Dropout the High-rate Downsampling:
A Novel Design Paradigm for UHD Image Restoration
Supplementary Materials

Chen Wu[1]   Ling Wang[2]   Long Peng[1]   Dianjie Lu[3]   Zhuoran Zheng[4] *

[1]University of Science and Technology of China
[2]The Hong Kong University of Science and Technology (Guangzhou)
[3]Shandong Normal University
[4]Sun Yat-sen University

wuchen5X@mail.ustc.edu.cn

1. UHD Image Deraining

1.1. Dataset

4K-Rain13k [1] contains 13,000 rainy/rain-free image pairs at 4K resolution, with 12,500 pairs allocated for training and 500 pairs for testing.

1.2. Result

To validate the effectiveness of our method on the task of rain streak Removal, we compare it with many methods, including IDT [4], Restormer [5], DRSformer [3], UDR-S2Former [2] and UDR-Mixer [1]. Compared to the latest UHD image deraining methods, our approach achieves a 0.47 dB PSNR improvement. You can see the quantitative comparison results in Tab. 1, and we also provide visual comparison results in Fig. 1. Our method can better handle rain streaks and recover occluded background.

Table 1. Comparison of quantitative results on 4K-Rain13k dataset. Best and second best values are indicated with **bold** text and underlined text respectively.

Methods	Type	Venue	PSNR ↑	SSIM ↑	Param ↓
IDT	non-UHD	TPAMI'22	32.91	<u>0.948</u>	16.41M
Restormer		CVPR'22	33.02	0.934	26.12M
DRSformer		CVPR'23	32.96	0.933	33.65M
UDR-S2Former		ICCV'23	33.36	0.946	8.53M
UDR-Mixer	UHD	arxiv'24	<u>34.30</u>	**0.951**	4.90M
Ours		-	**34.77**	**0.951**	5.22M

2. Additional Visual Results

We present images reproduced by the proposed D2Net and you can find these results from the Figs. 2, 3, 4, 5, 6 and 7.

---

*Corresponding author

References

[1] Hongming Chen, Xiang Chen, Chen Wu, Zhuoran Zheng, Jinshan Pan, and Xianping Fu. Towards ultra-high-definition image deraining: A benchmark and an efficient method. *arXiv preprint arXiv:2405.17074*, 2024. 1

[2] Sixiang Chen, Tian Ye, Jinbin Bai, Erkang Chen, Jun Shi, and Lei Zhu. Sparse sampling transformer with uncertainty-driven ranking for unified removal of raindrops and rain streaks. In *Proceedings of the IEEE/CVF International Conference on Computer Vision*, pages 13106–13117, 2023. 1

[3] Xiang Chen, Hao Li, Mingqiang Li, and Jinshan Pan. Learning a sparse transformer network for effective image deraining. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 5896–5905, 2023. 1

[4] Jie Xiao, Xueyang Fu, Aiping Liu, Feng Wu, and Zheng-Jun Zha. Image de-raining transformer. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 45(11):12978–12995, 2022. 1

[5] Syed Waqas Zamir, Aditya Arora, Salman Khan, Munawar Hayat, Fahad Shahbaz Khan, and Ming-Hsuan Yang. Restormer: Efficient transformer for high-resolution image restoration. In *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition*, pages 5728–5739, 2022. 1

Figure 1. Visual quality comparisons with state-of-the-art methods on 4K-Rain13k dataset. Please zoom in for details.
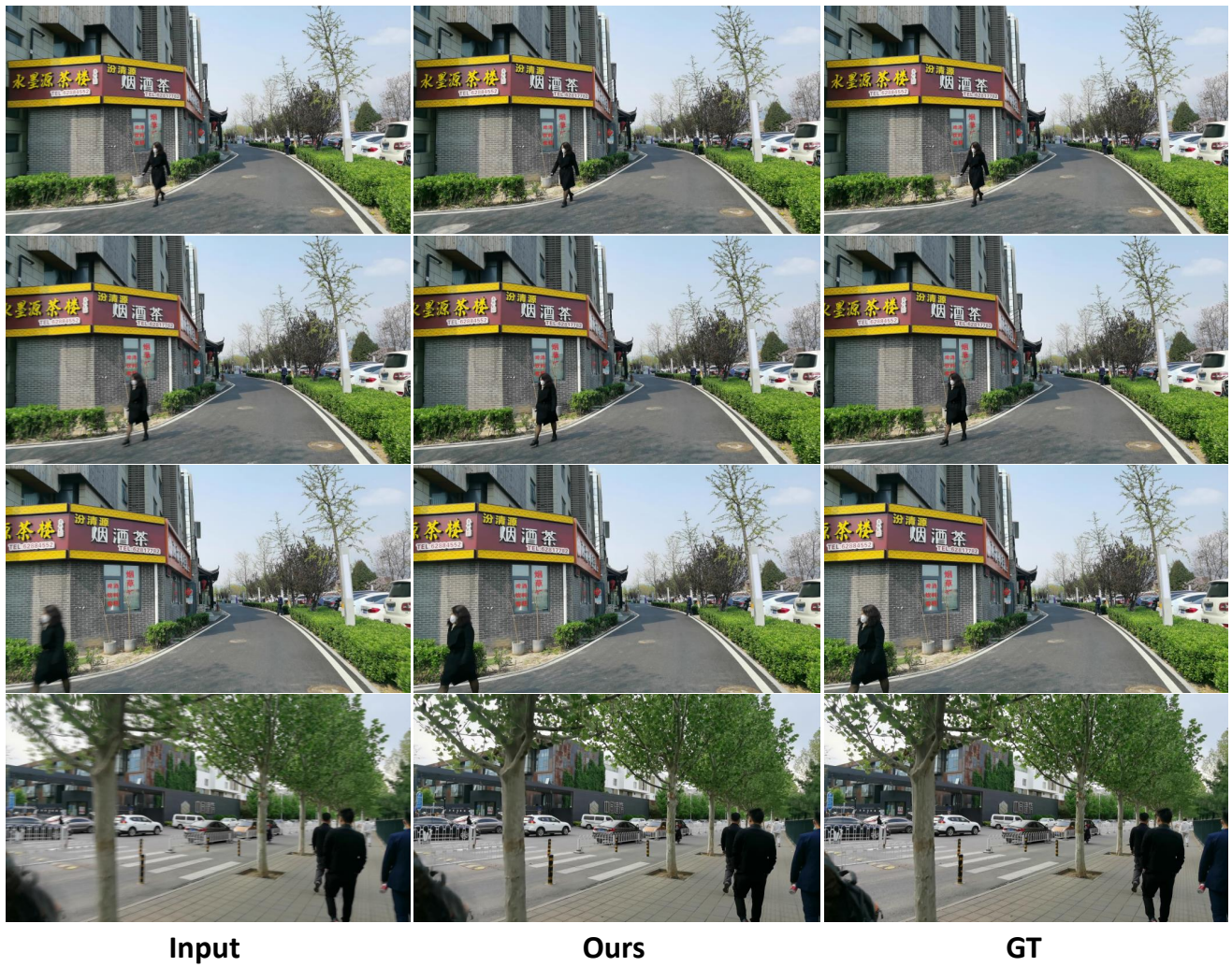
| Input | DRSformer | UDR-S2Former | UDR-Mixer | Ours | GT |

Input   Ours   GT

Figure 2. Visual quality comparisons on UHD-Blur dataset.

Input   **Ours**   **GT**
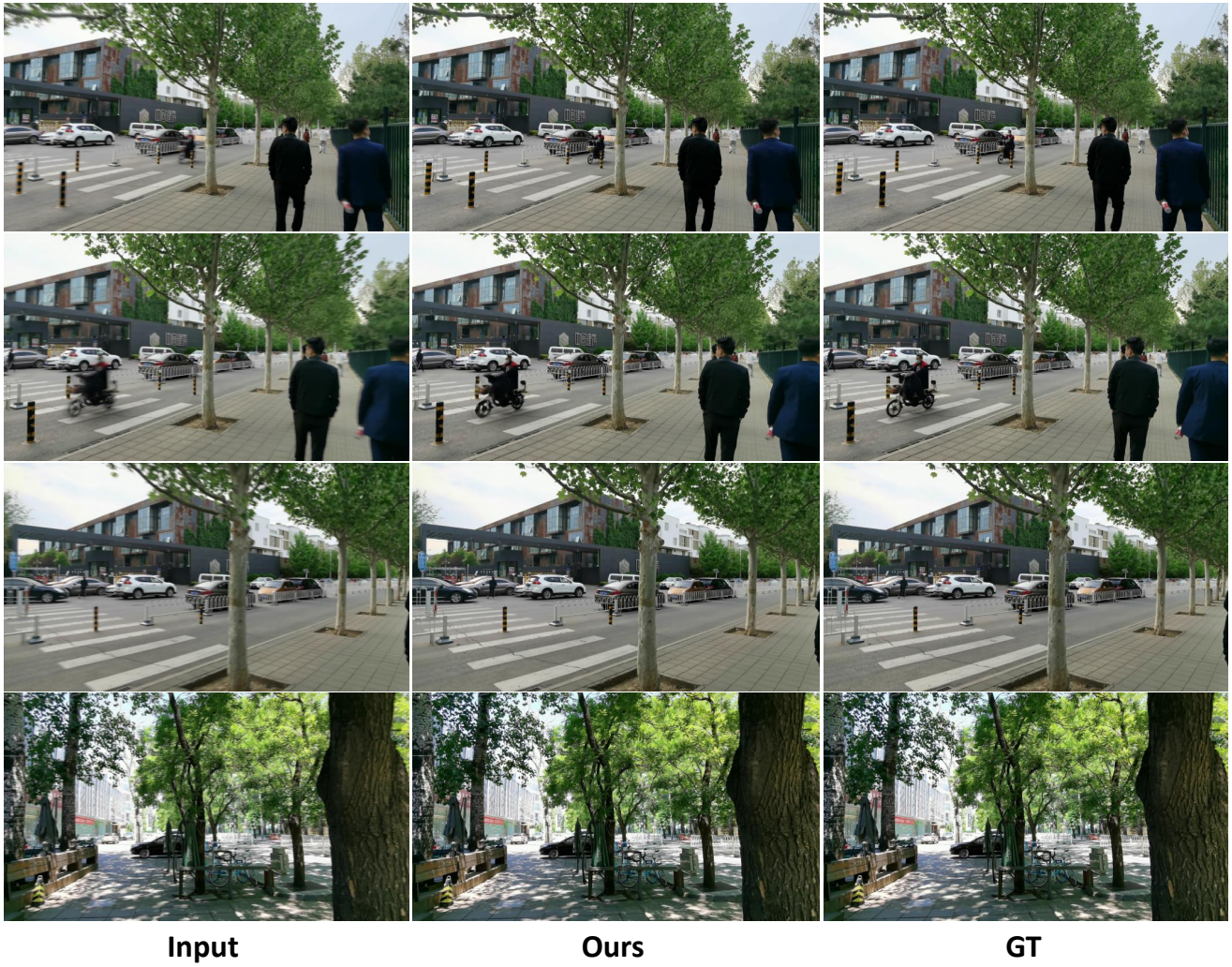
Figure 3. Visual quality comparisons on UHD-Blur dataset.

Input **Ours** **GT**
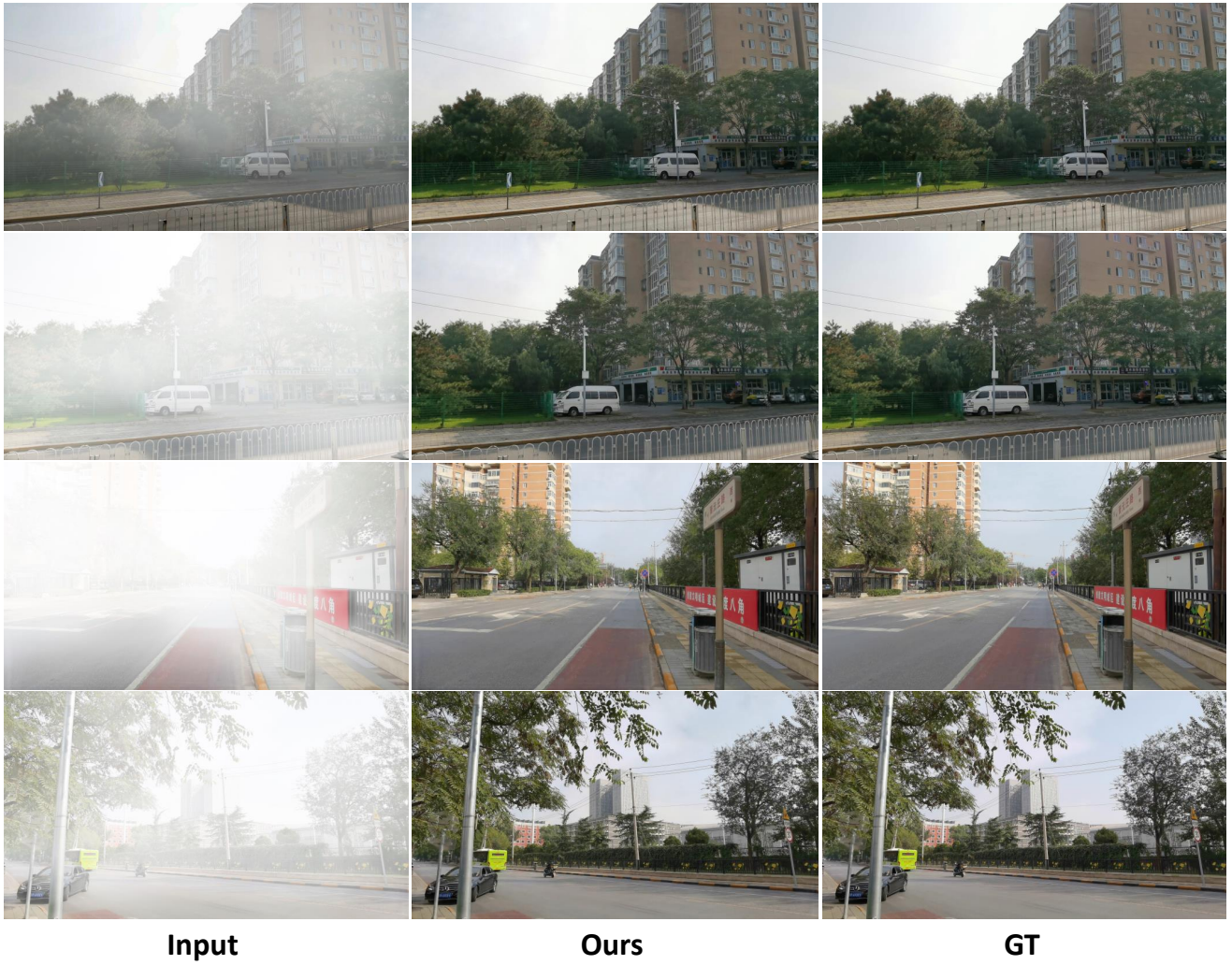
Figure 4. Visual quality comparisons on UHD-Haze dataset.

Input   **Ours**   **GT**
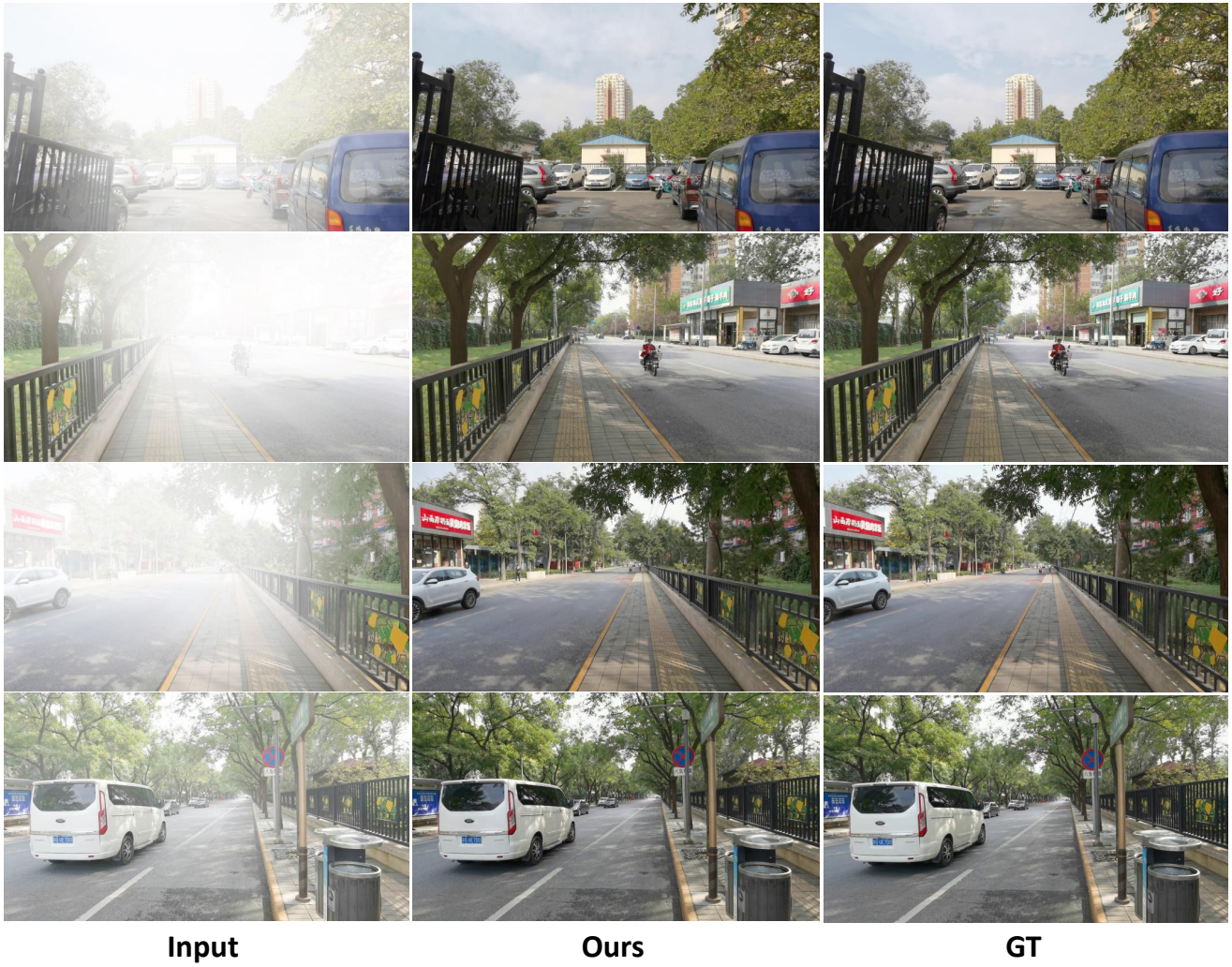
Figure 5. Visual quality comparisons on UHD-Haze dataset.

| Input | Ours | GT |

Figure 6. Visual quality comparisons on UHD-LOL4K dataset.

Input   **Ours**   **GT**

Figure 7. Visual quality comparisons on UHD-LOL4K dataset.