Real-ESRGAN: Training *Real-World* Blind Super-Resolution with *Pure Synthetic Data*

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Codes

Introduction

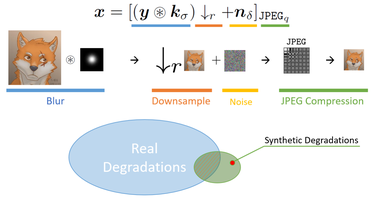
Challenges in Real-World Blind Super-Resolution

- Unknown and complex degradations
- Different and various contents
- Deal with them in one unified network

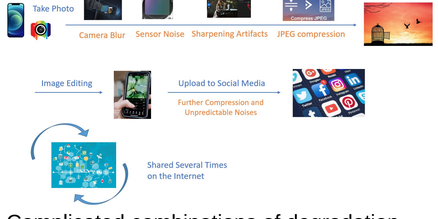
Contributions

- Propose a **high-order degradation** process to model practical degradations, and utilize *sinc* filters to model common **ringing and overshoot artifacts**.
- Employ **several essential modifications** (*e.g.*, U-Net discriminator with spectral normalization) to increase discriminator capability and stabilize the training dynamics.
- Real-ESRGAN trained with pure synthetic data is able to restore most real-world images and achieve better visual performance than previous works, making it more **practical in real-world applications**.

Motivation of Practical Degradation Modelling



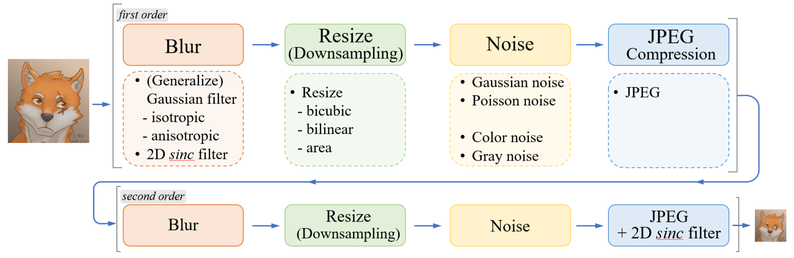
Classical degradation model



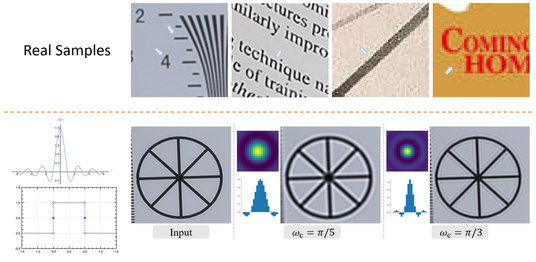
Complicated combinations of degradation processes for real images on the Internet

Real-ESRGAN

High-Order Degradation Process

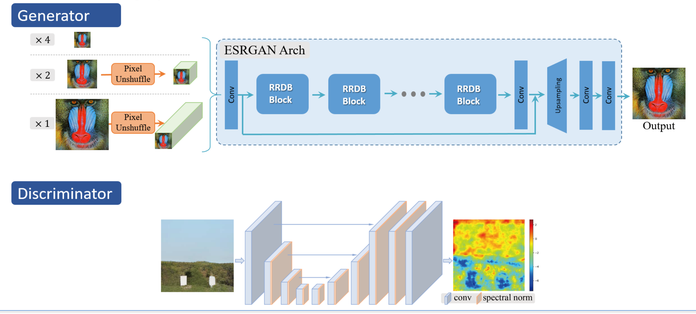


The sinc Filters to Model Common Ringing and Overshoot Artifacts.



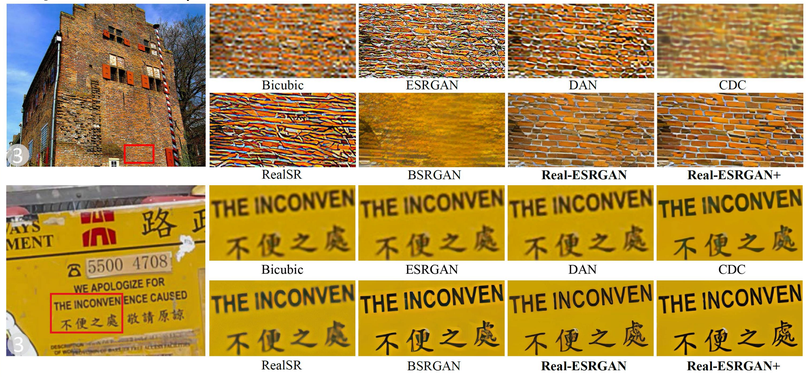
Network Architecture

- We employ the same generator architecture as ESRGAN
- U-Net discriminator with spectral normalization is used to increase discriminator capability and stabilize the training dynamics



Results and Open Source

Qualitative Comparisons



Optimize for Anime Images

Open Source

In the GitHub, we provide:

- Full **training and testing** codes
- **Colab Demo** for Real-ESRGAN Open in Colab
- Portable **Windows / Linux / MacOS executable files** for Intel/AMD/Nvidia GPU, which is based on *Tencent ncnn*

We also incorporate the face restoration method – **GFPGAN**, to improve the face performance.

BasicSR

Codes & Models