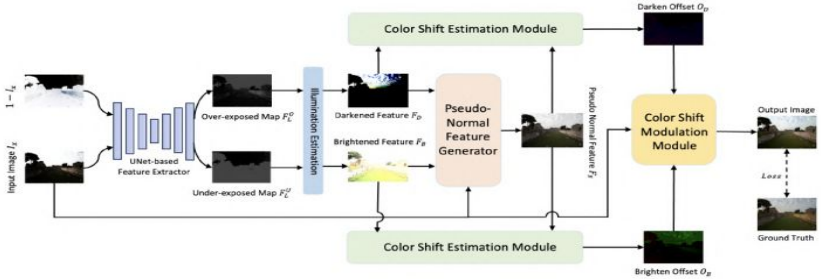
Color Shift Estimation-and-Correction for Image Enhancement

What is the problem?

The paper addresses the challenge of enhancing images with both over-exposed and under-exposed regions, which often display opposite color tone shifts. Existing methods mostly focus on correcting brightness but fail to accurately restore color tones in such cases, leading to color distortions and poor image quality.

What has been done earlier?

Previous approaches to image enhancement primarily focus on either over-exposed or under-exposed images, using techniques like exposure-invariant feature learning and frequency-spatial domain integration. These methods assume uniform exposure issues across the image, which makes them ineffective when both over- and under-exposed regions coexist. More recent works, like local color distribution-based methods, attempt to address this by focusing on local color adjustments but still struggle with large, homogeneous regions.



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What are the remaining challenges?

The key challenges include estimating and correcting the complex color shifts in images with both over- and under-exposures and lacking a reference for normal-exposed pixels. Existing methods also fail to address color distortions effectively in large over- or under-exposed regions.

What novel solution proposed by the authors to solve the problem?

COlor Shift Estimation (COSE) module, which estimates and corrects color shifts for over- and under-exposed regions separately by extending deformable convolution into the color space.

COlor MOdulation (COMO) module, which modulates and combines the corrected color shifts to generate an enhanced image. The method also introduces a pseudo-normal feature generator to create reference color maps that help estimate and correct color shifts more effectively. Comprehensive experiments show that this approach outperforms state-of-the-art methods in image enhancement.

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