Rebuttal Supplementary Evaluations and Results

Anonymous CVPR submission

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Dear reviewers, We show additional evaluations and results in this document, which we could not include in the rebuttal letter due to limited space. Sec. 1 shows the rain removal output frames' PSNR/SSIM comparison with two additional video based rain removal methods, i.e., *VST-ICCV17'* [5] and *TCL-TIP15'* [2]. Sec. 2 shows additional visual comparisons.

1. Derain Frame PSNR/SSIM Comparison

We show additional PSNR/SSIM evaluations for two more video based derain methods, i.e., *VST-ICCV17'* [5] and *TCL-TIP15'* [2]. The best performance for each video sequence has been highlighted in red, and the second best in blue. It can be seen from the table, the proposed SPAC-CNN algorithm's advantage holds among all additional competing methods. We also put the results of *DDN-CVPR17'* [1] and *VMD-CVPR17'* from the manuscript for your reference.

Table 1: Rain removal performance comparison between different methods in terms of scene reconstruction PSNR/SSIM, and F-measure for rain streak edge PR curves.

Camera Motion	*Clip No.*	Rain –		*DDN-CVPR17* [1] Image-Based		*VMD-CVPR17* [4] Video-Based		*VST-ICCV17'* [3] Video-Based		*TCL-TIP15'* [2] Video-Based		*SPAC-CNN* Video-Based	
		PSNR	SSIM	PSNR	SSIM	PSNR	SSIM	PSNR	SSIM	PSNR	SSIM	PSNR	SSIM
panning unstable camera	*a*1	28.46	0.94	28.02	0.95	26.96	0.92	26.14	0.94	**29.87**	**0.96**	**29.78**	**0.97**
	*a*2	28.09	0.95	27.38	**0.95**	24.80	0.93	24.03	0.83	**29.01**	**0.96**	**30.09**	**0.96**
	*a*3	27.84	0.93	27.41	0.94	26.45	0.90	20.50	0.70	**28.82**	**0.95**	**29.75**	**0.96**
	*a*4	31.48	0.95	32.47	**0.97**	29.55	0.94	33.41	0.96	**34.12**	**0.98**	**34.82**	**0.98**
	avg. *a*	28.97	0.94	28.82	0.95	26.94	0.92	26.02	0.86	**30.46**	**0.96**	**31.11**	**0.97**
camera speed 20-30 km/h	*b*1	28.72	0.92	**29.48**	**0.96**	24.09	0.84	22.25	0.76	28.07	**0.94**	**31.19**	**0.96**
	*b*2	29.49	0.90	30.23	0.95	25.81	0.89	25.13	0.79	**32.41**	**0.97**	**34.05**	**0.98**
	*b*3	31.04	0.95	**31.39**	**0.97**	26.12	0.90	22.08	0.84	28.29	0.94	**33.73**	**0.98**
	*b*4	27.99	0.92	29.83	**0.96**	25.90	0.88	25.63	0.80	**30.38**	0.95	**33.79**	**0.97**
	avg. *b*	29.31	0.92	**30.23**	**0.96**	25.48	0.88	23.77	0.80	29.79	0.95	**33.19**	**0.97**

In the table, the results are calculated as average of all frames in each video sequence. Video based method generally perform better for Group *a* data with panning unstable camera. When camera motion is larger, video based methods face larger challenge than image based methods, which explains why DDN-CVPR17' performs better for Group *b* data whilst worse for Group *a* data as compared with *TCL-TIP15'*. However, our proposed *SPAC-CNN* proves to be able to produce best results among all competing methods for both Group *a* and Group *b* data.

2. Additional Visual Comparison

We show selected frames of each test video to highlight the performance of our method. Comparisons are carried out between *DDN-CVPR17'* [1] (single image-based), *TCL-TIP15'* [2] (video-based), *VST-ICCV17'* [5] (video-based), *VMD-CVPR17'* [4] (video-based), and the proposed *SPAC-CNN*.

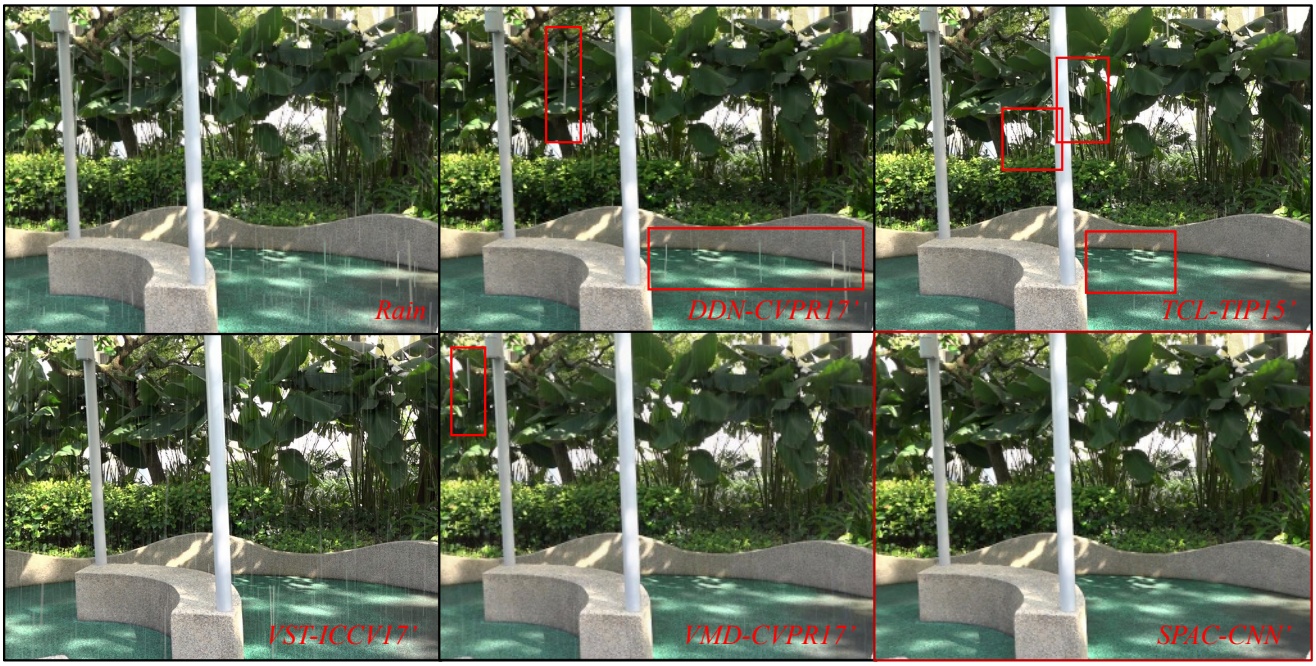

Figure 1: Derain output comparison for testing data *a*1: synthetic rain, panning unstable camera.

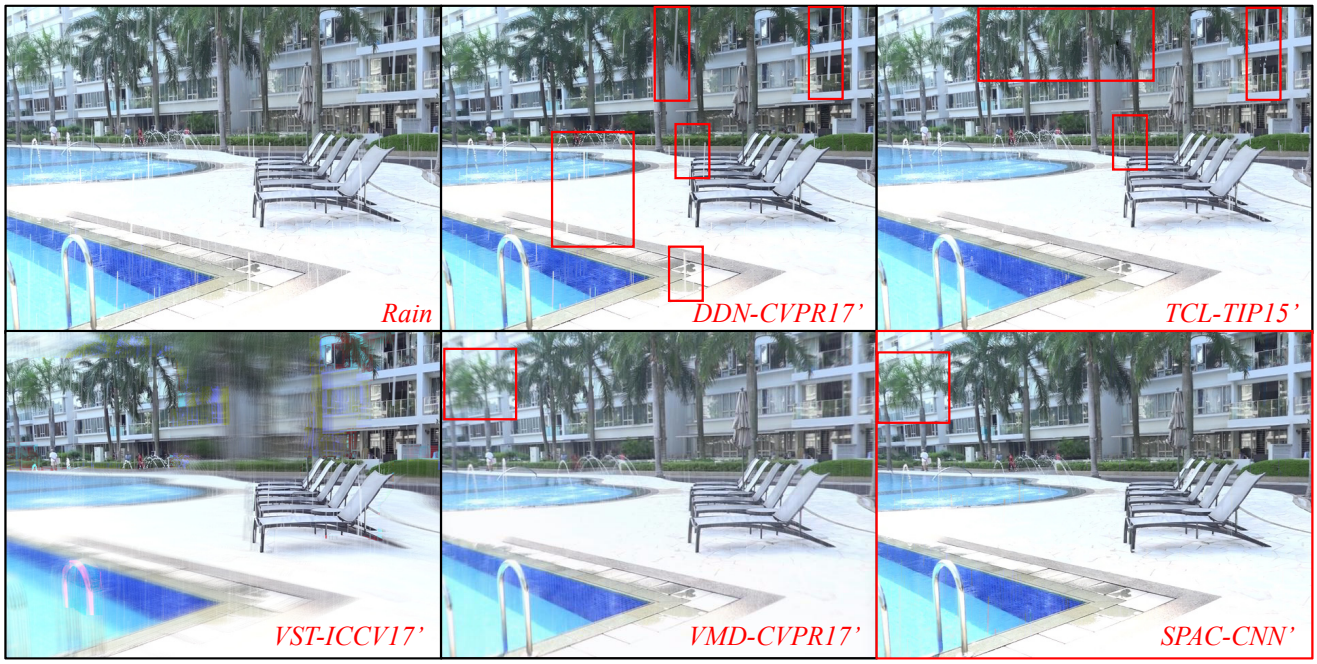

Figure 2: Derain output comparison for testing data *a*2: synthetic rain, panning unstable camera.

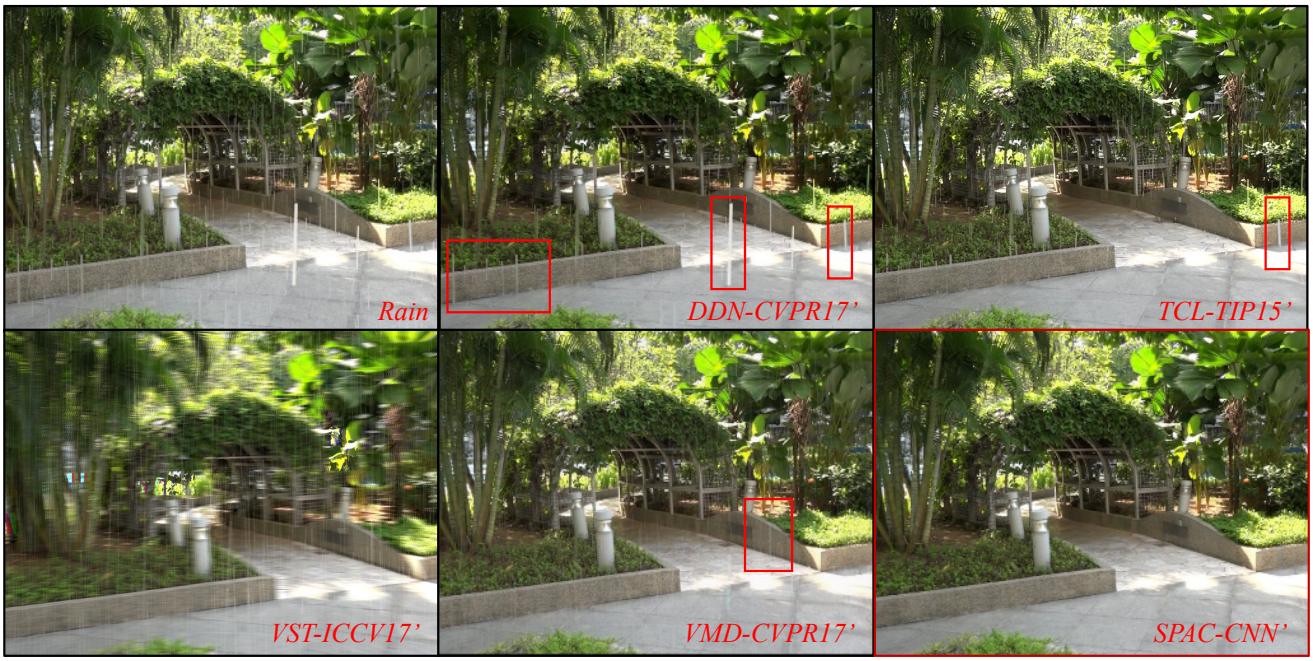

Figure 3: Derain output comparison for testing data *a*3: synthetic rain, panning unstable camera.

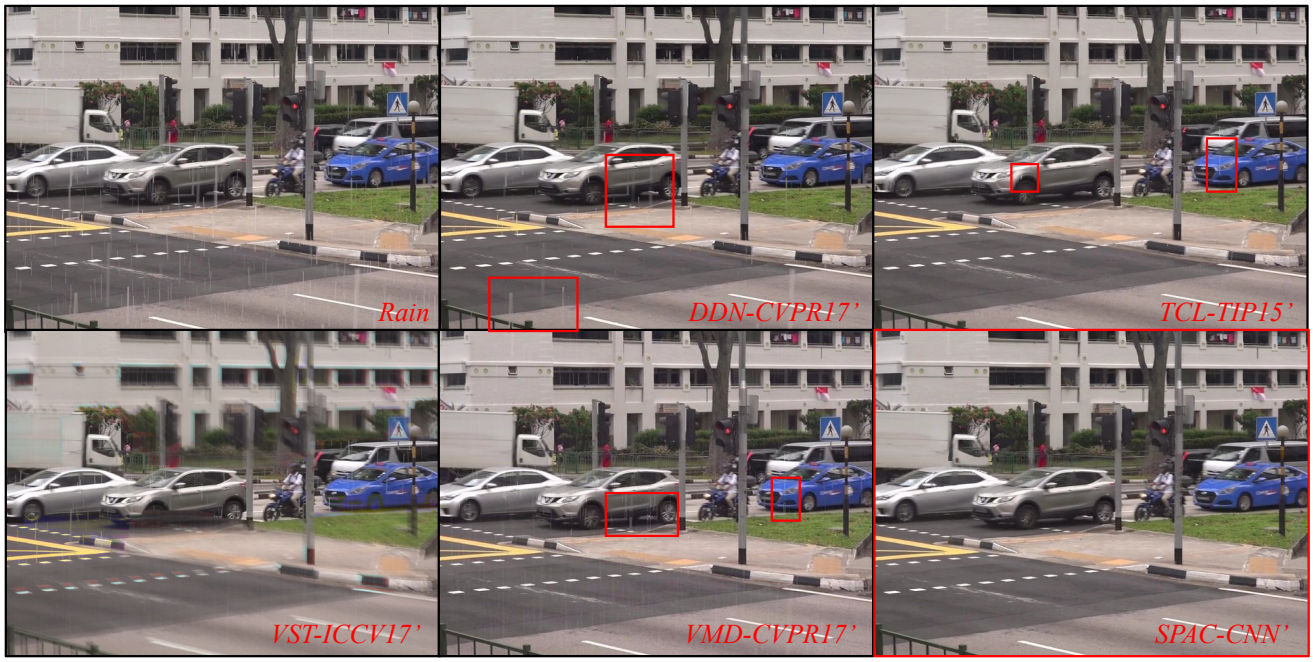

Figure 4: Derain output comparison for testing data *a*4: synthetic rain, stable camera, very dynamic scene.

Figure 5: Derain output comparison for testing data *b*1: synthetic rain, fast moving camera.

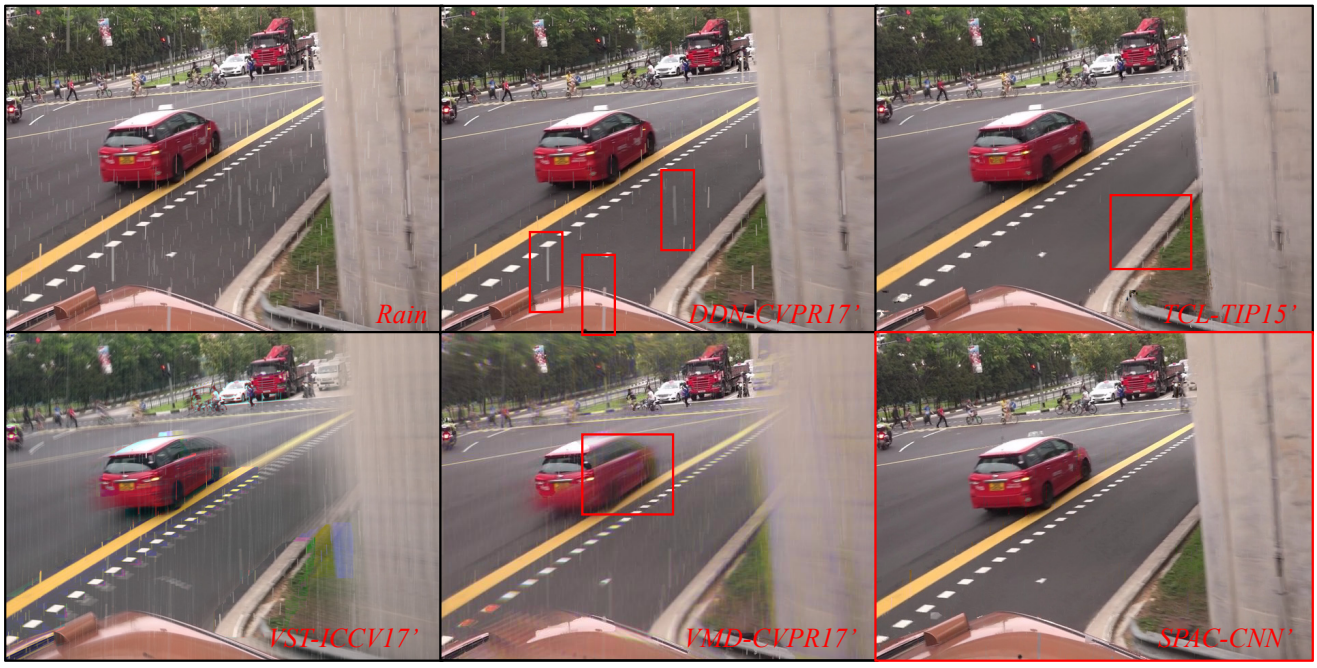

Figure 6: Derain output comparison for testing data *b*2: synthetic rain, fast moving camera.

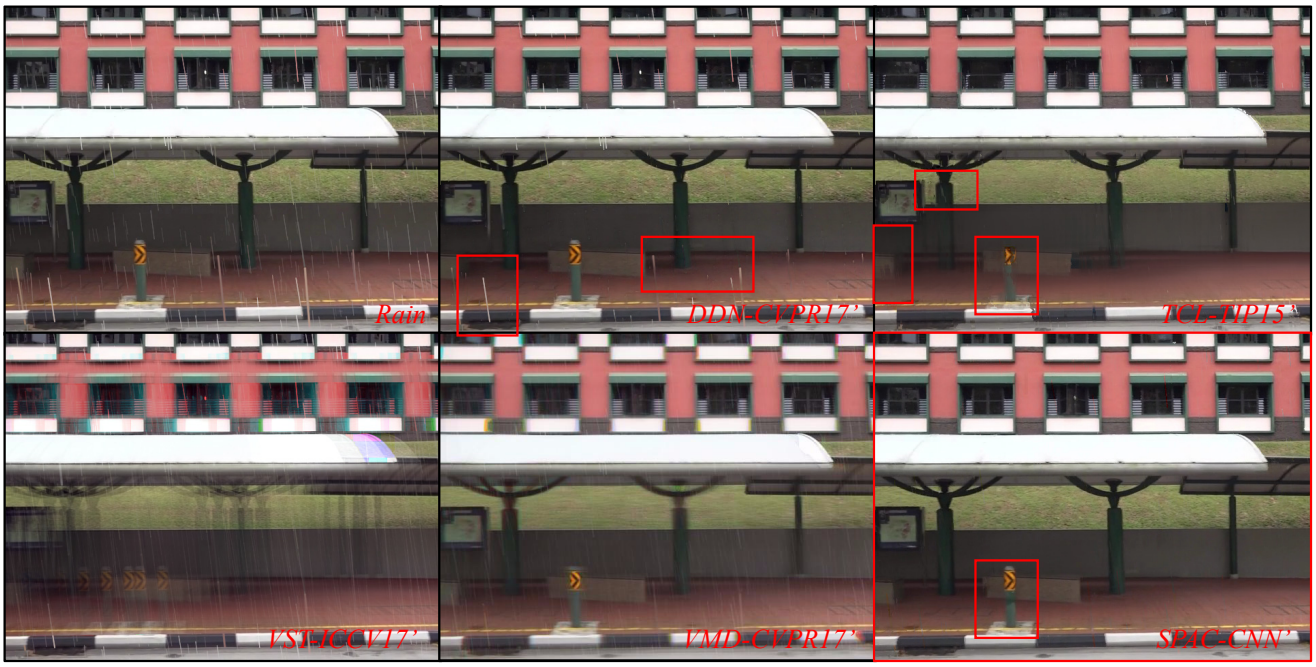

Figure 7: Derain output comparison for testing data *b*3: synthetic rain, fast moving camera.

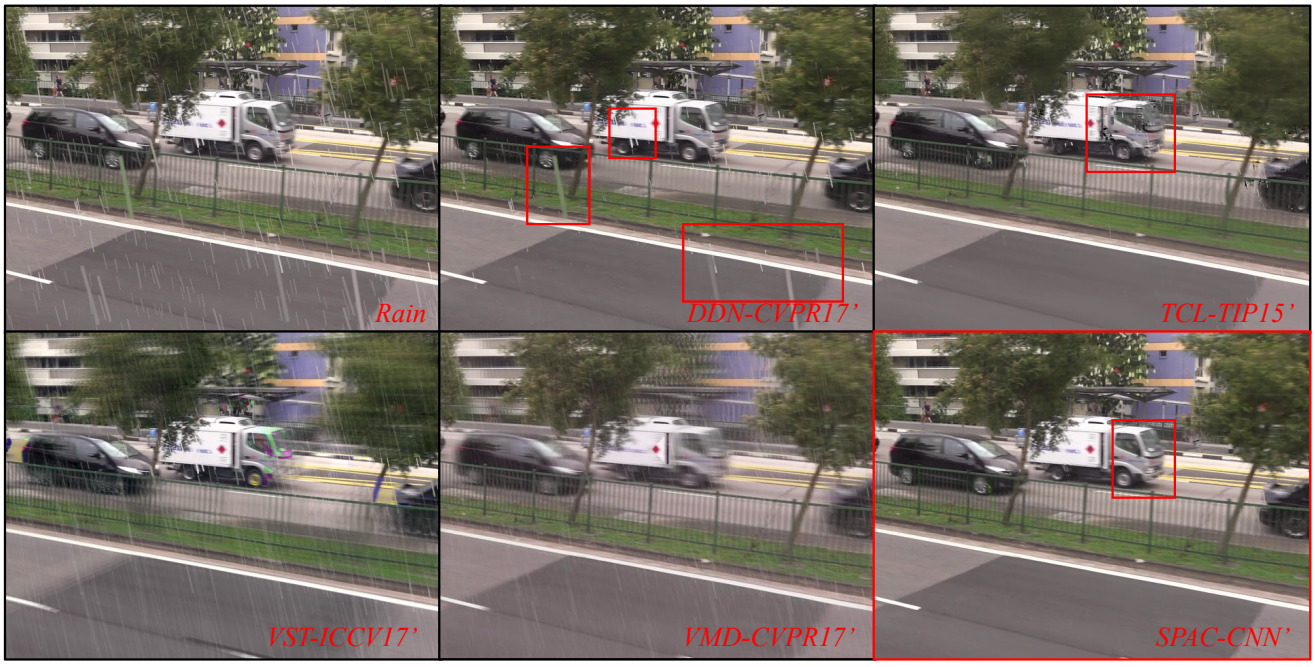

Figure 8: Derain output comparison for testing data *b*4: synthetic rain, fast moving camera.

References

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[2] J. H. Kim, J. Y. Sim, and C. S. Kim. Video deraining and desnowing using temporal correlation and low-rank matrix completion. *IEEE Transactions on Image Processing*, 24(9):2658–2670, Sept 2015. 1, 2

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