Non-blind Deblurring: Handling Kernel Uncertainty with CNNs

Subeesh Vasu, Venkatesh Reddy Maligireddy, and A.N. Rajagopalan, Indian Institute of Technology Madras, INDIA

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Goal

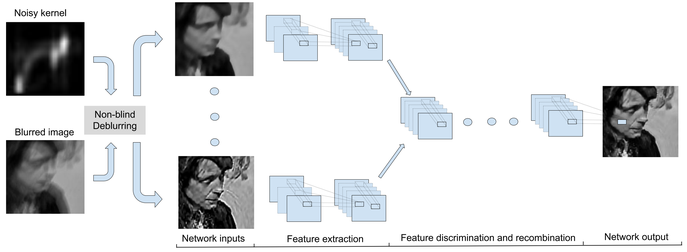
- Detail-preserving artifact-free restoration of motion blurred images from noisy kernel estimates

Motivation

- Existing learning-based methods assumes the availability of ground truth kernels
- In practice, kernel estimates are often noisy
- With noisy kernels, detail preservation of existing methods comes at the cost of amplified artifacts

Our approach

- Use CNN to improve the outputs of existing image-prior based deconvolution methods



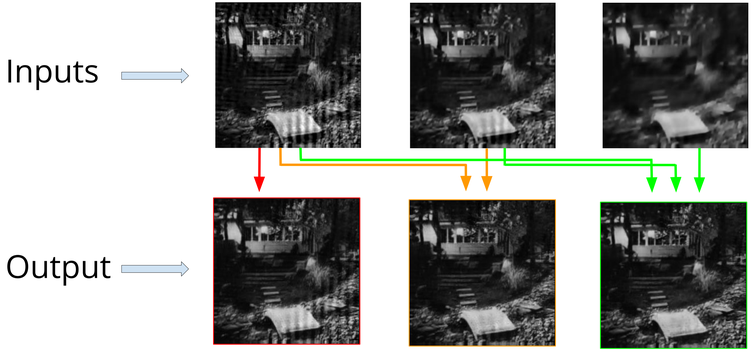
Challenges

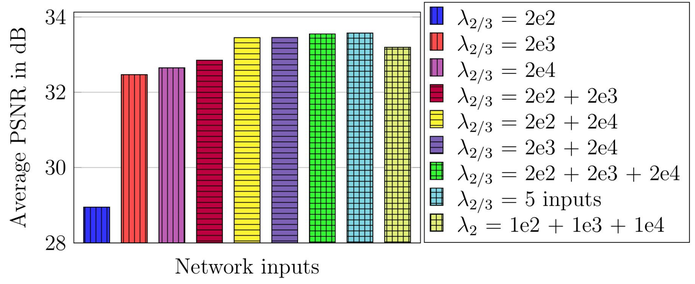
- Training data generation with realistic noisy blur kernels and aligned input-output images
- Identification of the optimal choice of network inputs
- Performance generalization to arbitrary kernels, kernel noises, and non-blind deblurring methods

Key Observations

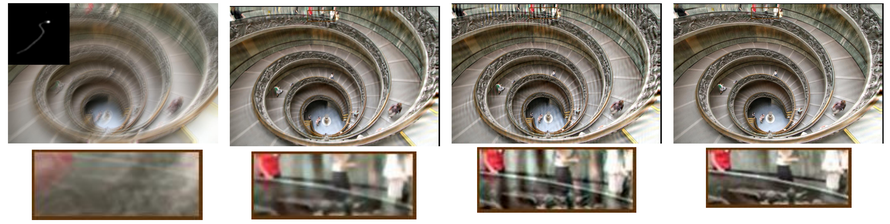
- Restored images with different prior weights carry compliementory information which can improve the performance of CNN
- Realistic noisy kernels with implicit alignment can be generated through regularized optimization
- Training with wide variety of ground truth kernels and noise patterns can ensure performance generalization

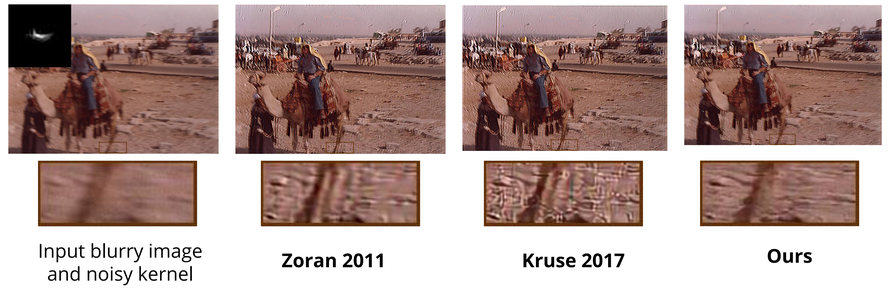
Performance Vs Input



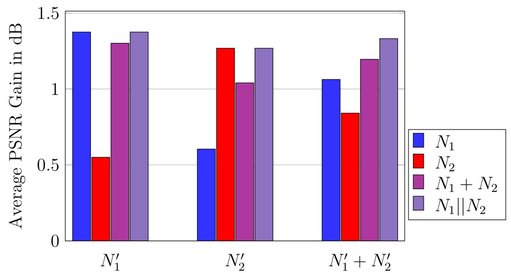


Results





Performance Vs Noise level



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