Computer Vision 1 - Assignment 2
Linear Filters: Gaussians and Derivatives

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1 1D Gaussian Filter

Our function takes the same arguments as the built-in fspecial, but it generates different output. On the one hand our function generates a vector of size $kernelLength$. On the other hand, the fspecial function returns a rectangular or squared matrix dependant on the hsize parameter.

2 Convolving an image with a 2D Gaussian

We use a value of $\sigma_x = 2$ and $\sigma_y = 2$ and a kernel length of 11. First we call the gaussian function defined in the prefious section to get a 1D filter. We multiply this 1D vector by its traspose to get a 2D gaussian filter.

To convolve the images and filters we use the built-it function $conv2$: After testing the different options we found out the following:

- "full": performs the full convolution. Visually, we note that the produced images have black frames on the edges since the dimensions are slightly larger than the original image.
- "valid": performs convolution but omits padding
- "same": performs the convolution and returns an image that is the same size as the original.

In order to check that both functions produce the same images we make a pixel per pixel comparison. We check that the absolute value of the difference among the values is less that a small value ϵ. Hereby we show the original and filtered images:

Figure 1: Original image

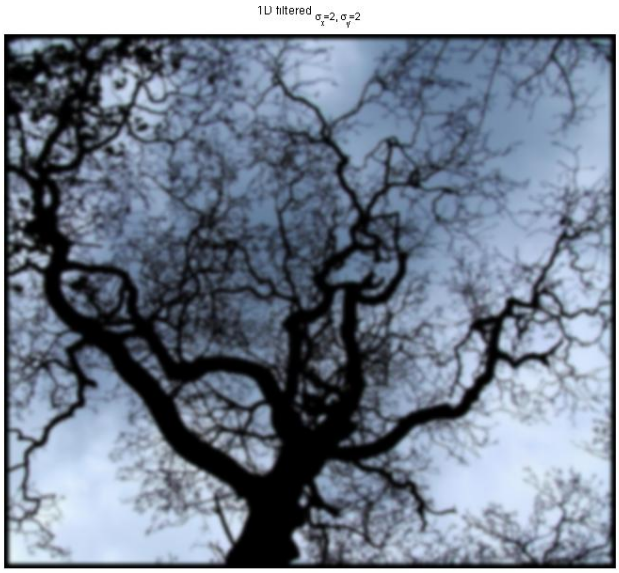

Figure 2: 1D convoluted image

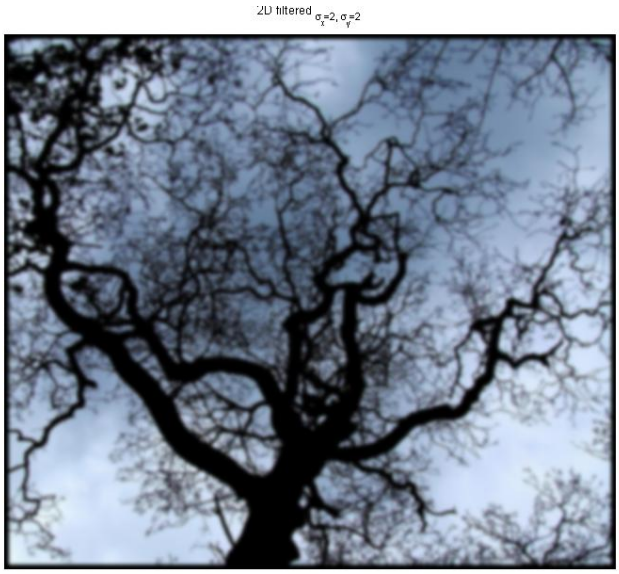

Figure 3: 2D convoluted image

3 Gaussian Derivative