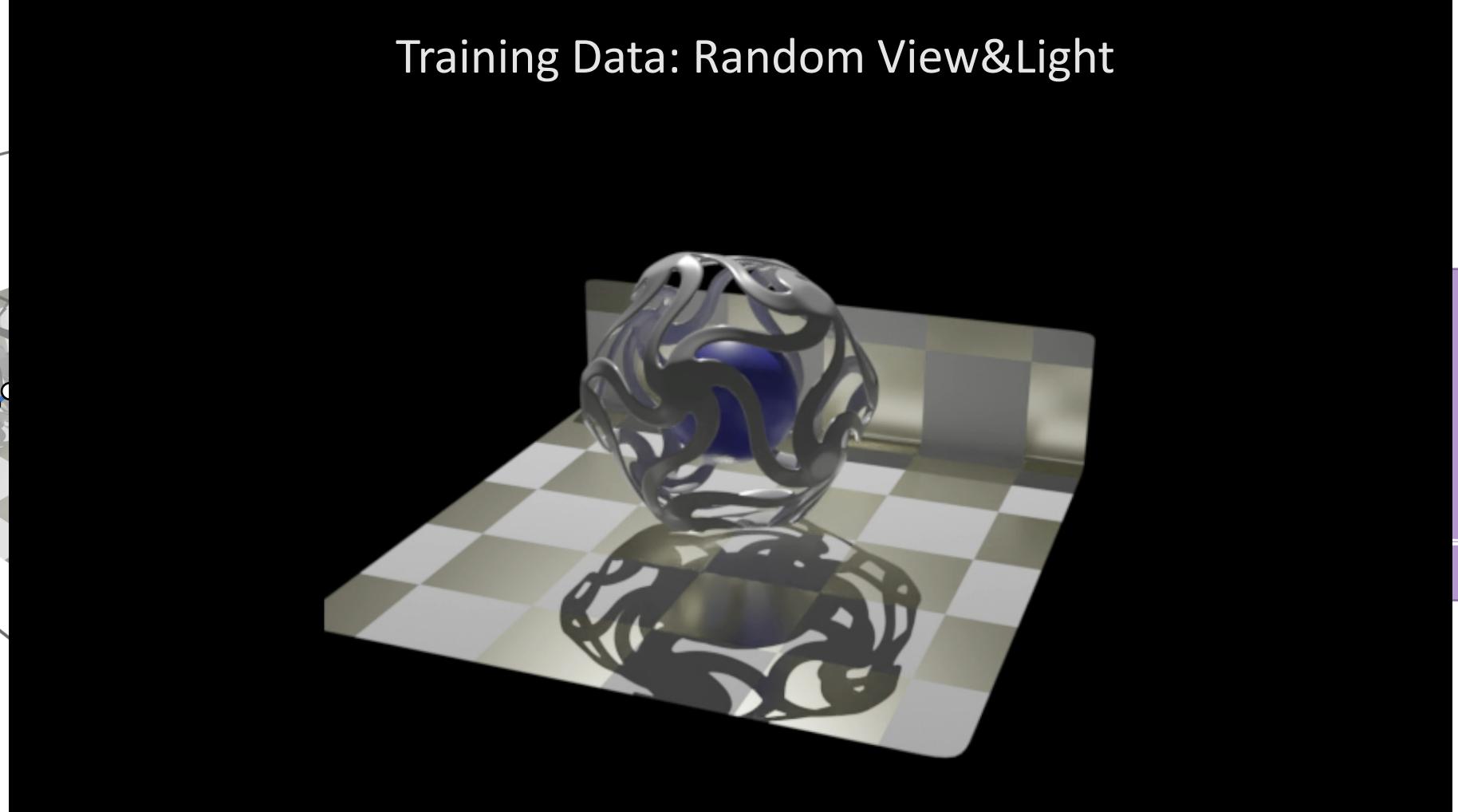
# Rendering Neural Radiance Field



# Relighting Neural Radiance Field



# Relighting Neural Radiance Field



# Challenge: Sharp Shadow Edges



Reference



Naïve Solution

# Challenge: Specular Highlights

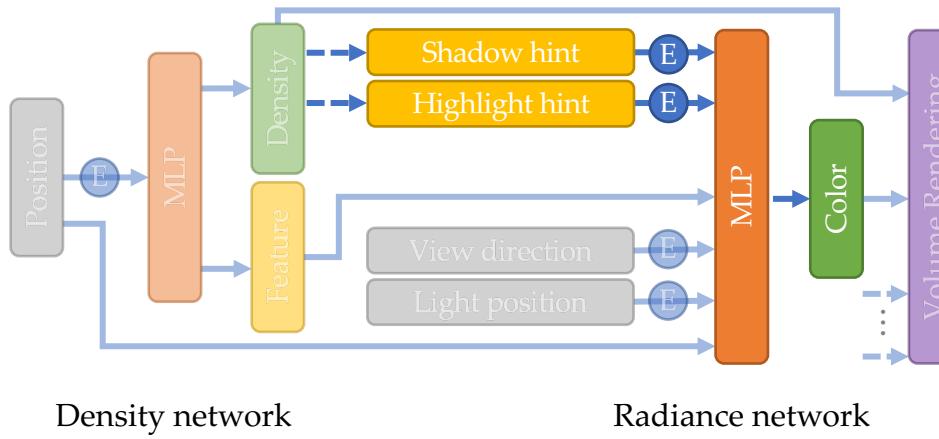


Reference



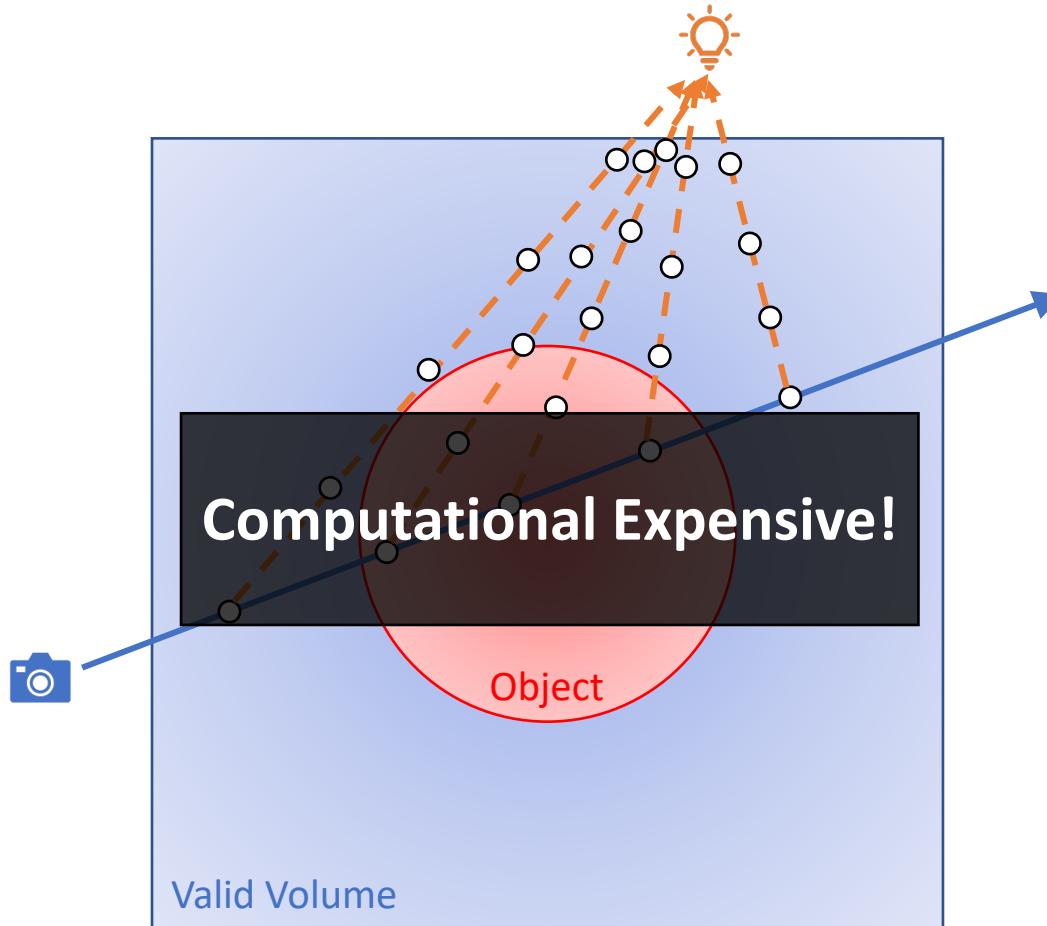
Naïve Solution

# Solution: Use Hints

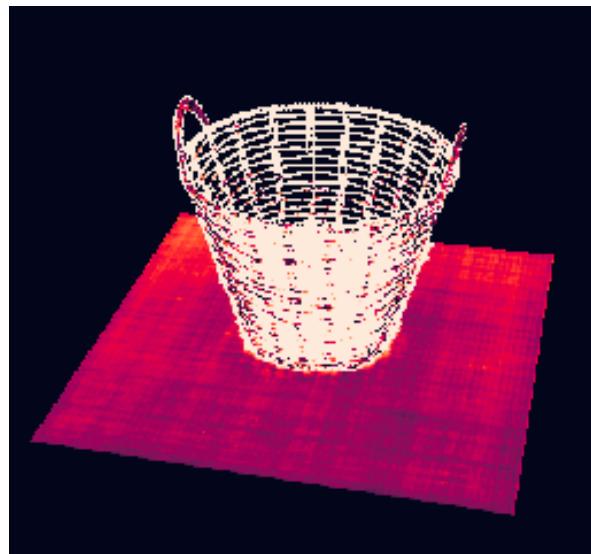
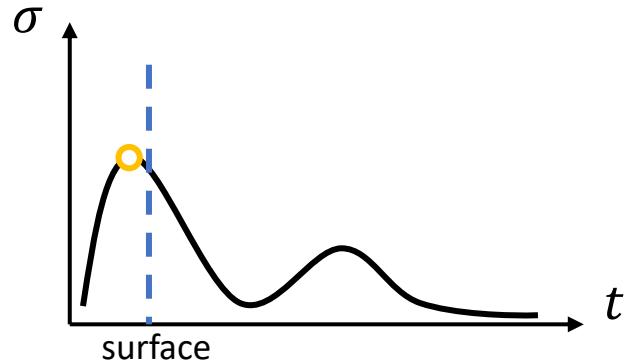


**Let Network Decide!**

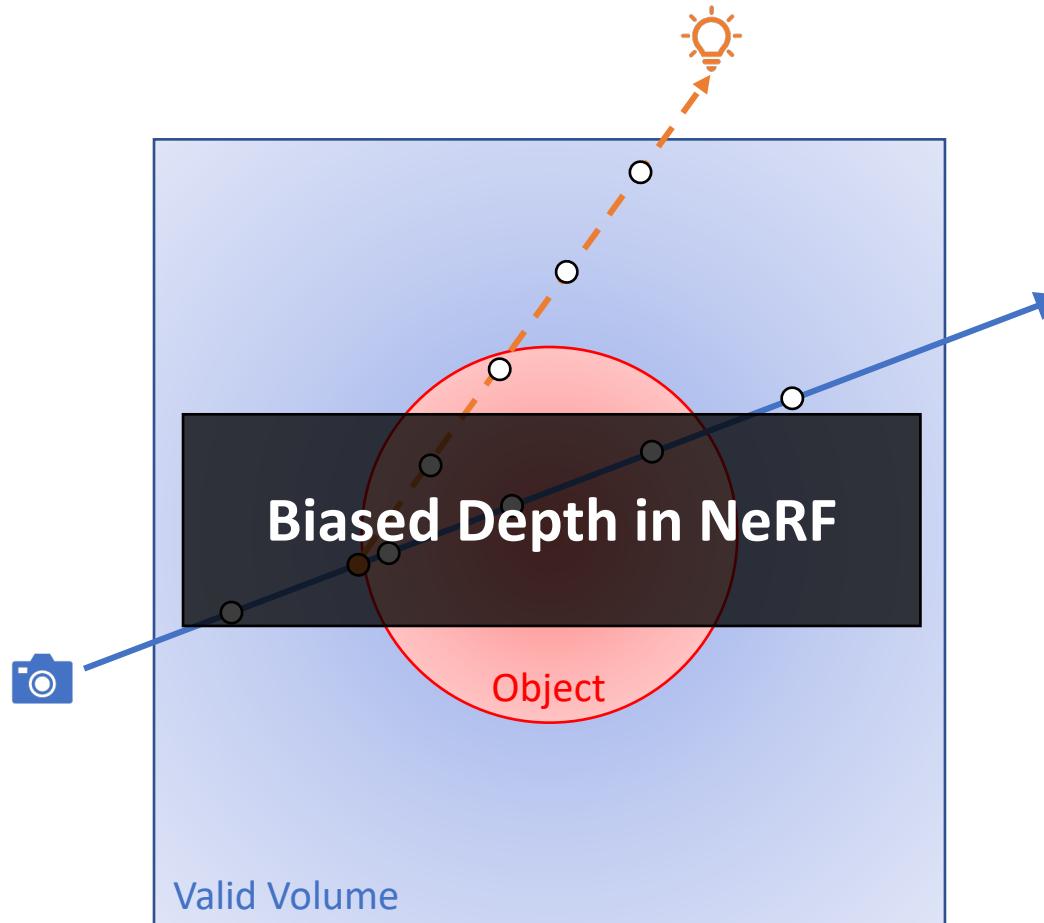
# Shadow Hint



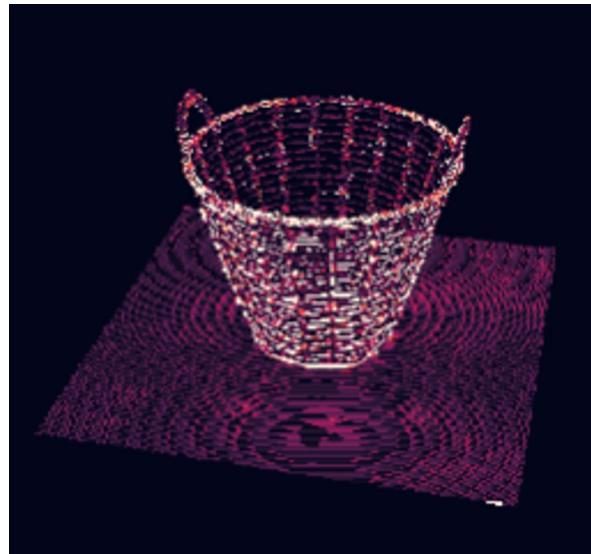
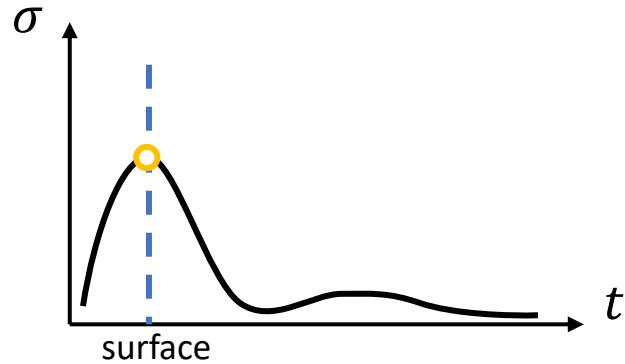
# Shadow Hint



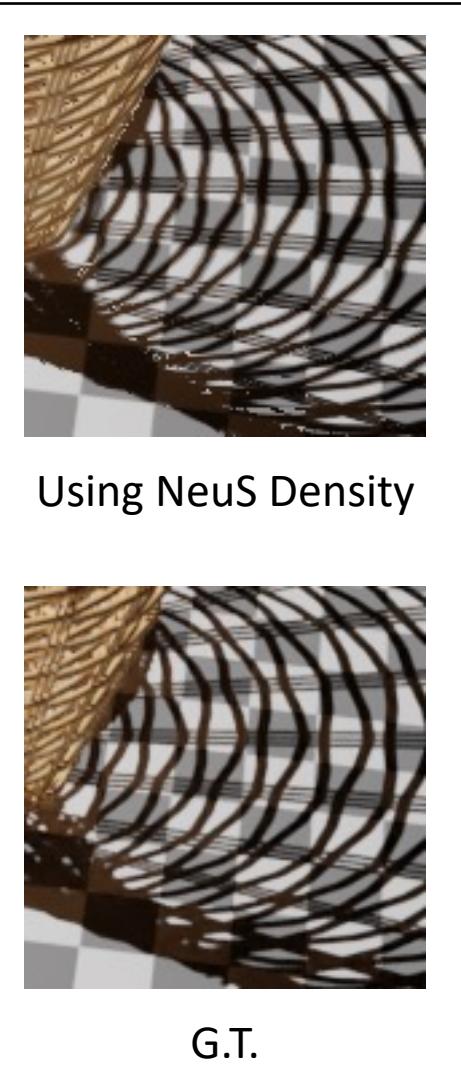
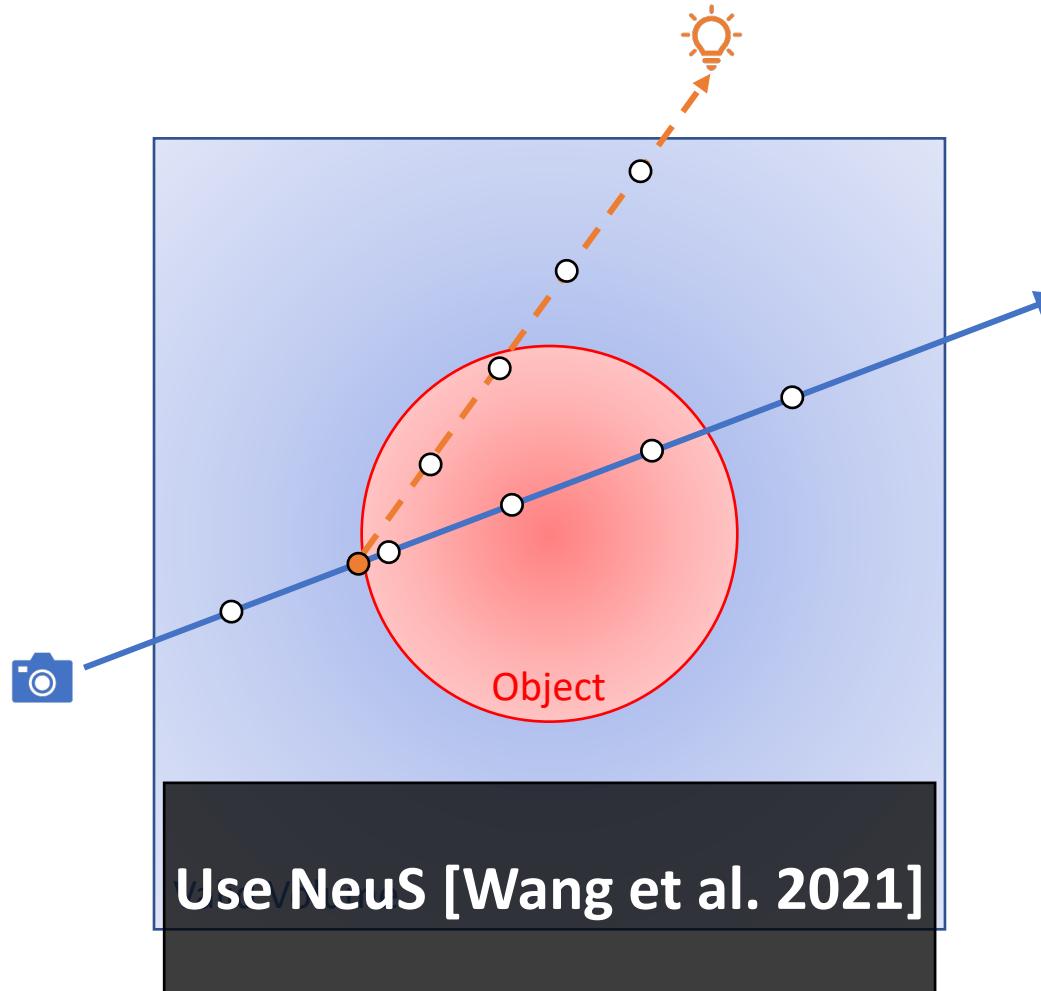
Depth Error Map



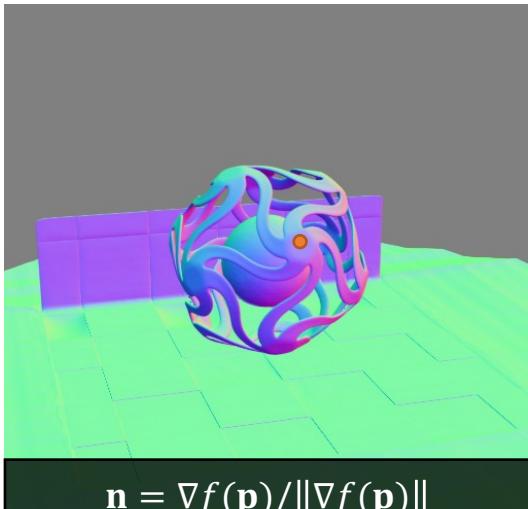
# Shadow Hint



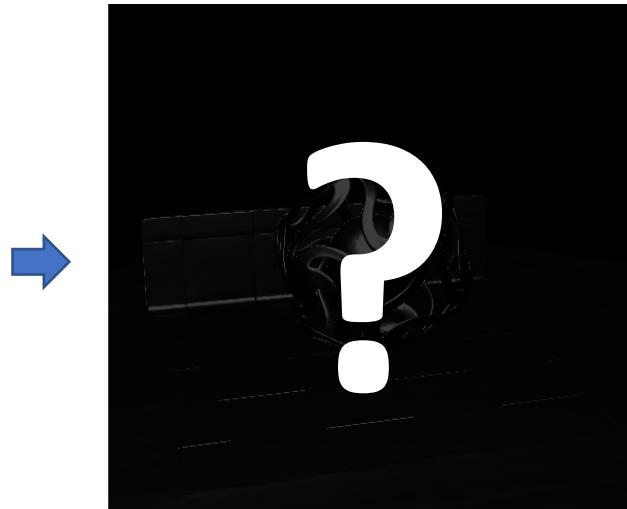
Depth Error Map



# Highlight Hint



Est. Normal



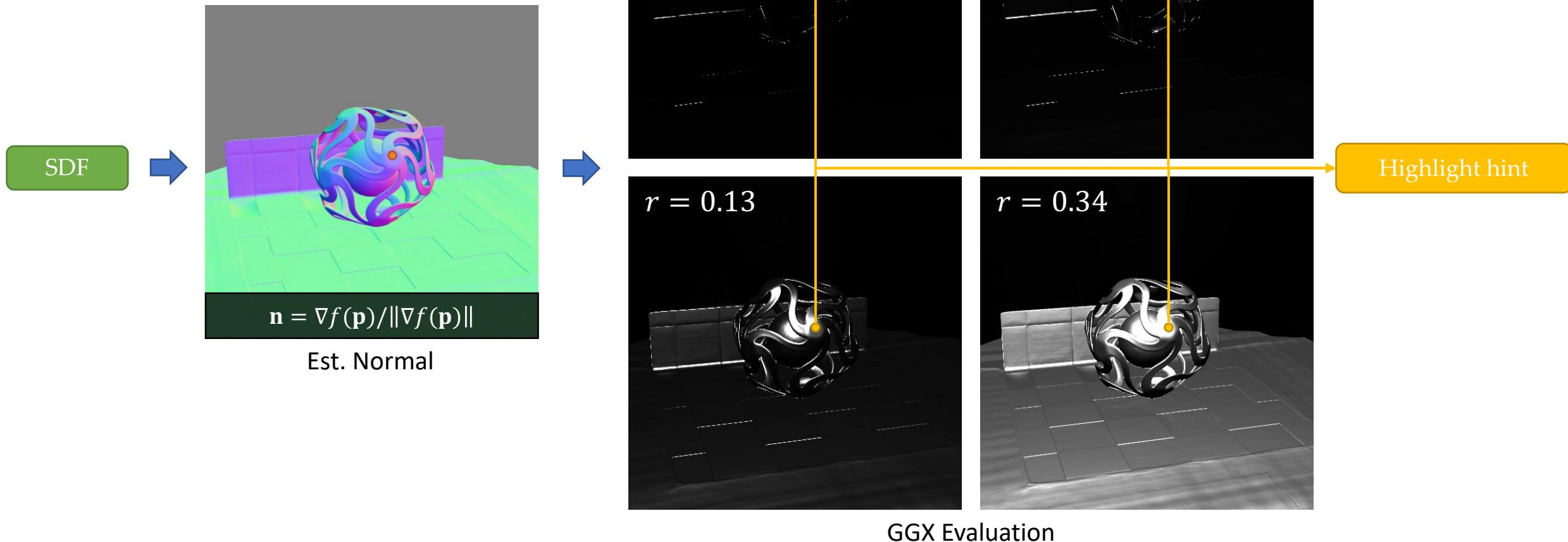
GGX Evaluation



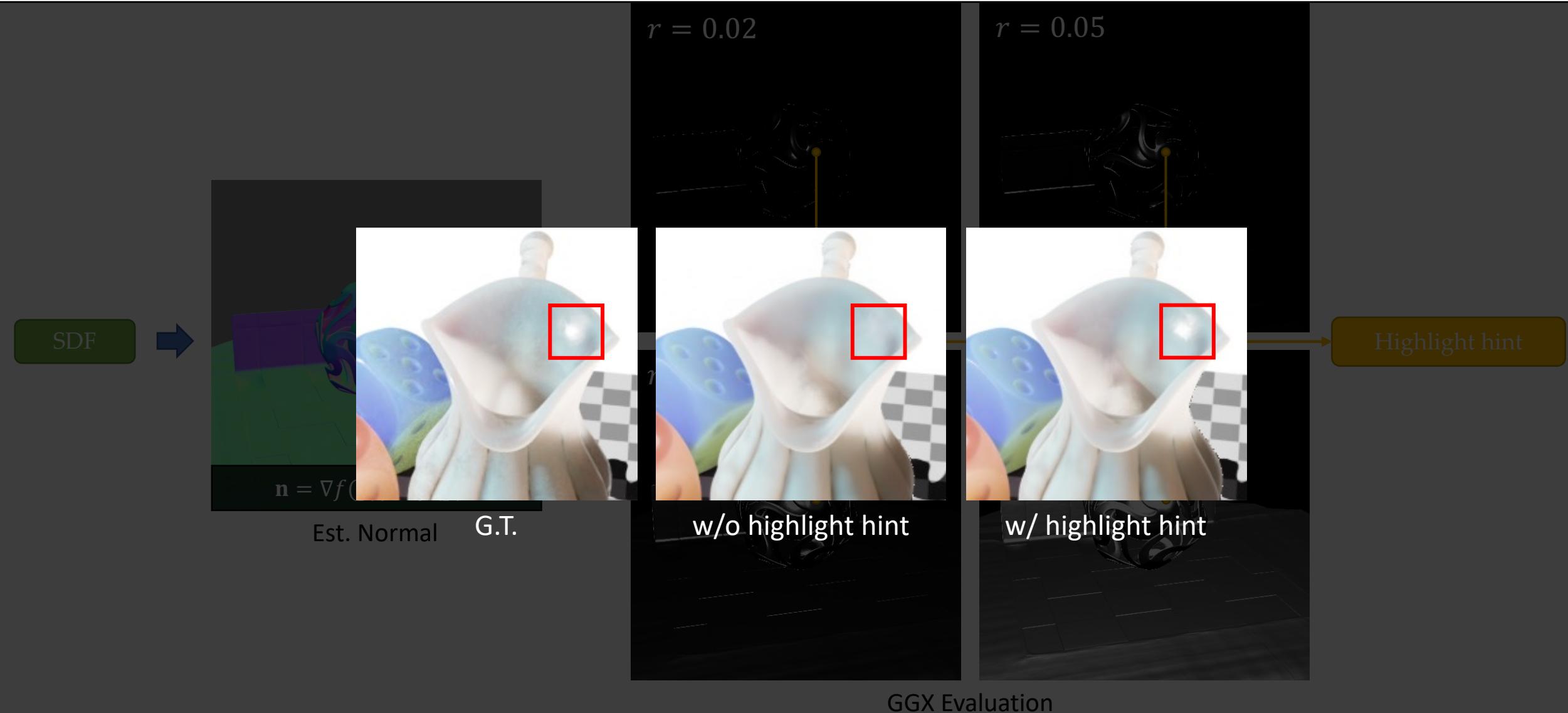
Highlight hint

Roughness Unknown!

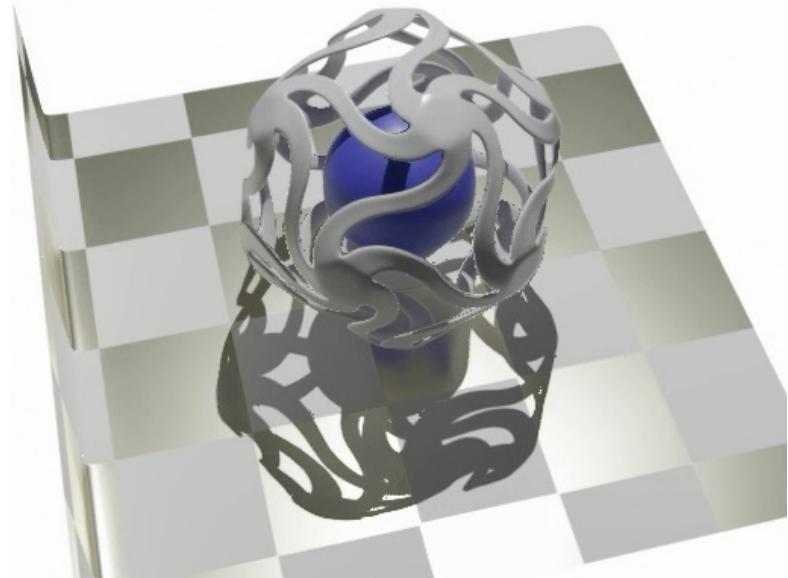
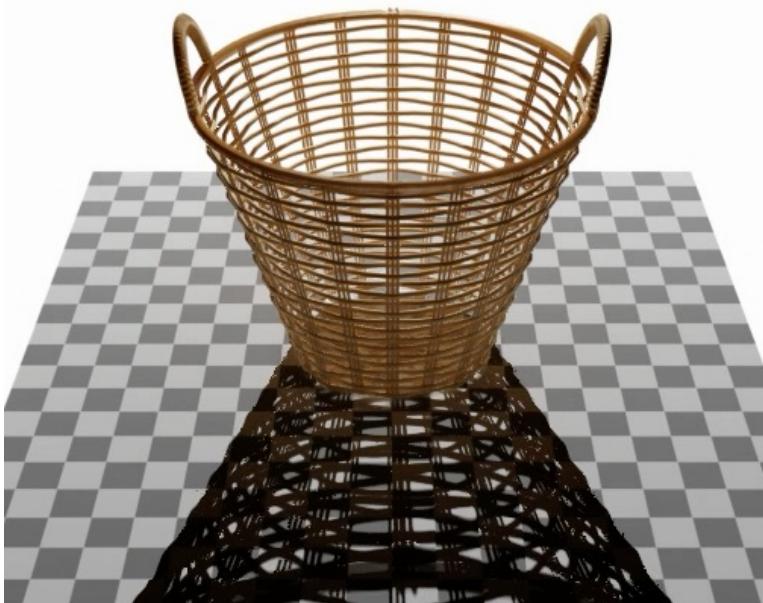
# Highlight Hint



# Highlight Hint



# Validation: Synthetic Scenes



# Validation: Arbitrary Material & Full Light Transport



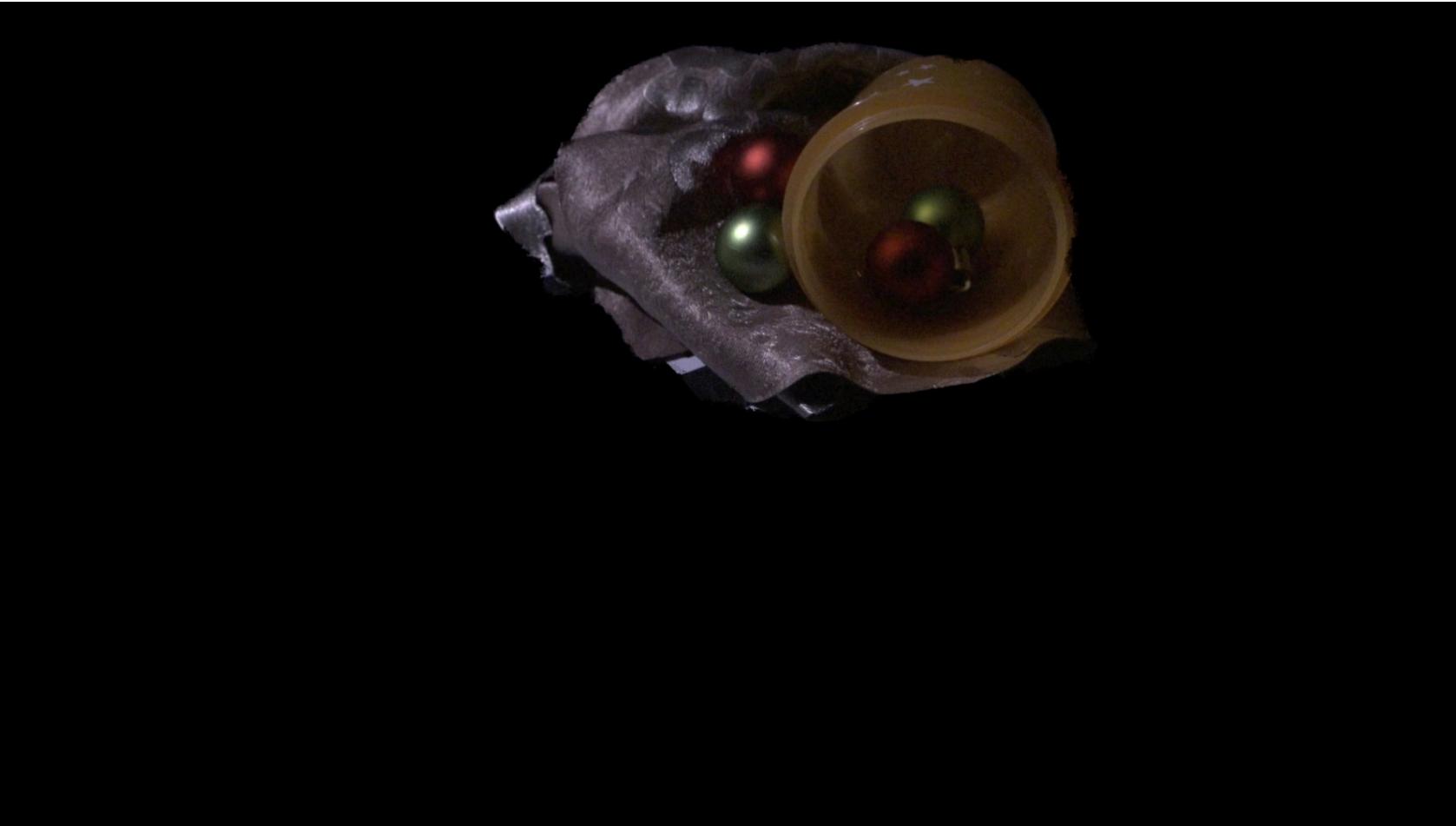
# Validation: Complex Ill-defined Shapes



# Validation: Synthetic Scenes



# Real Capture Setup



Follows DNL [Gao et al. 2020] Capture Process

# Validations – Real Captures



# Comparisons



Reference

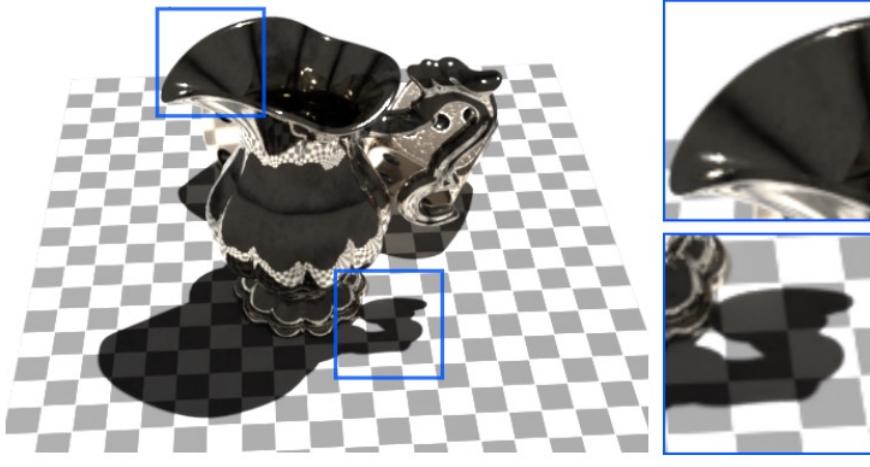


IRON  
[Zhang et al. 2022]

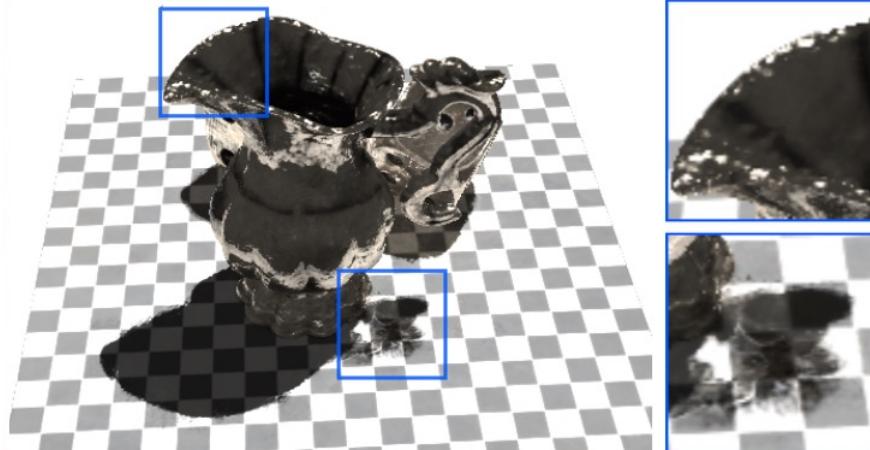


Ours

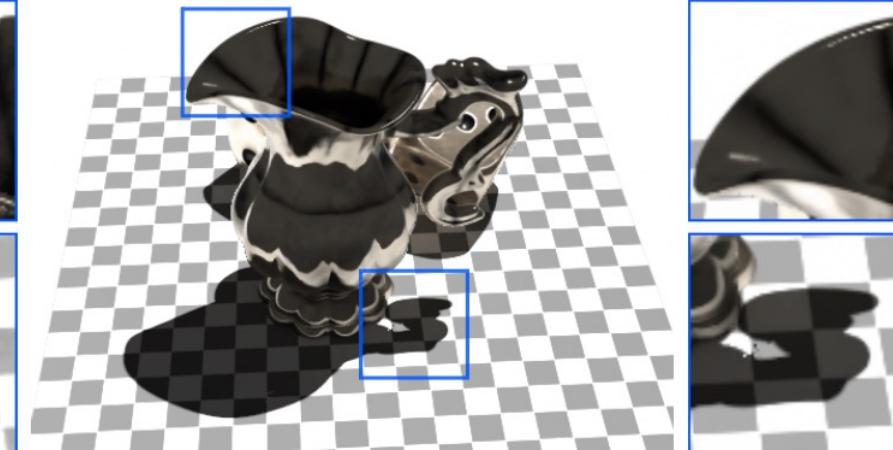
# Comparisons



Reference



NRTF  
[Lyu et al. 2022]

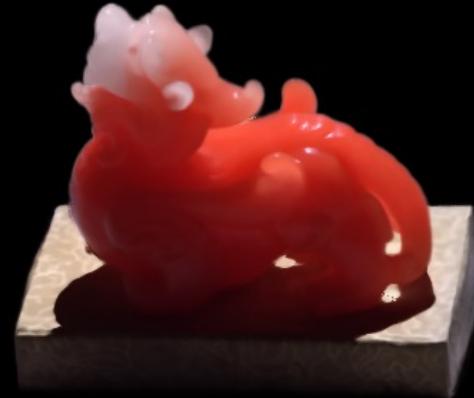
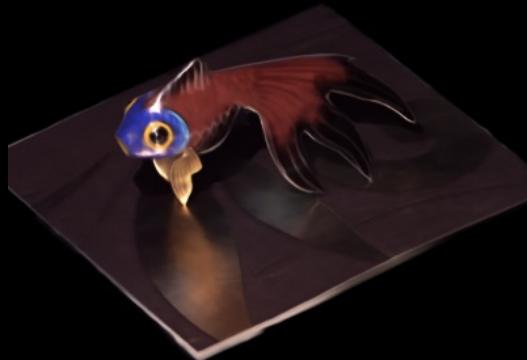


Ours

# Comparisons

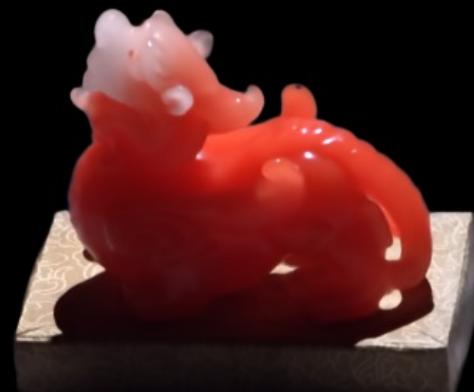
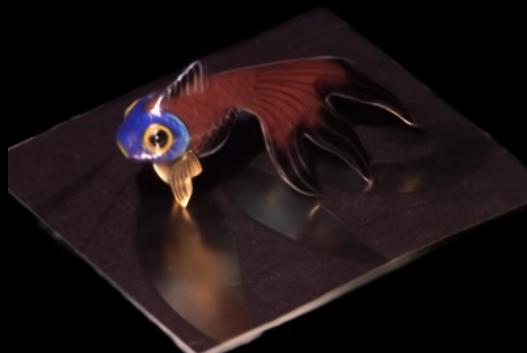
Ours

#Input: 500~1000



DNL[Gao et al. 2020]

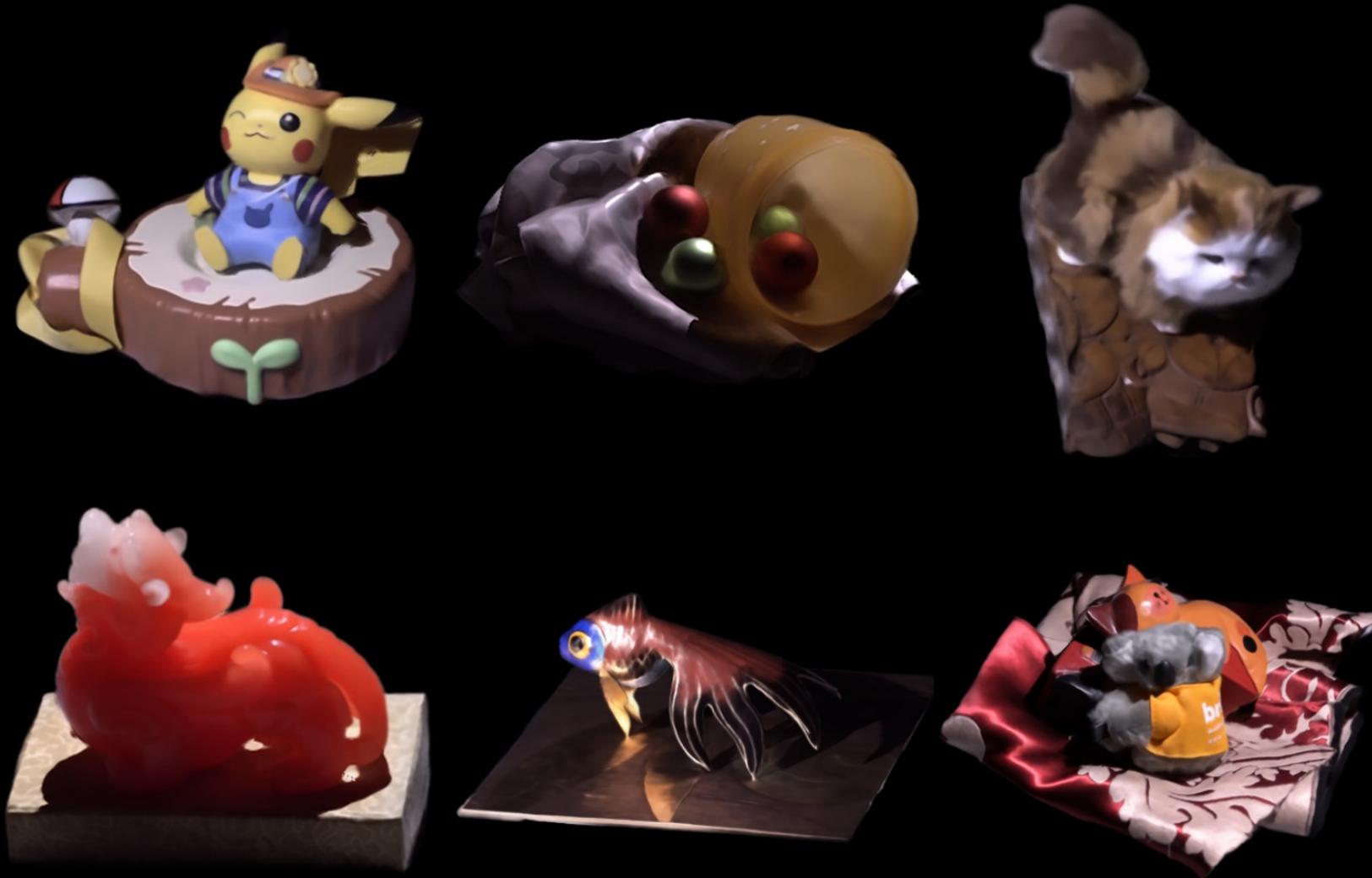
#Input: 10000+



# Conclusion: Neural Radiance Field Relighting

- 360° free-viewpoint relighting from unstructured photographs
- Arbitrary shape & material & all light transport effects
- Provide network with *hints* to model high frequency light transport effects





Thanks