

# CS-E4850 Computer Vision

## Exercise Round 3

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### Exercise 1. Image denoising.

Run the example file `imagedenoising.m` and see the instructions in the comments of the source code. In this task you will need to denoise the two example images using

- a) Gaussian filtering.

#### Solution.

```
gflt_imns_conv2 = imns_conv2(imns_rows, imns_cols);  
gflt_imng_conv2 = imng_conv2(imng_rows, imng_cols);
```

- b) median filtering.

#### Solution.

```
medflt_imns = medfilt2(im, [5 5]);  
medflt_imng = medfilt2(im, [5 5]);
```

- c) bilateral filtering.

#### Solution.

```
i_vals = max(i-w,1):min(i+w,n(1));  
j_vals = max(j-w,1):min(j+w,n(2));  
I = A(i_vals,j_vals);  
H = exp(-(I-A(i,j)).^2/(2*sigma(2)^2));  
F = G((i_vals)-i+w+1,(j_vals)-j+w+1).*H;  
B(i,j) = sum(F(:).*I(:))/sum(F(:));
```

The filtering results are shown in the Figure 3.

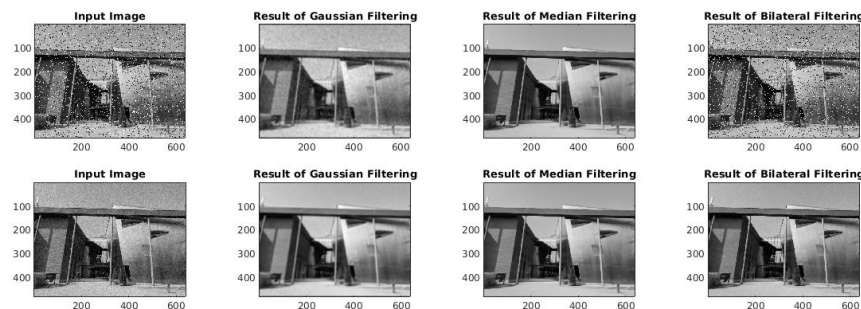


Figure 1: Filtering results with Gaussian, median and bilateral filtering.

### Exercise 2. Hybrid images.

Run the example file `hybridimage.m` and see the instructions in the comments of the source code. In this task you will need to construct a hybrid image that combines facial images of a wolf and a man. In addition, visualize the log magnitudes of the Fourier transforms of the original images and their low-pass and high-pass filtered versions (i.e. constituents of the hybrid image).

**Solution.**

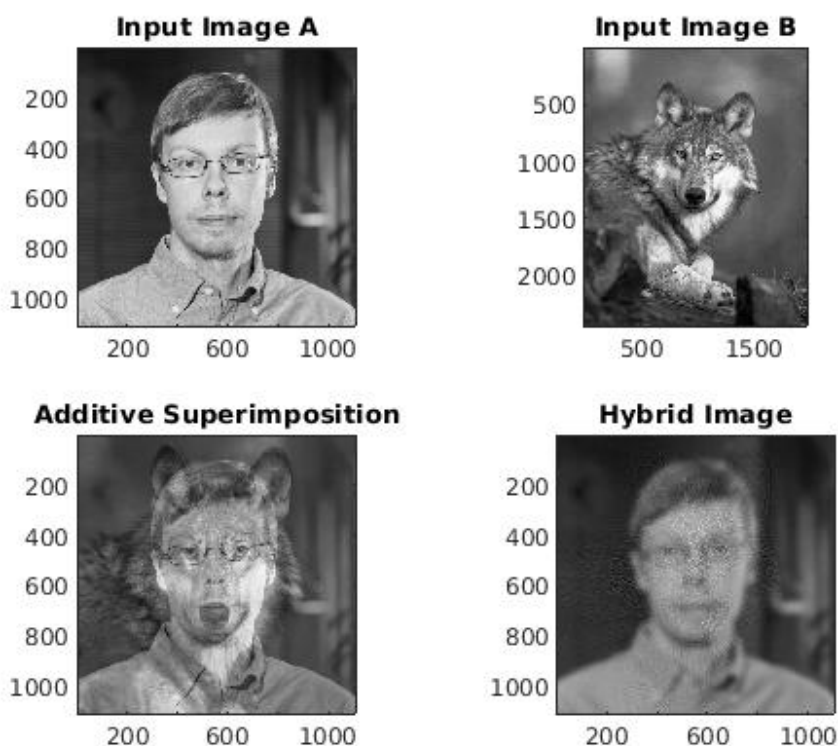


Figure 2: Superimposition filtering results.

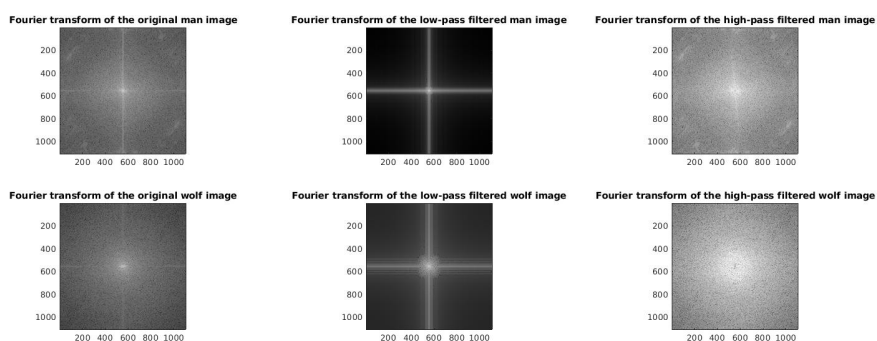


Figure 3: Fourier transforms of the different filtered images.

**Exercise 3.** Image blending via Laplacian pyramids.

Run the example file `imageblending.m` and see the instructions in the comments of the source code. The example implements Laplacian pyramid blending and blends facial images of a wolf and a man. The blending process is described in Section 3.5.5 of Szeliski's book. You need to implement the generation procedure for Gaussian and Laplacian image pyramids and the reconstruction procedure for reconstructing an image from its Laplacian pyramid.

**Solution.** Dindn't manage to solve it.