Guest Editorial
Introduction to the Special Section on Deep Learning in Video Enhancement and Evaluation: The New Frontier

ALTHOUGH video enhancement and evaluation have been studied for many years, they are still challenging due to the evolutions of video acquiring and processing techniques. While the development of deep learning is undoubtedly exciting and has demonstrated its superior performance in a variety of applications, it is important to further investigate advanced technologies and solutions to bring seemingly endless possibilities for video enhancement and evaluation. This Special Section intends to collect some recent solutions toward video enhancement and evaluation.

The article "Blind realistic blur assessment based on discrepancy learning," by L. Li *et al.*, proposes a Realistic Blur Assessment method (RBA) based on discrepancy learning. In the RBA, the discrepancy map from the distorted image is generated by a deep CNN discrepancy generation model, which is used to extract sparse representation based entropy of primitive and content-guided variation of power. The proposed method achieves better performance than both the general-purpose quality metrics and image blur metrics on realistic blur image databases.

The article "Distortion rectification from static to dynamic: A distortion sequence construction perspective," by K. Liao *et al.*, introduces a distortion rectification approach based on residual distortion map estimation using convolutional neural networks and presents a refinement rectification method accordingly. The experimental results demonstrate that the proposed method outperforms the state-of-the-art methods for distortion rectification on the constructed synthesized distorted image dataset.

The article "Subjective and objective de-raining quality assessment towards authentic rain image," by Q. Wu *et al.*, presents a de-raining quality assessment database (IVIPC-DQA) which contains 206 authentic rain images with their de-rained versions produced by six single-image rain removal algorithms, and develops a bidirectional feature embedding network (B-FEN) to quantitatively measure the quality of a de-rained image. The experimental results demonstrate that the proposed model outperforms many NR-IQA models on de-raining quality assessment.

The article "PEA265: Perceptual assessment of video compression artifacts," by L. Lin *et al.*, introduces a large-scale subject-labeled database for H.265/HEVC compressed video, namely, PEA265, which includes six typical PEAs and at least 60,000 positive or negative labels for each type of PEA. The article also develops convolutional neural networks for objective PEA recognition. The proposed PEA-based VQM model shows comparable performance with typical video quality metrics.

The article "Channel-wise and spatial feature modulation network for single image super-resolution," by Y. Hu, introduces a channel-wise and spatial feature modulation network (CSFM) cascaded by a series of feature modulation memory (FMM) modules and a densely connected structure to exploit multilevel information for better image super-resolution. The FMM module is constructed by stacking CSAR blocks, which combines channel-wise and spatial attention mechanisms into the residual block. Experiments validate the effectiveness of CSFM for single-image super-resolution.

The article "IENet: Internal and external patch matching ConvNet for web image guided denoising," by H. Yue *et al.*, explores both internal and external correlations when similar external images are available, resulting in an internal and external patch matching network for efficient image denoising. The experimental results demonstrate that the proposed method achieves state-of-the-art web image-guided denoising results.

The article "Image de-raining using a conditional generative adversarial network," by H. Zhang *et al.*, leverages powerful generative modeling capabilities of a newly designed conditional generative adversarial network (CGAN) and designs a densely connected generator subnetwork and a multiscale discriminator to enforce quantitative, visual, and discriminative information in single-image de-raining. The proposed method achieves state-of-the-art image de-raining results.

The article "Color transferred convolutional neural networks for image dehazing," by J.-L. Yin *et al.*, proposes a variational image dehazing algorithm based on a color-transfer image dehazing model with a deep CNN framework to generate visually pleasing haze removal and preserve fine textures on either synthesized or real haze images. The experimental results show that the proposed method outperforms existing methods for single image dehazing.

The article "A multi-scale position feature transform network for video frame interpolation," by X. Cheng, presents a multiscale position feature transform network (MS-PFT) for video interpolation. The PFT layer helps to estimate scaling factors and the multiscale structure helps to handle the ghosting artifacts caused by large motion. Experiments show that MS-PFT is effective for handling the challenging

scenarios like occlusion and large motion and achieves state-of-the-art performance on video interpolation.

The article "Implicit dual-domain convolutional network for robust color image compression artifact reduction," by B. Zhang *et al.*, reduces high-quality color image artifacts by developing an implicit dual-domain convolutional network (IDCN) to utilize both pixel-domain features and DCT-domain priors. The experimental results show that the proposed method has superior performance for image compression.

The article "Deep joint depth estimation and color correction from monocular underwater images based on unsupervised adaptation networks," by X. Ye *et al.*, presents an unsupervised adaptation network for the challenging underwater color correction problem through joint depth estimation and color correction based on style-level and feature-level adaptations. Extensive experiments show that the proposed method performs favorably on depth estimation and color correction tasks.

The Guest Editors are very grateful to everyone for their contributions to this Special Section. They sincerely thank all the authors for their important and innovative work, and all the reviewers for their careful reviews and valuable comments. Finally, They would also like to thank the Editor-in-Chief, Prof. Feng Wu, for his encouragement and support of this Special Section.

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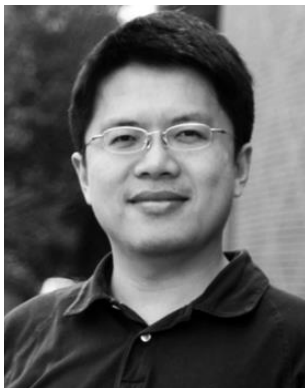
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