

Neumann Network with Recursive Kernels for Single Image Defocus Deblurring (Supplementary Materials)

1. Visual Comparison of SIDD Results of LFDOF-Trained Models on CUHK-BD Dataset

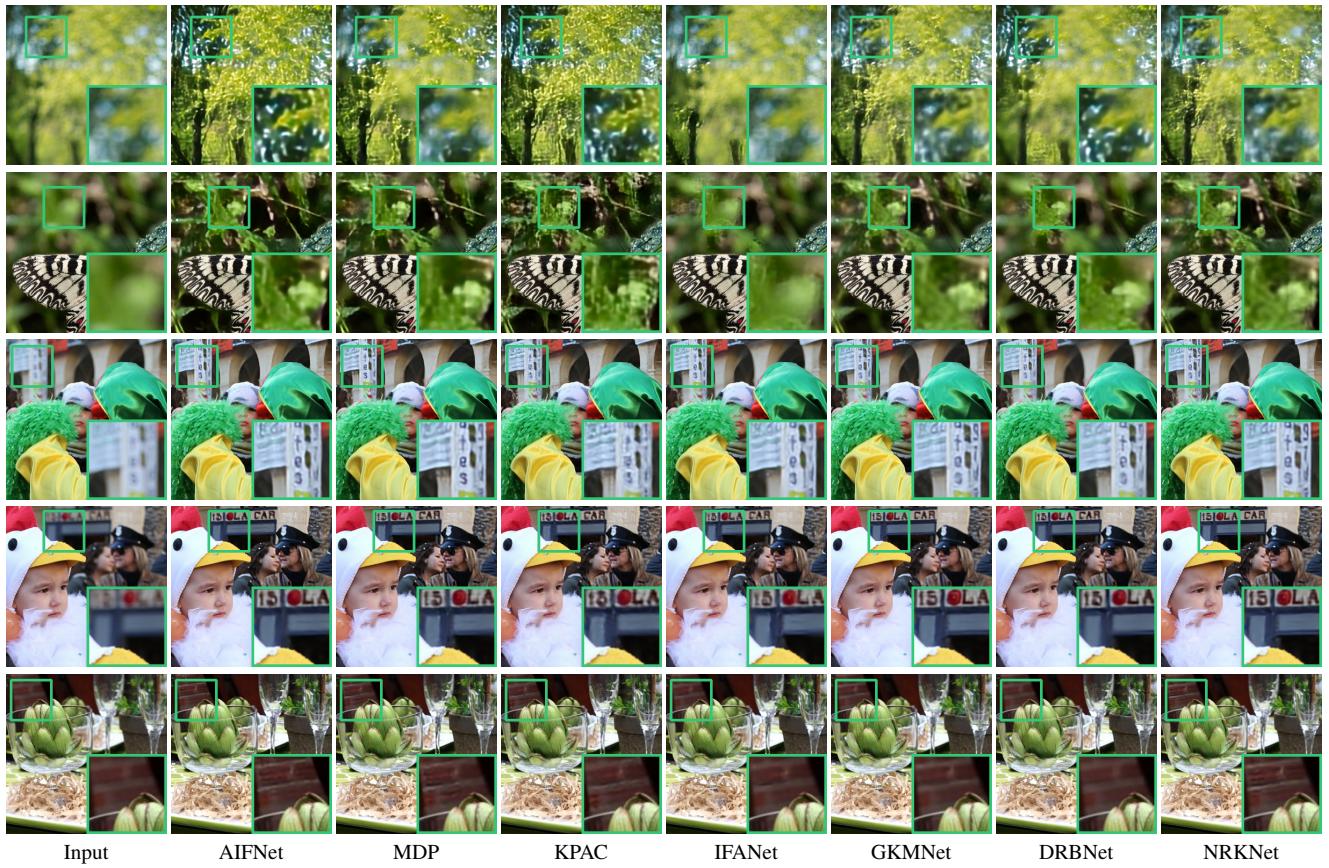


Figure 1. SIDD results from LFDOF-trained models on selected images from CUHK-BD dataset.

2. Code Link and Animated Versions of Visual Results

Our code is also published via the link <https://github.com/csZcWu/NRKNet>. We also supply animated versions of the visual results via this link for clarity and convenient sake.

3. Results of Ablation Studies on Other Datasets

Method	RealDOF			RTF			LFDOF			RTF		
	PSNR	SSIM	LPIPS									
Input	23.890	0.725	0.349	24.200	0.717	0.248	25.874	0.777	0.320	24.200	0.717	0.248
NonAdaptive	24.501	0.756	0.372	24.738	0.807	0.246	30.360	0.881	0.154	27.753	0.883	0.166
NonRecursive	25.148	0.768	0.342	25.346	0.817	0.241	30.475	0.883	0.148	27.814	0.885	0.150
NonSeparable	25.150	0.769	0.339	25.538	0.825	0.231	30.450	0.883	0.150	27.968	0.888	0.149
FullRKR	25.148	0.768	0.340	25.931	0.829	0.215	30.537	0.884	0.147	28.047	0.889	0.145

Table 1. Results of ablation study on RKR using DPDD-trained models (left part) and LFDOF-trained models (right part).

Method	RealDOF			RTF			LFDOF			RTF		
	PSNR	SSIM	LPIPS									
Input	22.333	0.633	0.524	24.200	0.717	0.248	25.874	0.777	0.320	24.200	0.717	0.248
FullExp	25.149	0.768	0.340	25.569	0.813	0.225	30.517	0.883	0.149	28.028	0.891	0.147
2Scales	24.914	0.755	0.356	25.561	0.812	0.248	29.497	0.864	0.180	26.975	0.848	0.235
4Scales	25.146	0.769	0.361	25.728	0.814	0.247	30.470	0.883	0.149	27.904	0.887	0.149
w/o LSTM	24.679	0.747	0.361	24.725	0.787	0.323	29.053	0.860	0.174	25.223	0.844	0.178
Original	25.148	0.768	0.340	25.931	0.829	0.215	30.537	0.884	0.147	28.047	0.889	0.145]

Table 2. Results of ablation study on DNN pipeline using DPDD-trained models (left part) and LFDOF-trained models (right part).

Method	RealDOF			RTF			LFDOF			RTF		
	PSNR	SSIM	LPIPS									
Input	22.333	0.633	0.524	24.200	0.717	0.248	25.874	0.777	0.320	24.200	0.717	0.248
w/o \mathcal{L}_{reblur}	25.009	0.758	0.352	25.052	0.812	0.233	30.006	0.880	0.156	27.674	0.885	0.163
w/o FDR Loss	24.972	0.764	0.349	25.275	0.819	0.249	30.280	0.873	0.165	27.689	0.875	0.188
Single-scale Loss	24.785	0.749	0.363	25.173	0.797	0.278	29.296	0.861	0.185	26.487	0.832	0.275
Full Loss	25.148	0.768	0.340	25.931	0.829	0.215	30.537	0.884	0.147	28.047	0.889	0.145

Table 3. Results of ablation study on loss functions using DPDD-trained models (left part) and LFDOF-trained models (right part).

4. Visualization of Learned Atoms Kernels in RKR

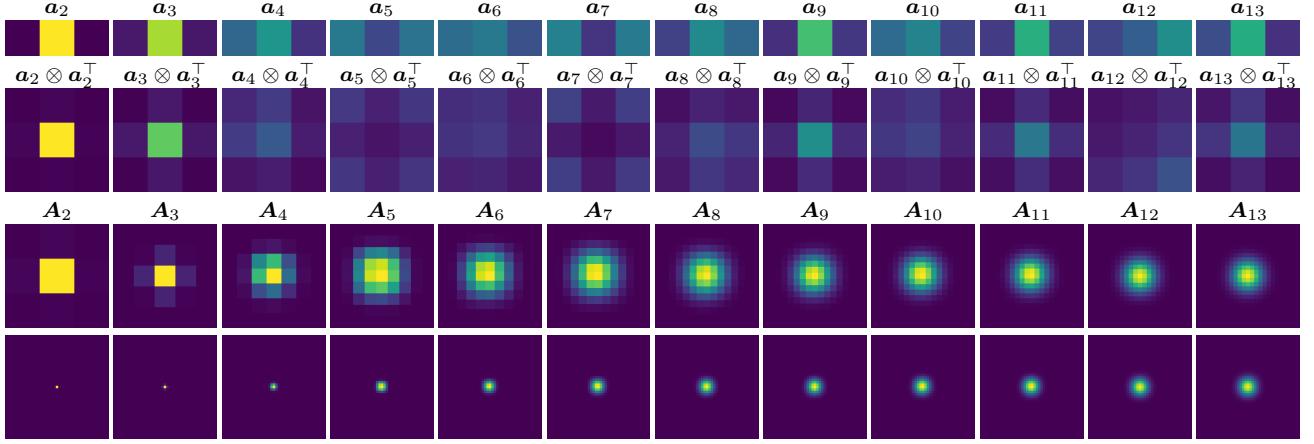


Figure 2. Visualization of learned adaptive kernels in our DPDD-trained NRKNet. The kernels shown in the 4th row are the ones of the 3rd row padded with zeros to have the same size.

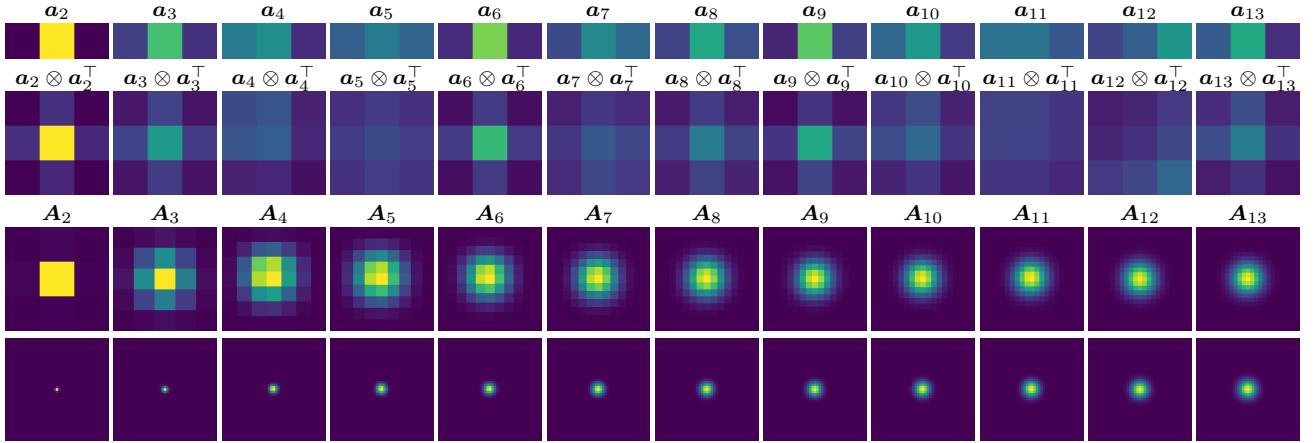


Figure 3. Visualization of learned adaptive kernels in our LFDOF-trained NRKNet. The kernels shown in the 4th row are the ones of the 3rd row padded with zeros to have the same size.

5. Visualization of Coefficient Maps

See Fig. 4 for the visualization of some coefficient maps at the original image scale. We can observe that the regions with larger blur amount tend to have larger coefficients on large-size kernels, and vice versa.

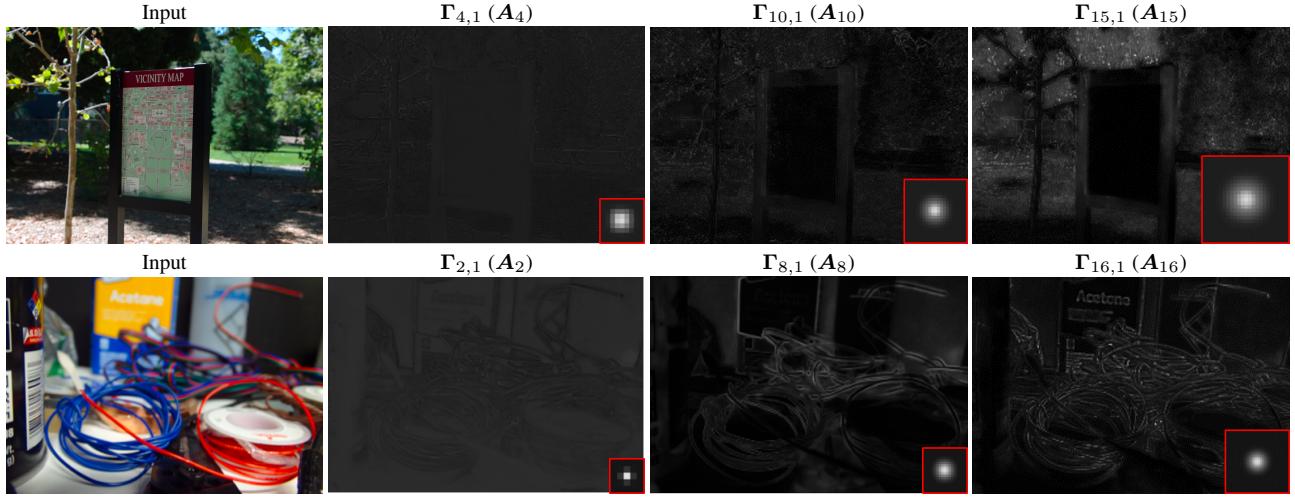


Figure 4. Visualization of coefficient maps and learned kernels.