

Compressing Explicit Voxel grid Representations: fast NeRFs become also small

Supplementary material

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1. Detailed results

Here follow the detailed tables for Synthetic-NeRF (Table 1), Synthetic-NSVF (Table 2) and Tanks & Temples (Table 4). For these, we also include, as output quality metric, the LPIPS score evaluated on the VGG backbone.

Besides, we also provide evaluations on the BlendedMVS dataset for DVGO (Table 3), whose configuration follows.

1.1. Configuration for BlendedMVS

BlendedMVS, although being a synthetic dataset, differently from Synthetic-NeRF and Synthetic-NSVF, has more realistic ambient lighting, which is taken from real image blending. In this case, following the same approach as [1], we have used a subset of 4 objects (namely: *jade*, *fountain*, *character* and *statue*). We have here used as image resolution 768×576 pixels; 10% of the images are used for validation and 10% for testing. For Re:NeRF, we have used $\gamma = 0.5$ and $\delta = 0.5$, with $\Delta T = 1$ dB.

References

- [1] Cheng Sun, Min Sun, and Hwann-Tzong Chen. Direct voxel grid optimization: Super-fast convergence for radiance fields reconstruction. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 5459–5469, 2022. 1

Table 1: Results for Synthetic-NeRF.

		Synthetic-NeRF									
	Architecture	Pruning	Chair	Drums	Ficus	Hotdog	Lego	Materials	Mic	Ship	Avg
PSNR(dB) (↑)	DVGO	-	34.11	25.48	32.59	36.77	34.69	29.52	33.16	29.04	31.92
		LOW	33.75	25.34	32.36	36.00	34.30	29.26	33.16	28.69	31.61
		HIGH	33.45	24.98	32.11	35.44	33.90	28.38	32.77	28.60	31.20
		-	33.98	25.35	31.83	36.43	34.10	29.14	33.26	27.78	31.48
		LOW	34.35	25.09	31.69	36.33	34.40	28.73	33.92	27.71	31.52
		HIGH	33.65	24.96	31.21	35.44	33.91	28.15	33.14	27.31	30.97
	TensoRF	-	35.76	26.01	33.99	37.41	36.46	30.12	34.61	30.77	33.14
		LOW	36.00	26.01	34.12	37.58	36.73	30.01	34.67	30.92	33.26
		HIGH	35.66	25.59	33.57	37.35	36.38	29.64	34.00	30.31	32.81
		-	103.994	92.06	108.71	130.01	124.201	171.36	49.41	100.98	110.09
		LOW	4.44	2.62	2.67	5.19	5.38	7.47	1.50	5.43	4.33
		HIGH	2.53	1.21	1.82	2.41	2.85	3.06	0.89	2.85	2.20
Size(MB)(↓)	DVGO	-	187.04	160.83	108.39	290.64	291.65	196.15	80.83	197.08	189.08
		LOW	85.59	56.34	38.51	179.26	183.48	91.25	37.69	62.07	91.77
		HIGH	47.26	42.34	28.8	96.81	97.78	66.4	21.07	36.94	54.68
		-	65.46	65.62	67.87	77.61	65.75	80.06	64.45	67.12	69.24
		LOW	12.78	8.47	13.30	14.77	12.82	15.65	7.67	8.77	11.78
		HIGH	8.51	6.11	8.88	9.47	8.41	10.31	5.58	6.26	7.94
	TensoRF	-	0.976	0.930	0.977	0.986	0.976	0.950	0.983	0.878	0.957
		LOW	0.974	0.924	0.975	0.973	0.973	0.943	0.982	0.871	0.952
		HIGH	0.971	0.916	0.962	0.969	0.967	0.915	0.981	0.867	0.943
		-	0.977	0.933	0.976	0.98	0.975	0.949	0.985	0.869	0.956
		LOW	0.978	0.922	0.97	0.979	0.976	0.939	0.985	0.867	0.952
		HIGH	0.971	0.915	0.97	0.972	0.972	0.923	0.977	0.854	0.944
SSIM(↑)	DVGO	-	0.985	0.937	0.982	0.982	0.983	0.952	0.988	0.895	0.963
		LOW	0.985	0.931	0.982	0.982	0.983	0.947	0.987	0.894	0.962
		HIGH	0.983	0.917	0.979	0.980	0.981	0.939	0.984	0.882	0.956
		-	0.027	0.079	0.025	0.034	0.027	0.059	0.018	0.161	0.054
		LOW	0.035	0.090	0.033	0.060	0.032	0.070	0.022	0.167	0.064
		HIGH	0.038	0.103	0.037	0.067	0.039	0.102	0.026	0.171	0.073
	Plenoxels	-	0.031	0.067	0.026	0.037	0.028	0.057	0.015	0.178	0.055
		LOW	0.026	0.081	0.038	0.043	0.027	0.074	0.019	0.18	0.061
		HIGH	0.033	0.088	0.044	0.062	0.033	0.090	0.031	0.193	0.072
		-	0.022	0.073	0.022	0.032	0.018	0.058	0.015	0.138	0.047
		LOW	0.022	0.103	0.026	0.035	0.018	0.067	0.022	0.138	0.054
		HIGH	0.028	0.157	0.042	0.045	0.022	0.081	0.042	0.159	0.072
LPIPS _{VGG} (↓)	TensoRF	-	0.022	0.073	0.022	0.032	0.018	0.058	0.015	0.138	0.047
		LOW	0.022	0.103	0.026	0.035	0.018	0.067	0.022	0.138	0.054
		HIGH	0.028	0.157	0.042	0.045	0.022	0.081	0.042	0.159	0.072

Table 2: Results for Synthetic-NSVF.

		Synthetic-NSVF									
	Architecture	Pruning	Bike	Lifestyle	Palace	Robot	Spaceship	Steamtrain	Toad	Wineholder	Avg
PSNR(dB)(\uparrow)	DVGO	-	38.13	33.64	34.32	36.23	37.56	36.47	33.02	30.21	34.95
		LOW	38.16	33.68	34.47	36.29	37.26	36.10	32.98	30.11	34.88
		HIGH	37.97	33.16	33.88	36.00	36.82	35.79	32.39	29.75	34.47
	TensoRF	-	39.23	34.51	37.56	38.26	38.6	37.87	31.32	34.85	36.53
		LOW	39.38	34.68	37.92	38.72	38.58	38.06	34.85	31.77	36.75
		HIGH	38.90	34.33	37.53	38.40	38.10	37.40	33.20	31.23	36.14
Size(MB)(\downarrow)	DVGO	-	104.10	97.12	105.00	97.17	128.31	144.64	128.30	97.71	112.79
		LOW	3.55	3.53	4.84	3.76	4.95	5.41	5.67	3.30	4.38
		HIGH	2.52	2.38	2.63	2.55	2.78	2.77	1.87	1.65	2.39
	TensoRF	-	70.92	65.46	64.94	68.63	68.01	80.02	68.71	65.74	69.05
		LOW	13.74	12.84	12.67	13.15	13.38	15.39	14.24	12.77	13.52
		HIGH	9.11	8.47	8.36	8.80	8.83	7.12	9.12	8.35	8.52
SSIM(\uparrow)	DVGO	-	0.991	0.964	0.992	0.992	0.987	0.989	0.965	0.949	0.979
		LOW	0.991	0.963	0.961	0.991	0.985	0.986	0.966	0.950	0.974
		HIGH	0.990	0.958	0.953	0.991	0.982	0.982	0.957	0.942	0.969
	TensoRF	-	0.993	0.968	0.979	0.994	0.989	0.991	0.961	0.978	0.982
		LOW	0.993	0.968	0.980	0.995	0.988	0.991	0.978	0.963	0.982
		HIGH	0.992	0.963	0.978	0.994	0.985	0.988	0.966	0.957	0.978
LPIPS _{VGG} (\downarrow)	DVGO	-	0.011	0.055	0.045	0.013	0.020	0.019	0.047	0.059	0.034
		LOW	0.015	0.056	0.043	0.013	0.024	0.027	0.045	0.055	0.035
		HIGH	0.015	0.063	0.050	0.013	0.028	0.036	0.054	0.067	0.041
	TensoRF	-	0.003	0.021	0.011	0.003	0.009	0.006	0.024	0.016	0.012
		LOW	0.011	0.049	0.020	0.010	0.022	0.017	0.035	0.054	0.027
		HIGH	0.016	0.061	0.022	0.011	0.027	0.029	0.059	0.077	0.038

Table 3: Results for BlendedMVS

		BlendedMVS					
	Architecture	Pruning	Character	Fountain	Jade	Statue	Avg
PSNR(dB)(\uparrow)	DVGO	-	30.26	28.27	27.75	26.41	28.17
		LOW	30.05	28.21	27.48	26.08	27.86
		HIGH	29.78	27.90	27.08	25.97	27.68
Size(MB)(\downarrow)	DVGO	-	131.73	72.33	158.03	97.08	114.79
		LOW	5.43	3.54	5.24	2.81	4.26
		HIGH	2.92	1.70	1.85	1.85	2.08
SSIM(\uparrow)	DVGO	-	0.963	0.923	0.916	0.887	0.922
		LOW	0.960	0.921	0.909	0.876	0.917
		HIGH	0.957	0.910	0.887	0.867	0.908
LPIPS _{VGG} (\downarrow)	DVGO	-	0.046	0.116	0.106	0.137	0.101
		LOW	0.048	0.114	0.107	0.142	0.103
		HIGH	0.052	0.126	0.129	0.151	0.115

Table 4: Results for Tanks & Temples.

		Tanks & Temples							
	Architecture	Pruning	Barn	Caterpillar	Family	Ignatius	Truck	Avg	
PSNR(dB)(↑)		-	26.84	25.70	33.68	28.00	27.09	28.26	
	DVGO	LOW	26.76	25.67	33.60	28.06	27.04	28.23	
		HIGH	26.32	25.22	33.36	27.86	26.78	27.91	
		-	25.95	24.63	32.25	27.49	26.52	27.37	
	Plenoxels	LOW	26.58	24.78	32.86	27.22	26.87	27.66	
		HIGH	26.31	24.40	32.29	27.00	26.69	27.34	
		-	28.34	27.14	27.22	26.19	33.92	28.56	
	TensoRF	LOW	27.28	26.09	33.75	28.06	27.32	28.50	
		HIGH	26.99	25.77	33.36	27.86	27.20	28.40	
	Size(MB)(↓)		-	128.21	109.94	92.72	95.10	106.43	106.48
		DVGO	LOW	5.52	5.23	3.85	3.51	5.35	4.69
			HIGH	1.75	1.89	2.37	1.08	1.87	1.79
		-	282.85	133.43	103.64	115.81	104.08	147.96	
Plenoxels		LOW	213.45	87.08	73.16	93.94	43.65	102.26	
		HIGH	181.09	66.67	60.53	84.06	35.01	85.47	
		-	73.95	64.56	60.06	61.25	65.36	65.04	
TensoRF		LOW	9.39	8.16	7.40	12.13	12.87	9.99	
		HIGH	6.62	5.69	5.17	7.66	8.34	6.70	
SSIM(↑)			-	0.836	0.904	0.961	0.941	0.905	0.909
		DVGO	LOW	0.838	0.904	0.962	0.941	0.904	0.910
			HIGH	0.826	0.859	0.958	0.931	0.895	0.894
		-	0.828	0.899	0.954	0.942	0.899	0.904	
	Plenoxels	LOW	0.856	0.894	0.959	0.935	0.902	0.909	
		HIGH	0.844	0.871	0.95	0.923	0.892	0.896	
		-	0.948	0.914	0.864	0.912	0.965	0.920	
	TensoRF	LOW	0.862	0.901	0.961	0.941	0.913	0.916	
		HIGH	0.852	0.888	0.956	0.934	0.907	0.907	
	LPIPS _{VGG} (↓)		-	0.297	0.171	0.071	0.089	0.162	0.158
		DVGO	LOW	0.291	0.172	0.079	0.091	0.161	0.159
			HIGH	0.312	0.194	0.073	0.107	0.174	0.172
		-	0.306	0.169	0.081	0.102	0.167	0.165	
Plenoxels		LOW	0.263	0.174	0.071	0.112	0.155	0.155	
		HIGH	0.285	0.200	0.081	0.126	0.165	0.171	
		-	0.078	0.145	0.252	0.159	0.064	0.140	
TensoRF		LOW	0.258	0.187	0.067	0.087	0.149	0.149	
		HIGH	0.277	0.211	0.077	0.096	0.169	0.166	

Table 5: Results for forward-facing scenes from NeRF

Forward-facing-NeRF											
	Architecture	Pruning	Fern	Flower	Fortress	Horns	Leaves	Orchids	Room	Trex	Avg
PSNR(dB)(↑)	Plenoxel	-	24.57	27.64	30.17	27.10	21.56	20.54	29.20	26.41	25.90
		LOW	25.45	27.82	30.57	27.51	21.38	20.37	30.33	26.50	26.24
		HIGH	25.23	27.65	30.18	26.98	21.12	20.32	29.76	26.27	25.94
	TensorRF	-	25.27	28.60	31.36	28.14	21.30	19.87	32.35	26.97	26.73
		LOW	24.50	28.64	31.30	28.87	21.22	19.31	33.33	27.26	26.80
		HIGH	24.40	28.29	31.09	28.49	20.78	19.08	33.10	27.16	26.55
Size(MB)(↓)	Plenoxel	-	1658.40	1471.78	1407.66	1726.17	1851.71	720.01	1421.66	1622.31	1484.96
		LOW	407.02	726.00	383.61	432.01	438.90	221.51	495.84	552.94	457.23
		HIGH	305.97	523.17	291.59	321.62	327.51	163.36	366.04	404.93	338.02
	TensorRF	-	148.49	152.44	149.99	152.51	151.72	159.80	151.14	148.20	151.79
		LOW	19.26	30.72	19.69	31.29	19.66	21.96	86.23	29.93	32.34
		HIGH	12.97	19.44	13.36	20.17	13.38	15.29	48.47	19.09	20.27
SSIM(↑)	Plenoxel	-	0.830	0.863	0.884	0.857	0.763	0.681	0.937	0.890	0.838
		LOW	0.831	0.862	0.880	0.859	0.758	0.684	0.938	0.895	0.838
		HIGH	0.821	0.858	0.873	0.840	0.734	0.681	0.927	0.889	0.828
	TensorRF	-	0.814	0.871	0.897	0.877	0.752	0.649	0.952	0.900	0.839
		LOW	0.764	0.864	0.891	0.892	0.725	0.570	0.955	0.900	0.820
		HIGH	0.744	0.842	0.880	0.873	0.677	0.520	0.950	0.889	0.797
LPIPS _{VGG} (↓)	Plenoxel	-	0.225	0.177	0.180	0.230	0.194	0.271	0.194	0.237	0.213
		LOW	0.225	0.177	0.183	0.228	0.197	0.264	0.199	0.234	0.213
		HIGH	0.241	0.178	0.188	0.254	0.226	0.265	0.234	0.250	0.229
	TensorRF	-	0.237	0.169	0.148	0.196	0.217	0.278	0.167	0.221	0.204
		LOW	0.299	0.158	0.144	0.158	0.299	0.383	0.149	0.203	0.224
		HIGH	0.337	0.200	0.172	0.193	0.364	0.449	0.168	0.227	0.264