

Unsupervised Cross-modal Synthesis of Subject-specific Scans

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1. Coupled sparse representation

While the contribution of coupled sparse representation is very small when synthesizing T1-MRI from T2-MRI, it improves the quality of synthesized images when generating T2-MRI from T1-MRI. To report the results for coupled sparse representation, we ran the CSR step 20 times for each image. The results reported for CSR in table 1 of the main paper are averaged over 20 runs. To quantify the statistical significance of the contribution of CSR while synthesizing T2 from T1, we also report the minimum (among 20 runs) improvement in correlation and SNR values along with the corresponding p -values in table 1 of this supplementary material.

2. Unsupervised synthesis results

The correlation and SNR values reported for various unsupervised synthesis approaches in table 2 of the main paper were averaged over 19 subjects. In this supplementary material, we report the correlation and SNR values for individual subjects. Table 2 shows the results for T2-MRI synthesis from T1-MRI and table 3 shows the results for T1-MRI synthesis from T2-MRI.

Table 1: Contribution of CSR while synthesizing T2 from T1.

Subject	Source: T1-MRI, Target: T2-MRI			
	Correlation		SNR (dB)	
	minimum improvement	p -value (in %)	minimum improvement	p -value (in %)
1	0.012	0.30	0.42	0.29
2	0.017	2.35	0.64	2.64
3	0.013	2.88	0.54	1.66
4	0.013	4.57	0.43	5.30
5	0.016	3.74	0.59	7.19
6	0.017	2.73	0.62	0.64
7	0.016	0.72	0.50	0.20
8	0.010	1.62	0.37	1.66
9	0.019	6.05	0.70	6.39
10	0.012	0.20	0.40	0.02
11	0.014	2.01	0.64	1.81
12	0.010	0.12	0.36	0.27
13	0.013	4.21	0.42	4.14
14	0.009	0.16	0.38	0.13
15	0.015	0.15	0.52	0.14
16	0.016	3.32	0.45	3.25
17	0.015	0.55	0.57	0.72
18	0.014	9.18	0.52	9.82
19	0.012	3.41	0.41	1.95

Table 2: Correlation and SNR values for various approaches under unsupervised setting.

Subject	Source: T1-MRI, Target: T2-MRI											
	Correlation						SNR (dB)					
	F-NN	A-NN	MI only	SC only	Proposed No CSR	Proposed CSR	F-NN	A-NN	MI only	SC only	Proposed No CSR	Proposed CSR
1	0.708	0.816	0.821	0.816	0.862	0.878	9.83	12.19	11.96	12.11	13.31	13.84
2	0.697	0.810	0.801	0.808	0.839	0.859	10.05	12.65	11.78	12.38	13.06	13.80
3	0.782	0.861	0.852	0.855	0.881	0.894	11.03	13.28	12.59	12.99	13.78	14.35
4	0.721	0.810	0.803	0.809	0.841	0.853	10.08	12.11	11.56	11.98	12.72	13.13
5	0.713	0.779	0.809	0.768	0.814	0.832	9.72	11.40	11.35	10.98	11.81	12.44
6	0.704	0.812	0.789	0.815	0.841	0.863	10.23	12.80	11.60	12.64	13.24	14.01
7	0.682	0.794	0.742	0.784	0.792	0.811	9.66	12.08	10.46	11.66	11.76	12.33
8	0.716	0.815	0.814	0.808	0.833	0.846	10.10	12.35	11.83	12.06	12.56	13.01
9	0.720	0.831	0.814	0.821	0.856	0.875	10.08	12.72	11.81	12.31	13.21	13.92
10	0.735	0.837	0.826	0.822	0.848	0.863	10.70	13.41	12.33	12.78	13.33	13.96
11	0.774	0.850	0.855	0.839	0.871	0.886	10.94	13.23	12.78	12.63	13.53	14.20
12	0.695	0.800	0.782	0.804	0.822	0.837	9.72	12.05	11.13	11.98	12.34	12.82
13	0.719	0.814	0.809	0.812	0.838	0.853	10.00	12.10	11.60	11.94	12.53	13.01
14	0.757	0.851	0.838	0.844	0.861	0.872	10.50	12.99	12.26	12.69	13.12	13.55
15	0.668	0.784	0.742	0.776	0.791	0.810	9.59	12.16	10.63	11.75	11.96	12.57
16	0.681	0.772	0.799	0.764	0.830	0.845	9.36	11.16	11.29	10.92	12.23	12.69
17	0.732	0.829	0.824	0.824	0.851	0.868	10.20	12.68	12.01	12.34	13.01	13.66
18	0.739	0.835	0.835	0.827	0.859	0.874	10.32	12.63	12.27	12.33	13.19	13.72
19	0.690	0.782	0.790	0.780	0.811	0.826	9.80	11.78	11.37	11.59	12.14	12.61
average	0.717	0.815	0.808	0.809	0.839	0.855	10.10	12.41	11.72	12.11	12.78	13.35

Table 3: Correlation and SNR values for various approaches under unsupervised setting.

Subject	Source: T2-MRI, Target: T1-MRI											
	Correlation						SNR (dB)					
	F-NN	A-NN	MI only	SC only	Proposed No CSR	Proposed CSR	F-NN	A-NN	MI only	SC only	Proposed No CSR	Proposed CSR
1	0.859	0.906	0.918	0.901	0.932	0.936	13.18	15.12	15.34	14.79	16.38	16.66
2	0.868	0.916	0.908	0.913	0.932	0.936	13.50	15.61	15.03	15.40	16.39	16.69
3	0.867	0.917	0.912	0.915	0.934	0.938	13.46	15.67	15.17	15.50	16.55	16.83
4	0.867	0.920	0.913	0.913	0.933	0.937	13.49	15.85	15.20	15.44	16.48	16.80
5	0.781	0.833	0.878	0.829	0.873	0.870	12.51	13.91	15.07	13.71	14.99	14.90
6	0.871	0.926	0.914	0.920	0.939	0.943	13.64	16.01	15.37	15.74	16.92	17.22
7	0.850	0.904	0.859	0.894	0.900	0.905	12.99	14.94	13.18	14.54	14.76	14.99
8	0.876	0.927	0.916	0.922	0.941	0.944	13.86	16.28	15.46	15.94	17.09	17.39
9	0.869	0.916	0.910	0.911	0.933	0.937	13.34	15.51	14.81	15.12	16.28	16.62
10	0.867	0.923	0.907	0.917	0.936	0.941	13.70	16.23	15.20	15.84	16.89	17.30
11	0.868	0.913	0.917	0.911	0.935	0.939	13.60	15.64	15.54	15.41	16.73	17.01
12	0.862	0.916	0.893	0.910	0.925	0.930	13.27	15.37	14.34	15.16	15.89	16.22
13	0.858	0.910	0.901	0.906	0.926	0.931	13.30	15.38	14.81	15.15	16.13	16.43
14	0.875	0.927	0.911	0.923	0.940	0.943	13.71	16.20	15.13	15.91	16.93	17.21
15	0.850	0.909	0.877	0.905	0.915	0.921	13.01	15.22	13.85	15.03	15.50	15.82
16	0.863	0.912	0.920	0.909	0.936	0.940	13.25	15.48	15.34	15.11	16.53	16.88
17	0.857	0.911	0.901	0.907	0.929	0.934	13.08	15.38	14.49	15.03	16.13	16.52
18	0.848	0.902	0.903	0.903	0.923	0.928	12.88	14.90	14.74	14.89	15.86	16.18
19	0.849	0.904	0.897	0.905	0.924	0.928	13.00	14.84	14.60	14.98	15.92	16.14
average	0.858	0.910	0.903	0.906	0.927	0.931	13.30	15.45	14.88	15.19	16.23	16.52