

SR-AFU: Super-Resolution Network using Adaptive Frequency Component Upsampling and Multi-Resolution Features

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Problems & ideas

- Problems of existing single-image super-resolution method
 - Few models take the correlation between distant pixels (i.e.pixel context) into account, which is very valuable for SR reconstruction.
 - Most existing models only perform upsampling in the last layer of the network, while the reconstruction of low-frequency information in the image does not actually need to go through so many layers.
 - MAE or MSE loss usually leads to poor visual effects of the SR image.
- Ideas: Super-Resolution Network using Adaptive Frequency Component Upsampling and Multi-Resolution Features
 - Use dilated convolution to establish associations between distant pixels.
 - Each layer of the network up-samples a frequency component of the super-resolution image, so that the deep layers of the network pay more attention to the high-frequency components of the image
 - A new loss function based on high-order wavelet decomposition is defined, which makes the reconstructed SR images closer to human perception.

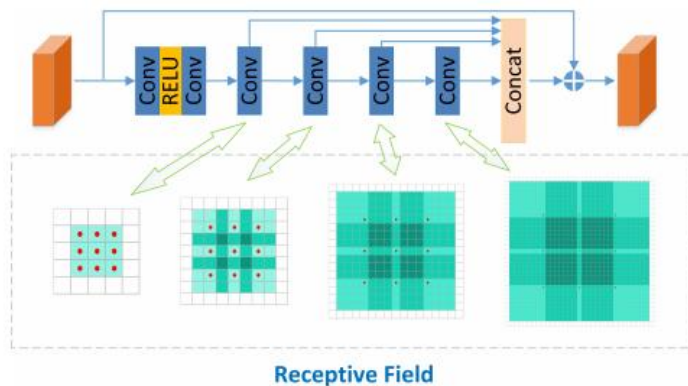


Fig.1. Use dilated convolution to establish associations between distant pixels.

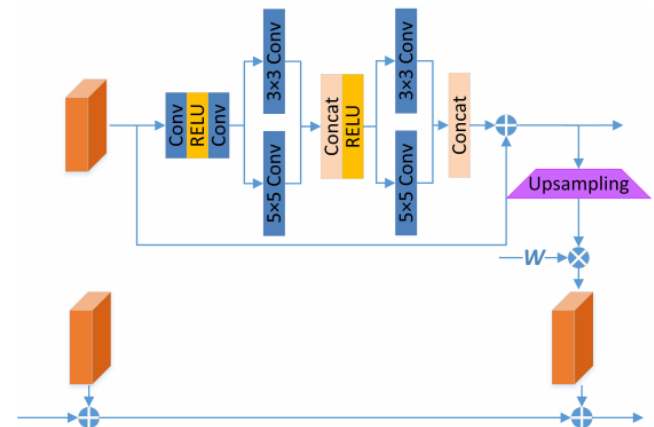
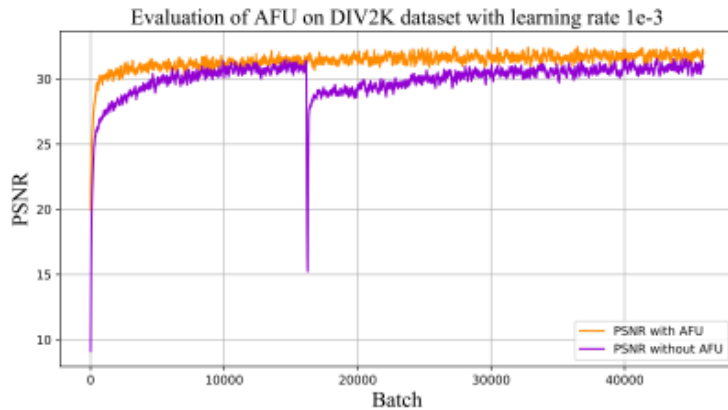


Fig.2. Each layer of the network up-samples a frequency component of the super-resolution image

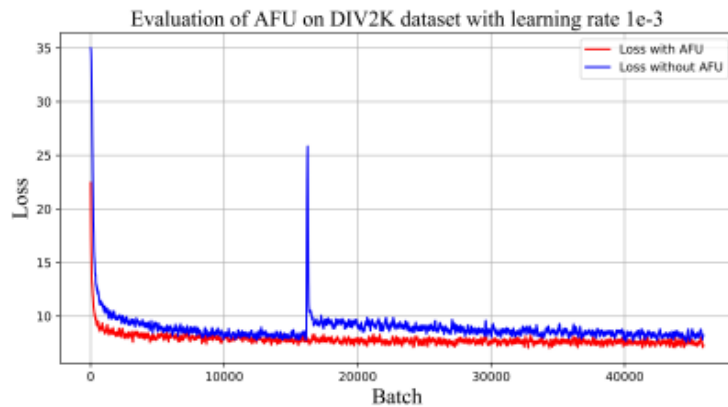
Main Contributions

- Adaptive frequency component upsampling can stabilize the gradient, improve PSNR and speed up training

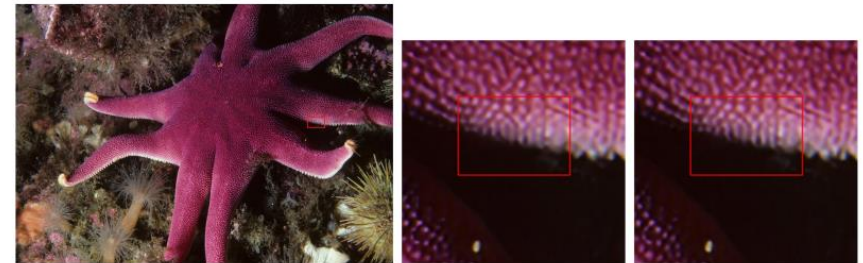
- The loss function based on wavelet transform helps to improve the visual effect of the image



(a) PSNR



(b) Loss



- Results of ablation experiments

Dilated Conv.	✗	✓	✗	✓	✗	✓	✗	✓
AFU	✗	✗	✓	✓	✗	✗	✓	✓
Loss _{WAV}	✗	✗	✗	✗	✓	✓	✓	✓
PSNR	38.12	38.19	38.21	38.25	38.15	38.23	38.24	38.27