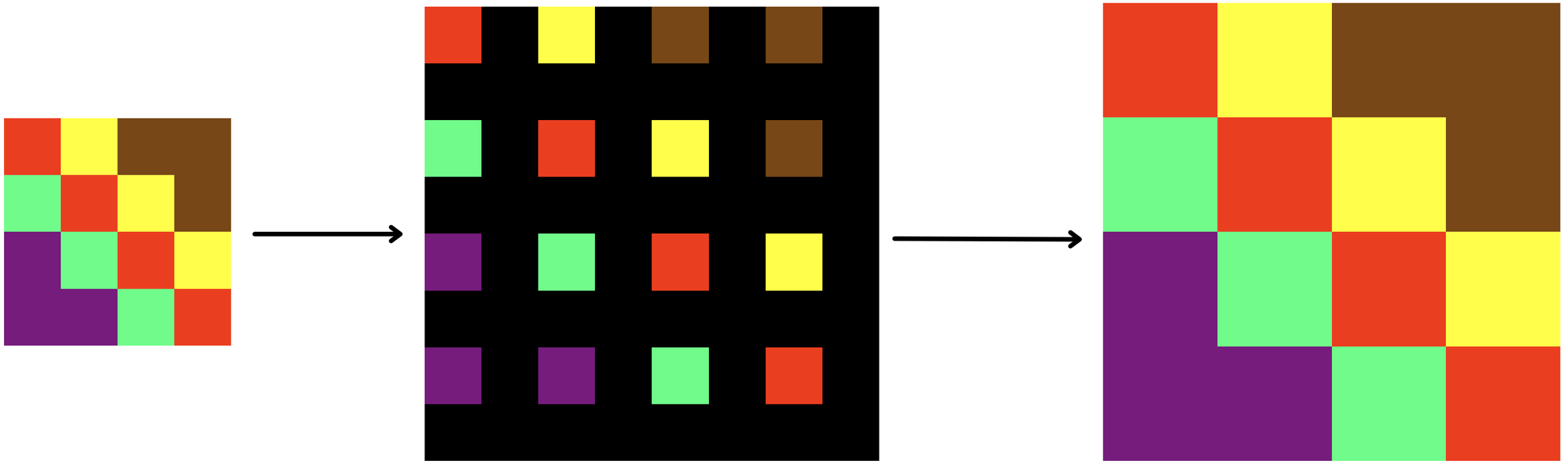
IMAGE SUPER-RESOLUTION

Или как увеличить разрешение изображения

IMAGE SUPER-RESOLUTION



NEAREST NEIGHBOR

NEAREST NEIGHBOR

BICUBIC

Data Processing Inequality

Processing data cannot add information content

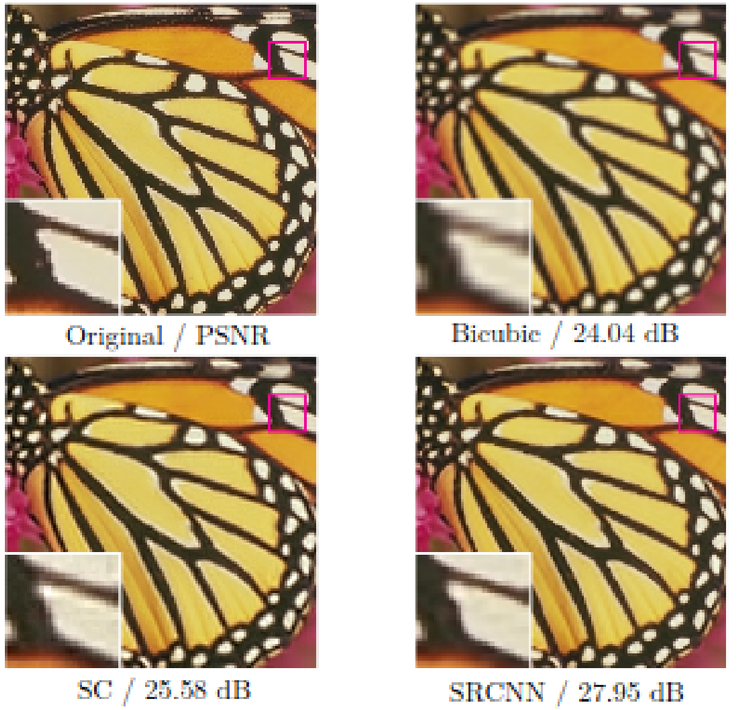
$$X \to Y \to Z$$

$$I(X;Y) \geq I(X;Z)$$

Image Super-Resolution Using Deep Convolutional Networks

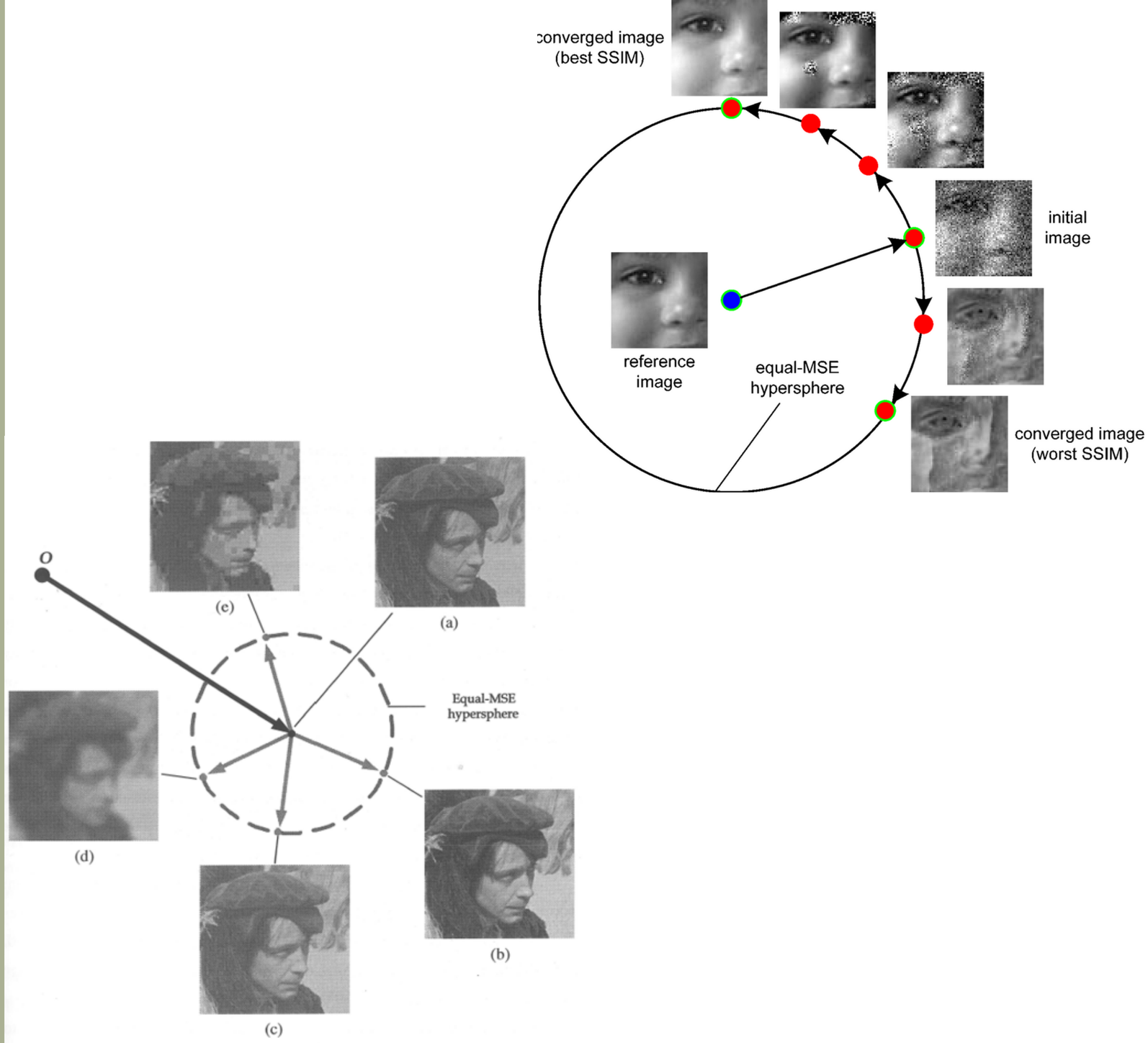
Chao Dong, Chen Change Loy, *Member, IEEE,* Kaiming He, *Member, IEEE,*
and Xiaoou Tang, *Fellow, IEEE*

Abstract—We propose a deep learning method for single image super-resolution (SR). Our method directly learns an end-to-end mapping between the low/high-resolution images. The mapping is represented as a deep convolutional neural network (CNN) that takes the low-resolution image as the input and outputs the high-resolution one. We further show that traditional sparse-coding-based SR methods can also be viewed as a deep convolutional network. But unlike traditional methods that handle each component separately, our method jointly optimizes all layers. Our deep CNN has a lightweight structure, yet demonstrates state-of-the-art restoration quality, and achieves fast speed for practical on-line usage. We explore different network structures and parameter settings to achieve trade-offs between performance and speed. Moreover, we extend our network to cope with three color channels simultaneously, and show better overall reconstruction quality.



МИНИМИЗАЦИЯ КВАДРАТИЧНОЙ РАЗНИЦЫ

MEAN SQUARED ERROR



Pre-trained Neural Network

Pre-trained Neural Network

Feature maps

Feature maps

MINIMIZE

VGG-19

VGG-19

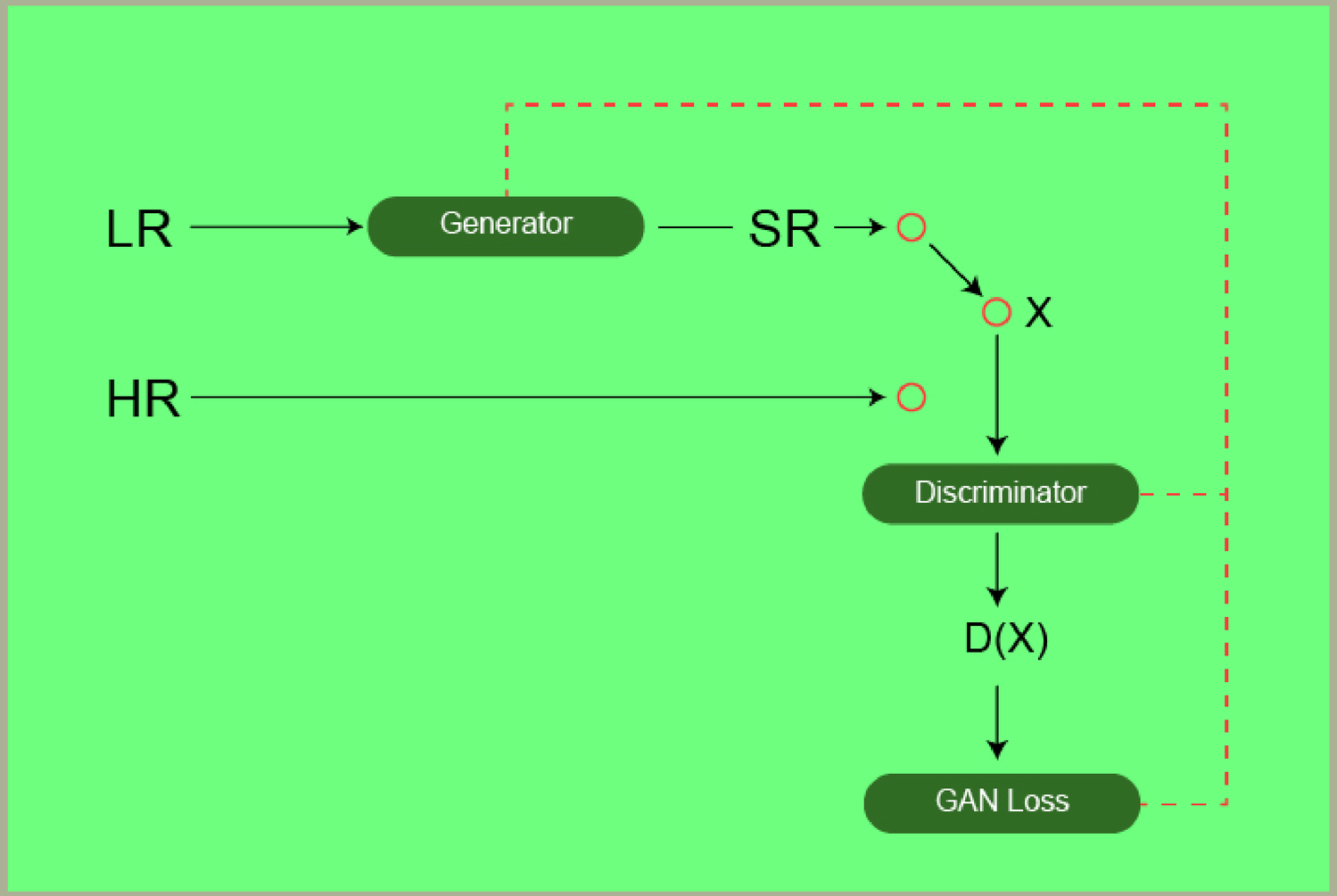
VGG-19

VGG-19

Feature maps

Feature maps

MINIMIZE



SRGAN

GENERATOR

DISCRIMINATOR

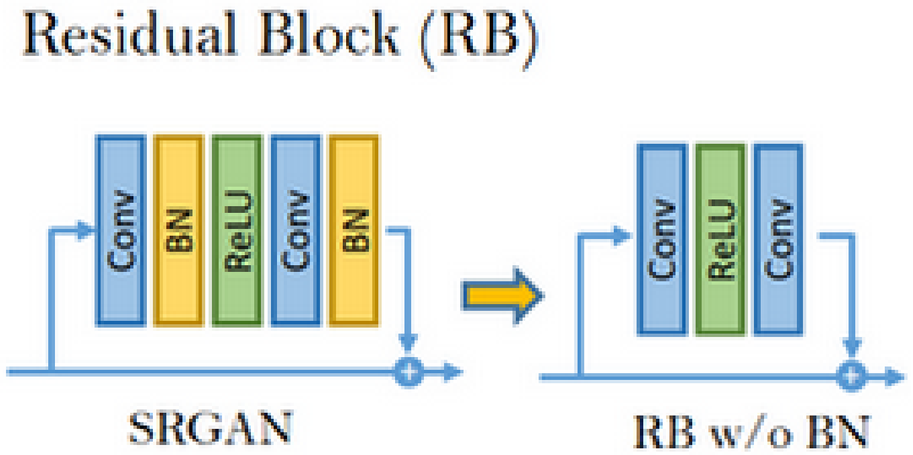
HIGH RESOLUTION?

GAN

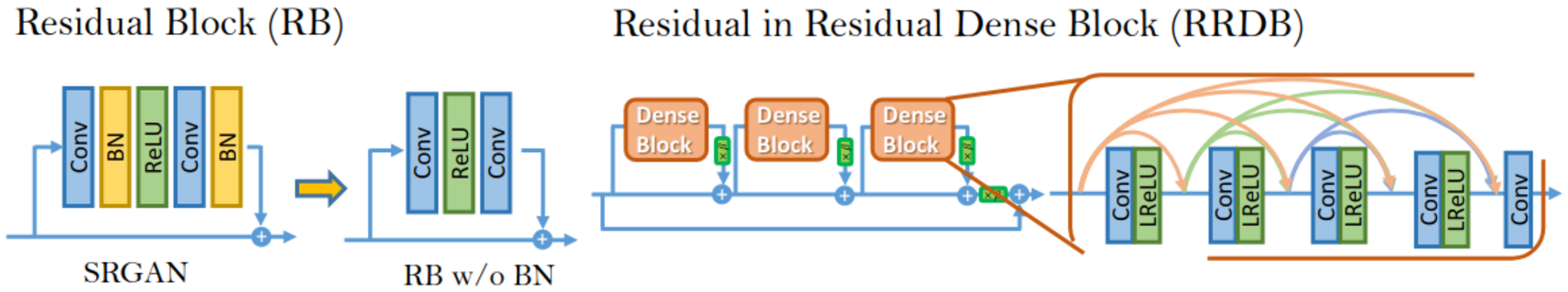
GENERATOR

SRGAN

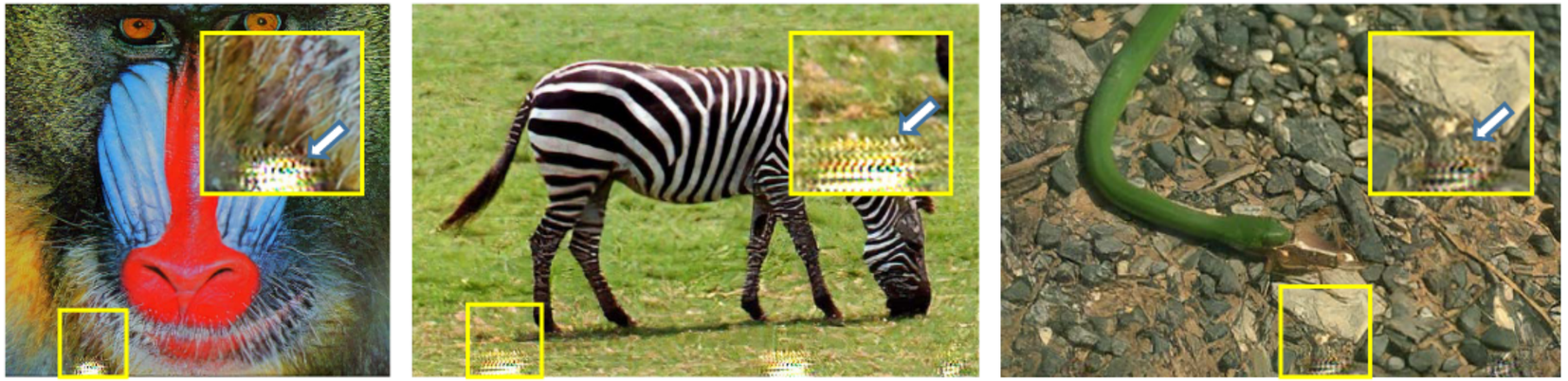
NO BATCH NORMALIZATION



ESRGAN


Residual Block (RB)
Residual in Residual Dense Block (RRDB)
Conv
BN
ReLU
Conv
BN
SRGAN
Conv
ReLU
Conv
RB w/o BN
Dense Block
Dense Block
Dense Block
Conv
LReLU
Conv
LReLU
Conv
LReLU
Conv
LReLU
Conv

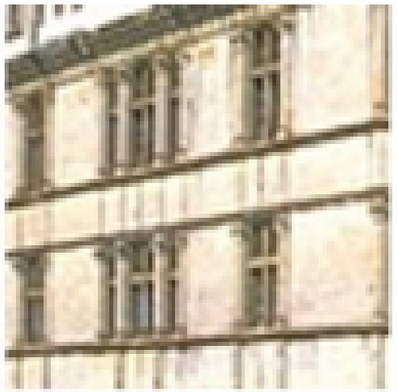
ESRGAN



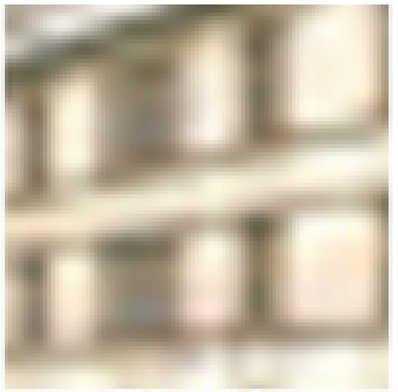
baboon from Set14 zebra from Set14 175043 from BSD100

SRGAN ARTIFACTS

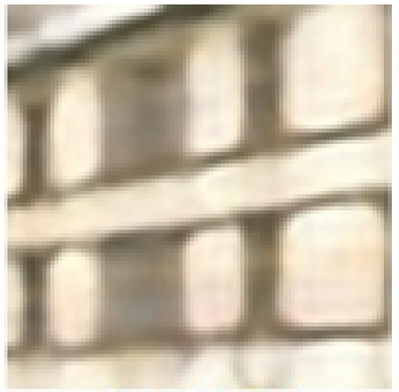
102061 from BSD100
(PSNR / Perepetual Index)



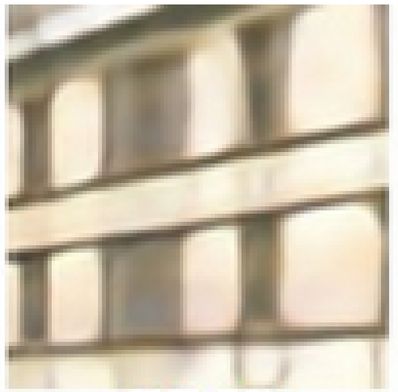
HR
(∞ / 2.12)



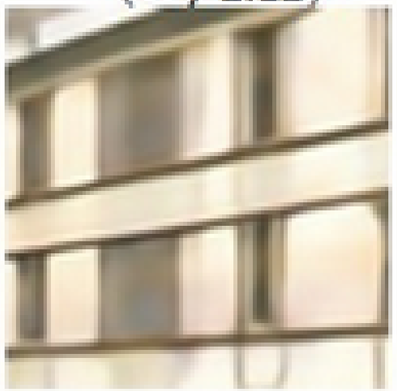
Bicubic
(25.12 / 6.84)



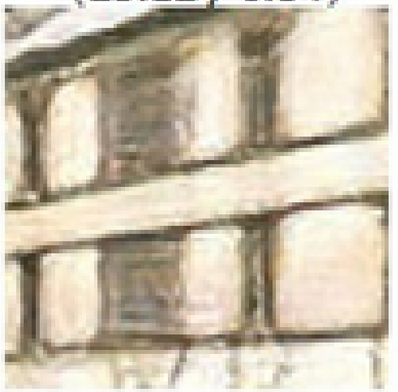
SRCNN
(25.83 / 5.93)



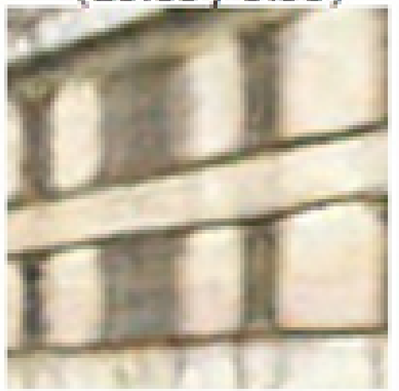
EDSR
(26.62 / 5.22)



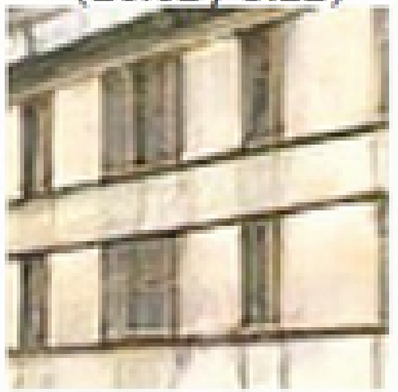
RCAN
(26.86 / 4.43)



EnhanceNet
(24.73 / 2.06)



SRGAN
(25.28 / 1.93)



ESRGAN(ours)
(24.83 / 1.96)

СРАВНЕНИЕ АЛГОРИТМОВ

ESRGAN

ССЫЛКИ:

1) HTTPS://TECH-ALGORITHM.COM/ARTICLES/NEAREST-NEIGHBOR-IMAGE-SCALING/
2) HTTPS://EN.WIKIPEDIA.ORG/WIKI/DATA_PROCESSING_INEQUALITY
3) HTTPS://EN.WIKIPEDIA.ORG/WIKI/DATA_PROCESSING_INEQUALITY
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8)HTTPS://ARXIV.ORG/PDF/1808.03344.PD