LAB-9

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EE20S049

In this experiment, we will implement non-local means (NLM) filtering algorithm for the application of denoising. You are given a noisy image, g (krishna 0 001.png), corresponding to a latent image, f (krishna.png), corrupted with additive Gaussian noise of mean 0 and variance 0.001. Your task is to apply NLM filtering on g following the steps in the given pseudocode to arrive at the denoised image, ˆf. The parameters of the algorithm are the search neighbourhood radius W , the similarity neighbourhood radius Wsim and the filter parameter σNLM . A radius of W at a pixel denotes a window size of (2W + 1) × (2W + 1) around that pixel. The same applies to Wsim.

 Q1. Show plots between the PSNR between f and ˆf (y-axis) for different NLM filter parameter values σNLM = 0.1 to 0.5 in steps of 0.1 (x-axis) for the following search radius and similarity radius settings: (a) W = 3, Wsim = 3, (b) W = 5, Wsim = 3. Show two plots in the same window with two different colours corresponding to (a) and (b). Compare the PSNR plots with the baseline PSNR between the noisy image g and the latent image f.
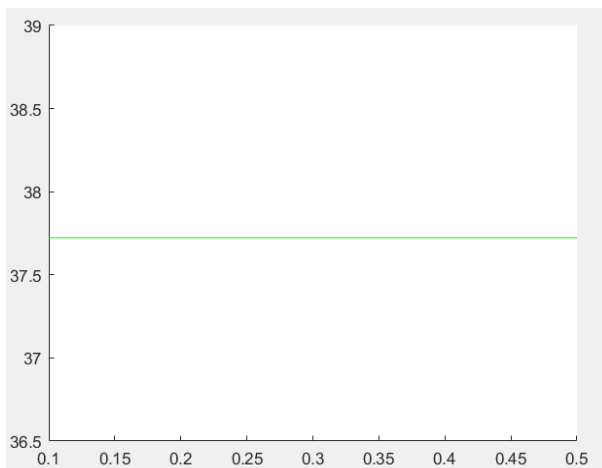
**Q2. We will now compare NLM filtering with the traditional Gaussian filtering. Denoise g using space-invariant Gaussian filter with σg = 0.1 to 0.5 in steps of 0.1 having a kernel window size of 7 × 7 for all σg values. Calculate the PSNR between the denoised images and f. Add this plot to the plot window in Q1. For the following filtering settings: (a) W = 5, Wsim = 3, σNLM = 0.5 for the NLM filtering, and (b) σg = 1.0 for Gaussian filtering, and at the following pixel locations p: (i) row = 31, column = 46, and (ii) row = 38, column = 58, (total four combinations), do Q3 and Q4.**
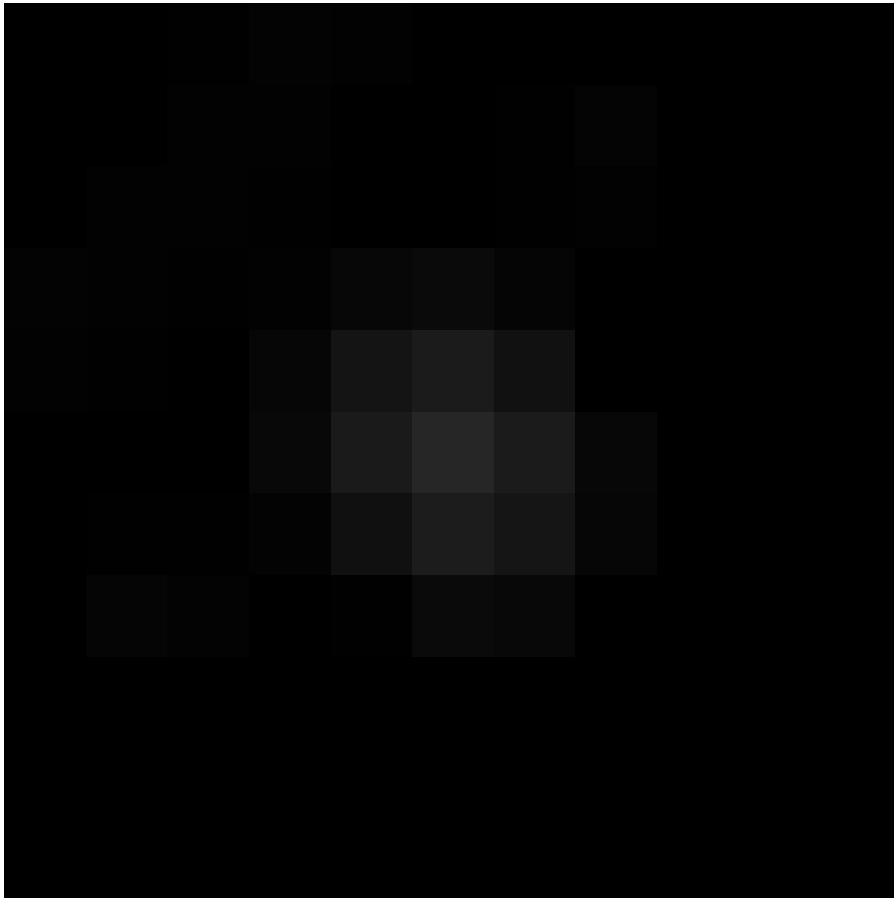
Plot:

Red:NLM

Blue:Gaussian
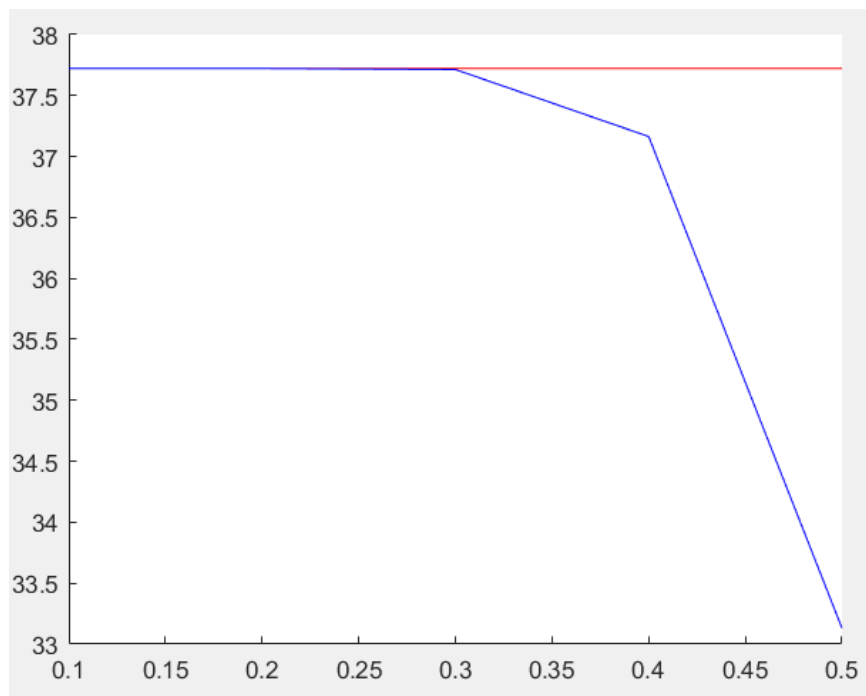
Q3. Show the 11 11 filter (kernel) as an image.

Q4. Show the 11 11 image patch from the noisy image and the denoised images.

Noisy	NLM Denoised	Gaussian Denoised