



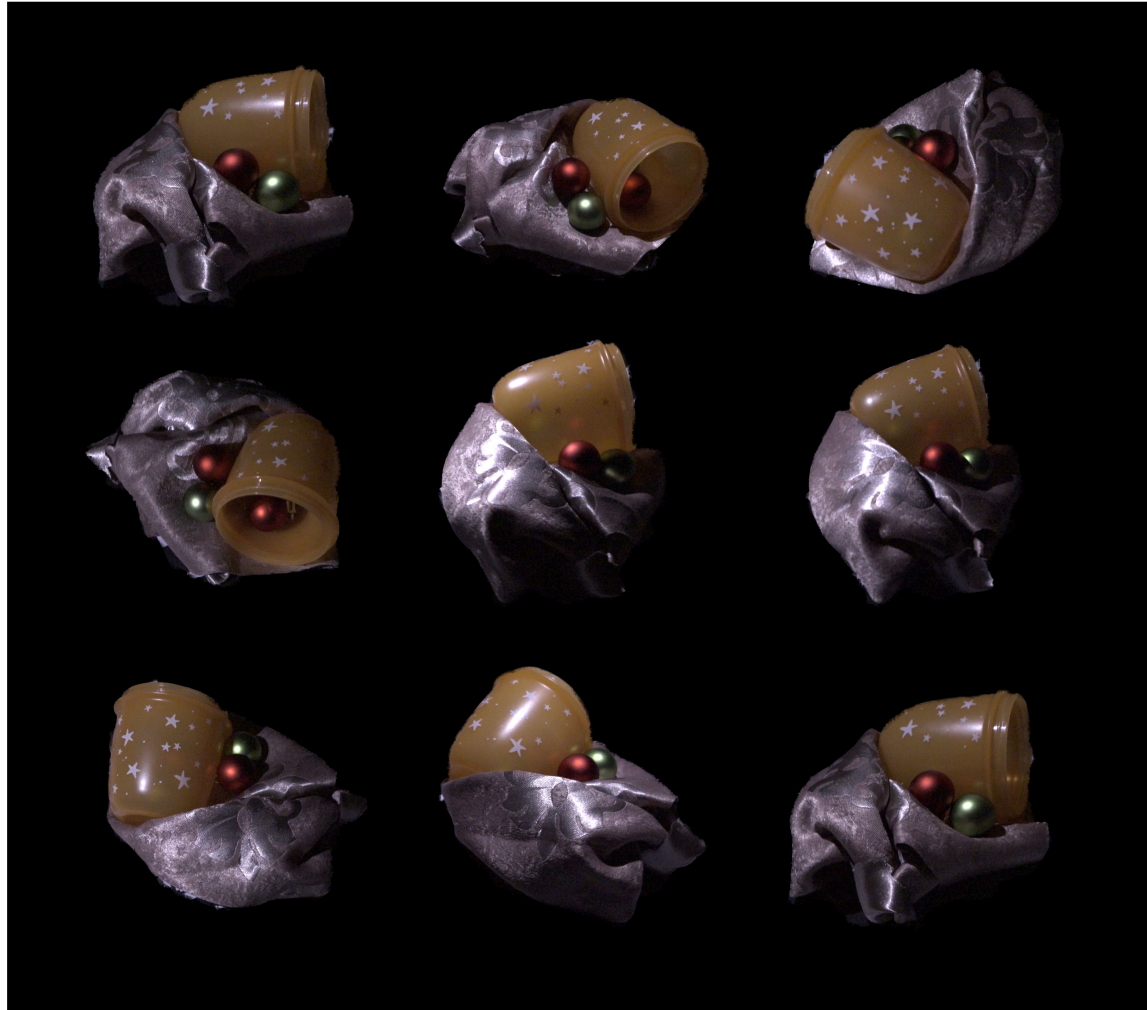
**SIGGRAPH 2023**

LOS ANGELES+ 6-10 AUG

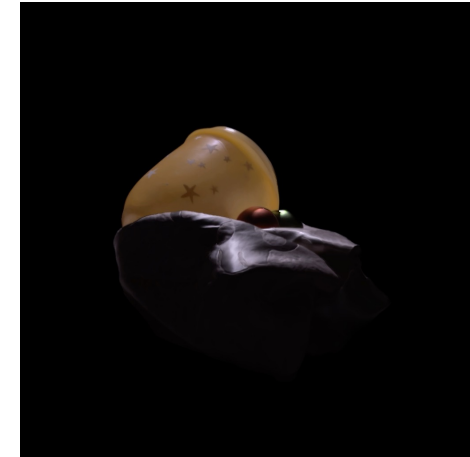
# Relighting Neural Radiance Fields with Shadow and Highlight Hints

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

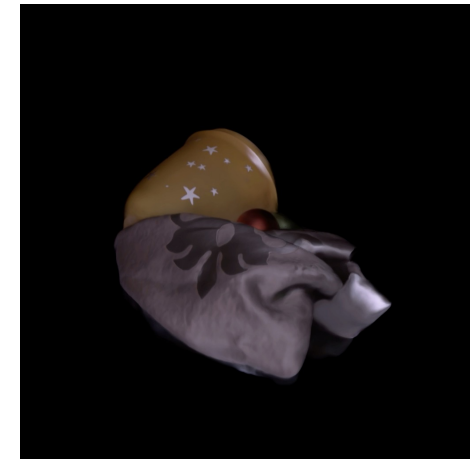
# Our Goal: Relighting from Unstructured Photographs



Unstructured Input Images

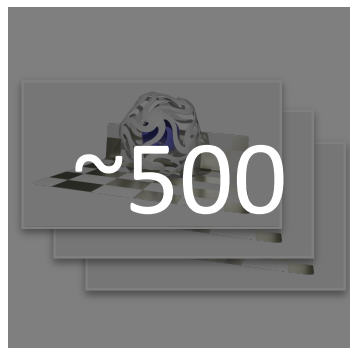
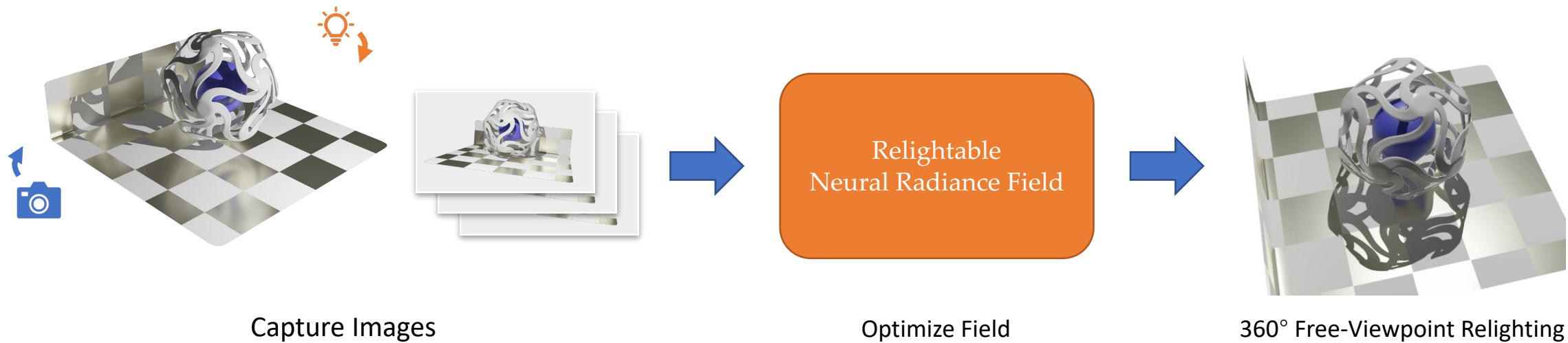


Novel Viewpoint



Novel Lighting

# Our Contribution



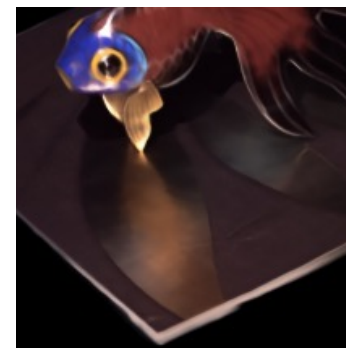
Limited Input



Arbitrary Shape

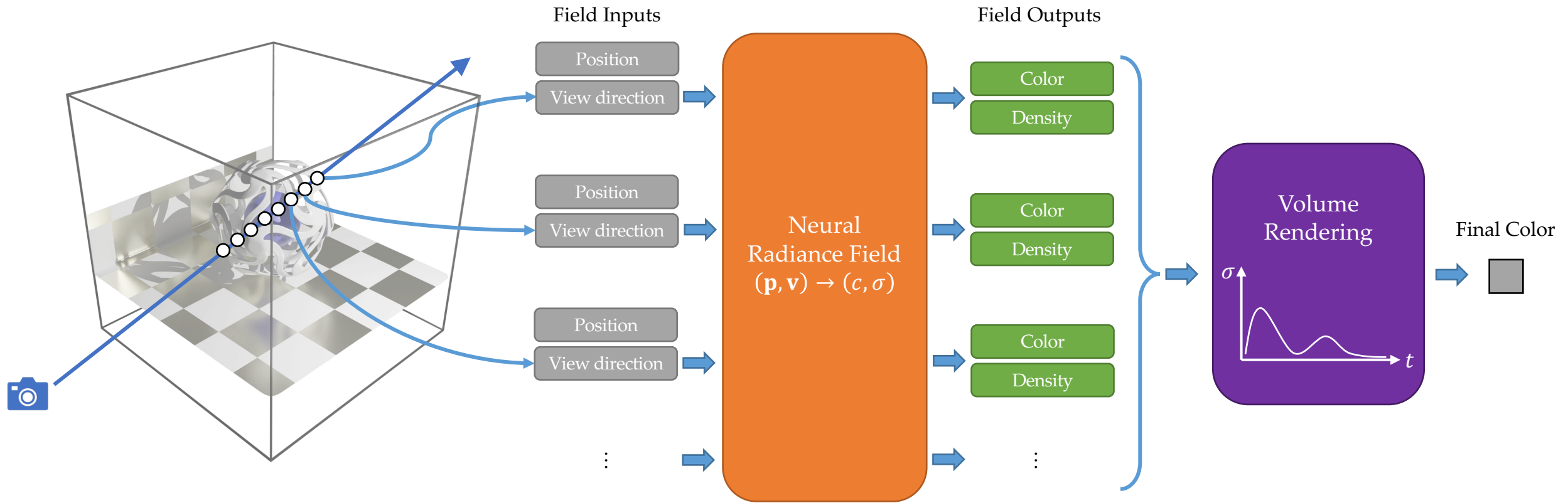


Arbitrary Material

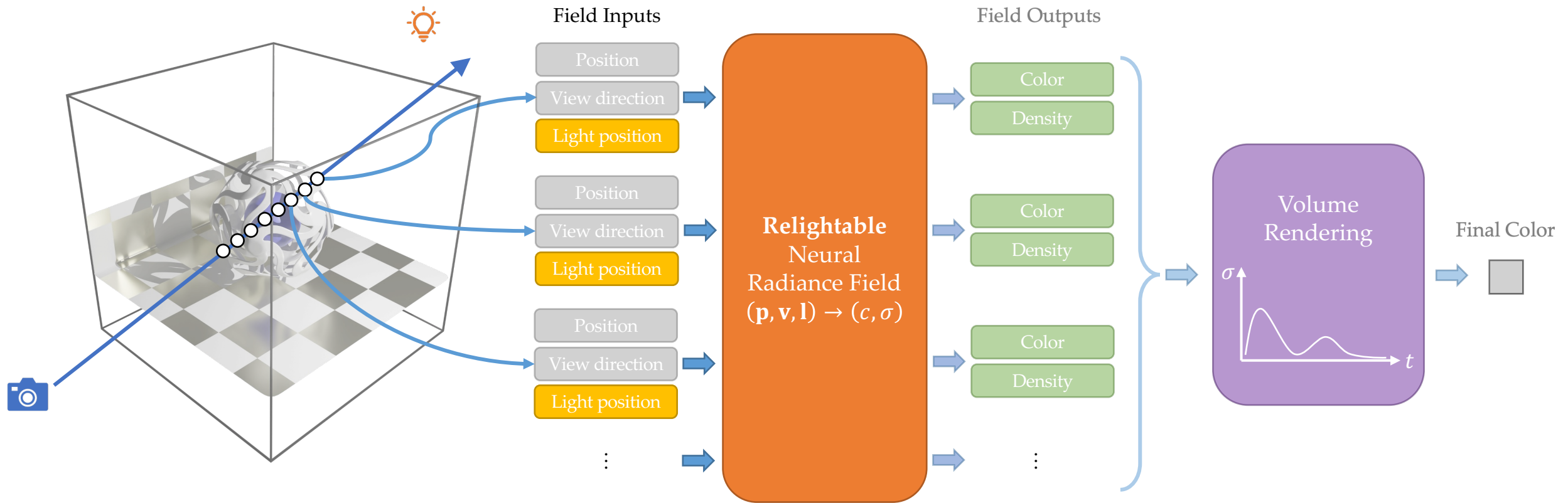


All Light Transport

# Rendering Neural Radiance Field

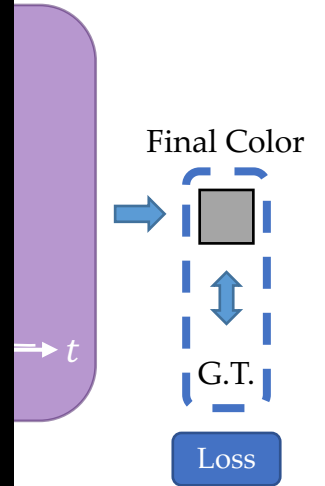
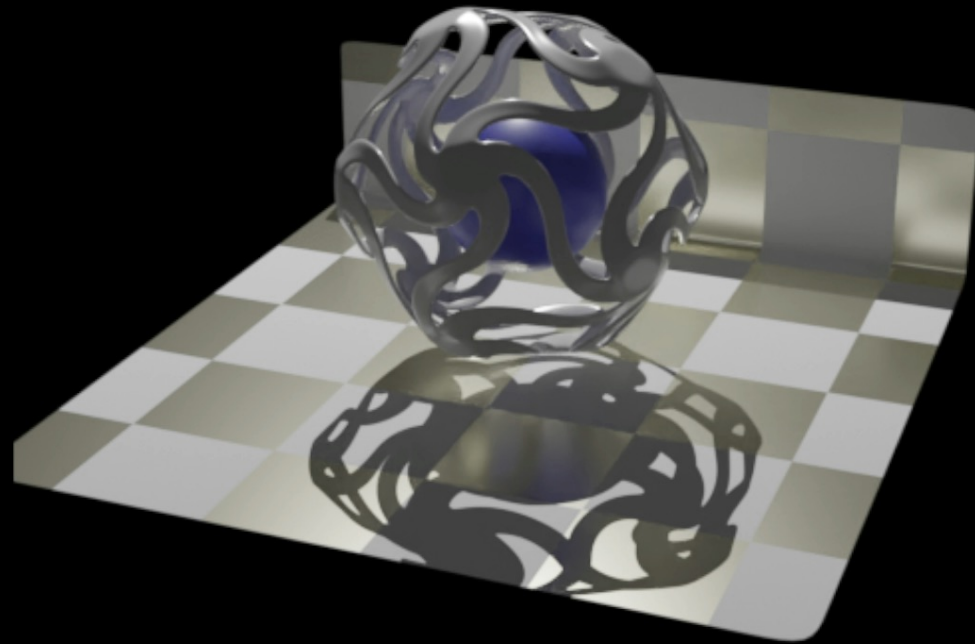
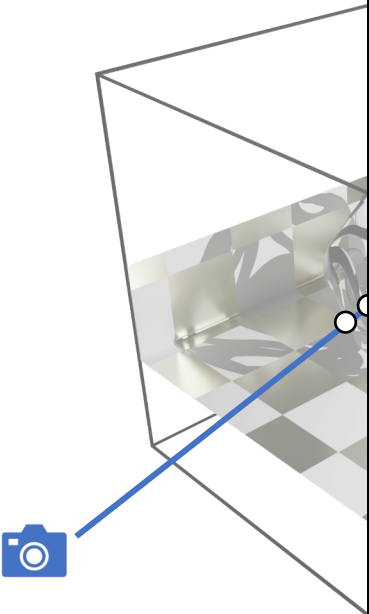


# Relighting Neural Radiance Field



# Relighting Neural Radiance Field

Training Data: Random View&Light



# Challenge: Sharp Shadow Edges



Reference



Naïve Solution

# Challenge: Specular Highlights



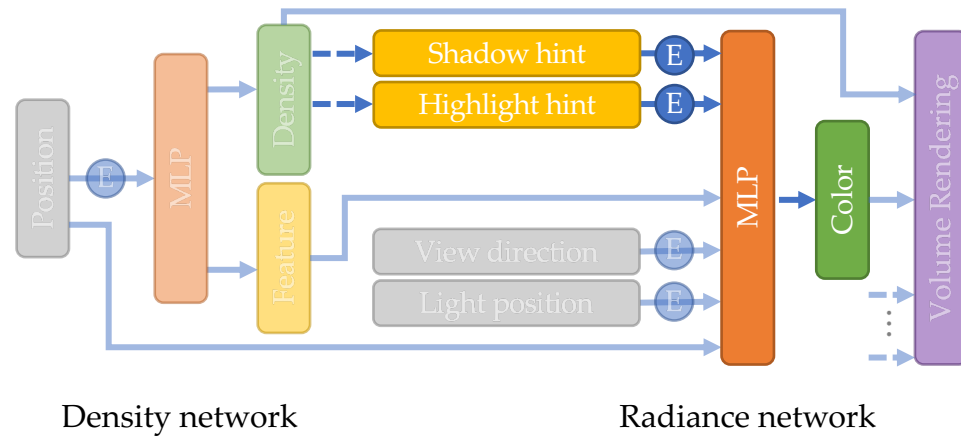
Reference



Naïve Solution

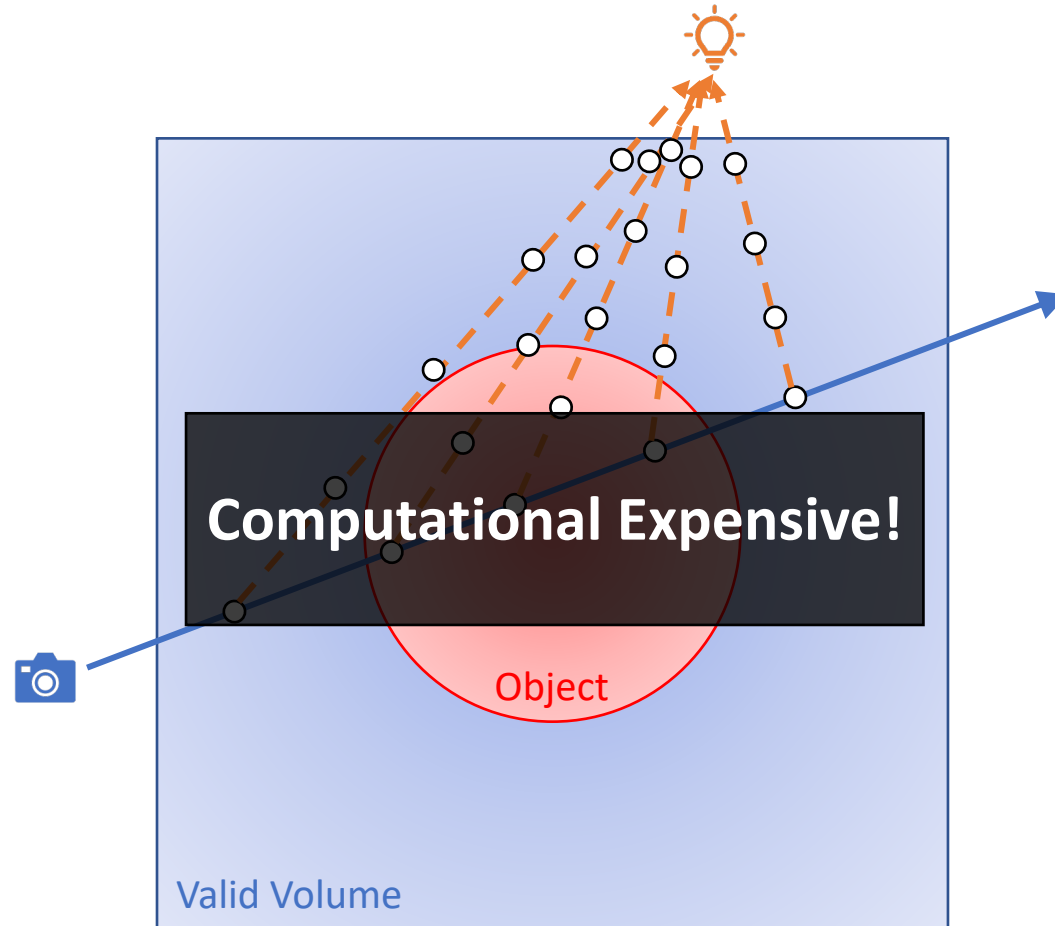


# Solution: Use Hints

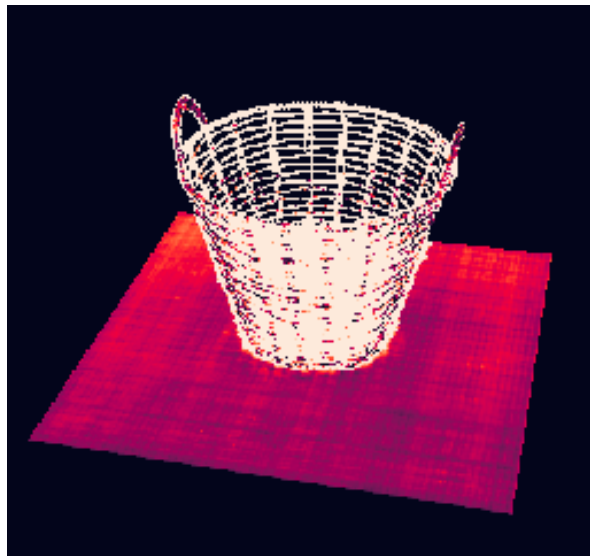
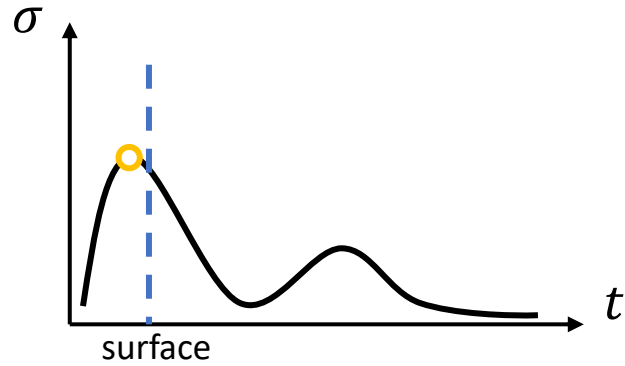


**Let Network Decide!**

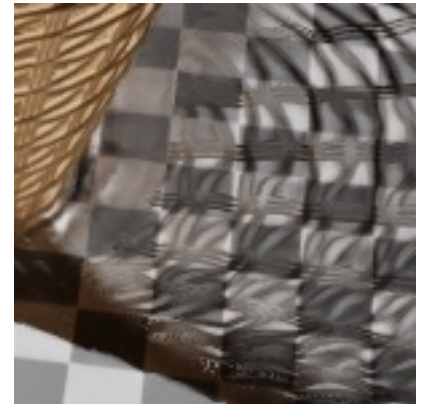
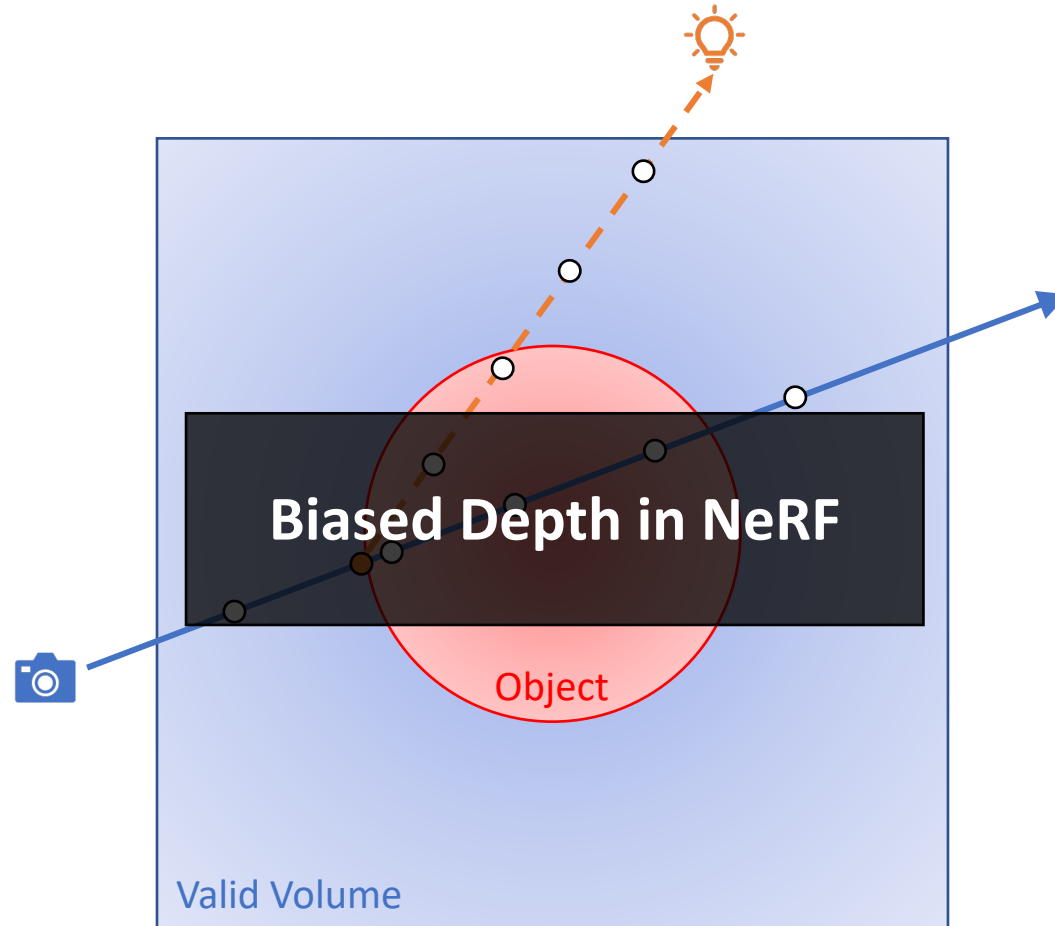
# Shadow Hint



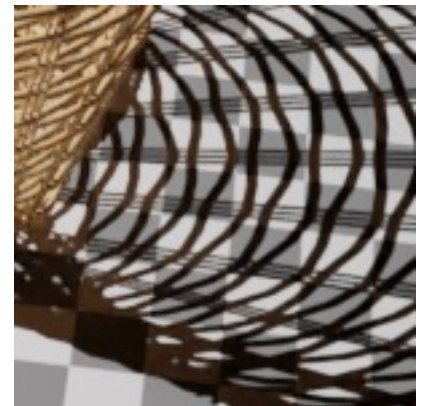
# Shadow Hint



Depth Error Map

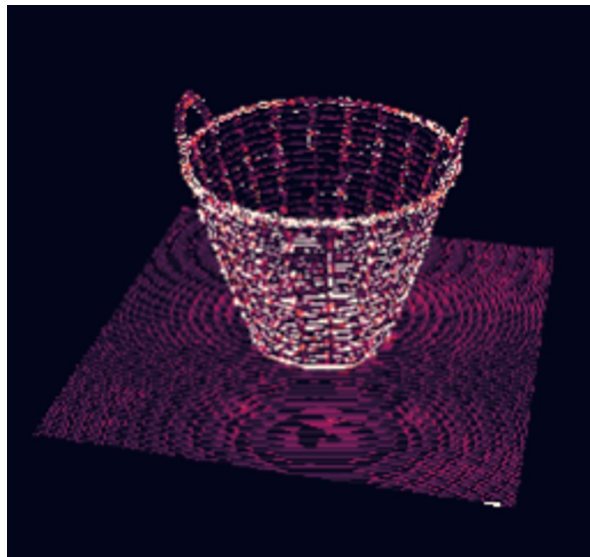
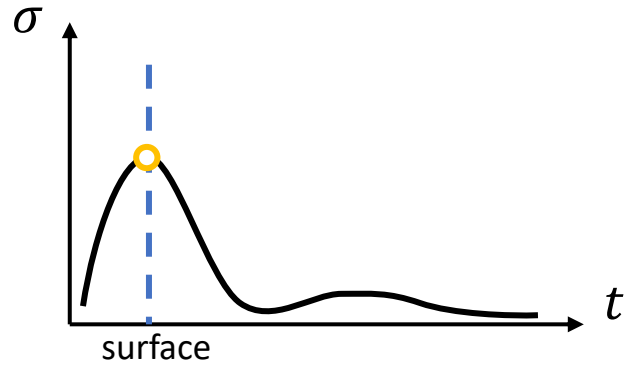


Using NeRF Density

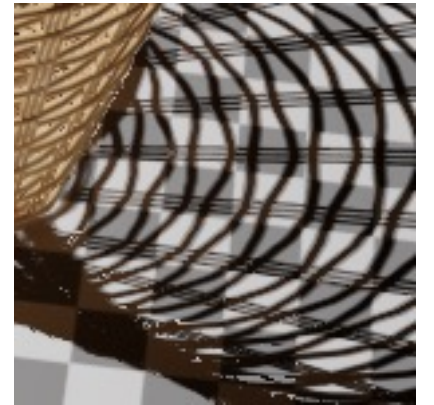
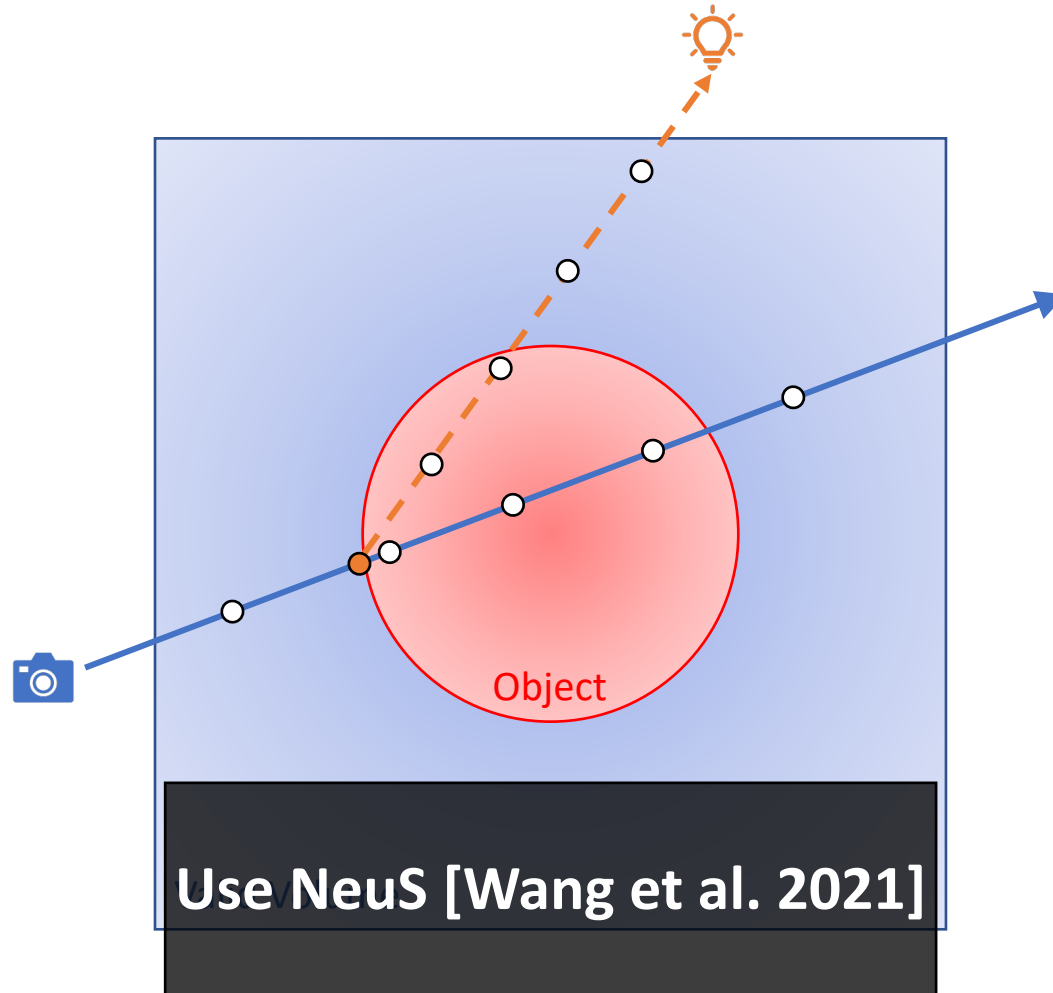


G.T.

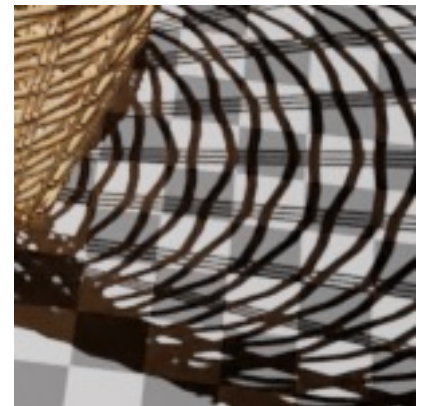
# Shadow Hint



Depth Error Map

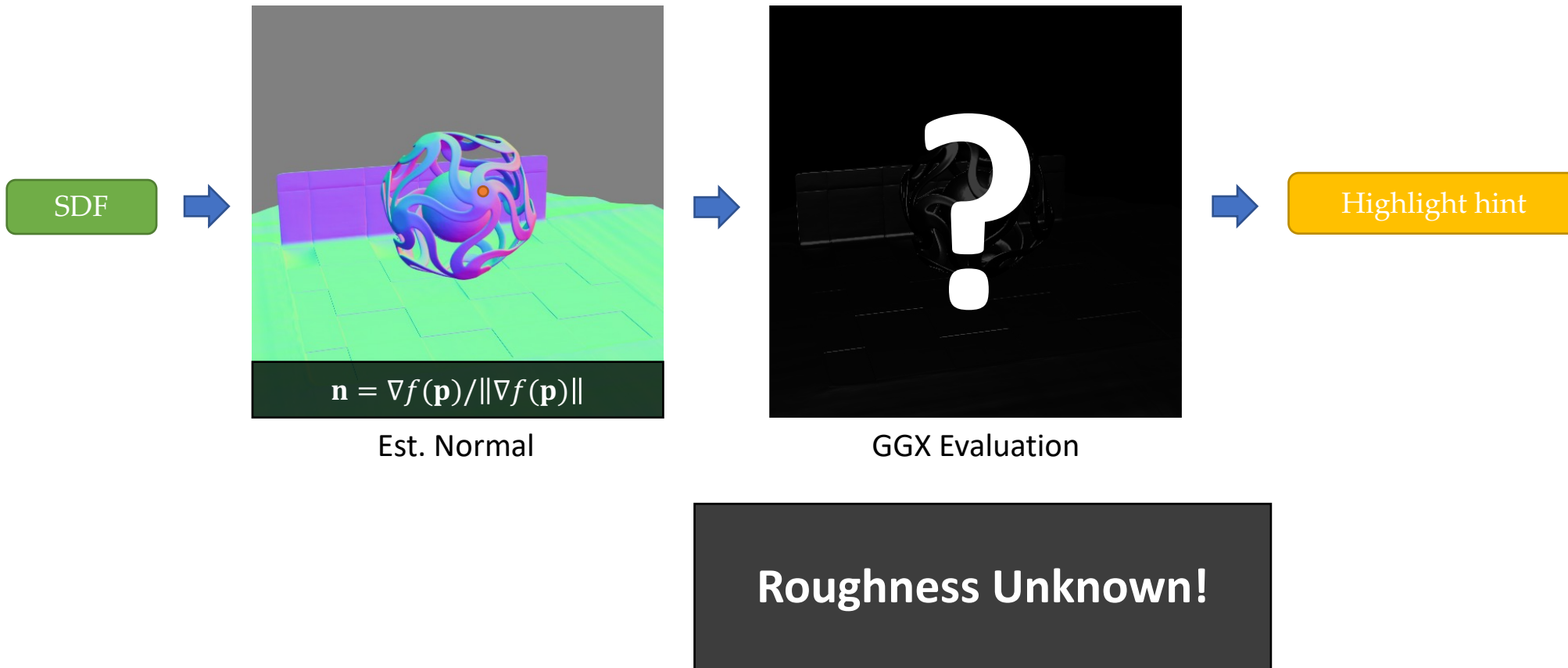


Using NeuS Density

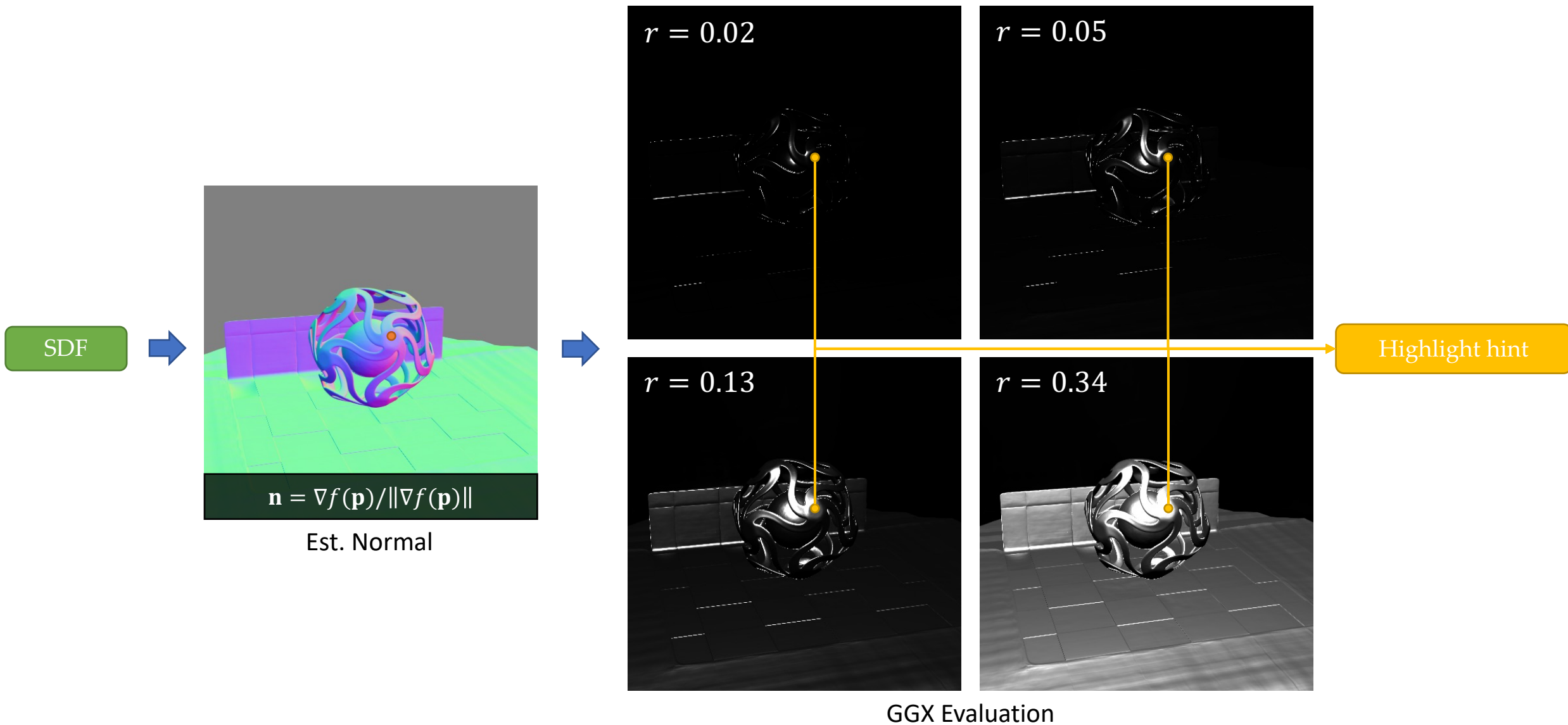


G.T.

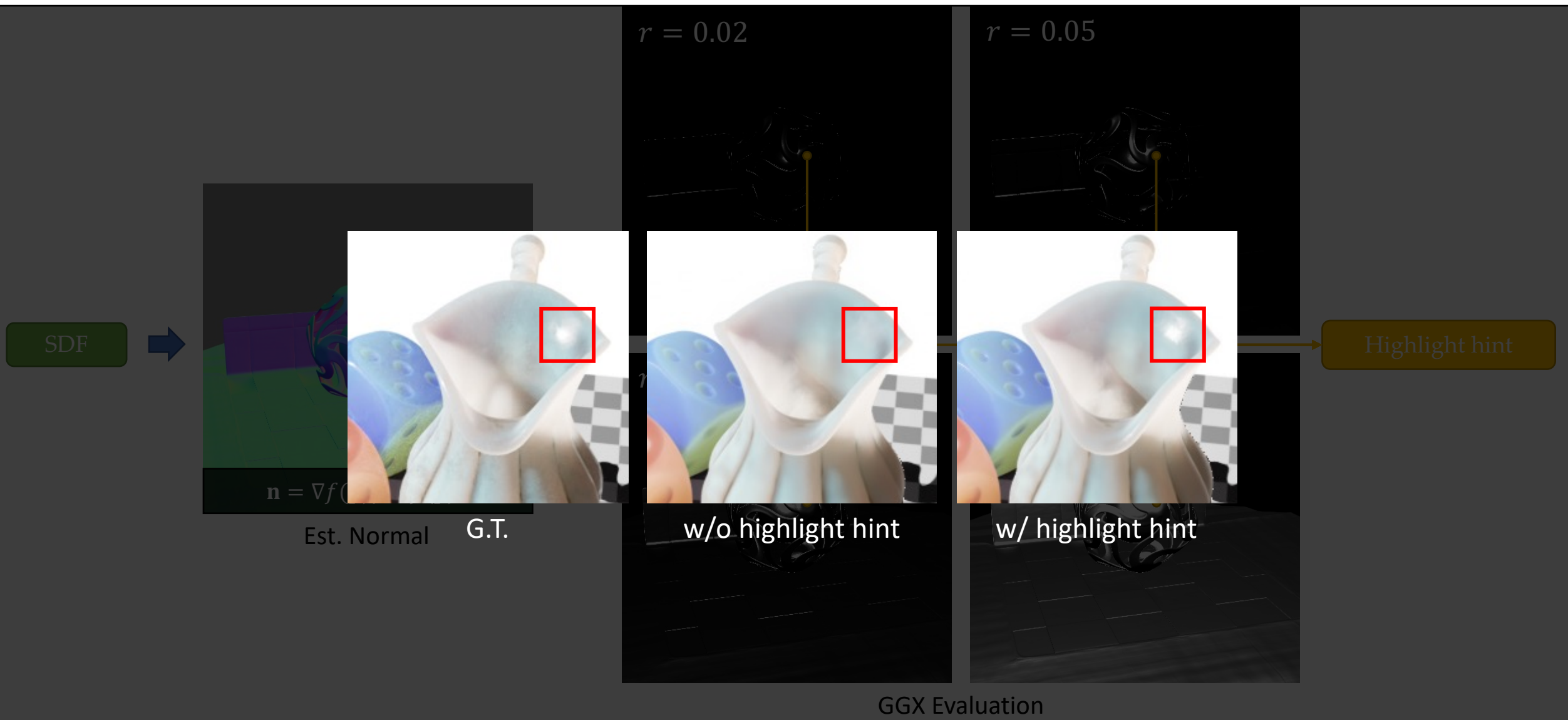
# Highlight Hint



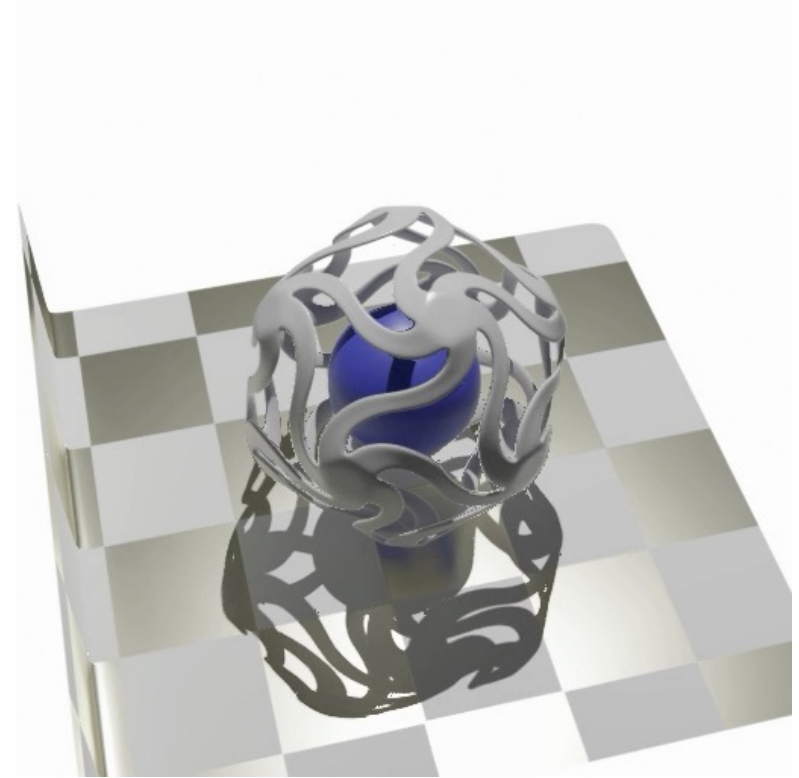
# Highlight Hint



# Highlight Hint



# Validation: Synthetic Scenes

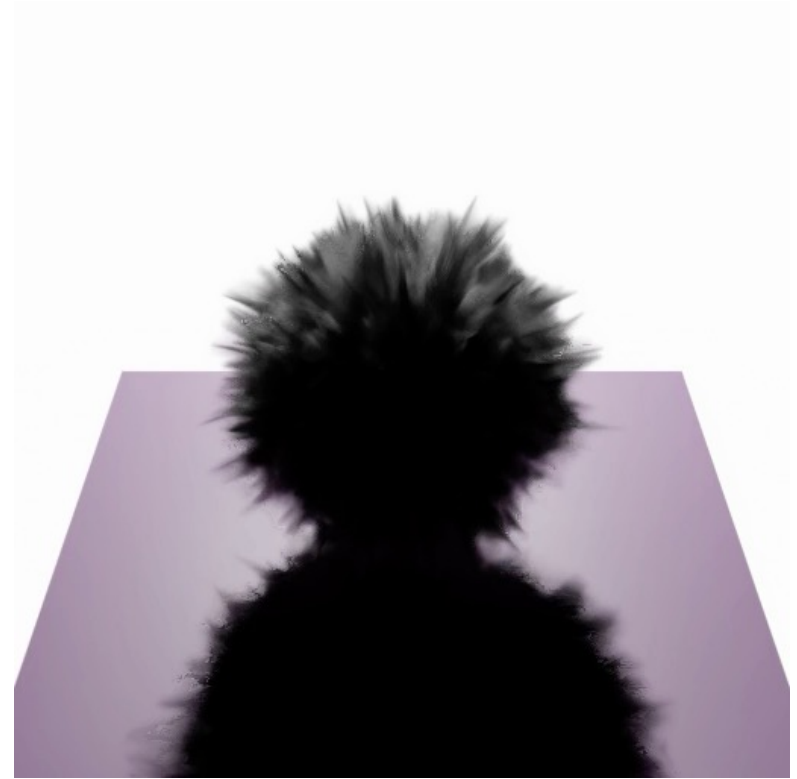
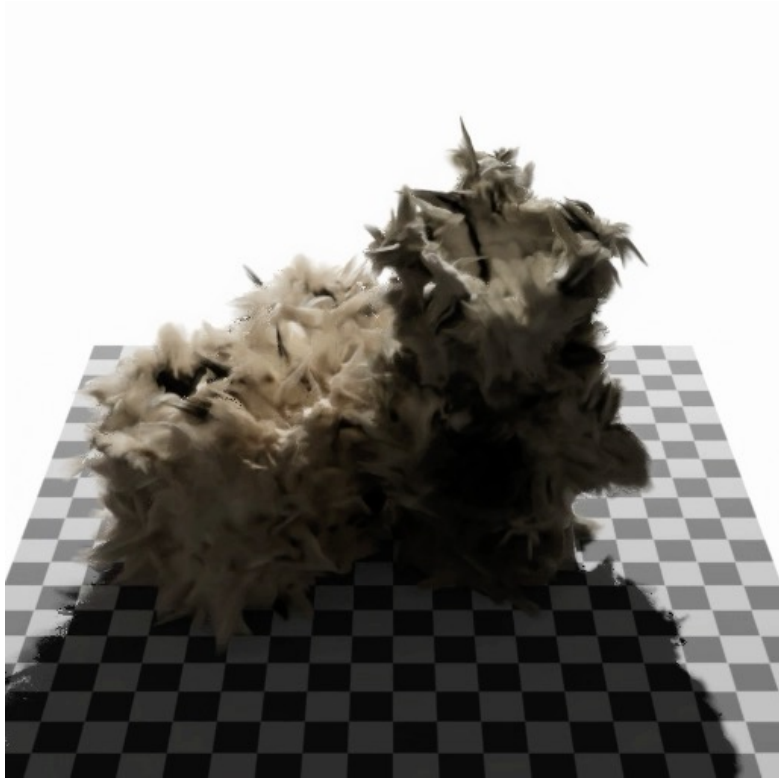




# Validation: Arbitrary Material & Full Light Transport



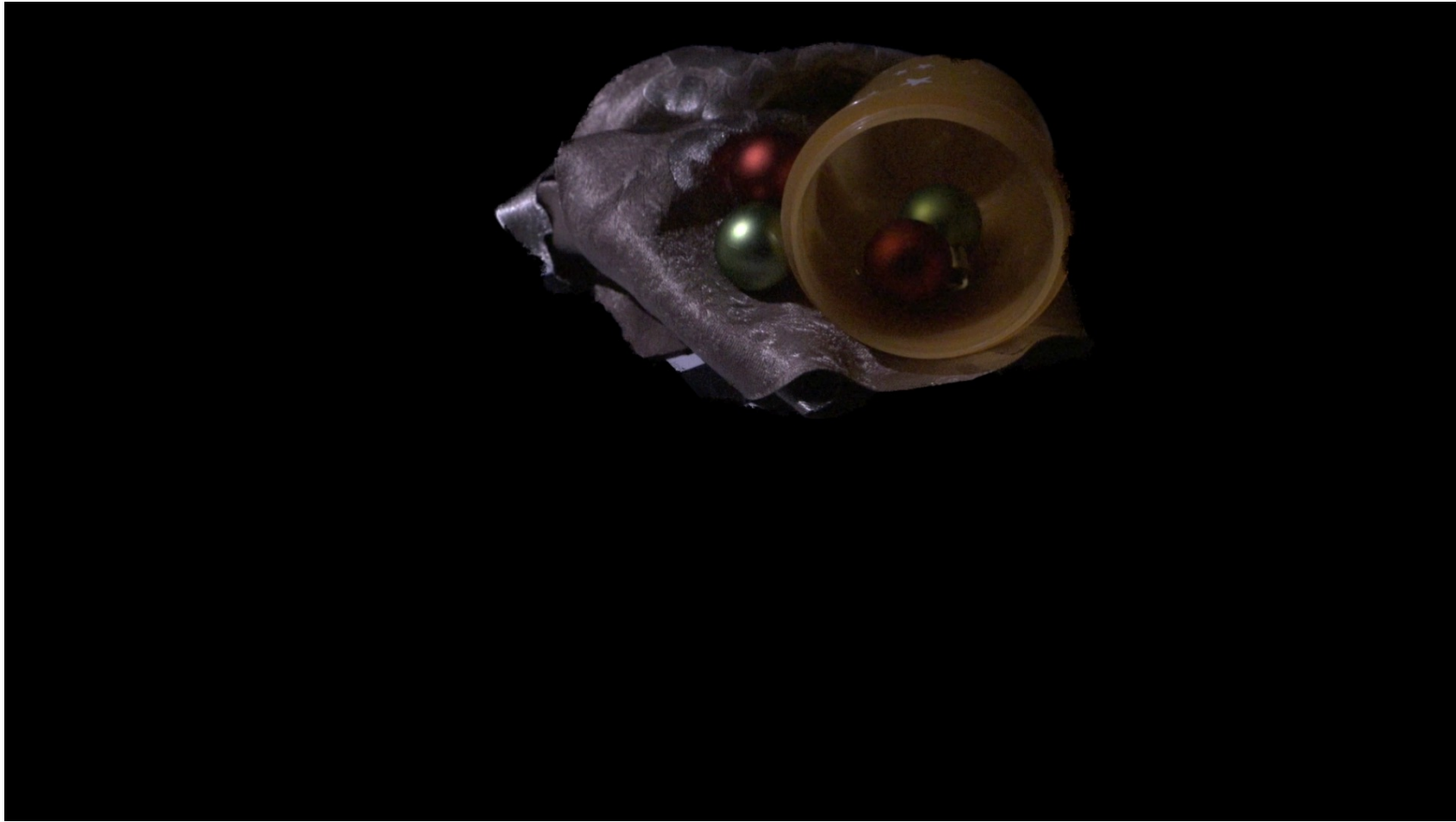
# Validation: Complex III-defined Shapes



# Validation: Synthetic Scenes



# Real Capture Setup



Follows DNL [Gao et al. 2020] Capture Process

# Validations – Real Captures



# Comparisons



Reference

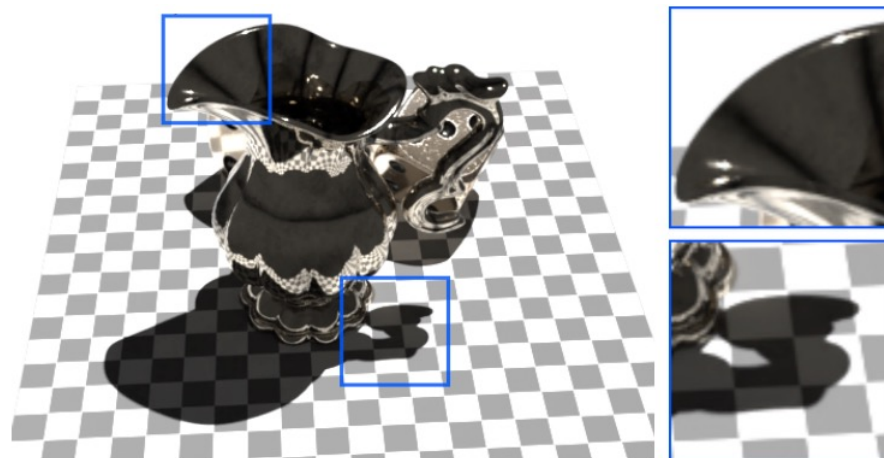


IRON  
[Zhang et al. 2022]

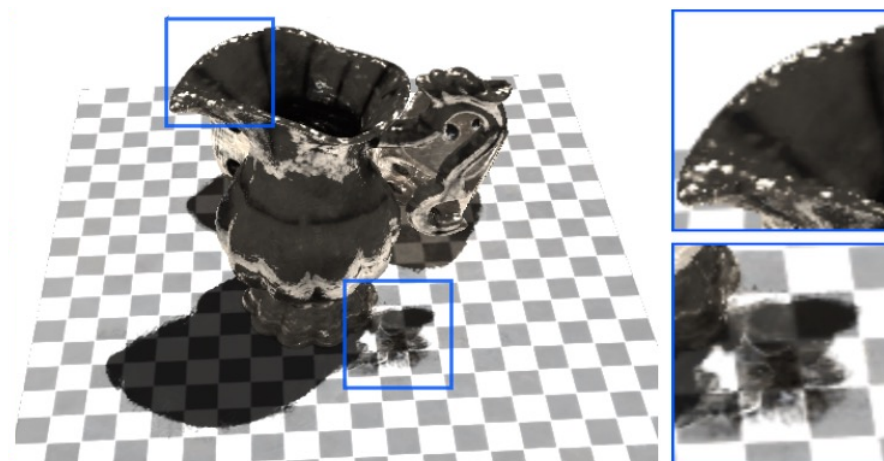


Ours

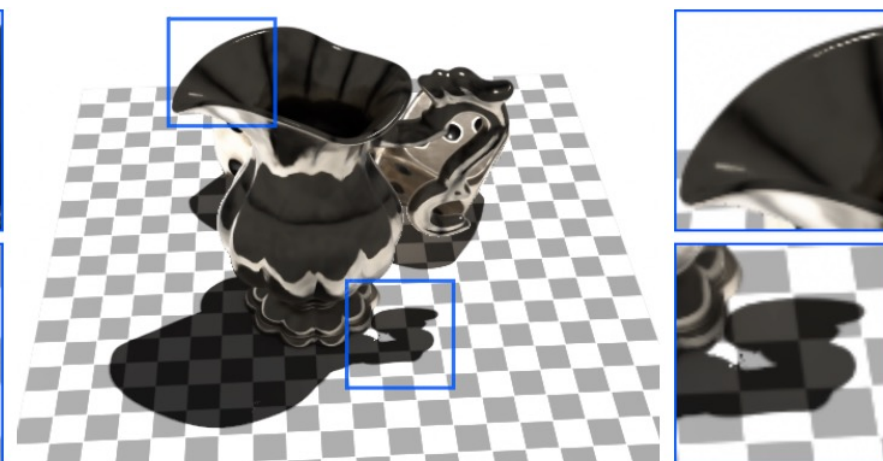
# Comparisons



Reference



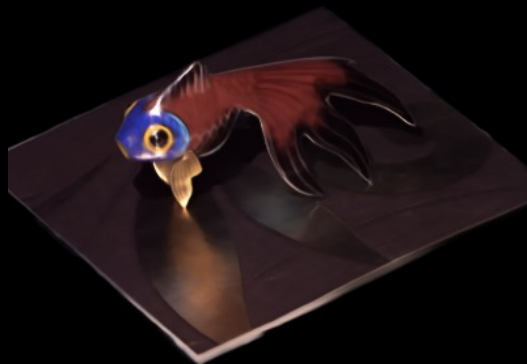
NRTF  
[Lyu et al. 2022]



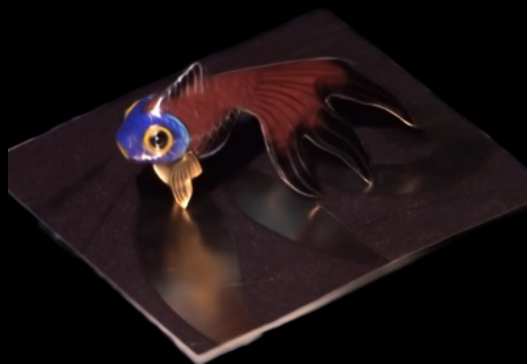
Ours

# 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