Progressive Semantic-Aware Style Transformation for Blind Face Restoration
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Overview

Introduction

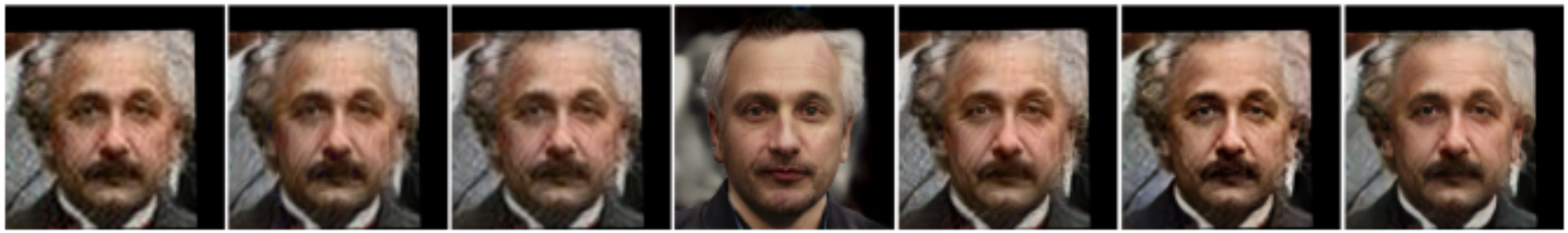

Figure: State-of-the-Art results

Face restoration is important in face image processing, and has been widely studied in recent years. However, previous works often fail to generate plausible high quality (HQ) results for real-world low quality (LQ) face images. In this paper, authors propose a new progressive semantic-aware style transformation framework, named PSFR-GAN, for face restoration.

How it works

Specifically, instead of using an encoder-decoder framework as previous methods, they formulate the restoration of LQ face images as a multi-scale progressive restoration procedure through semantic-aware style transformation.

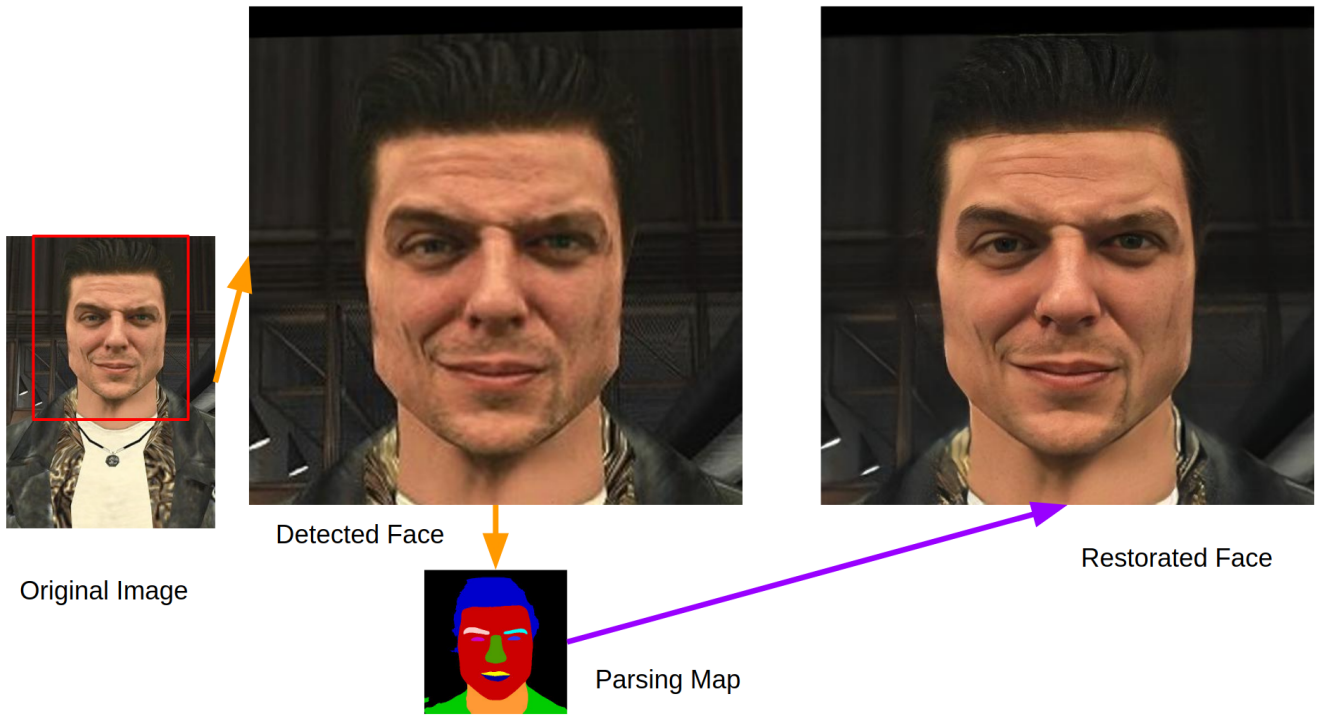

Figure: Brief explanation of framework.

Architecture

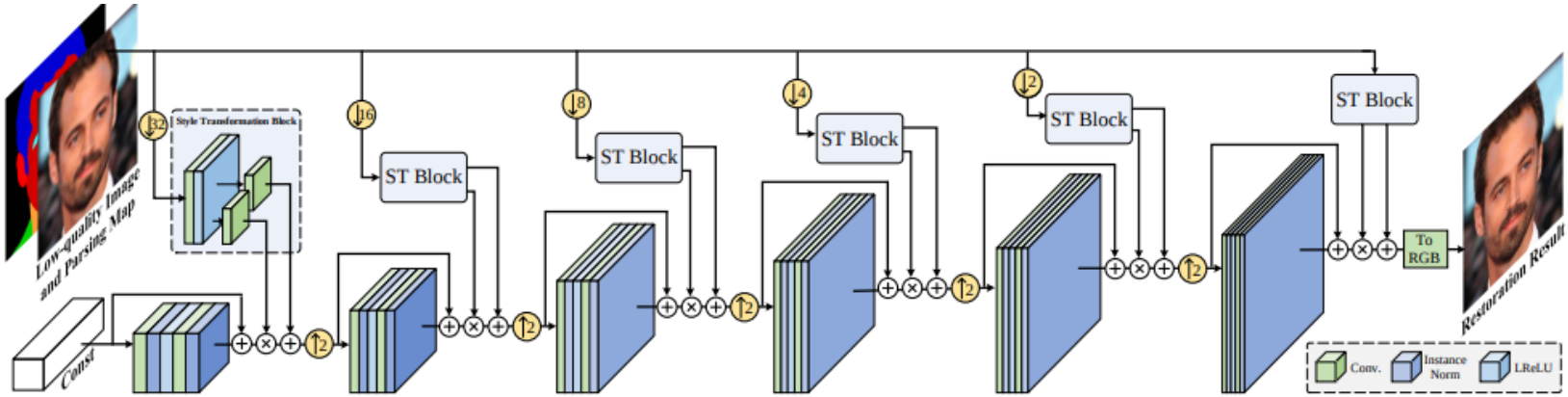

Figure: Visulization of the proposed progressive semantic-aware style transformation network for face restoration.

Dataset - Synthetic

They construct two testing datasets, a synthetic one and a real one. For the synthetic test dataset, they randomly choose 2, 800 HQ images from CelebAHQ then generate the corresponding LQ images in the same way as training dataset.

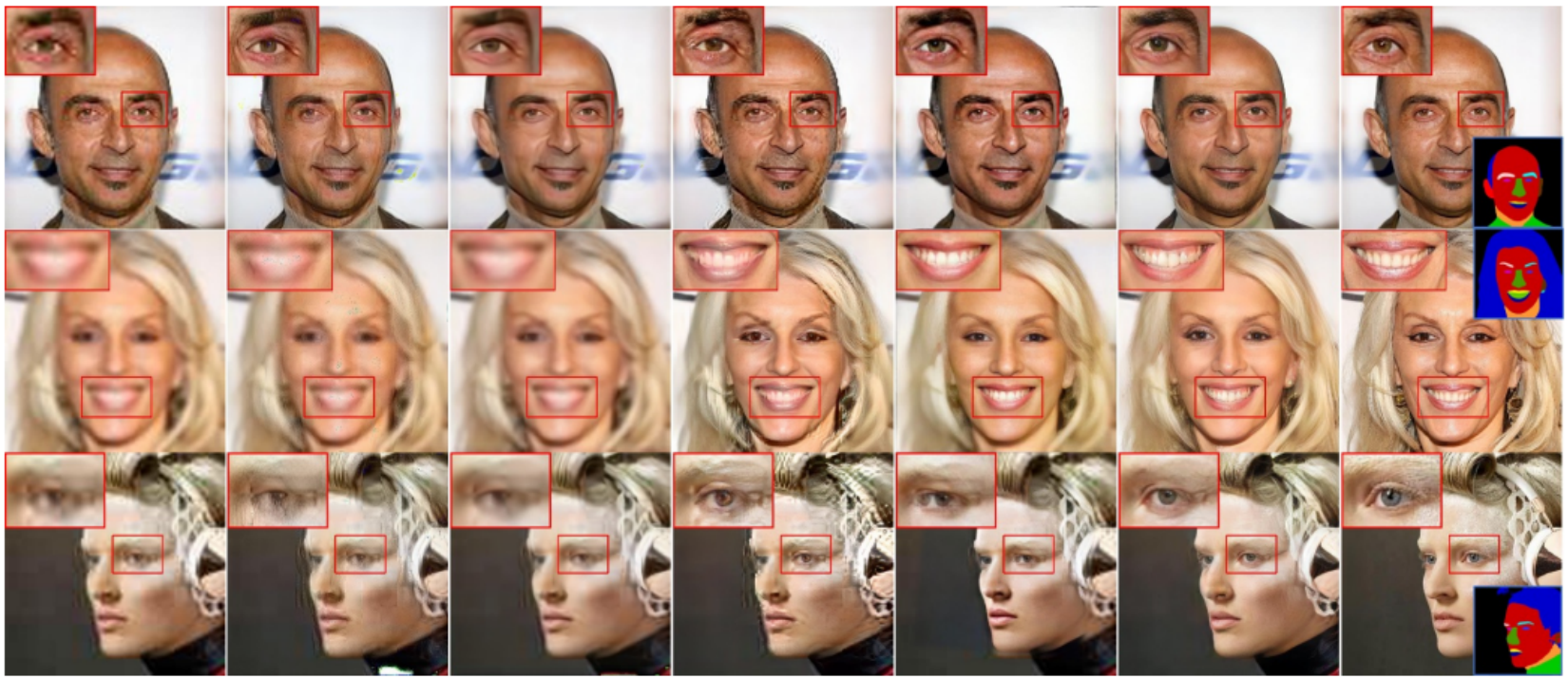

Figure: Visual comparisons on CelebAHQ-Test dataset.

Dataset - Real

And they also found some old photos from internet and resized it to 512 x 512 using bicubic upsampling.

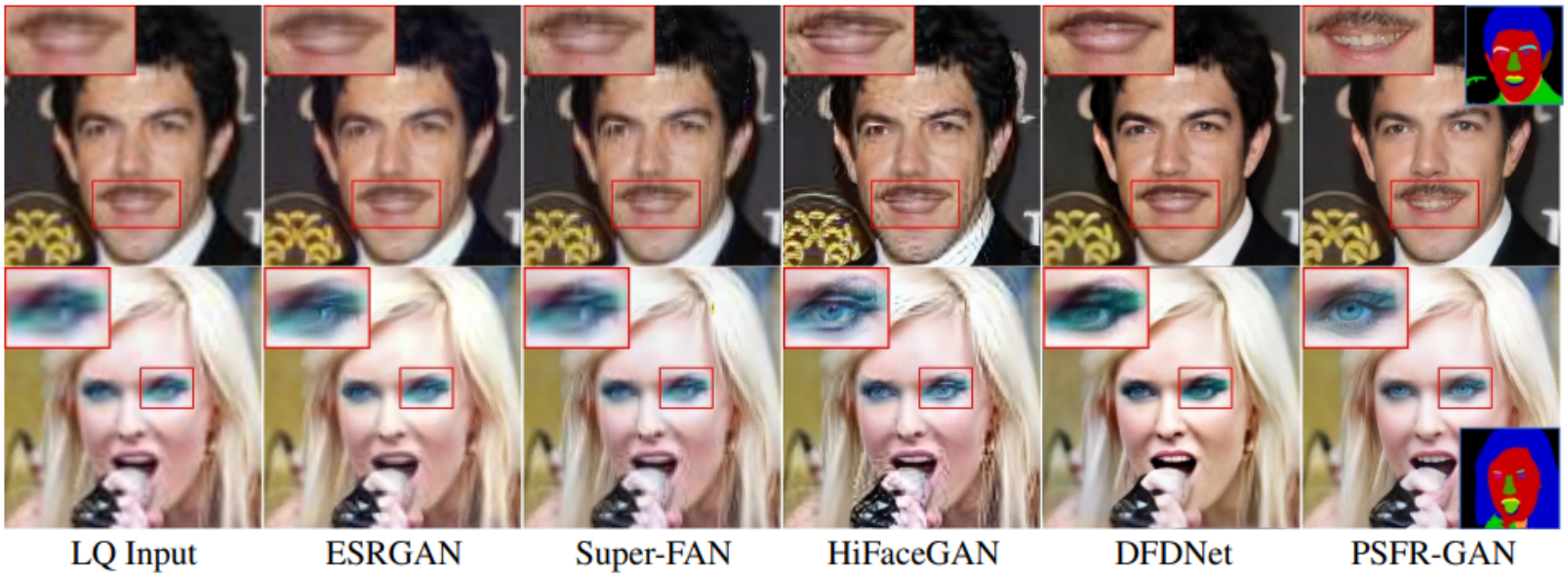

Figure: Visual comparisons on PSFR-RealTest dataset.

Results

Task	Methods	CelebAHQ-Test					PSFR-RealTest
		PSNR↑	SSIM↑	MSSIM↑	LPIPS↓	FID↓	FID↓
JPEG artifacts removal	ARCNN	22.78	0.6538	0.7462	0.5862	133.38	124.46
Deblur	DeblurGANv2	22.66	0.6587	0.7493	0.5546	113.85	97.42
Super-Resolution	ESRGAN	21.95	0.6096	0.7293	0.5515	97.02	57.51
	Super-FAN	22.71	0.6527	0.7459	0.4908	94.95	65.45
	WaveletSRNet	23.50	**0.6595**	0.7542	0.5409	111.60	108.21
Blind-Restoration	HiFaceGAN	21.50	0.5495	0.6900	0.4569	57.81	56.48
	DFDNet	22.28	0.6589	0.7650	0.3791	37.34	37.63
	PSFR-GAN (ours)	**23.64**	0.6557	**0.7740**	**0.3042**	**23.20**	**30.39**

Figure: The Results

PSNR - Peak signal-to-noise ratio;
SSIM - Structural similarity index measure;
MSSIM - Mean Structural similarity index measure;
LPIPS - Learned Perceptual Image Patch Similarity;
FID - Fréchet distance between two Gaussians fitted to feature representations;

Comparison with Pulse

PULSE (Menon et al. 2020) is a recent popular method for face restoration. Different from other methods, PULSE is an optimization based method which needs carefully finetune for each LQ input. They carefully finetune PULSE on these photos and get the best results as much as they can.

Solvay Conference 1927

Figure: Solvay Conference 1927 - original image.

Solvay Conference 1927

Figure: Parsing Map 1.

Solvay Conference 1927

Figure: Parsing map 2.

Solvay Conference 1927

Figure: HQ 1.

Solvay Conference 1927

Figure: HQ 2.

HMM3

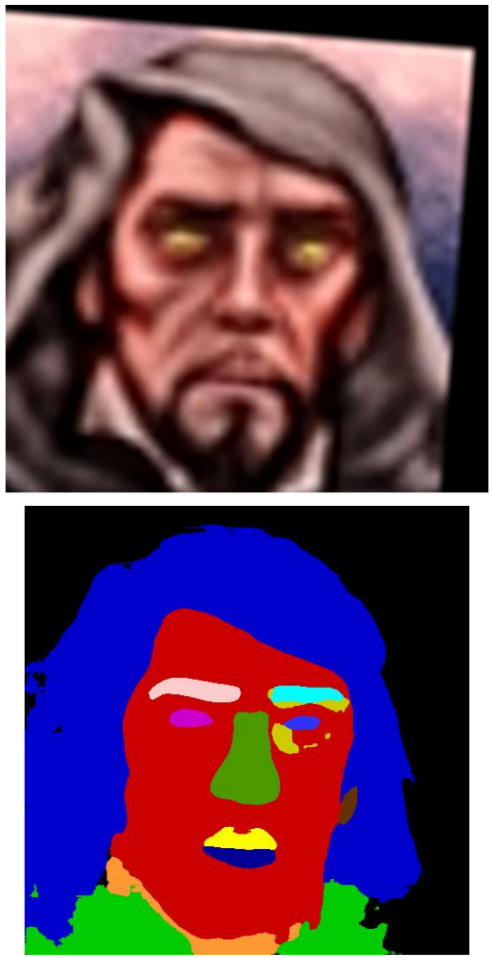

Figure: Jeddite.

Smart thought

Aim for the target.

References

Chaofeng Chen, Xiaoming Li, Lingbo Yang, Xianhui Lin, Lei Zhang, Kwan-Yee K. Wong (18 Sep 2020)

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The End