

Our DRLE-Net differs from Deblur-Net[1] from the following two aspects: (1) we propose to achieve the factor disentanglement using paired data under the weakly-supervised setup and the Deblur-Net achieve this under unsupervised setup. Taking de-raining task as example, for paired data setup, the difference only reflects in rainy components while the background is the same, thus guarantee a very precise factor separation with a well-defined framework (e.g., our DRLE-Net). Differently, Deblur-Net uses unpaired data for disentanglement via decomposing the image into style and content space. However, this is problematic because the unpaired images differ not only in style but also in content, thus resulting in a very confusing separation. By using these two frameworks for rainy images component disentanglement, we visualize the feature map of content space from Deblur-Net and the background factor from our DRLE-Net. As shown in Fig. R2, our model achieves a much better disentanglement than Deblur-Net, the content code of which are very confusing.

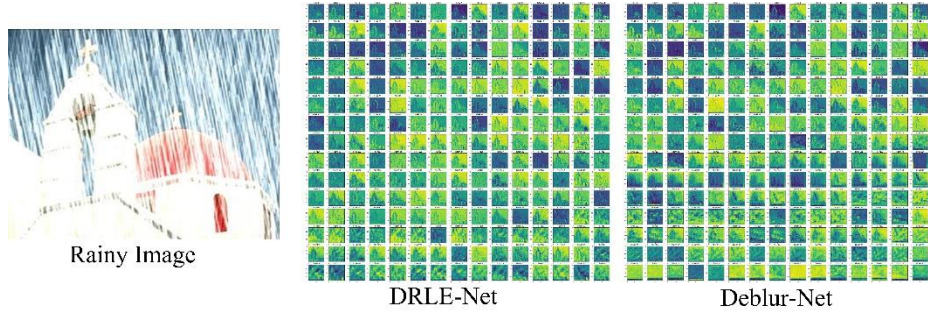


Fig. R2 Visualization of activations (before ReLU) for features from the output layer of task-relevant factor encoder in DRLE-Net and features from the output layer of content encoder in Deblur-Net.

(2) Apart from the theoretical analysis, we also use the Deblur-Net to do unsupervised image de-raining task on RD-Data and RS-Data by using random shuffling to break the pair relationship of existing dataset. The comparative results are as shown in Table R2.

Table R2: Results by using different disentanglement models.

Models	RS-Data	RD-Data
Deblur-Net	26.84/0.896	28.72/0.901
DRLE-Net	30.92/0.935	32.01/0.938

As can be seen from Table R2 and as expected, the unsupervised Deblur-Net is outperformed by our weakly-supervised DRLE-Net by a large margin, confirming our analysis on the deficiency of Deblur-Net for factor disentanglement. We will add the results and analysis to the paper in the camera-ready version.

Reference

[1] Lu, B., Chen, J.C. and Chellappa, R., 2019. Unsupervised domain-specific deblurring via disentangled representations. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (pp. 10225-10234).