

A Deep Belief Network Approach to Scalable Compression of Light Field Data for Auto-Stereoscopic Displays

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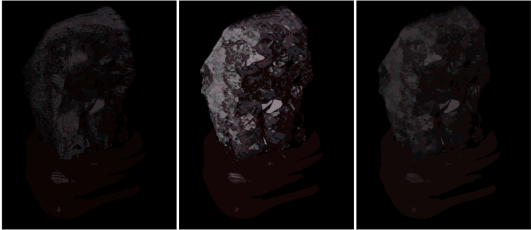
Supplementary Material:

Table 1: The percentage rate savings based on Bjontegaard metric for the proposed compression scheme with respect to HEVC (HM 17.0) on *Amethyst*, *Boxes*, *Bunny*, *Dice*, *DragonAndBunnies* and *Jellybeans* light fields.

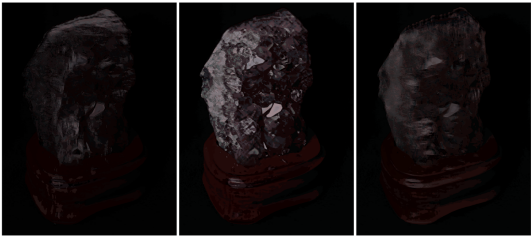
Amethyst										Boxes													
QP	Non-Scalable N = 1		Scalable N = 2		Scalable N = 3		Scalable N = 4		BD-Rate	Non-Scalable N = 1		Scalable N = 2		Scalable N = 3		Scalable N = 4		BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR
	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR		BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR						
0	-98.8690	57.6900	-55.7210	-8.0084	-61.2000	-7.4733	-24.1800	-15.2940	-41.8059	-11.8468	198.1354	-33.6725	-169.2788	-32.8233	-225.0941	-35.1330							
4	-98.6660	47.7800	-64.4650	-13.8590	-70.9230	-13.2360	-46.5880	-20.7910	-60.0660	-16.2634	73.3905	-37.8468	57.3914	-36.8934	78.3453	-39.2278							
8	-95.3180	23.4260	31.3520	-32.7900	17.1520	-32.5350	116.2800	-39.8830	25.4220	-34.0146	526.7320	-55.7807	483.1239	-54.7671	588.0735	-57.2147							
12	-86.5830	12.1360	267.0900	-43.1290	232.8400	-43.0600	528.8800	-50.7920	209.7793	-46.9153	1625.4085	-69.7935	1520.5142	-68.4530	1875.0145	-70.9254							
16	-66.8830	4.0749	1095.4000	-51.0790	1053.5000	-51.6410	2135.6000	-59.2240	863.3522	-58.7275	5477.7887	-82.8921	5028.0985	-81.0795	6294.1877	-83.2878							
20	-30.0260	0.0436	2155.4000	-53.1150	2173.8000	-53.5410	4320.4000	-60.7000	1883.4621	-66.4779	12072.7062	-91.7540	10746.6098	-88.9064	13314.8035	-90.9410							
24	-0.8148	2.5083	2152.0000	-46.1940	1964.9000	-42.6370	3591.6000	-49.1290	1974.4314	-59.1979	11442.4152	-81.5360	8855.567	-75.0587	9672.0447	-73.5113							
28	27.8410	5.0623	1396.0000	-38.8420	1019.7000	-29.7930	1687.2000	-35.8920	937.6225	-43.6612	3182.6067	-56.3625	2032.0911	-46.3679	1640.0668	-37.7108							
32	66.1340	4.5937	890.8700	-34.2510	570.5700	-21.8320	800.6000	-27.5280	356.6148	-26.4650	587.8523	-25.4563	384.0154	-16.0203	235.1648	-2.1866							
36	65.4110	3.0468	512.5400	-25.5620	385.7100	-12.5280	472.1000	-17.6450	223.1411	-27.8435	119.1653	-23.1585	65.1886	12.7977	15.0704	36.7899							
40	124.9200	6.2937	288.7800	-20.3660	259.5800	-11.6720	289.1500	-16.0210	75.2486	0.0205	39.3248	11.2568	-25.5882	74.0820	-28.8742	15.3509							
44	108.5400	-5.2522	219.9400	-30.2000	200.1300	-21.2540	227.6000	-27.0140	72.1109	-14.5280	-7.0705	9.7654	-24.0337	13.7988	-34.9223	16.8794							
48	30.8840	13.8740	6.6178	15.8100	23.6090	14.4030	17.8290	14.7260	-22.1333	-2.6566	-28.4868	-1.3933	-28.3266	-19.5992	-29.5321	-1.1023							
51	45.1830	-10.1580	22.7340	-8.8224	39.6500	-9.9032	33.6690	-9.5537	-9.7703	-1.1806	-16.3486	0.2101	-16.2866	0.2038	-16.5424	0.2631							
Bunny										Dice													
QP	Non-Scalable N = 1		Scalable N = 2		Scalable N = 3		Scalable N = 4		BD-Rate	Non-Scalable N = 1		Scalable N = 2		Scalable N = 3		Scalable N = 4		BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR
	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR		BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR						
0	-35.8541	-17.0095	73.0508	-32.3806	160.6051	-39.3341	624.6934	-52.8348	-66.4276	-2.2326	40.6093	-22.5932	130.0192	-28.8897	170.5627	-30.7740							
4	-41.8936	-34.0459	40.0770	-49.8663	86.2890	-57.2647	371.3065	-72.0286	-75.9316	-6.9096	-15.6806	-26.5816	22.7096	-32.4988	43.2013	-34.3269							
8	175.0928	-54.4521	596.2660	-71.5034	968.0501	-79.8450	2884.9865	-96.0686	-33.4818	-17.8915	158.3820	-36.8031	312.4884	-42.7621	399.1539	-44.3851							
12	581.4316	-69.2273	1738.6878	-88.2156	3027.9593	-97.0145	8733.8350	-115.7014	29.9134	-25.3225	422.0706	-44.1848	755.3686	-50.1750	956.5430	-51.6672							
16	1744.7020	-81.1327	5404.1429	-101.9941	9017.7433	-111.9698	29726.3101	-132.4633	227.5596	-31.2497	1279.9497	-49.7174	2232.8511	-55.6054	2712.3778	-56.8094							
20	3007.3424	-84.3790	9496.2841	-105.7178	17104.4903	-116.9110	59241.9373	-139.1975	440.0170	-31.5654	2349.4750	-49.3073	4050.7552	-54.6757	5005.8425	-55.4995							
24	2406.6269	-69.8786	6191.8533	-83.3898	10202.4810	-89.1761	33377.0580	-107.5293	472.3484	-24.1805	2008.4562	-37.2643	3733.7957	-42.3617	3824.9943	-41.7005							
28	1181.4572	-53.6379	1707.3778	-52.8878	2611.9269	-58.3495	4573.4586	-60.7393	296.4435	-13.8700	1788.9704	-21.6984	1222.9146	-23.3816	1264.8141	-21.9235							
32	655.5291	-45.8655	603.1516	-35.9773	1128.7717	-50.2445	1084.3900	-37.4922	144.7853	-4.2159	317.2983	-6.5884	349.4932	-5.1967	326.3524	-2.2371							
36	317.9121	-28.6696	1861.383	-12.7256	454.1258	-34.3873	282.1265	-15.3242	45.9910	6.8538	105.9174	4.2912	106.3240	11.0394	100.4300	8.1394							
40	143.5400	-18.2187	45.7421	7.3104	209.0109	-27.0753	108.9672	-6.3548	-22.5309	29.1828	12.5711	25.6253	10.0207	27.5119	-11.0958	33.5574							
44	125.4312	-42.8964	36.2615	-9.3876	158.8552	-49.7373	38.9808	-2.4908	-62.1477	56.4491	-25.8455	28.2568	-24.2835	28.0635	-41.4466	37.6781							
48	-4.4405	-2.4688	-10.8485	-1.1827	-3.5751	-2.5988	-6.8336	-1.9784	-82.2196	22.2027	-75.5257	20.9590	-76.0856	20.2116	-78.8015	21.0589							
51	7.4971	-1.0392	2.7308	-0.0387	8.3584	-1.1732	5.3396	-0.5691	-81.5310	22.0370	-75.0849	19.9392	-75.6145	20.0897	-78.4855	21.0813							
DragonAndBunnies										Jellybeans													
QP	Non-Scalable N = 1		Scalable N = 2		Scalable N = 3		Scalable N = 4		BD-Rate	Non-Scalable N = 1		Scalable N = 2		Scalable N = 3		Scalable N = 4		BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR
	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR		BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR	BD-Rate	BD-PSNR						
0	-85.5156	8.3380	32.0122	-20.2387	72.9238	-23.5259	66.2699	-22.0434	-09.5234	77.9058	-76.7885	-1.9367	-54.4376	-11.1967	125.1849	-29.2147							
4	-90.2718	4.0256	33.2095	-23.2836	-12.0985	-26.6480	-15.2971	-25.0874	-99.3836	55.7624	-82.6403	-15.0227	-69.6617	-23.9664	23.3035	-42.0870							
8	-72.5248	-5.6574	131.7141	-31.8302	212.8679	-34.8821	196.4963	-33.1752	-96.7078	33.6512	-1.4889	-32.4229	88.8461	-41.9025	773.3147	-40.4853							
12	-48.0885	-12.1782	376.6404	-37.9446	544.6392	-40.0934	514.1859	-38.8798	-91.5477	22.1932	177.6594	-42.7123	455.2631	-52.9002	2623.2910	-72.1530							
16	26.6078	-17.6267	1153.7395	-42.8081	1590.5743	-45.7413	1473.7028	-43.0534	-77.3925	13.0968	831.6044	-51.5420	1925.2471	-62.6116	10388.1426	-82.3759							
20	110.3281	-18.3644	2105.4681	-41.5987	2906.9074	-44.2775	2430.3875	-40.7478	-48.8109	11.0514	1693.8994	-50.8611	4117.8794	-62.3073	23403.4191	-81.2958							
24	123.8702	-10.5361	1665.6596	-31.4250	2048.6159	-30.8901	1559.1508	-27.8501	-38.5762	21.9889	1539.6563	-38.3265	3515.397	-47.9189	18169.2432	-65.0034							
28	56.7639	-0.7447	655.9266	-16.4986	592.6371	-11.8968	451.1796	-8.8809	-54.2492	49.7829	833.6331	-23.1061	1381.1249	-27.2223	4955.1499	-39.5767							
32	2.3774	9.0746	172.9573	0.5472	121.8285	6.8847	86.1353	6.9809	-59.9947	66.5945	323.5571	-6.5438	423.1734	-7.6443	677.8773	-6.105							
36	-41.3905	29.7503	7.3674	18.8344	-3.6047	22.8576	-22.2246	29.4171	-65.6308	95.8310	140.9084	12.6884	160.4089	12.6442	6.4096	57.1260							
40	-68.2151	57.5858	-51.7591	46.3843	-52.5853	47.4873	-60.6794	58.4989	-58.1097	87.6541	37.2424	30.8651	26.7779	35.6626	-56.4936	138.6558							
44	-78.7734	97.5241	-68.6222	62.3341	-66.0932	57.4959	-75.4121	59.2259	-76.5525	85.631	2.2206	20.61	2.2206	20.61	30.343	70.5624							
48	-85.9083	23.2501	-82.5366	20.8136	-81.8672	21.5602	-83.8443	22.759	-73.0002	21.4228	-56.0492	17.6420	-55.6653	17.5842	-67.0470	19.8675							
51	-83.5053	22.6011	-80.8041	21.8484	-79.9767	21.3327	-80.8549	21.7928	-70.1418	20.4150	-53.9243	16.7830	-53.4734	16.7459	-64.5351	18.9824							



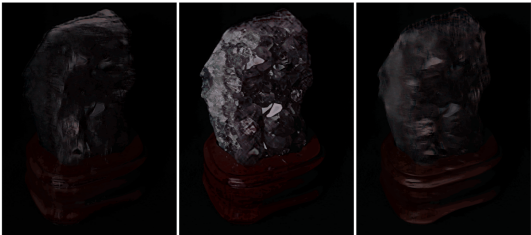
Original Layer Pattern



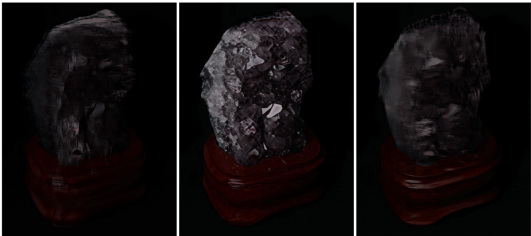
Level = 1



Level = 2



Level = 3



Level = 4

Figure 1: Non-scalable and Scalable layer reconstruction of *Amethyst*

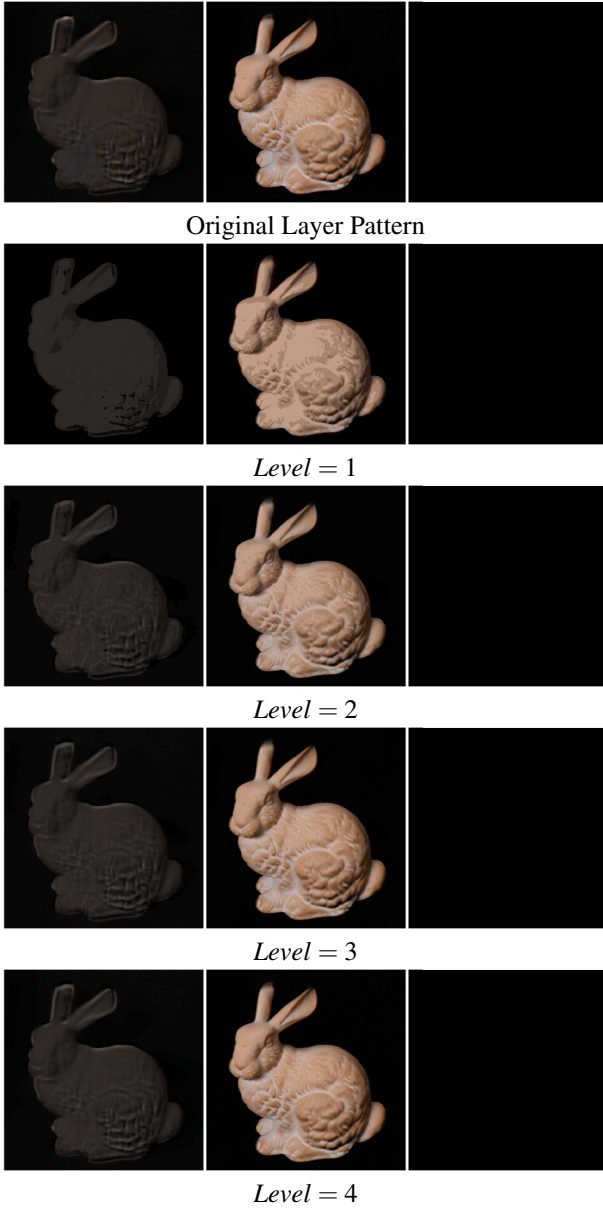


Figure 2: Non-scalable and Scalable layer reconstruction of *Bunny*.

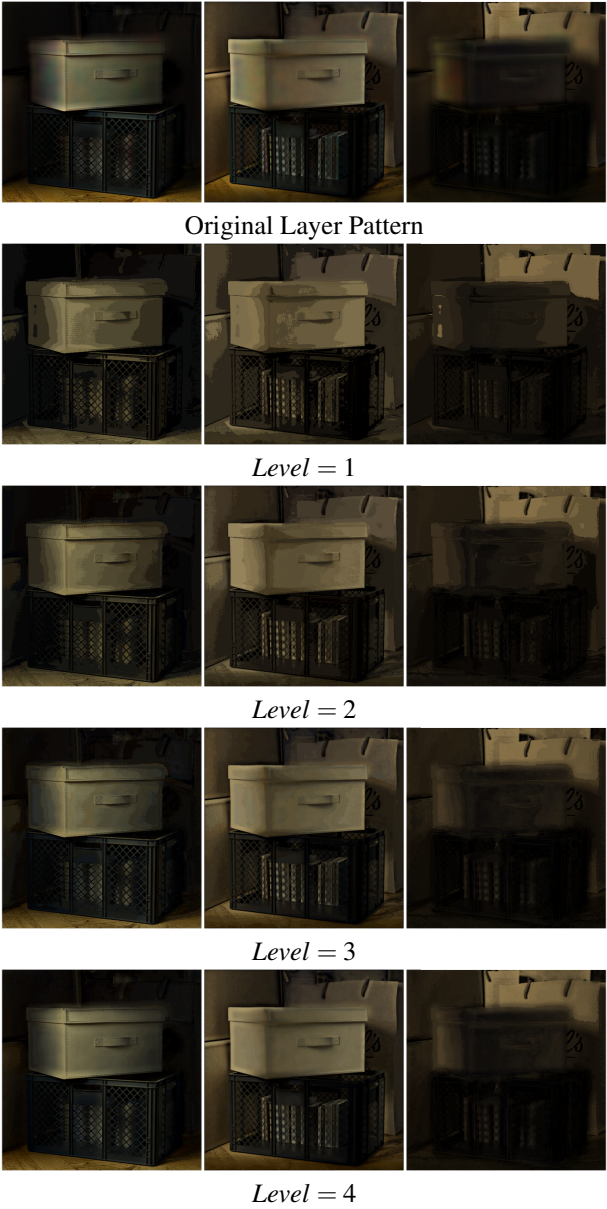


Figure 3: Non-scalable and Scalable layer reconstruction of *Boxes*.



Figure 4: Non-scalable and Scalable layer reconstruction of *Dice*.

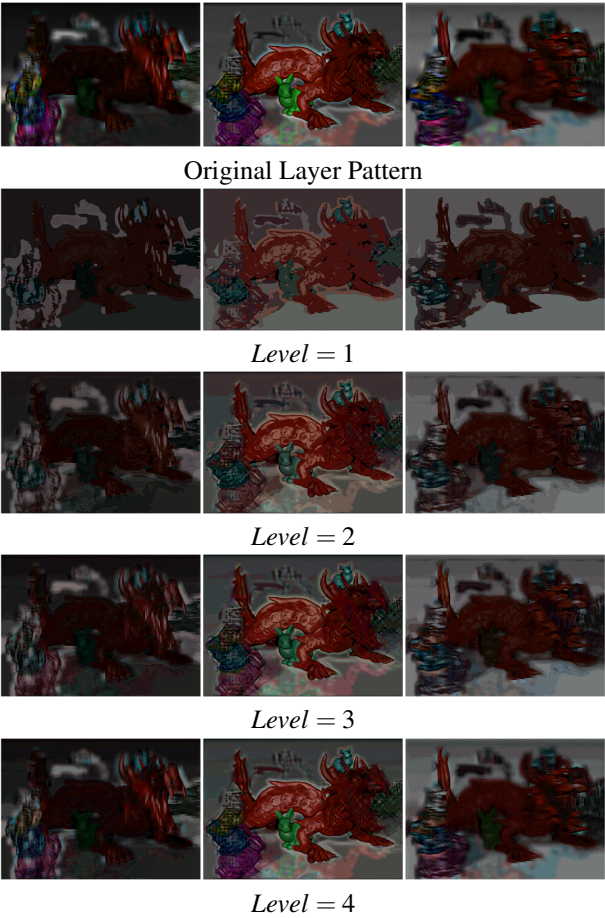


Figure 5: Non-scalable and Scalable layer reconstruction of *DragonAndBunnies*.



Figure 6: Non-scalable and Scalable layer reconstruction of *Jellybeans*.

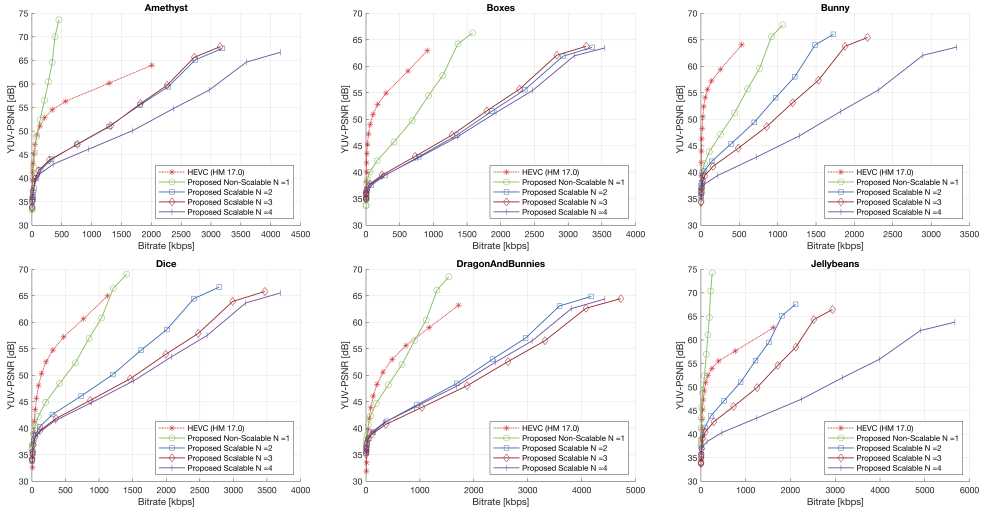


Figure 7: The rate-distortion curve of the proposed compression scheme compared to that of standard video codec (HEVC).

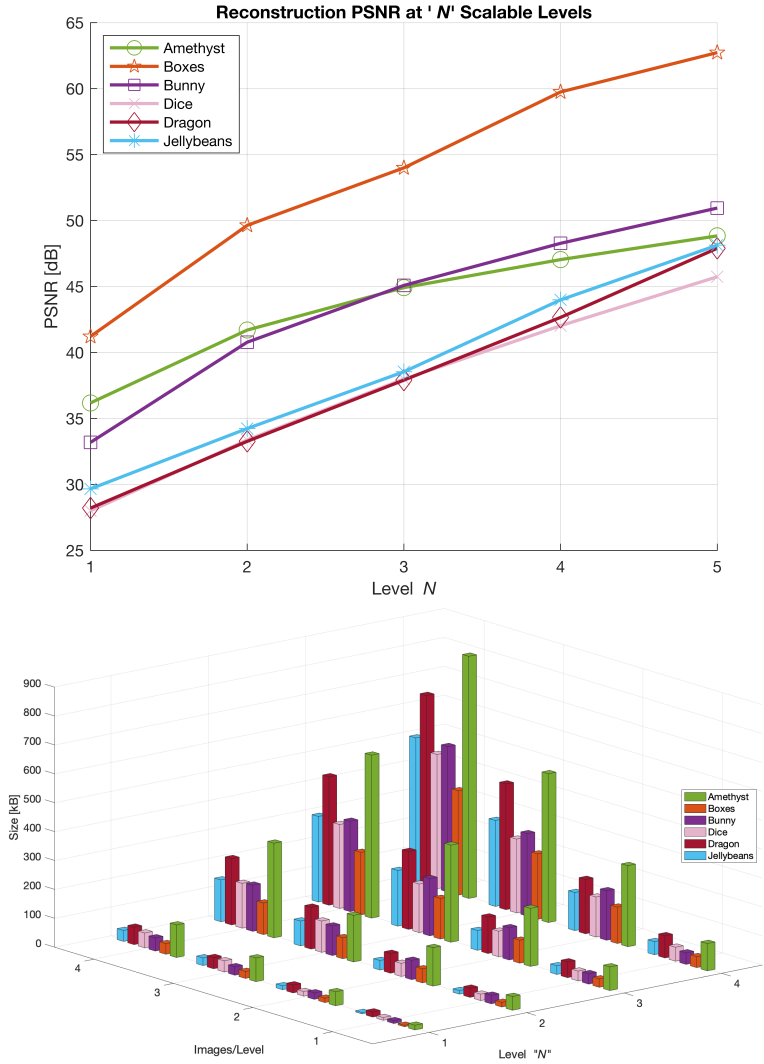


Figure 8: Comparison of (a) peak signal-to-noise ratio (PSNR) and (b) sizes between scalable and non-scalable codings with 10 binary images per level.