ZiChun Wang

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Hometown: Beijing · Second-year Postgraduate · CET-6：616 · Toefl：104

Education

Beijing Institute of Technology, Computer Science and Technology 2021.09 - 2024.06
(average grade：88.30), *Recommended Admission to Academic Master's Program*

Beijing Institute of Technology, Computer Science and Technology 2017.09 - 2021.06
(average grade：89.83), *Bachelor of Engineering*

Professional Skill

- Proficient in Python, familiar with Pytorch, TensorFlow, etc., and also with commonly used Linux commands.
- Familiar with mainstream image processing methods, *e.g.*, low-level image/video processing and enhancement.
- Proficient in commonly used data structures and algorithms, with a solid programming foundation.

Research Experience

Self-supervised Denoising for Real-world Images 2022.7 - 2022.11 BIT

- **Background:** Due to complex spatial noise correlation, most methods fail under real noise. Existing methods targeting real noise either ignore or insufficiently consider the correlation, resulting in significant detail loss.
- **Contribution:**
  - I utilized the Pearson correlation coefficient to analyze the spatial correlation between noise and position in real images. By incorporating this prior knowledge into the method design, I proposed a convolution module that significantly improved the network's sampling density compared to state-of-the-art methods.
  - I developed a dilated Transformer module to leverage distant dependencies in natural images, addressing inherent limitations in CNN-based blind-spot networks under self-supervision constraints.
  - I analyzed correlation statistics and attribution maps using tools including 3D bar charts, gradient response, and Fourier transformation, proving our superiority in terms of sampling frequency and receptive field.
- **Achievement:** Student first-authored paper: 'LG-BPN: Local and Global Blind-Patch Network for Self-Supervised Real-World Denoising', **CVPR 2023, Score: 4/4/5 (CCF-A Conference)**

Low-light Raw Video Denoising under Complex Motion Patterns 2022.1 - 2022.12 BIT

- **Background:** Clean video data requires long exposure time, which causes blurring in complex motion scenes. This results in limited generalization ability to existing datasets due to their simplified collection conditions.
- **Contribution:**
  - I collected high-quality paired data by playing real videos collected from the Internet on a display, and captured paired videos in a frame-by-frame manner. Using optical flow statistics, I demonstrated the motion richness in the dataset and validated its significant impact on the performance of video denoising networks.
  - I proposed a raw video denoising method based on 3D window-based self-attention, which better integrates spatio-temporal self-similarities in videos under complex motion patterns.
- **Achievement:** Student first-authored paper: 'Low-light Raw Video Denoising with a High-quality Realistic Motion Dataset', **IEEE Transactions on Multimedia, 2022 (SCI Q1 Journal)**

Project Experience

Quality Enhancement Techniques for Raw Videos 2022.1 - 2022.4 Huawei Noah's Ark Lab

- I developed a method to collect high-quality training data from real motion videos in the raw domain, enhancing the effectiveness of raw video denoising models based on deep learning.
- I decoupled noise components in raw domain under extremely low-light conditions, and established an accurate noise model. Based on this noise model, I calibrated the noise parameters, which can be generally applied to different phone sensors, enabling strong generalization ability for denoising methods in extreme scenarios.
- I developed a multi-scale fusion method based on re-parameterization technique. By integrating traditional filters into convolution kernel, it improves the PSNR by 0.23 dB and 0.56 dB respectively on Sony A7R4 and Huawei P40 Pro cameras, without increasing inference computational cost. This achieves raw video denoising at 4K resolution, with approaching/exceeding performance and faster speed of mainstream SOTA methods.