Page 19 of the manuscript.

7 Supplementary Materials

Fig. 7 shows the networks utilized in Subsection 3. The chosen `Spa`, `Spe`, `SS1`,and `SS2` have similar numbers of parameter size.

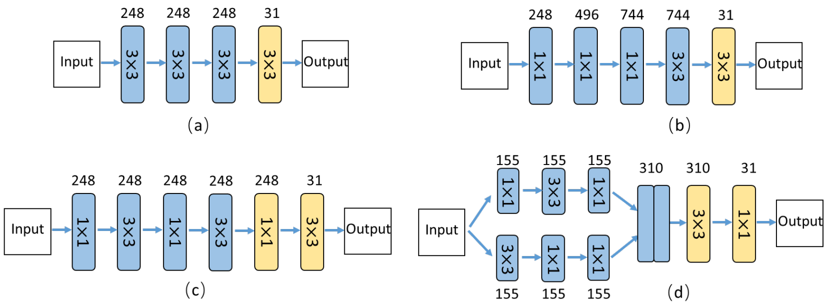


Fig. 7. (a) `Spa` with 1.24M parameters. (b) `Spe` with 1.08M parameters. (c) `SS1` with 1.31M parameters. (d) `SS2` with 1.20M parameters. The blue operation block means convolutions followed by BN and ReLU, meanwhile the yellow block means convolutions without BN or ReLU.

The comparison with closely related hand-crafted networks is summarized in Table 10. Actually, we can simply train STAS once, and apply the searched architecture to the restoration task on HSIs with similar spectral information, regardless of the noise level.

Table 10. A comparison with closely related hand-crafted works.

	Method	Spectrum -aware	Noisy-level independent	Task transferability
hand designed	HSI-DeNet	×	×	×
	SIP	√	√	×
	QRNN3D	√	√	×
NAS	STAS(ours)	√	√	√

Fig. 8 presents the performance of four different `nets` introduced in Fig. 7. We test above `nets` on a Pavia image of size $200 \times 200 \times 60$, and adopt PSNR to measure the spatial learning ability, while applying the mean *Cosine* value to the spectral learning ability. Fig. 8 shows that hand-crafted `SS1` can make use of the `spe` and `spa` to learn the spatial-spectral features. However, the well composed spatial and spectral architecture of `SS2` can achieve better learning ability.

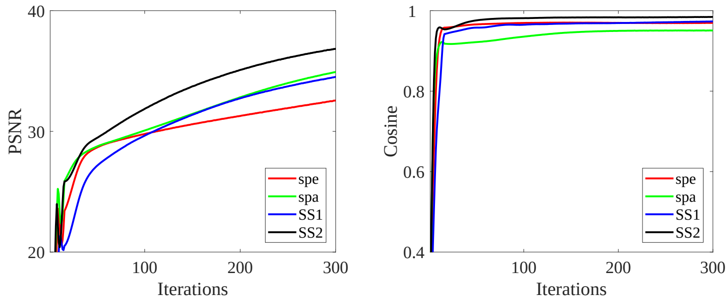


Fig. 8. The spatial and spectral learning ability of 4 different `net`. The well composed spatial and spectral architecture of `SS2` can achieve better learning ability.

We provide the code link to the compared classical denoising methods FastHyDe [55] [7], NGmeet [20] [8]; and learning-based methods, including SIP [24] [9] and QRNN3D [42] [10].

We also provide the code link to the compared imaging reconstruction methods λ-net [31] [11], TSA [30] [12], and GSM-based [23][13].

Table 11 and 12 are the detailed results as shown in Table 3. Table 11 shows the quantitative evaluation results of different methods on CAVE denoising. Table 12 shows the results on 10 ICVL test images.

Table 11. Quantitative evaluation of CAVE denoising experiments.

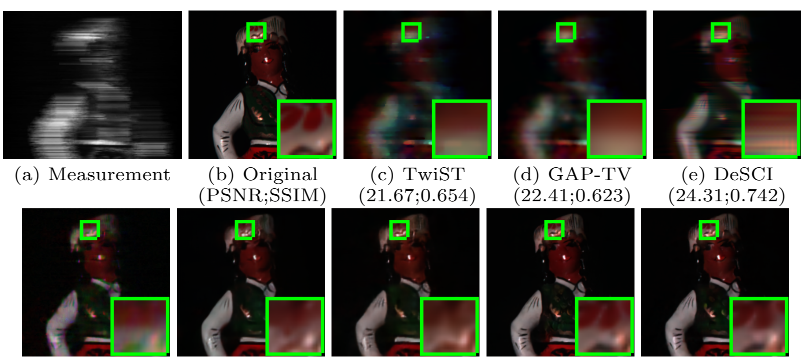
	method	FastHyDe			NGmeet			SIP			qrnn3d			$STAS_C$		
noise	index	PSNR	SSIM	MSA	PSNR	SSIM	MSA	PSNR	SSIM	MSA	PSNR	SSIM	MSA	PSNR	SSIM	MSA
30	1	37.78	0.952	8.09	39.01	0.968	5.58	35.38	0.939	9.41	36.23	0.960	7.84	38.59	0.964	6.62
	2	40.49	0.975	1.09	42.23	0.980	0.95	38.55	0.969	1.64	39.44	0.976	1.53	39.24	0.974	1.53
	3	38.33	0.949	8.24	39.39	0.961	6.21	38.63	0.953	7.32	39.00	0.959	6.84	40.00	0.966	5.83
	4	38.80	0.939	13.81	40.14	0.970	7.41	39.49	0.944	10.64	40.67	0.963	9.63	40.99	0.972	7.34
	5	39.96	0.939	5.96	40.45	0.945	4.64	37.83	0.931	6.95	38.51	0.932	6.51	38.95	0.944	5.58
	6	35.78	0.941	6.68	36.56	0.959	5.34	35.65	0.953	6.09	36.41	0.960	5.44	37.06	0.966	4.90
	7	34.86	0.945	1.56	35.60	0.953	1.37	33.23	0.944	2.16	33.32	0.947	2.18	33.89	0.945	1.89
	Average	38.00	0.949	6.49	**39.05**	**0.963**	**4.50**	36.97	0.948	6.31	37.65	0.957	5.71	38.39	0.961	4.81
50	1	35.03	0.914	11.40	35.88	0.948	7.37	34.21	0.931	9.77	34.38	0.933	9.43	36.03	0.959	7.00
	2	38.91	0.963	1.50	40.12	0.976	1.13	37.57	0.965	1.77	37.69	0.969	1.76	38.94	0.973	1.61
	3	35.75	0.910	11.74	36.78	0.939	7.99	37.72	0.949	7.24	37.60	0.939	7.64	38.28	0.955	6.31
	4	35.85	0.872	21.01	37.00	0.946	9.98	38.19	0.948	10.62	38.22	0.930	12.20	39.21	0.962	8.12
	5	37.39	0.901	8.63	38.08	0.915	6.18	36.79	0.910	8.07	36.79	0.908	7.13	37.80	0.922	6.34
	6	33.24	0.900	9.07	33.87	0.935	8.45	34.30	0.937	6.79	34.51	0.944	6.36	35.18	0.951	5.84
	7	32.53	0.920	1.94	32.92	0.926	1.71	31.88	0.917	2.21	31.67	0.921	2.21	32.15	0.924	2.13
	Average	35.53	0.911	9.33	36.38	0.941	6.12	35.81	0.937	6.64	35.84	0.935	6.68	**36.80**	**0.949**	**5.34**
70	1	33.25	0.868	14.69	34.21	0.926	8.84	34.16	0.925	11.83	34.93	0.923	8.41	35.97	0.959	6.92
	2	36.61	0.945	2.02	37.50	0.970	1.54	35.57	0.971	2.38	36.78	0.965	2.25	38.84	0.972	1.64
	3	34.07	0.868	15.46	34.76	0.916	11.06	36.32	0.936	7.48	36.72	0.932	7.26	37.03	0.947	6.56
	4	33.98	0.801	28.65	34.88	0.914	15.29	37.82	0.945	11.40	38.39	0.940	9.51	39.10	0.960	9.40
	5	35.72	0.865	10.88	36.37	0.888	8.29	35.98	0.899	7.29	35.89	0.901	7.58	36.07	0.903	7.22
	6	31.34	0.856	11.17	31.50	0.897	11.31	33.33	0.935	6.95	32.49	0.924	6.94	33.19	0.934	6.96
	7	30.91	0.894	2.30	31.16	0.902	2.04	29.32	0.894	3.66	29.51	0.906	2.66	30.64	0.908	2.56
	Average	33.70	0.871	12.17	34.34	0.916	8.34	34.64	0.929	7.29	34.96	0.927	6.37	**35.83**	**0.940**	**5.89**

[7] http://www.lx.it.pt/ bioucas/
[8] https://prowdiy.github.io/weihe.github.io/publication.html
[9] https://github.com/separable-image-prior
[10] https://github.com/Vandermode/QRNN3D
[11] https://github.com/xinxinmiao/lambda-net
[12] https://github.com/mengziyi64/TSA-Net
[13] https://see.xidian.edu.cn/faculty/wsdong/Projects/DGSM-SCI.htm

Table 12. Quantitative evaluation of ICVL denoising experiments.

	method	FastHyDe			NGmeet			SIP			qrnn3d			STAS$_C$		
noise	index	PSNR	SSIM	MSA	PSNR	SSIM	MSA	PSNR	SSIM	MSA	PSNR	SSIM	MSA	PSNR	SSIM	MSA
30	1	42.09	0.961	6.09	42.42	0.964	4.40	41.26	0.950	6.35	41.91	0.958	5.23	43.79	0.974	4.27
	2	42.65	0.973	2.53	43.31	0.977	2.00	41.90	0.965	2.93	42.37	0.969	2.61	44.16	0.982	1.58
	3	43.78	0.961	10.30	43.37	0.970	5.78	42.77	0.951	6.53	43.63	0.960	5.47	44.57	0.979	4.80
	4	43.27	0.974	0.92	43.81	0.974	1.11	40.02	0.957	1.56	40.32	0.965	1.58	44.06	0.979	1.14
	5	43.51	0.982	1.71	43.85	0.986	1.64	41.74	0.970	2.32	41.96	0.976	2.33	43.84	0.986	1.38
	6	43.57	0.980	4.30	44.63	0.977	2.36	42.53	0.970	5.45	43.05	0.977	4.75	44.23	0.978	2.69
	7	41.89	0.969	2.43	42.59	0.961	1.87	40.84	0.959	2.97	41.33	0.964	2.64	42.80	0.967	1.63
	Average	42.96	0.971	4.04	43.42	0.973	2.74	41.58	0.960	4.01	42.08	0.967	3.51	**43.92**	**0.978**	**2.50**
50	1	39.59	0.939	7.00	39.58	0.941	5.37	39.57	0.932	8.17	40.25	0.941	5.34	41.55	0.970	4.88
	2	40.45	0.962	3.04	40.83	0.966	2.53	40.48	0.958	3.43	40.94	0.967	2.67	41.87	0.963	1.84
	3	41.37	0.943	11.74	41.92	0.955	6.89	41.39	0.937	7.78	41.96	0.945	6.32	43.54	0.960	5.13
	4	41.45	0.963	0.97	41.55	0.962	0.77	37.98	0.944	2.10	39.09	0.955	1.58	42.12	0.961	1.49
	5	40.83	0.974	2.34	41.04	0.975	2.01	40.55	0.967	2.71	41.41	0.976	2.09	41.94	0.981	1.54
	6	40.95	0.973	4.80	41.14	0.978	3.20	41.11	0.965	6.58	41.03	0.975	4.24	42.40	0.984	3.16
	7	39.45	0.952	2.91	39.86	0.956	2.31	39.15	0.948	3.63	39.68	0.954	2.91	40.64	0.965	1.85
	Average	40.58	0.958	4.68	40.85	0.962	3.30	40.03	0.950	4.91	40.62	0.959	3.59	**42.01**	**0.969**	**2.84**
70	1	37.70	0.909	9.00	37.68	0.917	5.90	37.21	0.893	9.52	38.34	0.918	9.17	41.06	0.946	5.22
	2	38.84	0.947	3.79	39.40	0.957	2.87	40.82	0.964	3.42	40.45	0.959	3.47	41.46	0.965	3.02
	3	39.70	0.917	14.50	40.29	0.939	7.28	36.74	0.842	9.22	39.47	0.914	7.14	41.19	0.961	5.56
	4	39.49	0.949	1.21	39.74	0.951	0.78	39.38	0.948	1.38	37.57	0.935	1.69	39.73	0.943	1.71
	5	39.25	0.965	2.89	39.63	0.971	2.32	40.17	0.967	2.20	39.81	0.969	2.58	41.84	0.977	1.75
	6	39.08	0.961	6.25	39.52	0.971	3.50	39.38	0.955	7.09	40.20	0.964	6.62	42.37	0.979	3.64
	7	37.92	0.939	3.53	38.20	0.943	2.61	38.44	0.944	3.51	38.60	0.946	3.55	40.23	0.956	2.05
	Average	38.86	0.941	5.88	39.21	0.950	3.61	38.88	0.930	5.19	39.21	0.943	4.89	**41.13**	**0.961**	**3.28**

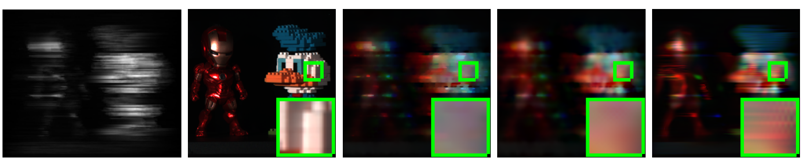
Figure 9 and 10 show the imaging reconstruction results of different methods on two selected KAIST images.



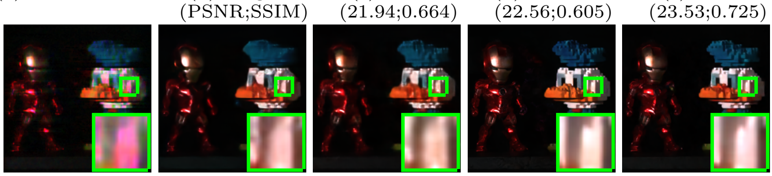
(a) Measurement (b) Original (PSNR;SSIM) (c) TwiST (21.67;0.654) (d) GAP-TV (22.41;0.623) (e) DeSCI (24.31;0.742)

(f) HSSP (29.16;0.819) (g) λ-net (30.69;0.892) (h) TSA (31.30;0.891) (i) GSM-based (32.84;0.937) (j) STAS$_C$ (33.47;0.933)

Fig. 9. Imaging reconstruction results of different methods on KAIST image.



(a) Measurement (b) Original (PSNR;SSIM) (c) TwiST (21.94;0.664) (d) GAP-TV (22.56;0.605) (e) DeSCI (23.53;0.725)



(f) HSSP (27.94;0.804) (g) λ-net (28.86;0.873) (h) TSA (29.69;0.880) (i) GSM-based (31.38;0.923) (j) STAS$_C$ (31.65;0.936)

Fig. 10. Imaging reconstruction results of different methods on KAIST image.