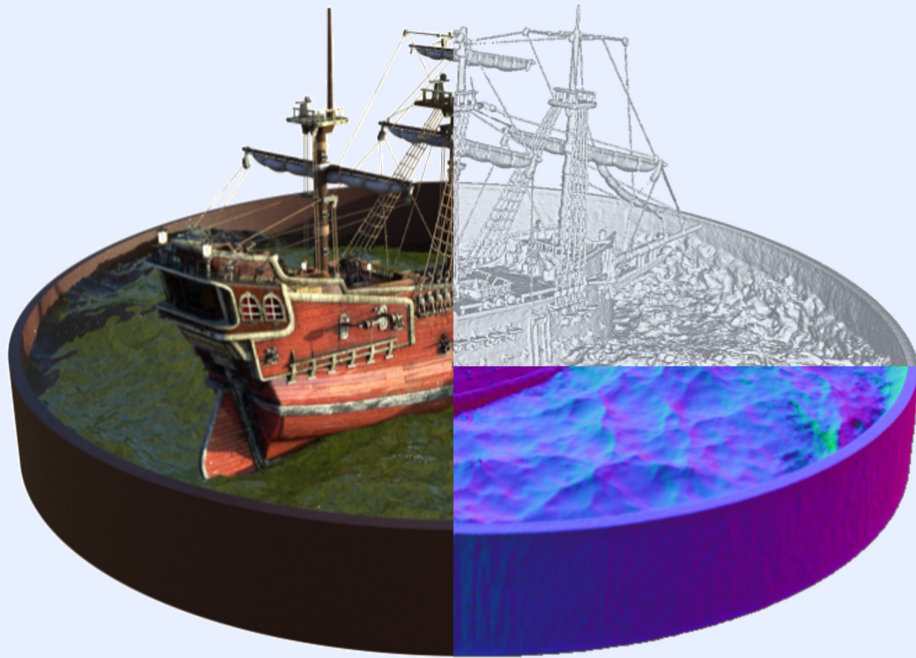


AniSDF: Fused-Granularity Neural Surfaces with Anisotropic Encoding for High-Fidelity 3D Reconstruction



High Fidelity 3D Reconstruction



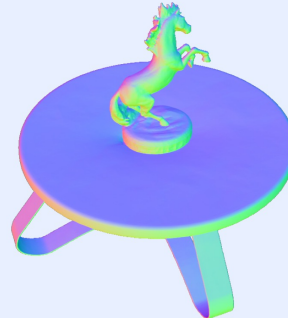
Complex object



Luminous object



Reflective object



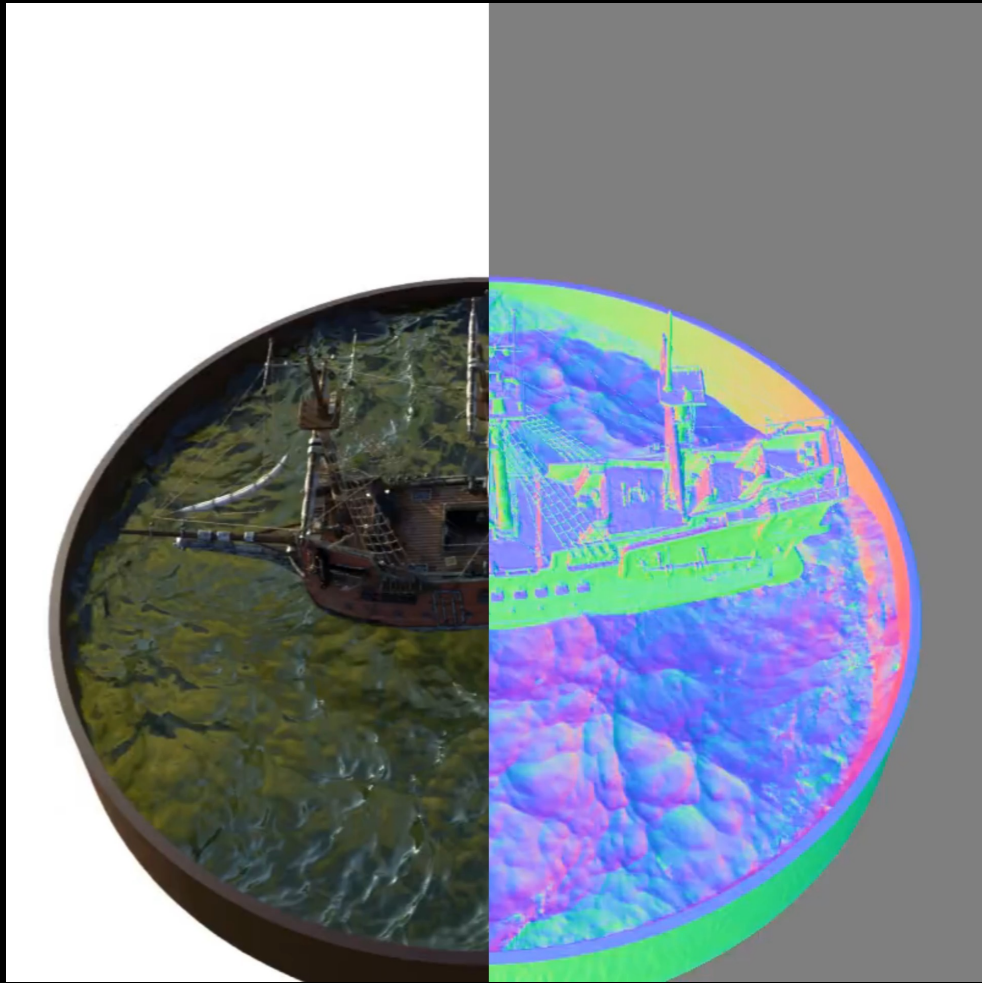
Fuzzy object

Jingnan Gao, Zhuo Chen, Xiaokang Yang, Yichao Yan



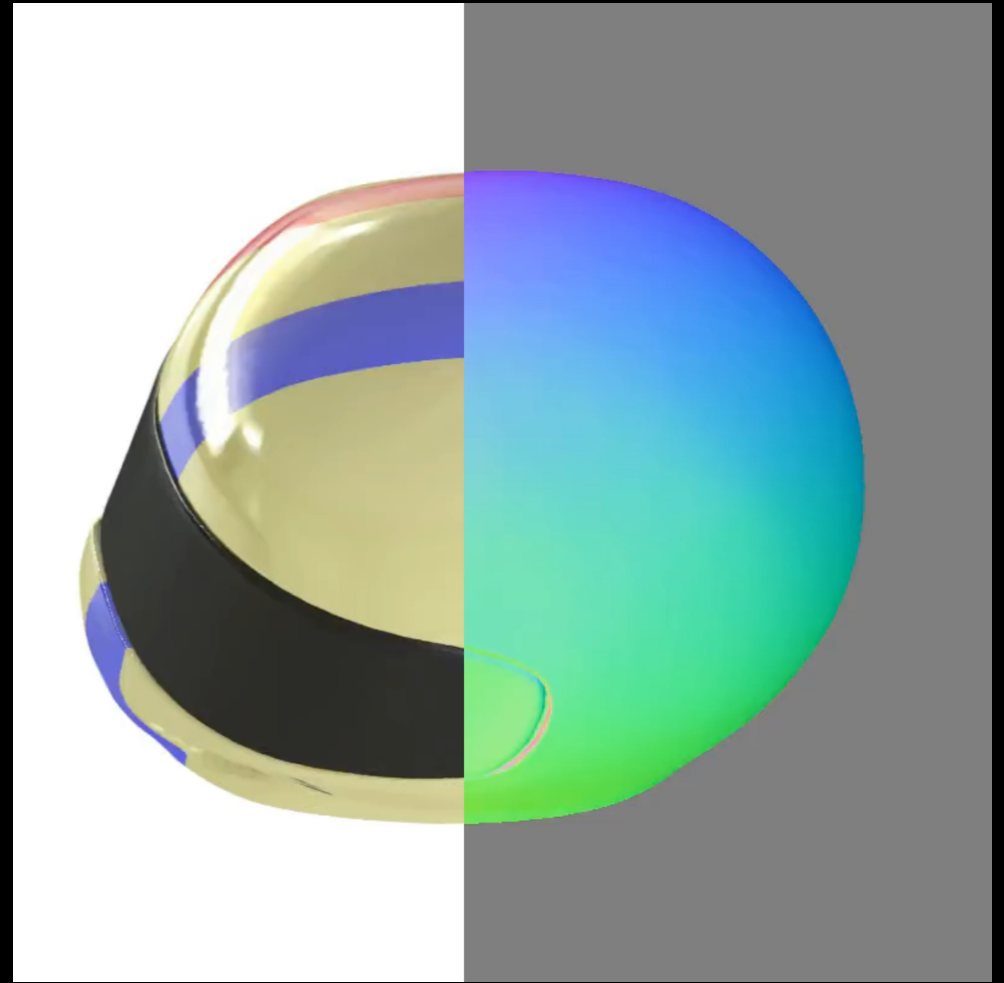
SHANGHAI JIAO TONG
UNIVERSITY

Reconstruction Results



Rendering

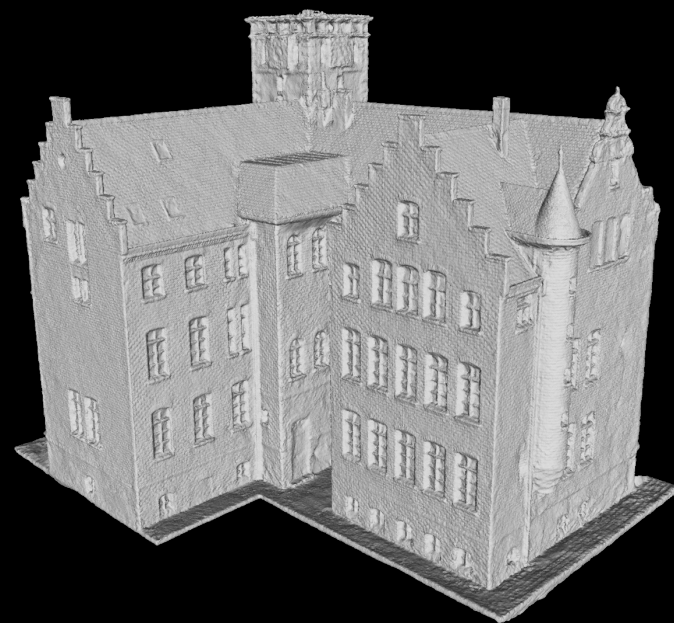
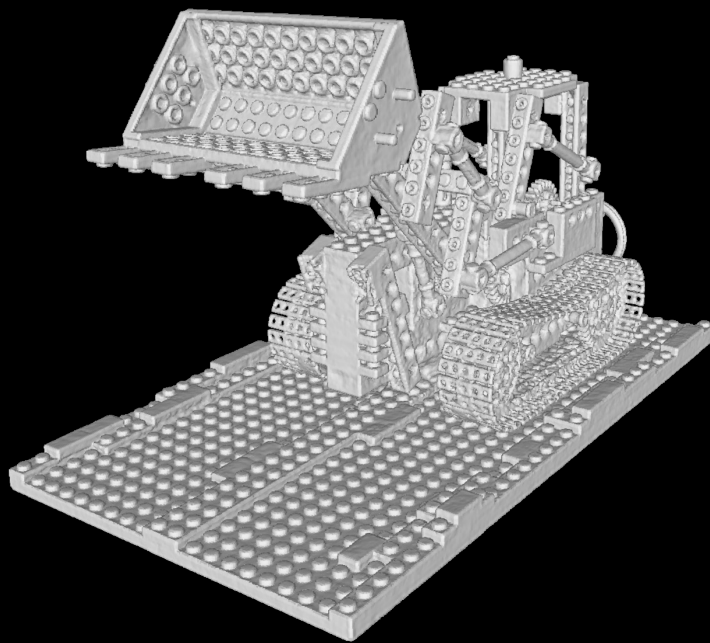
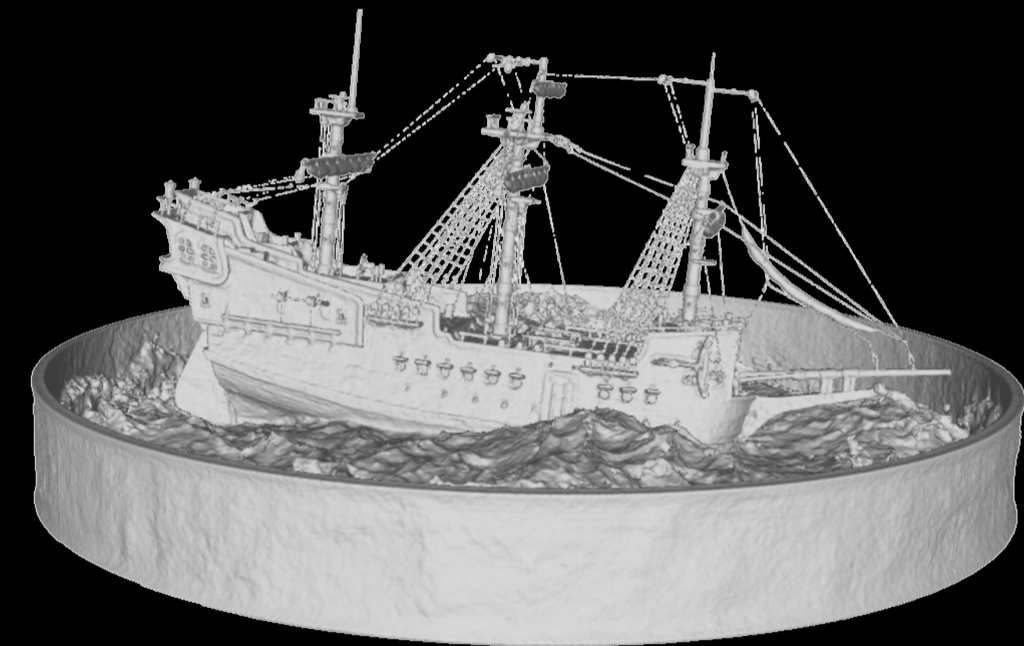
Normal



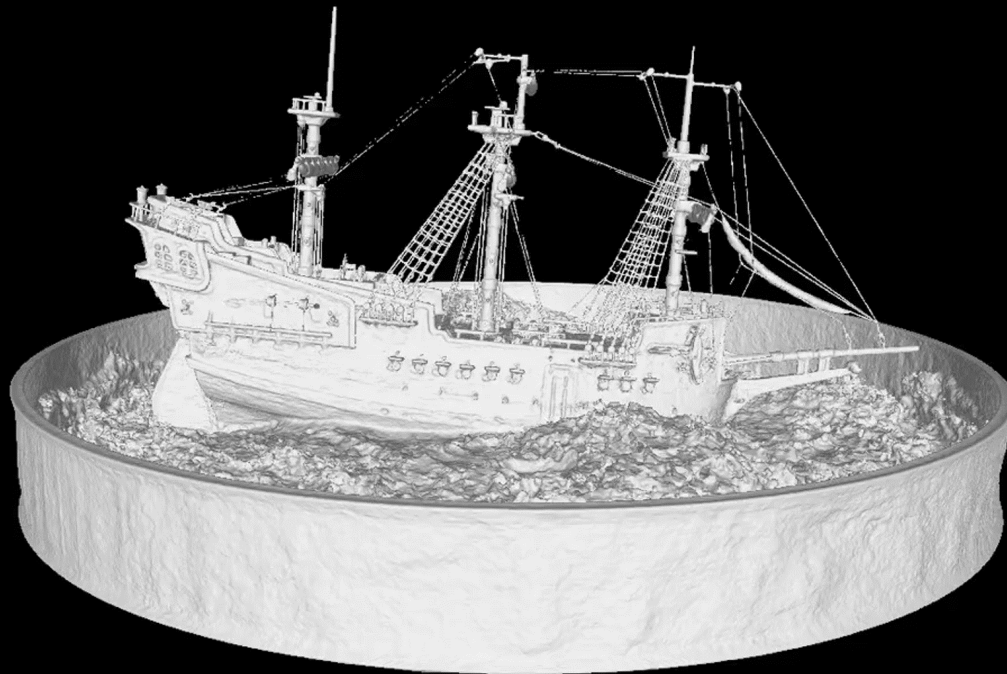
Rendering

Normal

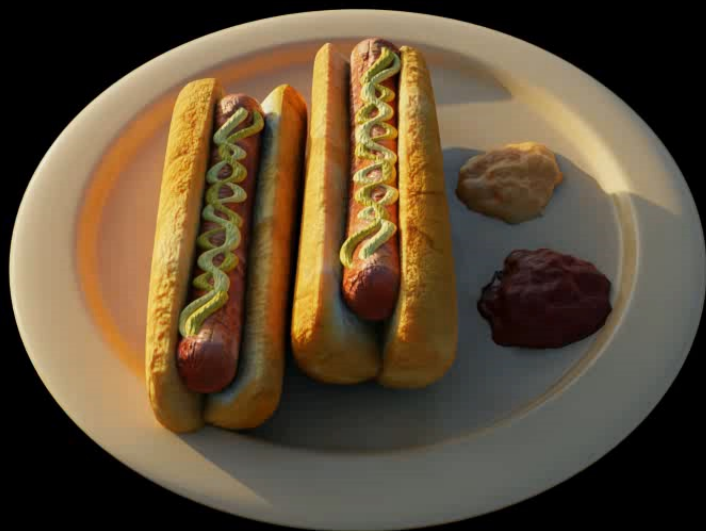
Mesh Results



Mesh Results



Neural Radiance Fields

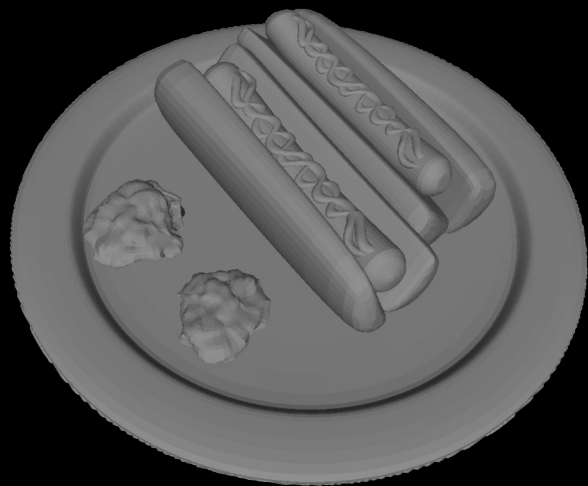


NeRF

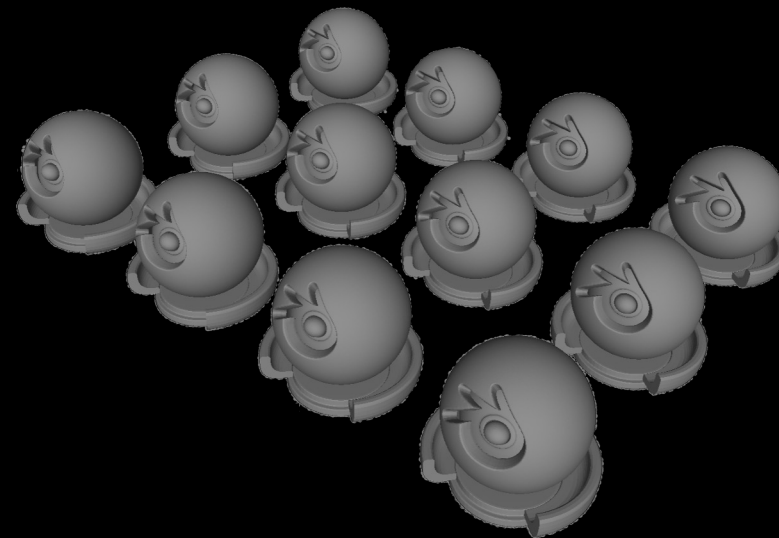


3DGS

Neural Surfaces

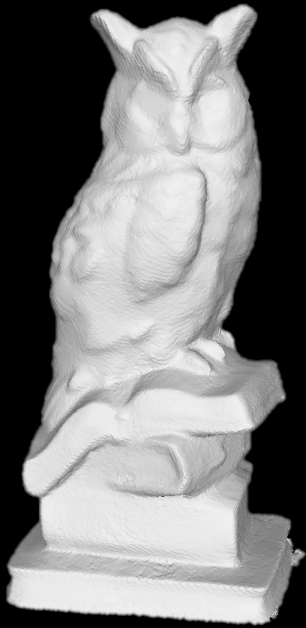


NeRF VS. GT



3DGS VS. GT

Neural Surfaces



NeuS



Neuralangelo

Neural Surfaces

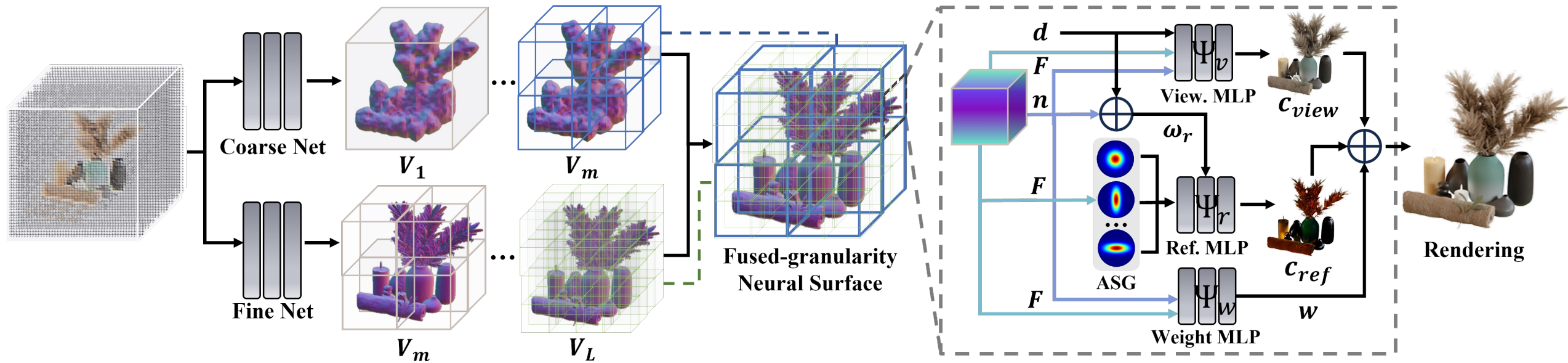


NeRO VS. GT

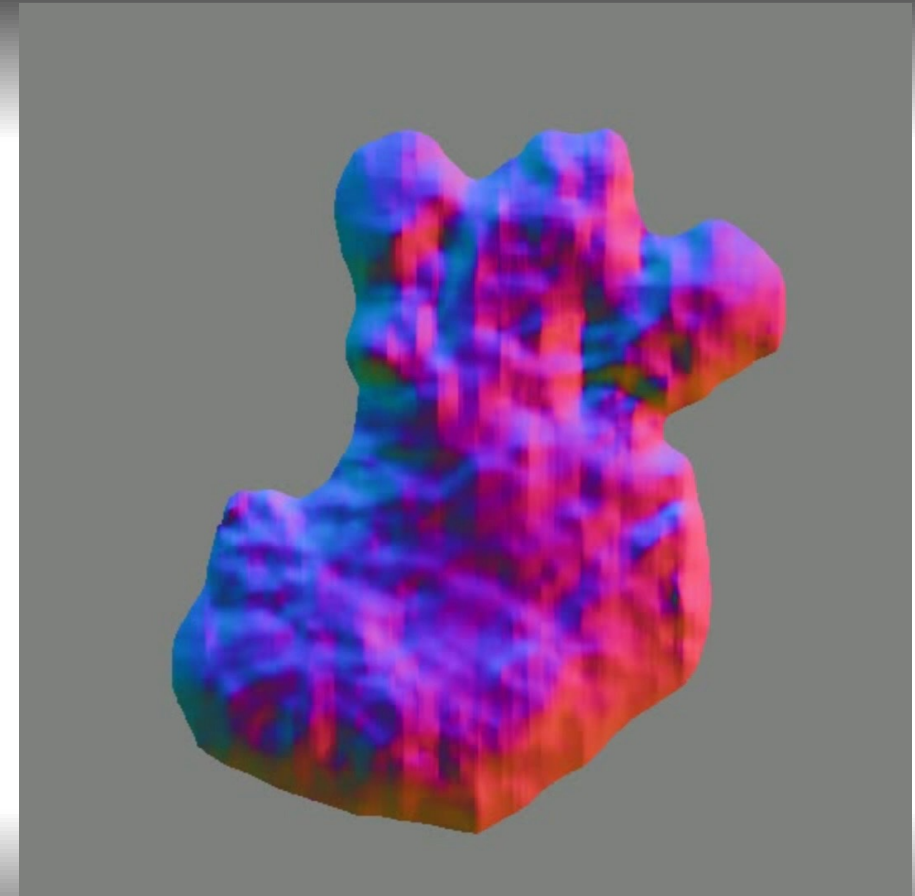
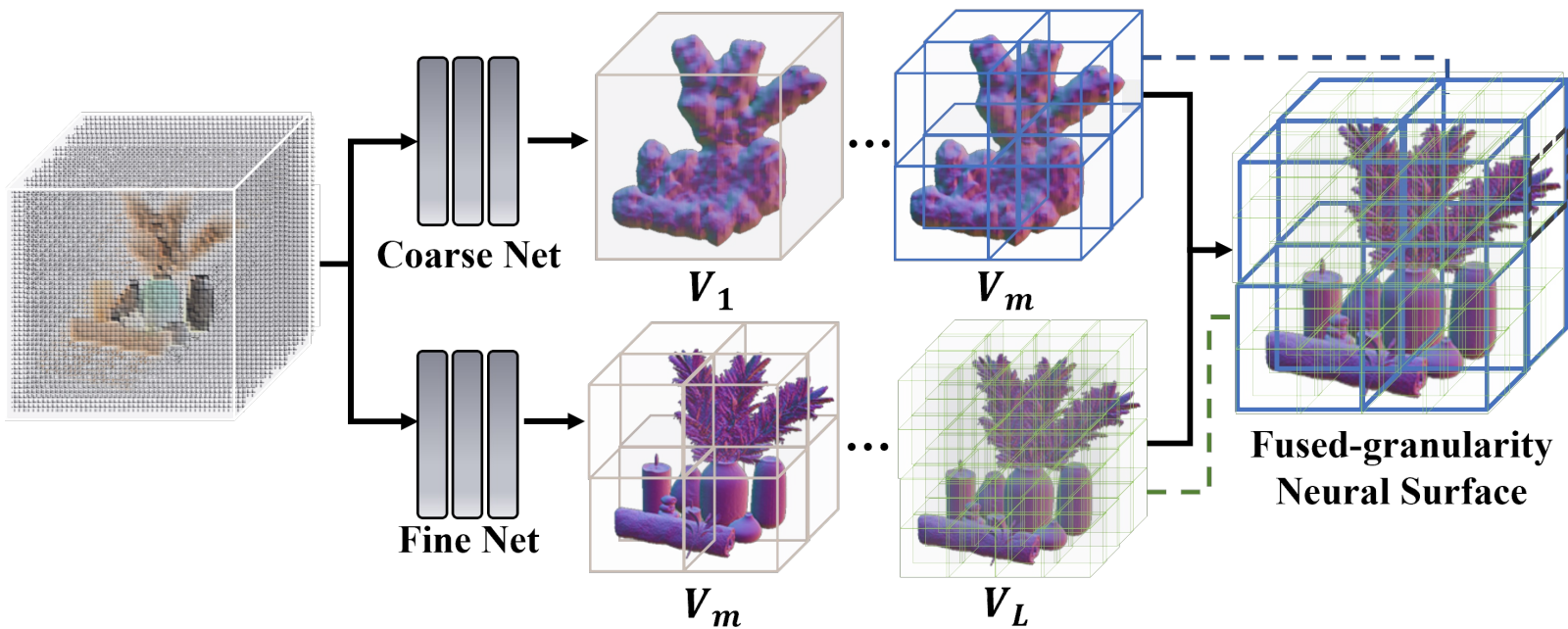


Neuralangelo VS. GT

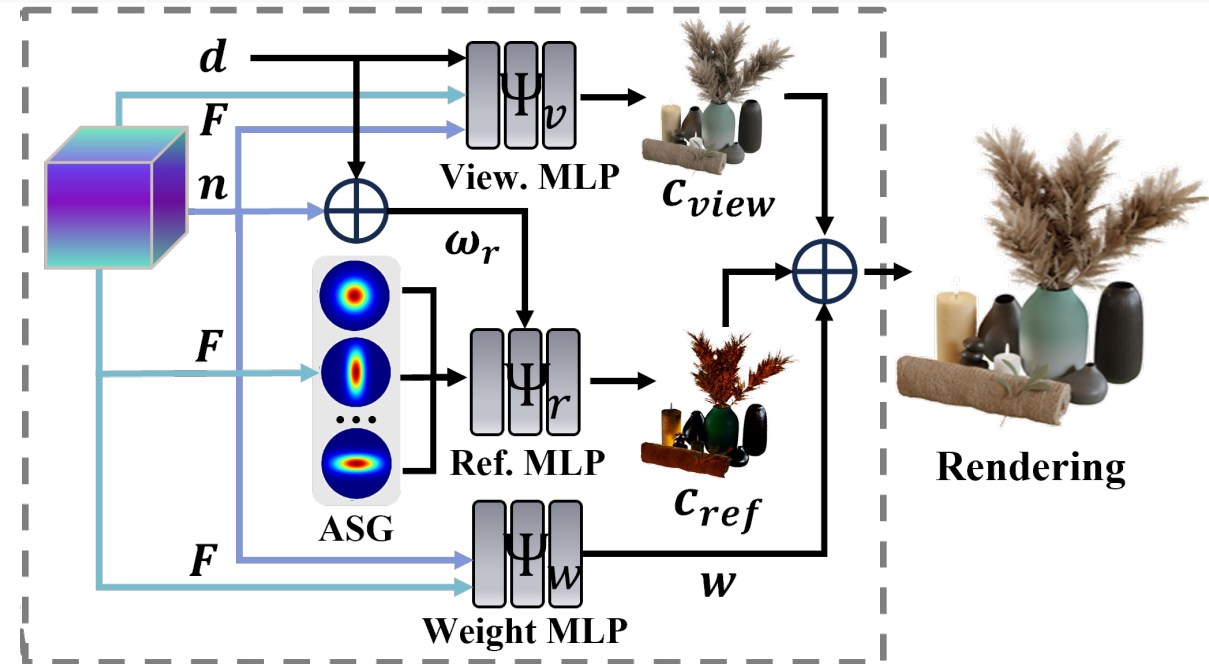
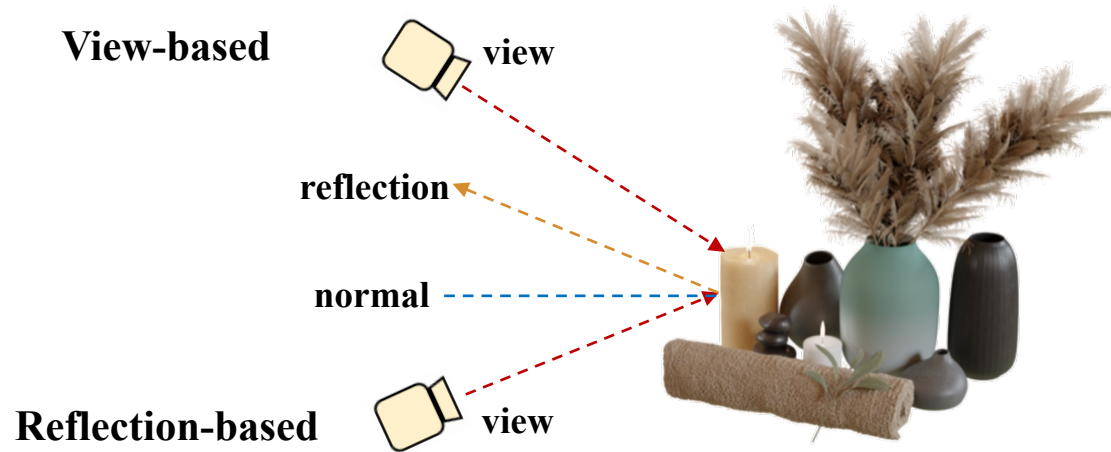
AniSDF Framework



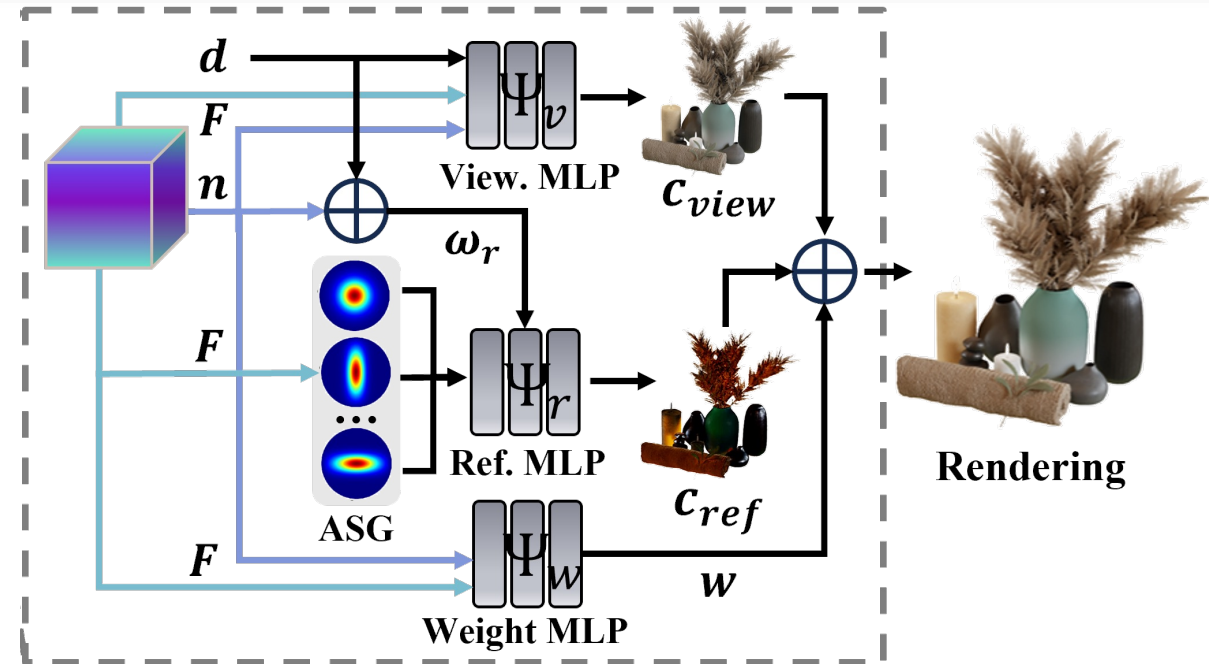
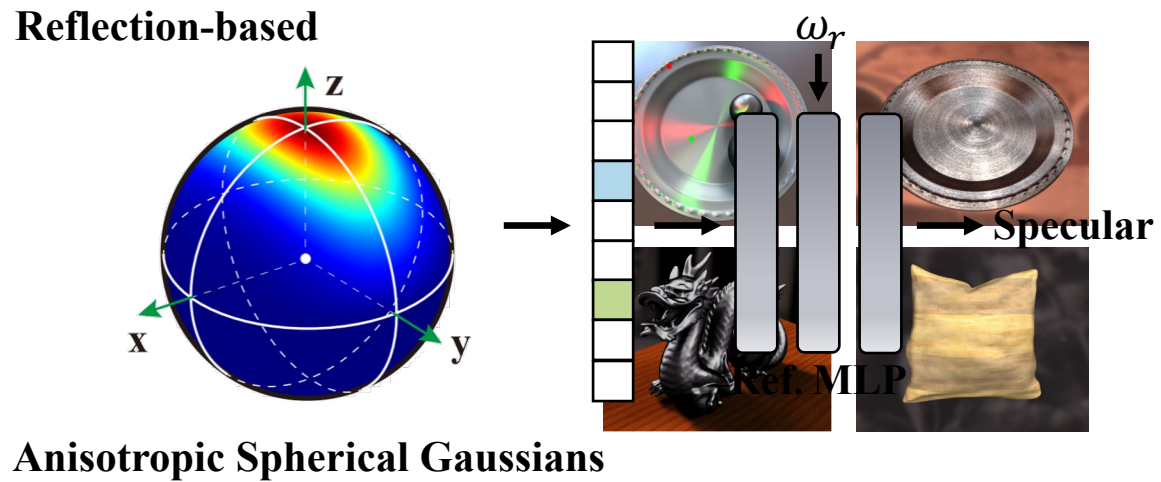
Fused-Granularity Neural Surfaces



Blended Radiance Fields



Blended Radiance Fields



Rendering Comparison



Neuralangelo VS. Ours



3DGS VS. Ours

Rendering Comparison

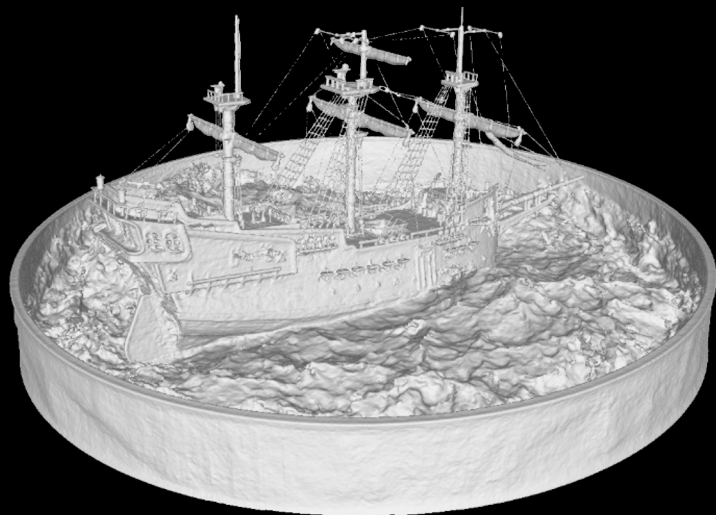


NeuS VS. Ours



2DGS VS. Ours

Geometry Comparison



NeRO VS. Ours
NeRF Synthetic



NeuS VS. Ours
Shiny Blender

Geometry Comparison



Neuralangelo VS. Ours
DTU

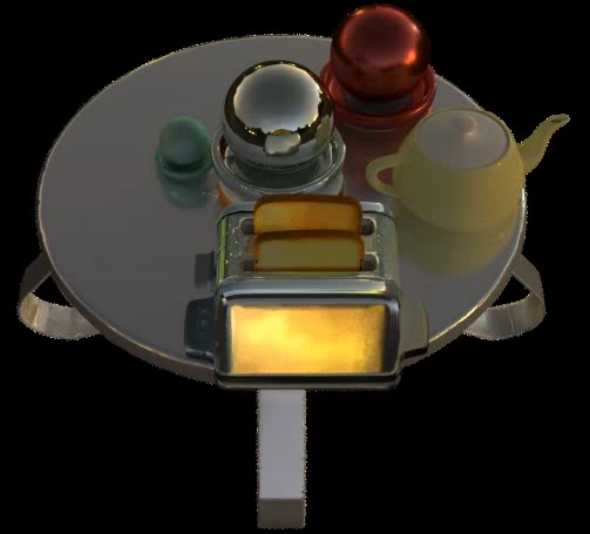
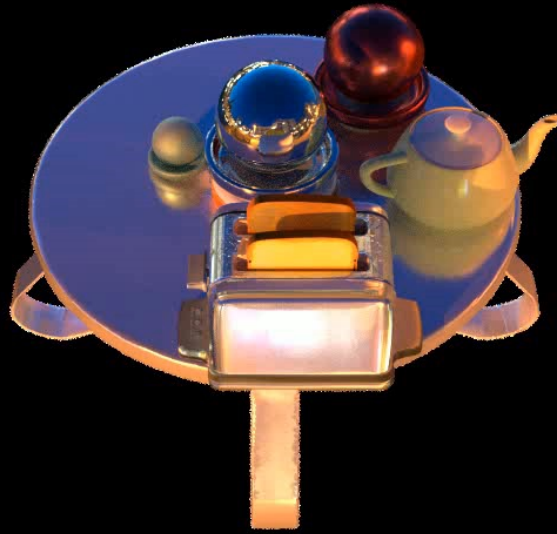
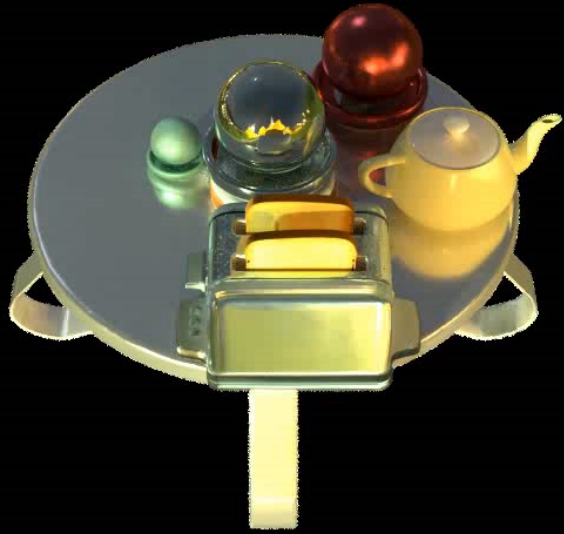


2DGS VS. Ours
Shelly

Applications: Relighting



Applications: Composition and Relighting



Qualitative Results

			Chair	Drums	Ficus	Hotdog	Lego	Materials	Mic	Ship	Avg
PSNR↑	Volumetric	NeRF [Mildenhall et al. 2020]	34.17	25.08	30.39	36.82	33.31	30.03	34.78	29.30	31.74
		InstantNGP [Müller et al. 2022]	35.00	26.02	33.51	37.40	36.39	29.78	36.22	31.10	33.18
		Mip-NeRF [Barron et al. 2021]	35.14	25.48	33.29	37.48	35.70	30.71	36.51	30.41	33.09
		3DGS [Kerbl et al. 2023]	35.36	26.15	34.87	37.72	35.78	30.00	35.36	30.80	33.32
	Surface	NeuS [Wang et al. 2021a]	31.22	24.85	27.38	36.04	34.06	29.59	31.56	26.94	30.20
		NeRO [Liu et al. 2023a]	28.74	24.88	28.38	32.13	25.66	24.85	28.64	26.55	27.48
		BakedSDF [Yariv et al. 2023]	31.65	20.71	26.33	36.38	32.69	30.48	31.52	27.55	29.66
		NeRF2Mesh [Tang et al. 2023b]	34.25	25.04	30.08	35.70	34.90	26.26	32.63	29.47	30.88
		2DGS [Huang et al. 2024]	35.05	26.05	35.57	37.36	35.10	29.74	35.09	30.60	33.07
		Ours	35.31	26.23	33.15	37.99	35.69	31.87	35.44	31.69	33.42
Chamfer Distance↓	Surface	NeuS [Wang et al. 2021a]	3.95	6.68	2.84	8.36	6.62	4.10	2.99	9.54	5.64
		NeRF2Mesh [Tang et al. 2023b]	4.60	6.02	2.44	5.19	5.85	4.51	3.47	8.39	5.06
		NeRO [Liu et al. 2023a]	3.66	8.25	10.52	4.79	8.93	5.68	3.65	21.05	8.32
		BakedSDF [Yariv et al. 2023]	4.05	7.41	3.23	6.72	5.69	5.39	3.17	8.98	5.58
		Neuralangelo [Li et al. 2023]	14.50	16.99	5.72	14.27	6.90	3.27	8.78	16.02	10.81
		2DGS [Huang et al. 2024]	5.25	10.33	4.41	9.55	6.74	9.09	11.06	9.55	8.25
		Ours	4.39	5.24	2.75	7.81	5.16	3.03	5.34	5.41	4.89

NeRF Synthetic Dataset

Qualitative Results

Methods	Helmet		Toaster		Coffee		Car		Mean	
	PSNR↑	MAE↓	PSNR↑	MAE↓	PSNR↑	MAE↓	PSNR↑	MAE↓	PSNR↑	MAE↓
NeuS [Wang et al. 2021]	27.78	1.12	23.51	2.87	28.82	1.99	26.34	1.10	26.61	1.77
RefNeRF [Verbin et al. 2022]	29.68	29.48	25.70	42.87	34.21	12.24	30.82	14.93	30.10	24.88
RefNeuS [Ge et al. 2023]	32.85	0.38	26.97	1.47	31.05	0.99	29.92	0.80	30.20	0.91
Ours	34.44	0.41	26.98	1.15	33.24	1.14	29.56	0.70	31.05	0.85

Shiny Blender Dataset

Scan ID	24	37	40	55	63	65	69	83	97	105	106	110	114	118	122	Mean
COLMAP	0.81	2.05	0.73	1.22	1.79	1.58	1.02	3.05	1.40	2.05	1.00	1.32	0.49	0.78	1.17	1.36
NeRF [Mildenhall et al. 2020]	1.90	1.60	1.85	0.58	2.28	1.27	1.47	1.67	2.05	1.07	0.88	2.53	1.06	1.15	0.96	1.49
NeuS [Wang et al. 2021a]	1.00	1.37	0.93	0.43	1.10	0.65	0.57	1.48	1.09	0.83	0.52	1.20	0.35	0.49	0.54	0.84
VolSDF [Yariv et al. 2021]	1.14	1.26	0.81	0.49	1.25	0.70	0.72	1.29	1.18	0.70	0.66	1.08	0.42	0.61	0.55	0.86
Neuralangelo [Li et al. 2023]	0.49	1.05	0.95	0.38	1.22	1.10	2.16	1.68	1.78	0.93	0.44	1.46	0.41	1.13	0.97	1.07
NeuralWarp [Darmon et al. 2022]	0.49	0.71	0.38	0.38	0.79	0.81	0.82	1.20	1.06	0.68	0.66	0.74	0.41	0.63	0.51	0.68
Gaussian Surfels [Dai et al. 2024]	0.66	0.93	0.54	0.41	1.06	1.14	0.85	1.29	1.53	0.79	0.82	1.58	0.45	0.66	0.53	0.88
2DGS [Huang et al. 2024]	0.48	0.91	0.39	0.39	1.01	0.83	0.81	1.36	1.27	0.76	0.70	1.40	0.40	0.76	0.52	0.80
Ours	0.52	0.82	0.65	0.43	0.76	0.64	0.71	0.97	0.86	0.64	0.52	0.67	0.42	0.67	0.50	0.65

DTU Dataset

Thank you!