Propagated Image Filtering

Supplemental Materials

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1. Image Denoising and Smoothing

We apply our propagation filter to the tasks of image denoising and smoothing tasks, using a variety of color images as the inputs. As noted in the main paper, we add Gaussian white noise with standard deviation 0.05 to the input images, and we present the highest PSNR and SSIM values of each filter with comparable settings (see the beginning of Section V in our paper). It is worth noting that, during image smoothing, we measure the distances between pixel values using the Euclidean distance in the CIELAB color space.

Starting from the next page, we present all the experimental results.

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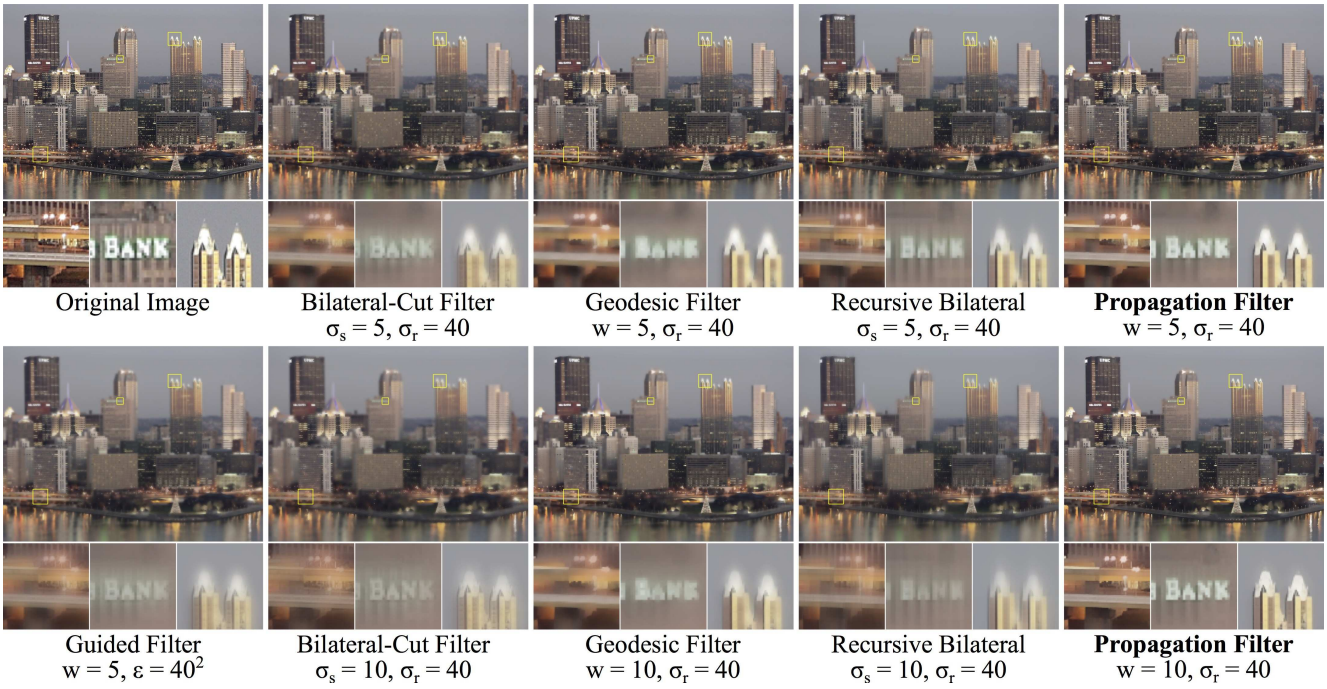
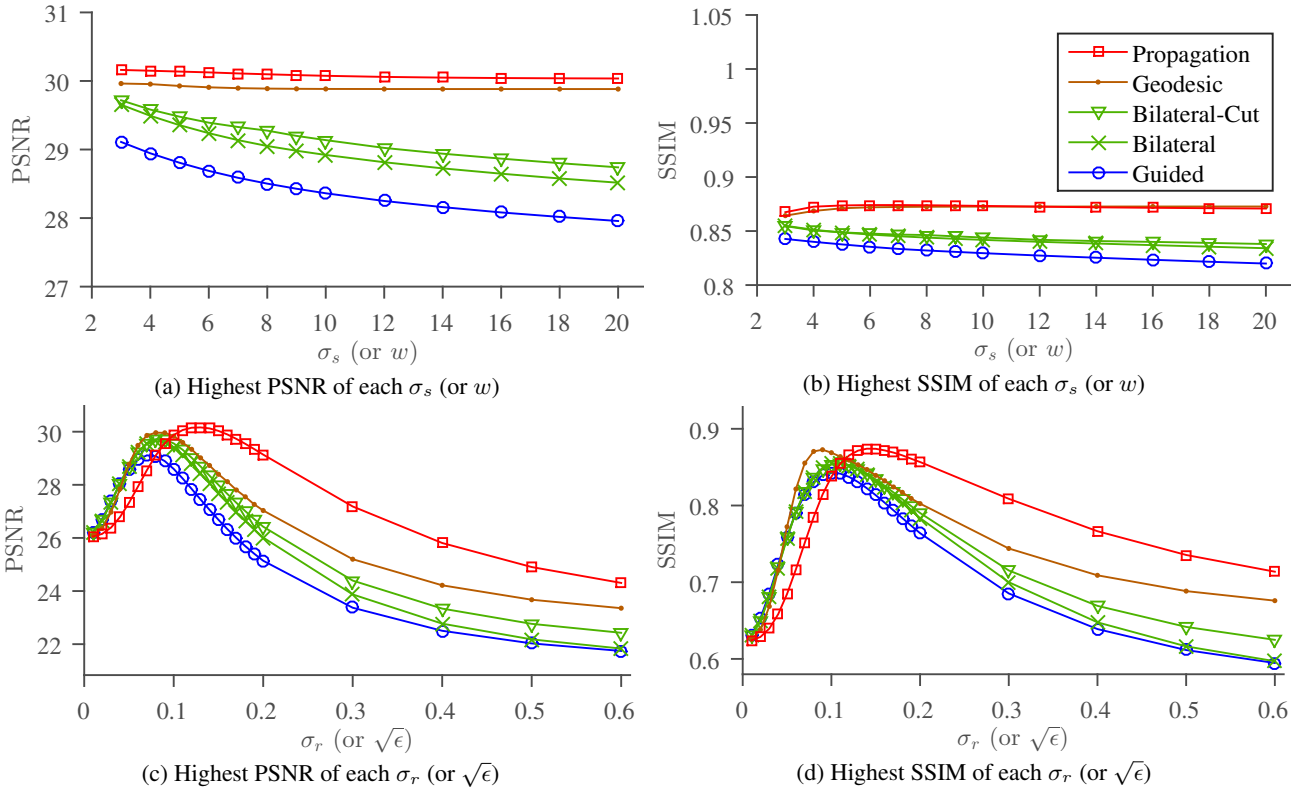


Figure 1: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/58621196@N 05/6513558769.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 2: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 1 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

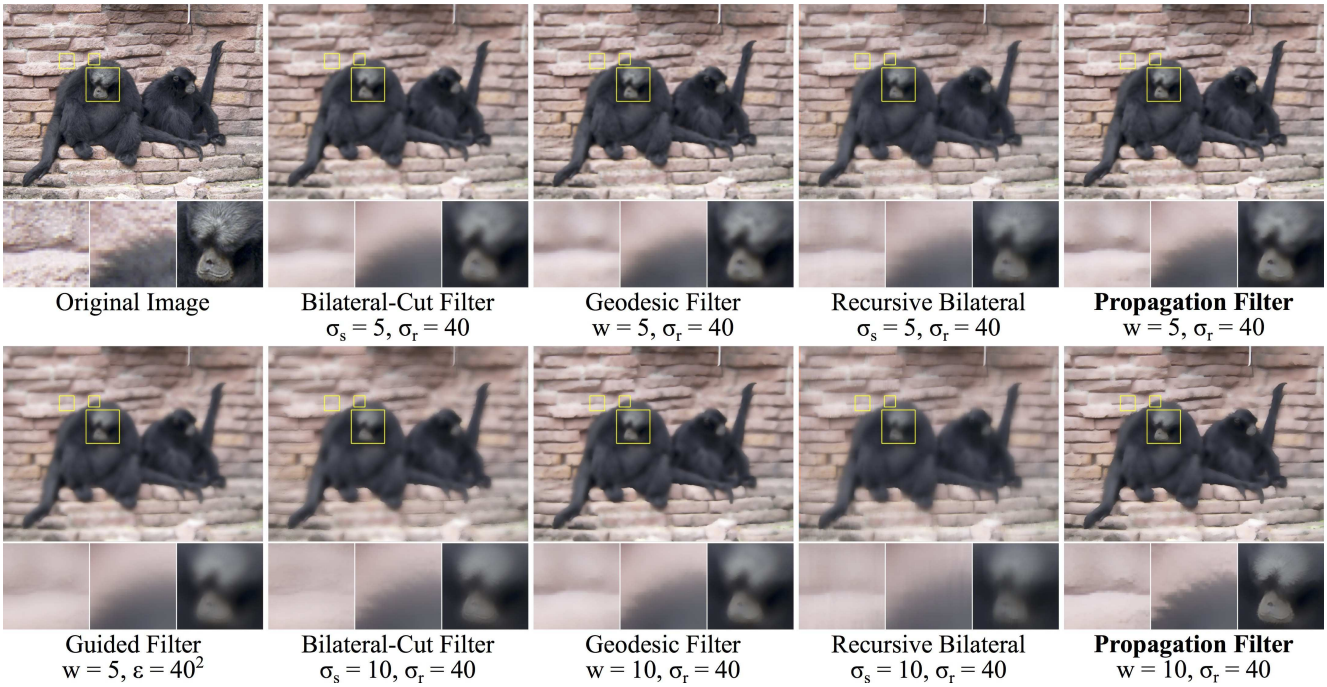
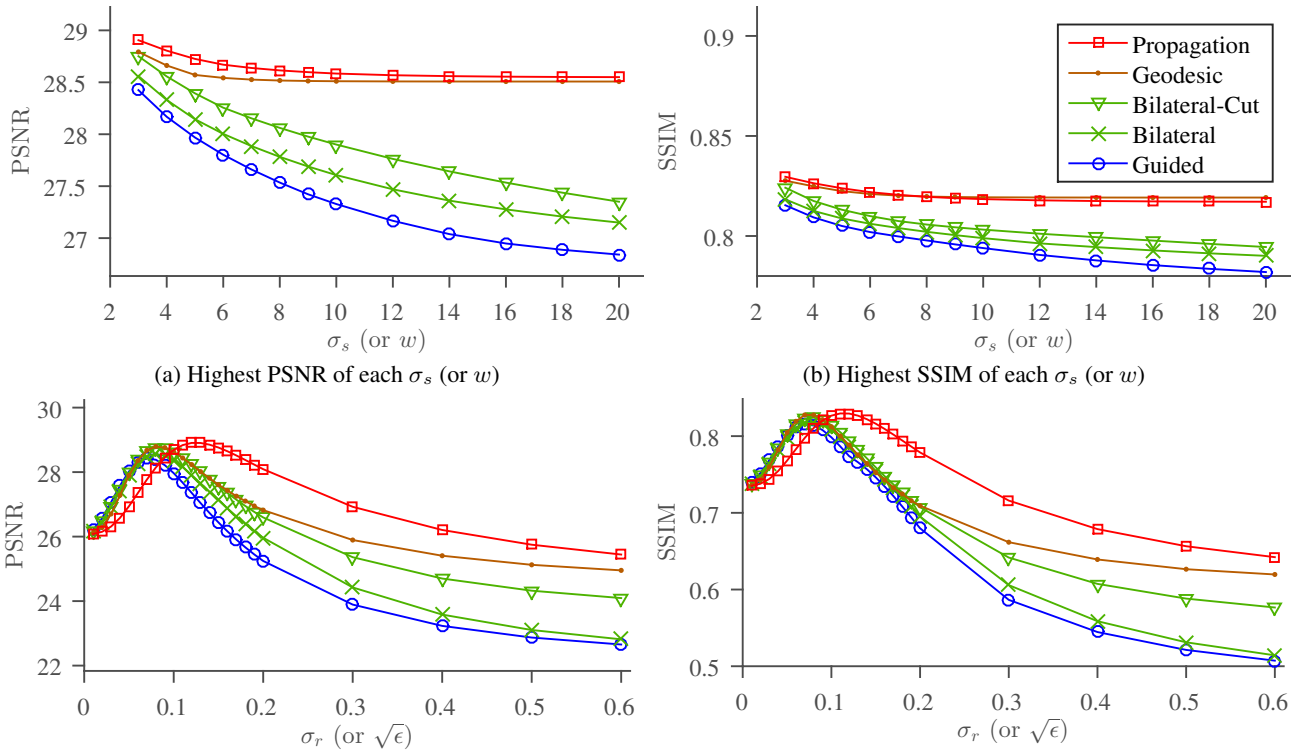


Figure 3: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/jster91/2383659639.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 4: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 3 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

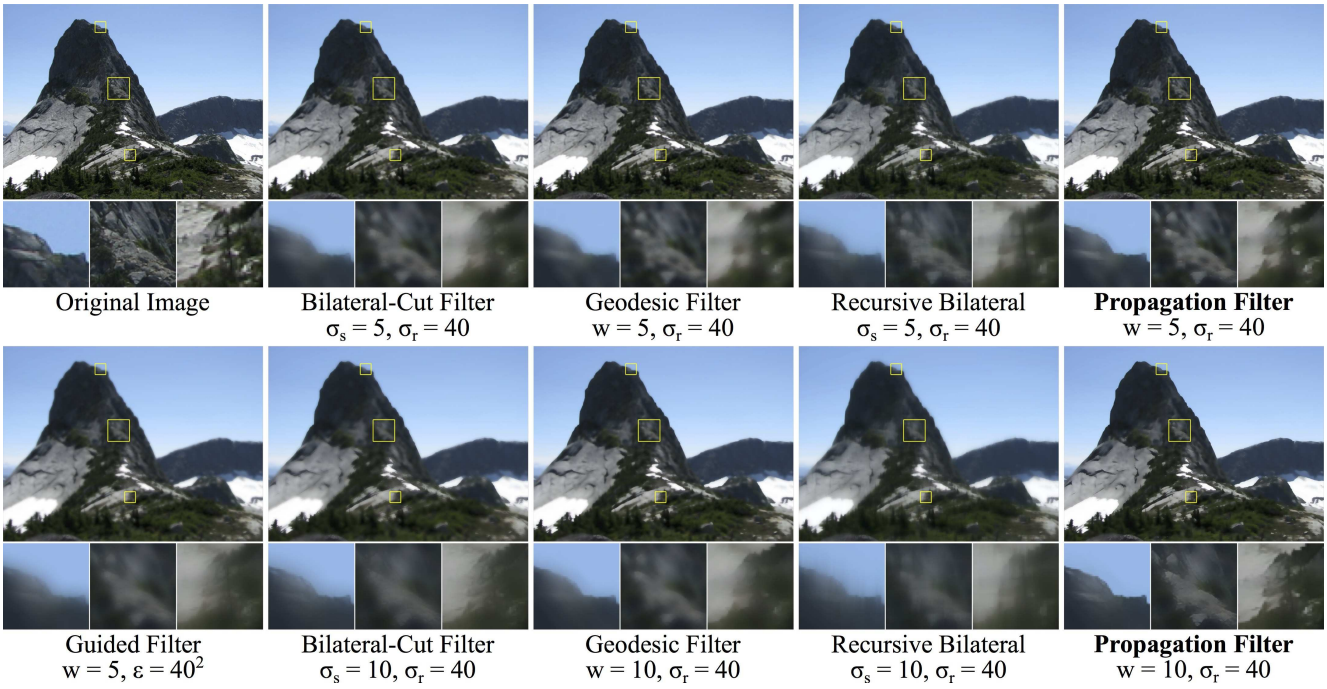
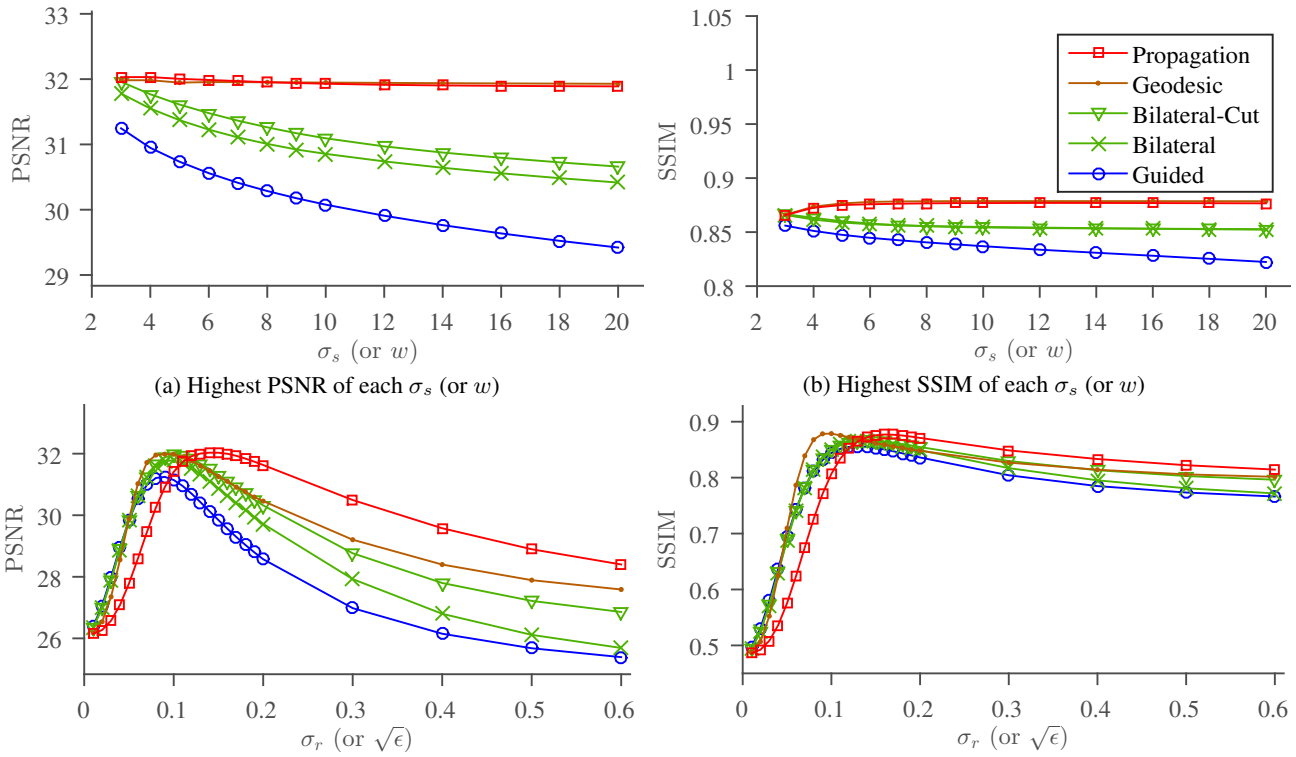


Figure 5: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/druclimb/8436420891.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 6: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 5 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

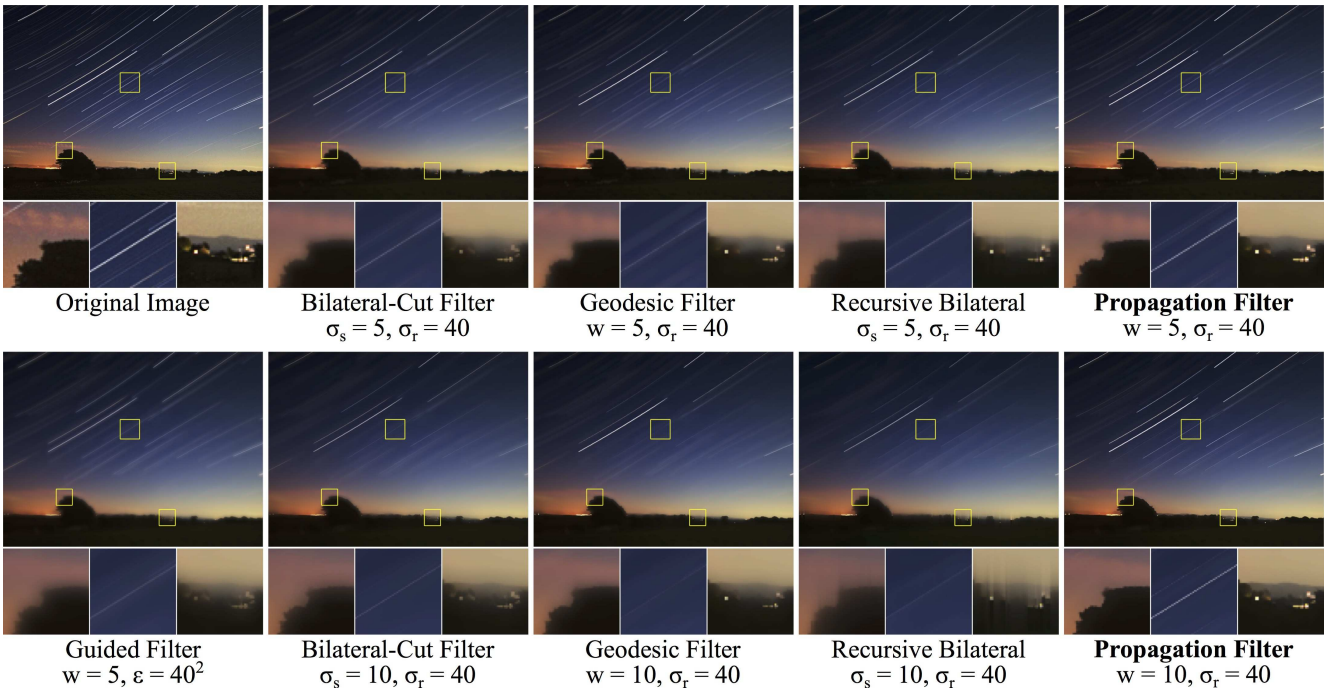
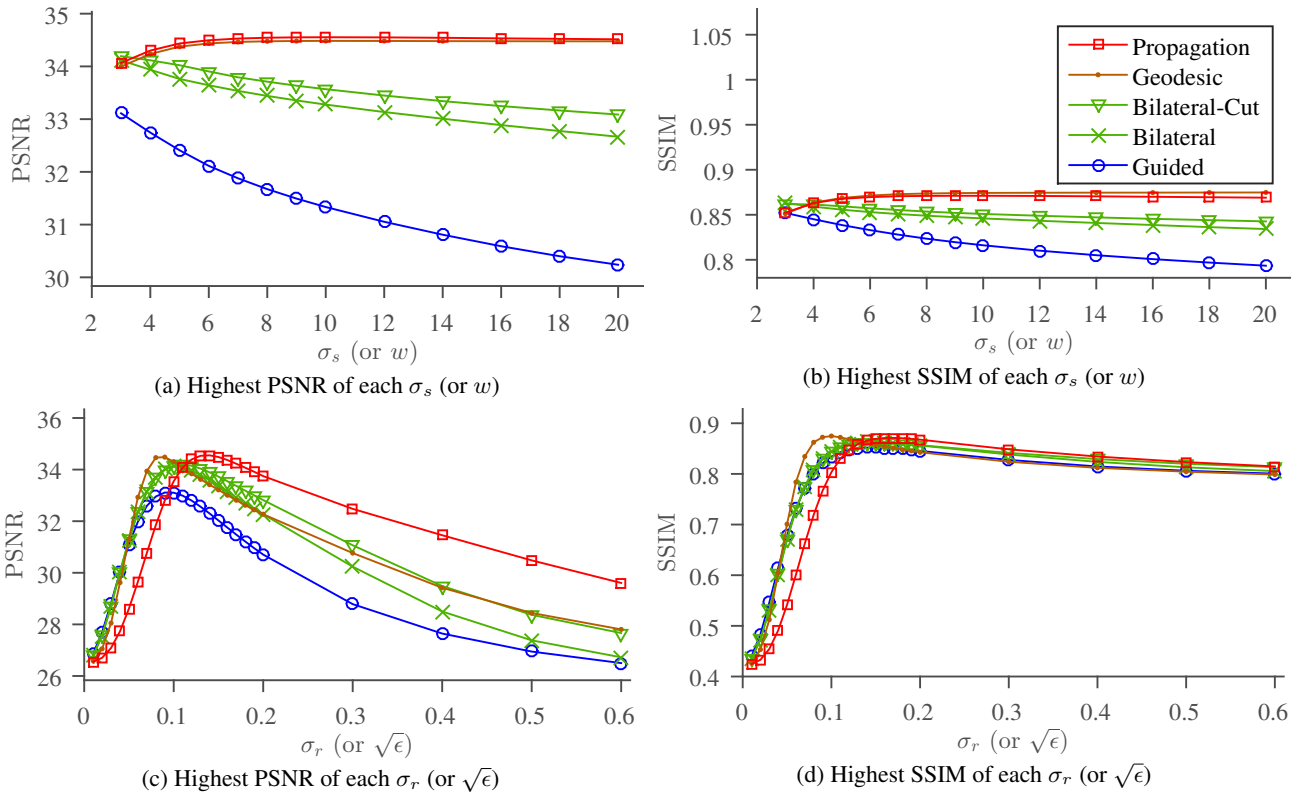


Figure 7: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/˙belial/521278577.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 8: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 7 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

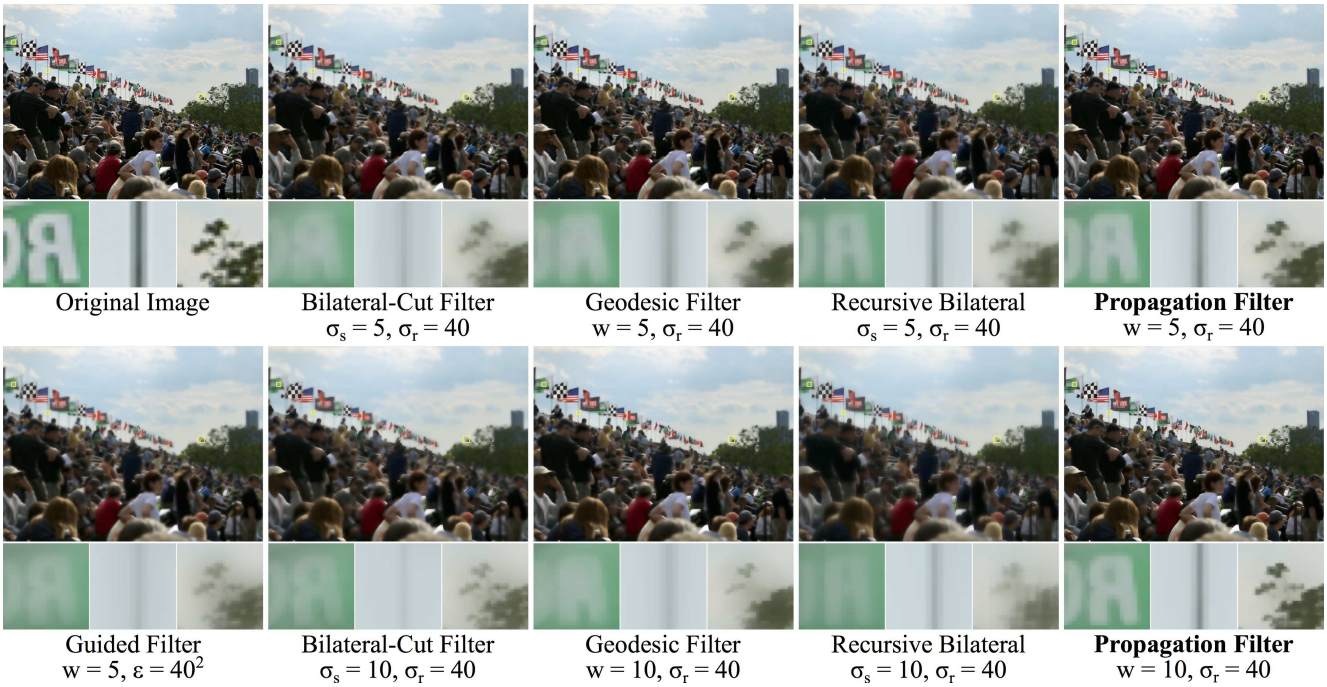
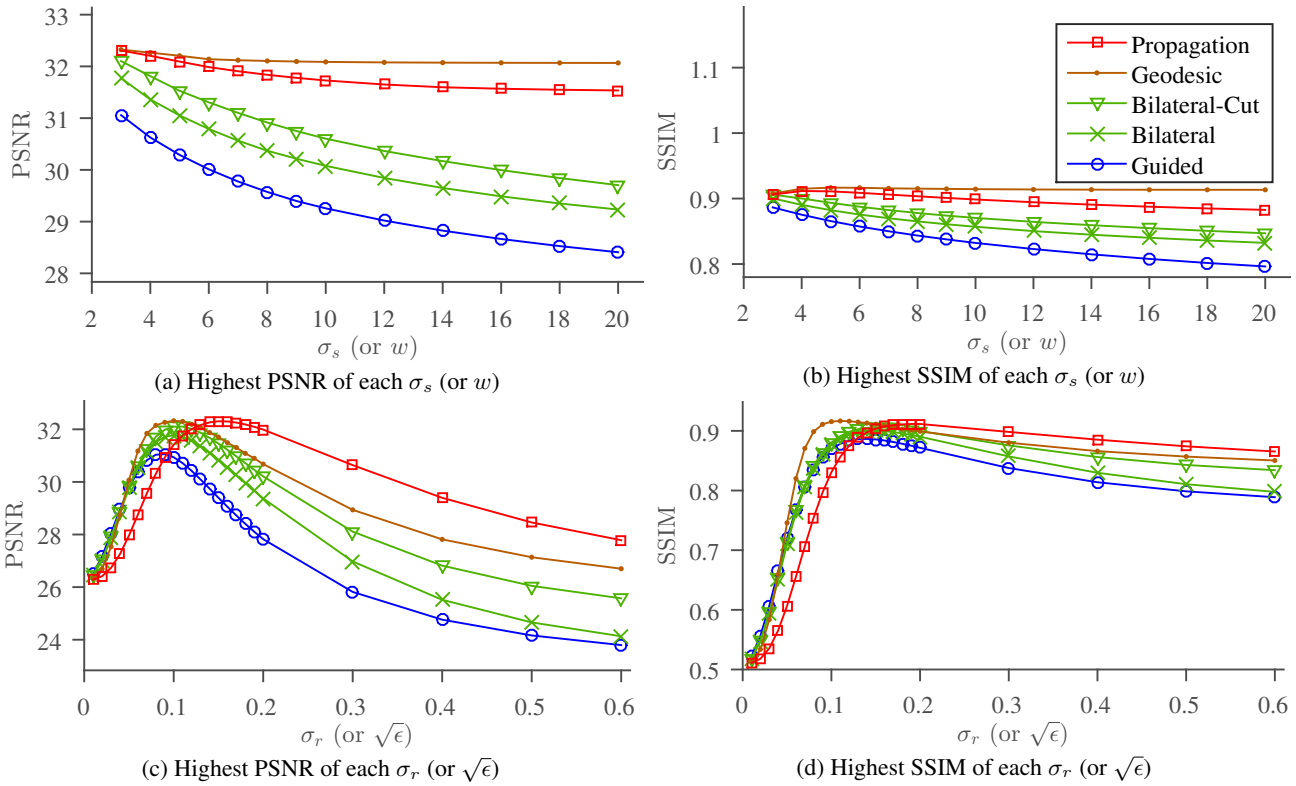


Figure 9: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/somethingness/7333129364.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 10: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 9 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

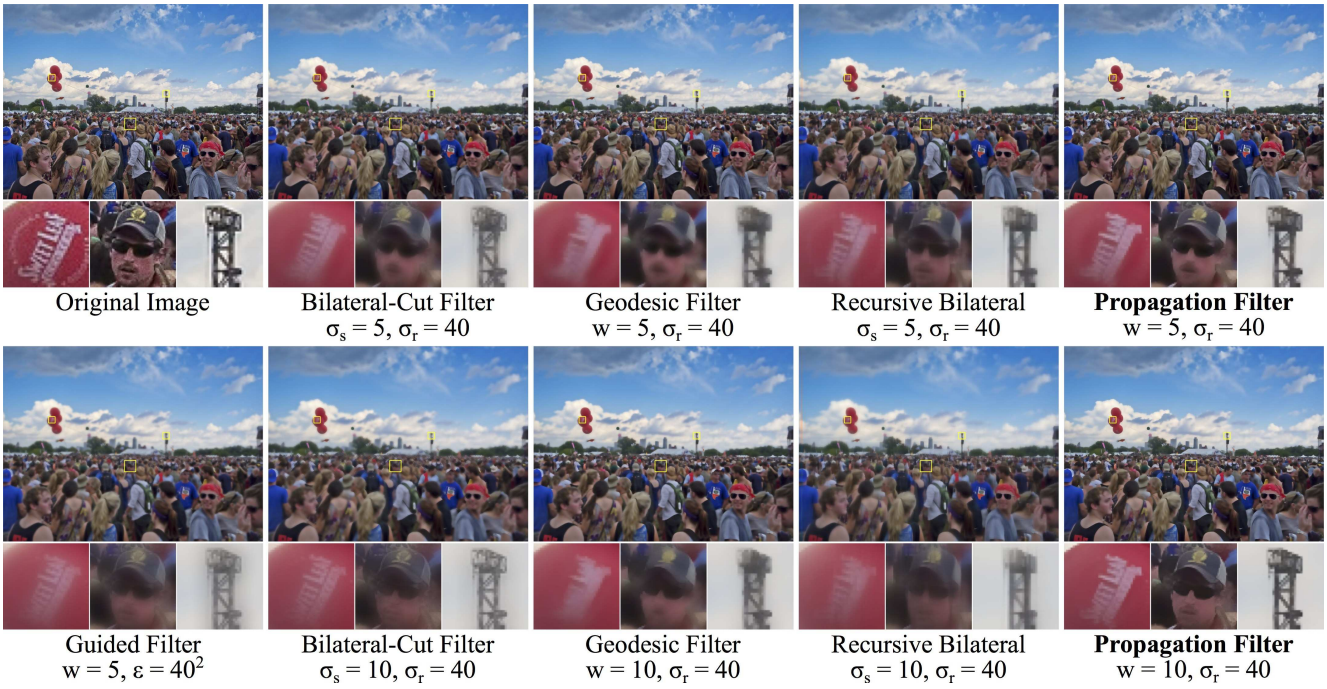
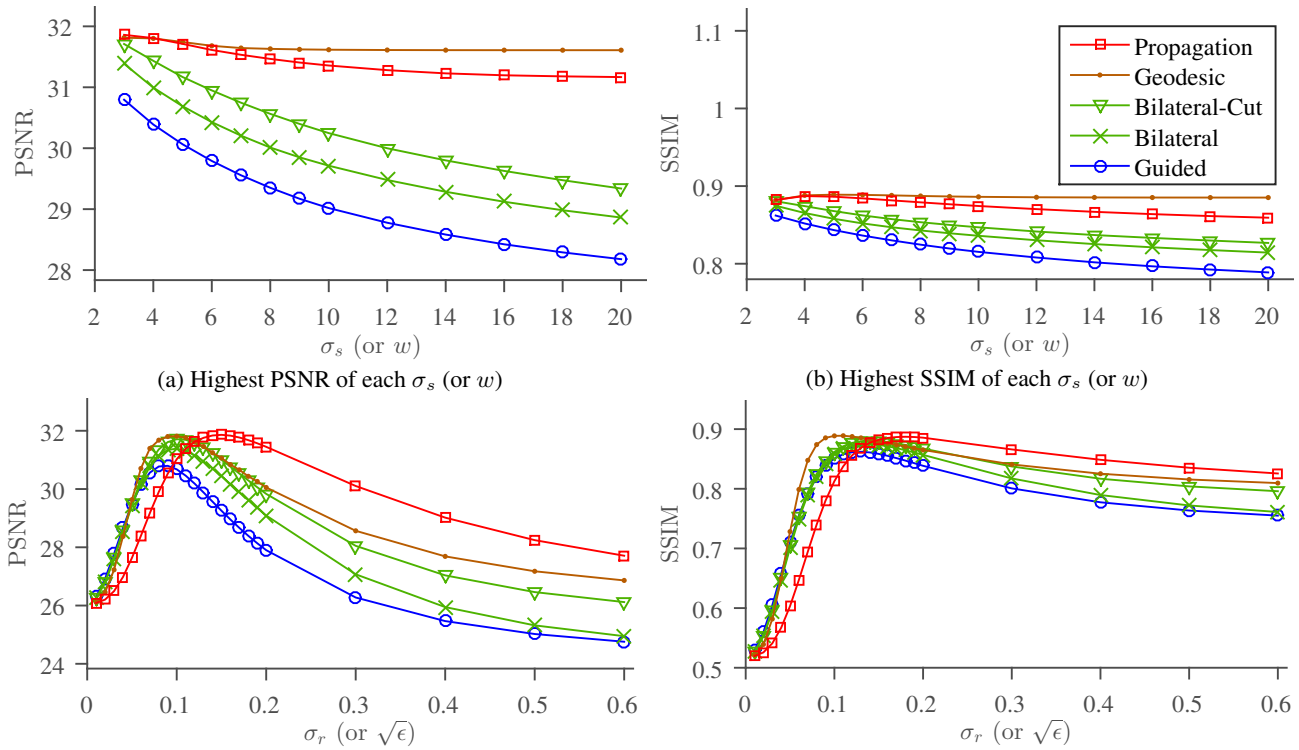


Figure 11: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/dingatx/6199250676.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 12: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 11 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

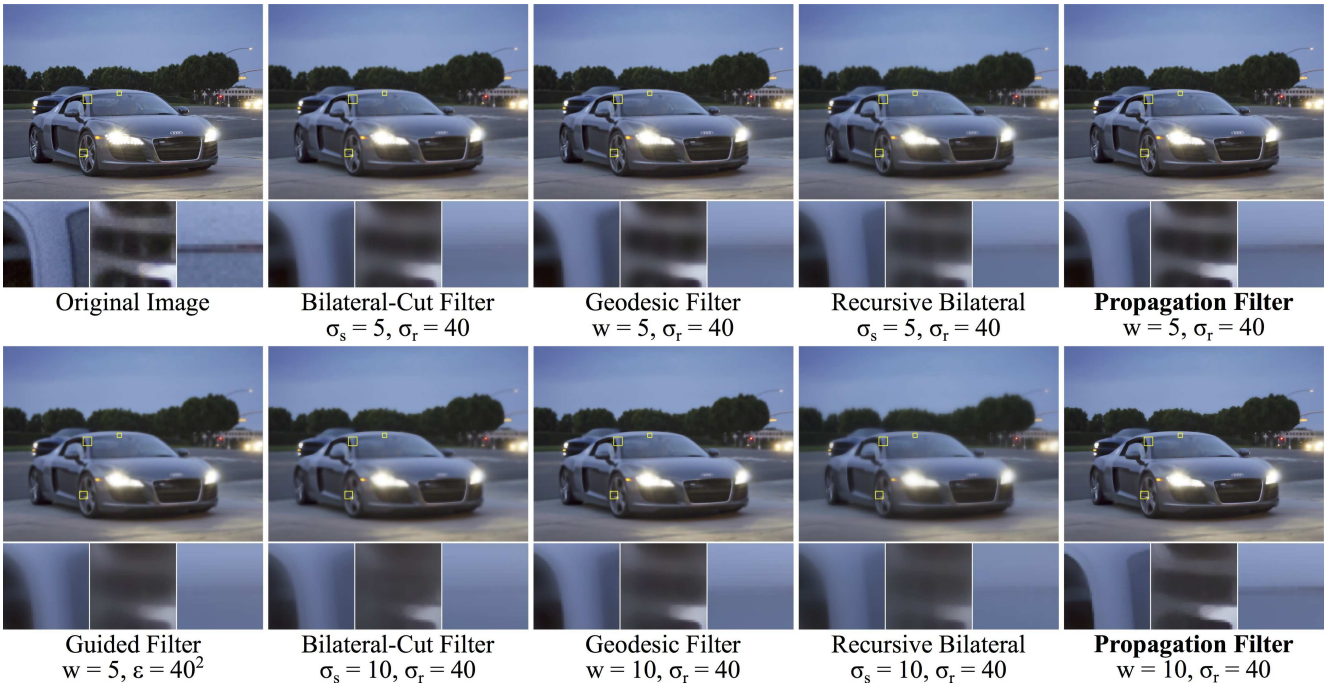
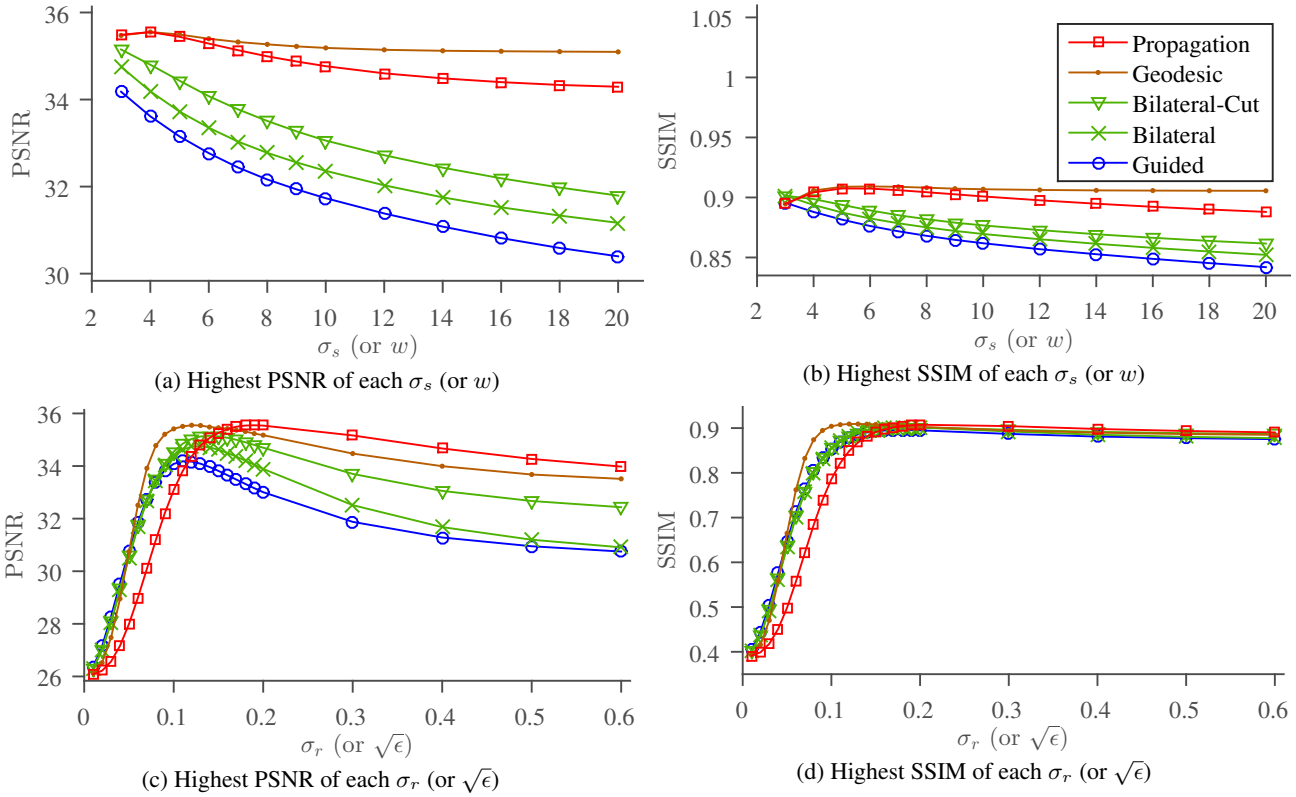


Figure 13: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/gfreeman23/11613922755.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 14: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 13 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

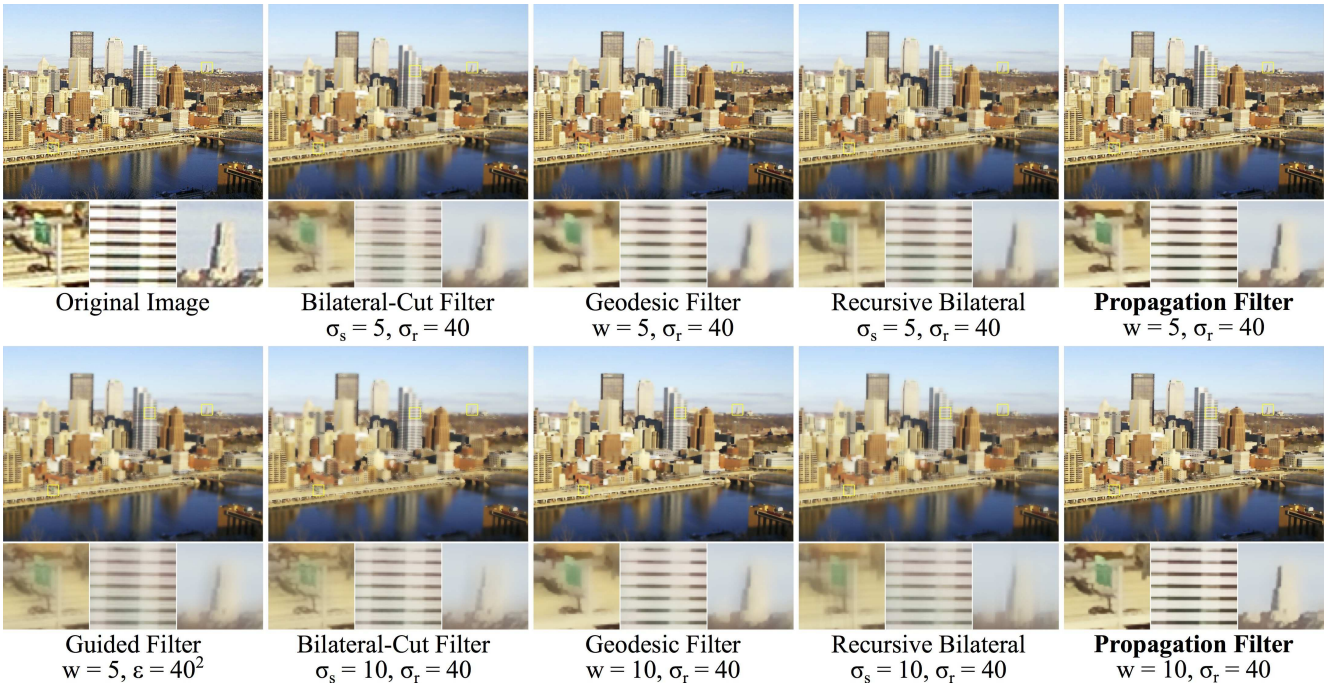
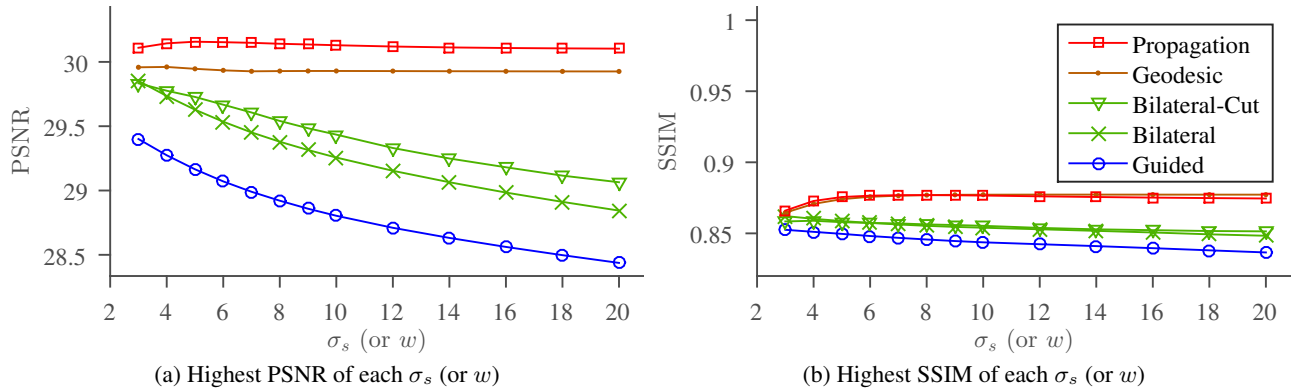
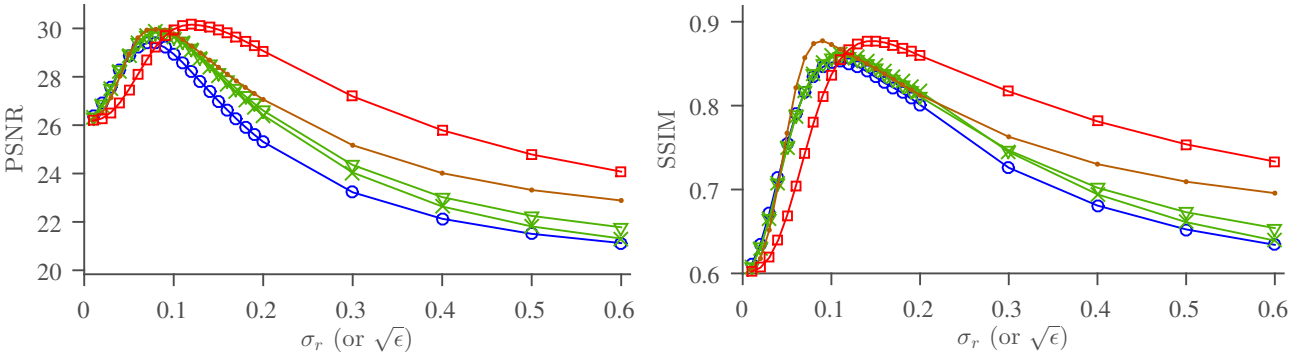


Figure 15: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/84263554@N00/4122418338.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)



(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 16: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 15 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

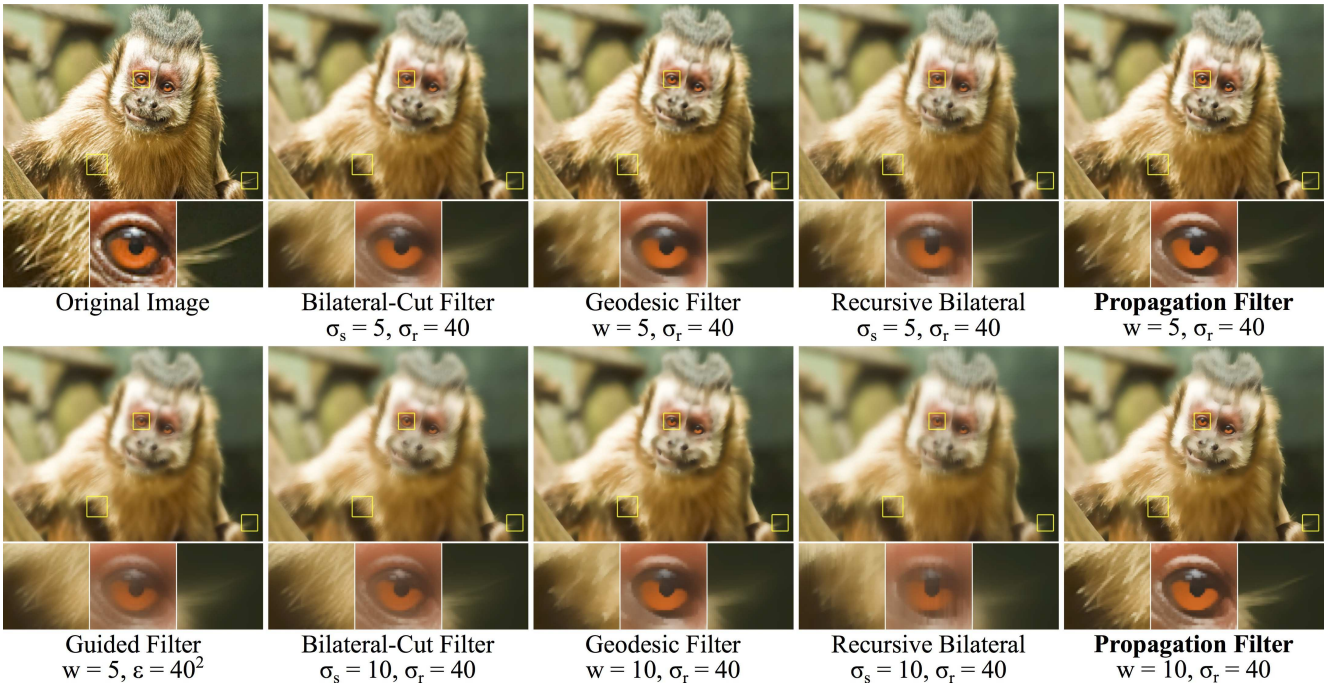
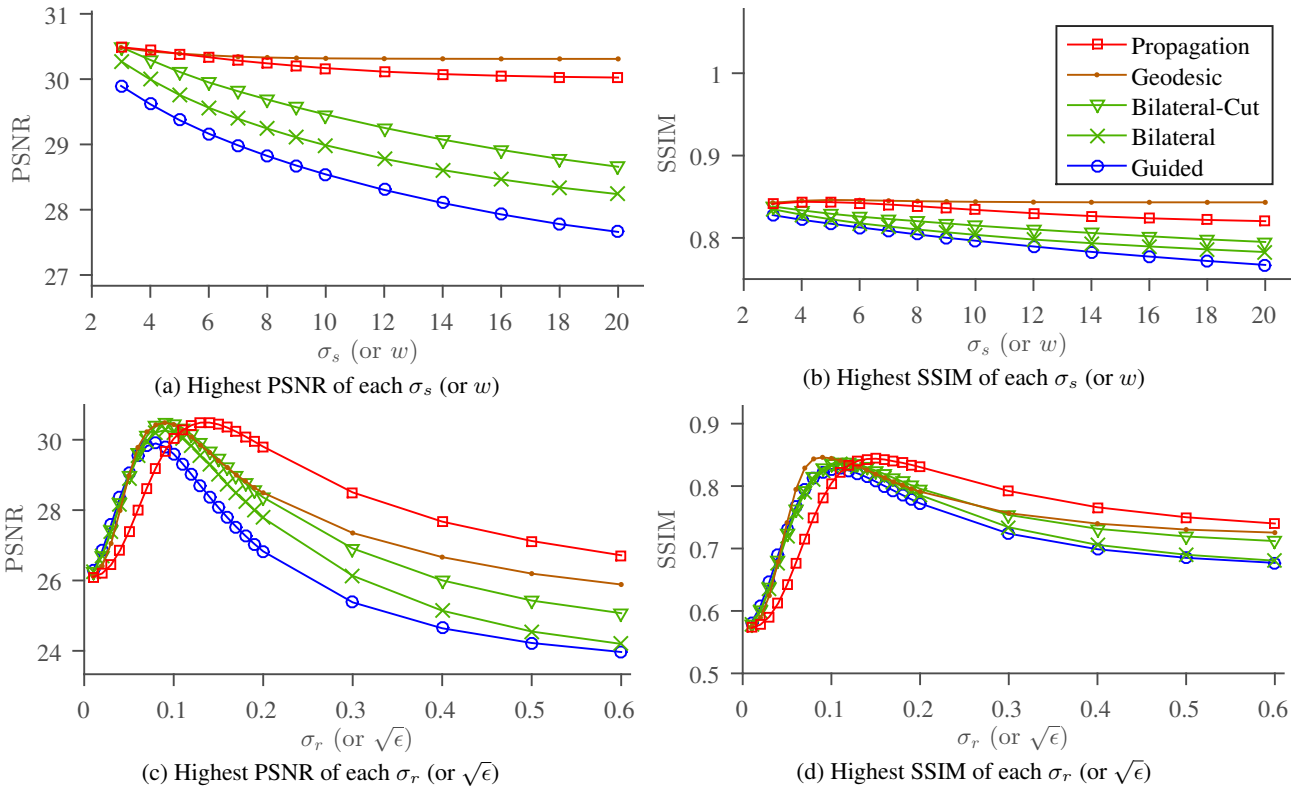


Figure 17: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/lhamadomal/4660898150.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 18: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 17 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

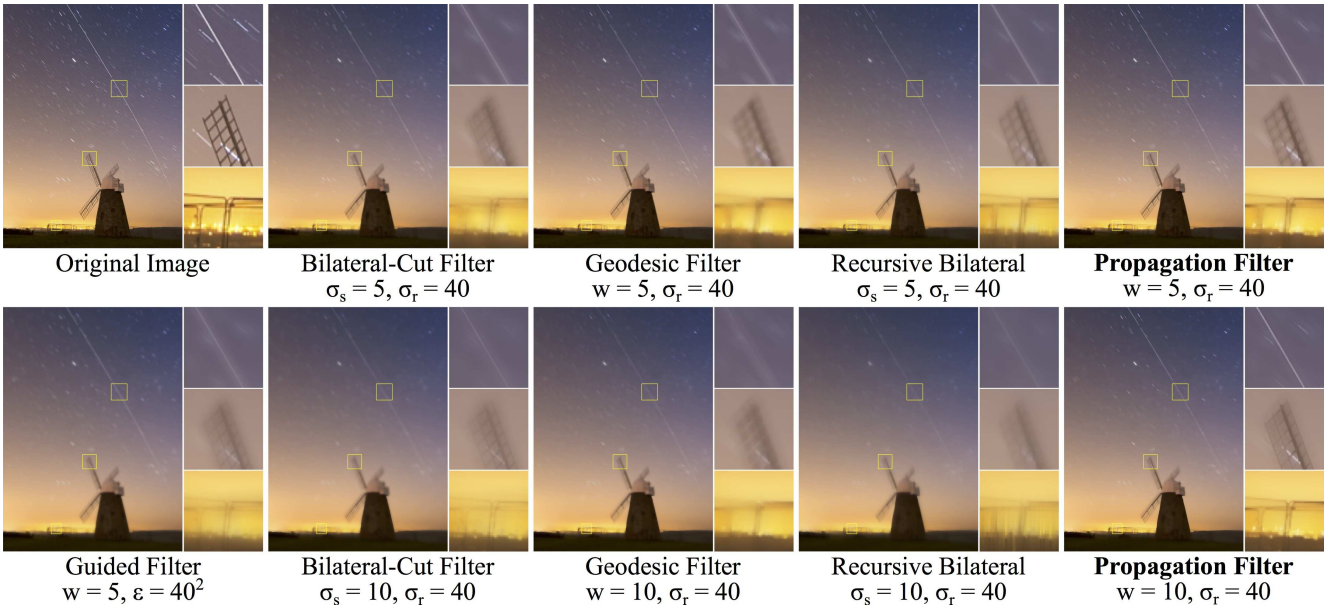
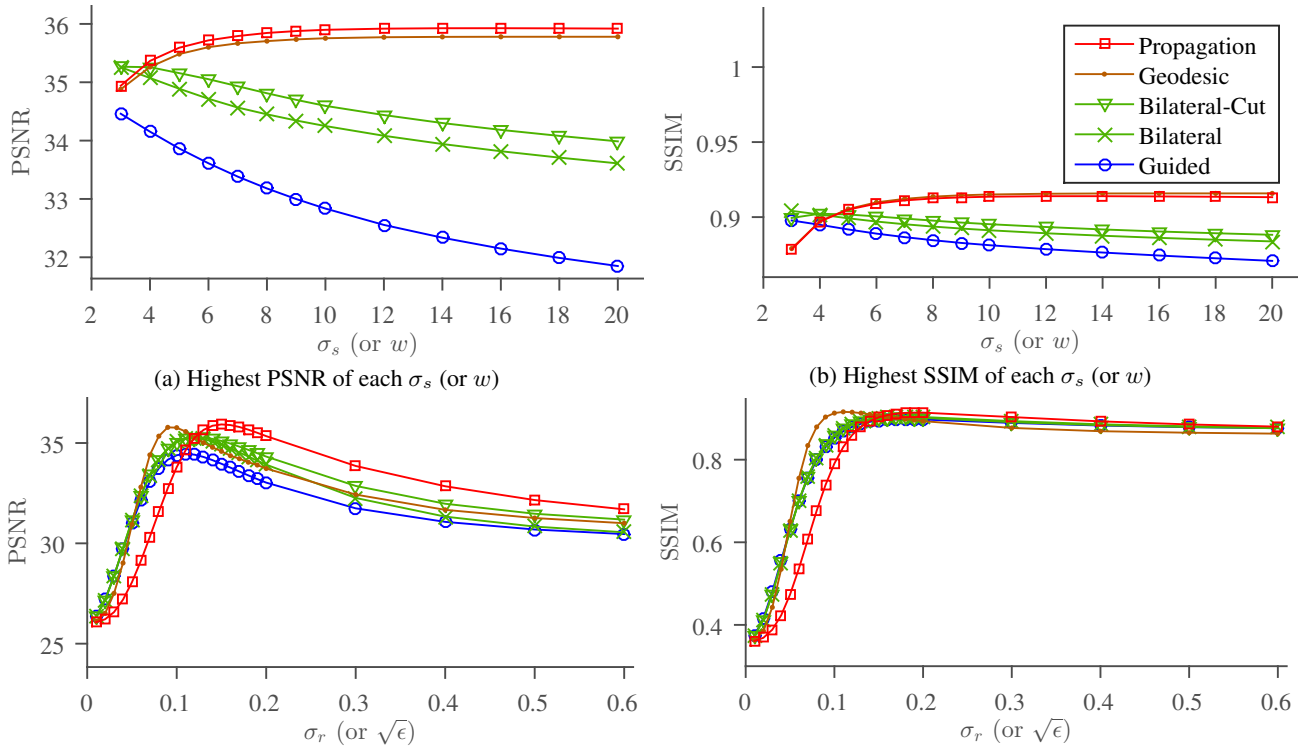


Figure 19: Examples of image smoothing. Input image is courtesy of http://www.flickr.com/photos/sagesolar/14024727914.



(a) Highest PSNR of each σ_s (or w)

(b) Highest SSIM of each σ_s (or w)

(c) Highest PSNR of each σ_r (or $\sqrt{\epsilon}$)

(d) Highest SSIM of each σ_r (or $\sqrt{\epsilon}$)

Figure 20: PSNR and SSIM comparisons for image denoising. The input image is shown in Figure 19 (grayscale). The noise is Gaussian white noise with standard deviation 0.05. (a) and (b) show the best PSNR and SSIM results for each σ_s (or w) value with the optimal σ_r (or $\sqrt{\epsilon}$), while (c) and (d) present those for each σ_r (or $\sqrt{\epsilon}$) value using the optimal σ_s (or w).

2. Flash/No-Flash Denoising

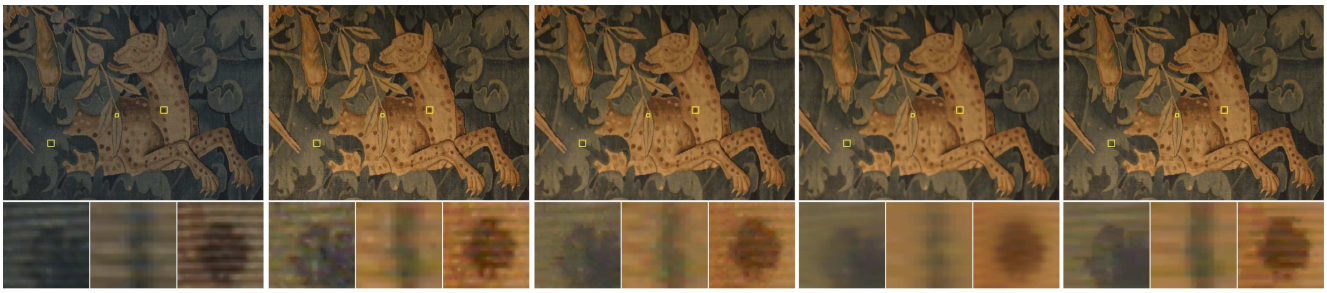


Figure 21: Examples of flash/no-flash denoising.

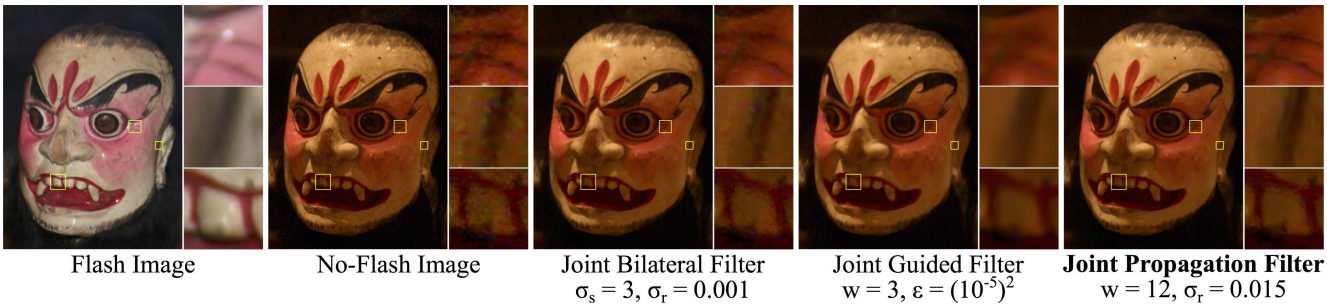


Figure 22: Examples of flash/no-flash denoising.

3. High-Dynamic-Range Compression

Figure 23: Examples of high-dynamic-range compression.