**ABSTRACT**

Recently, deep convolutional neural networks have been extensively applied into image deblurring and have achieved remarkable performance. However, most CNN-based image deblurring methods focus on simply increasing network depth, neglecting the contextual information of the blurred image and the reconstructed image. Meanwhile, most encoder-decoder based methods rarely exploit encoder’s multi-layer features. To address these issues, we propose a bi-attention neural network for single image deblurring, which mainly consists of a bi-attention network and a feature fusion network.

**THE PROPOSED METHOD**

**Framework**

Single image Deblurring has recently received much attention in our daily life. It is to generate a high-level deblurred image from its blurred image, which is caused by camera shaking or object moving. However, the inverse problem is ill-posed since it is hard to restore a deblurred image from its blur one. Therefore, numerous deblurring methods have been proposed ranging from prior-based deblurring and deep learning-based deblurring. Although considerable progress has been achieved, those methods still have some limitations: (1) underutilized the information of the original image and the reconstructed image: most CNN-based deblurred methods do not make full use of the structure information from either the blurred image or the reconstructed image; (2) rarely exploiting multiple layers of features in encoder: although a large number of methods have achieved good results, few consider the information of multiple layers in the encoder as the input of decoder.

In order to address above issues, we propose a single image deblurring method via a bi-attention network. The bi-attention network is designed by plugging two attention modules (Denoting criss-cross attention module) before and after the encoder and the decoder separately to capture long-range spatial contextual information from the blurred image and the reconstructed image, respectively. Between the encoder and the decoder, the feature fusion module is proposed to concatenate multi-layers of features from encoder such that the concatenated feature, which is the input of decoder, is rich of scale information.

**EXPERIMENTAL RESULTS**

We quantitatively and qualitatively evaluate the proposed network method against state-of-the-art single image deblurring methods on GOPRO and DVD datasets as shown in Figure 3 and Table 1.

**CONCLUSION**

We propose a bi-attention network for single image deblurring. This network mainly consists of bi-attention network and feature fusion network. Specifically, the bi-attention network captures long range feature information before and after encoder-decoder part and the feature fusion network is to combine more feature information from encoder part. Extensive experiments show the effectiveness of our proposed network.