

Appendix

A. EXPERIMENTAL DETAILS

In this section, we present the experimental setup for each method. Our aim is to ensure consistency with the official settings for each baseline model while introducing the GT-mean loss to demonstrate its effectiveness. To ensure fair comparisons, both the baseline models and the ones using GT-mean loss were trained under identical hardware and software environments, minimizing the effects of randomness.

Uformer. Both the baseline and the GT-mean loss variant were trained following the experimental setup for motion deblurring in [3], selected Uformer-T as the backbone model. The Charbonnier loss used in the baseline was extended to GT-mean loss for the variant.

MIRNet. Both the baseline and the GT-mean loss variant were trained according to the settings used for the denoising task in [6]. In the GT-mean loss variant, the Charbonnier loss was replaced with the GT-mean loss.

RetinexFormer. For both the baseline and the GT-mean loss variant, we followed the training settings for LOL datasets in [1]. The L_1 loss used in the baseline was extended to GT-mean loss in the variant.

Restormer. The baseline and the GT-mean loss variant were both trained following the motion deblurring settings described in [7]. The L_1 loss in the baseline was extended to GT-mean loss in the variant.

LLFormer. Both the baseline and the GT-mean loss variant were trained according to the settings for the LOLv1 dataset described in [2]. The Smooth L_1 loss used in the baseline was extended to GT-mean loss for the variant.

SNR-Aware. The baseline and the GT-mean loss variant were both trained using the settings for for LOL datasets outlined in [4]. The Charbonnier loss and perceptual loss used in the baseline were extended to GT-mean loss in the variant.

CID-Net. Both the baseline and the GT-mean loss variant were trained using the LOLv1 settings described in [5]. In the GT-mean loss variant, the Charbonnier loss, edge loss, and perceptual loss were extended to GT-mean loss.

In summary, for each method, the original loss functions were extended to GT-mean loss, and all models were trained using consistent settings to ensure a fair comparison.

References

- [1] Yuanhao Cai, Hao Bian, Jing Lin, Haoqian Wang, Radu Timofte, and Yulun Zhang. Retinexformer: One-stage retinex-based transformer for low-light image enhancement. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, 2023. 1
- [2] Tao Wang, Kaihao Zhang, Tianrun Shen, Wenhan Luo, Bjorn Stenger, and Tong Lu. Ultra-high-definition low-light image enhancement: A benchmark and transformer-based method. In *Proceedings of Association for the Advancement of Artificial Intelligence (AAAI)*, 2023. 1
- [3] Zhendong Wang, Xiaodong Cun, Jianmin Bao, Wengang Zhou, Jianzhuang Liu, and Houqiang Li. Uformer: A general u-shaped transformer for image restoration. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. 1
- [4] Xiaogang Xu, Ruixing Wang, Chi-Wing Fu, and Jiaya Jia. Snr-aware low-light image enhancement. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. 1
- [5] Qingsen Yan, Yixu Feng, Cheng Zhang, Pei Wang, Peng Wu, Wei Dong, Jinqui Sun, and Yanning Zhang. Hvi: A new color space for low-light image enhancement. In *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2025. 1
- [6] Syed Waqas Zamir, Aditya Arora, Salman Khan, Munawar Hayat, Fahad Shahbaz Khan, Ming-Hsuan Yang, and Ling Shao. Learning enriched features for real image restoration and enhancement. In *Proceedings of European Conference on Computer Vision (ECCV)*, 2020. 1
- [7] 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 (CVPR)*, 2022. 1