DMET 901 – Computer Vision

Assignment #3

(Due on January 12 at mid-night)
This assignment can be done in teams of maximum 2 students – Please include
a text files with your names and IDs in the submission.

Implement a function to apply a 3 x 3 weighted median filter to a gray-scale image. You should use the weights matrix given by

$$W = \begin{bmatrix} 1 & 3 & 1 \\ 3 & 5 & 3 \\ 1 & 3 & 1 \end{bmatrix}$$

where each entry in W indicates the number of times the intensity of the corresponding pixel should be repeated when computing the median. For example, consider the image given below where the pixel of interest is in the third row and fourth column (pixel with intensity 5)

$$I = \begin{bmatrix} 4 & 0 & 3 & 2 & 1 \\ 0 & 1 & 3 & 2 & 3 \\ 2 & 1 & 4 & 5 & 4 \\ 3 & 3 & 7 & 8 & 9 \end{bmatrix}$$

Applying the weighted median filter to replace this pixel starts first by forming a vector V that contains the intensities in the 3 x 3 window around the pixel, where each intensity is repeated a number of times equal to the corresponding value in W. For this pixel:

$V = [3\ 2\ 2\ 2\ 3\ 4\ 4\ 4\ 5\ 5\ 5\ 5\ 5\ 4\ 4\ 4\ 7\ 8\ 8\ 8\ 9]$

Sorted $V = [2\ 2\ 2\ 3\ 3\ 4\ 4\ 4\ 4\ 4\ 4\ 5\ 5\ 5\ 5\ 5\ 7\ 8\ 8\ 8\ 9]$

Based on this, the median value of Sorted V is 4. Therefore, the intensity of the considered pixel after filtering should be 4.

Your function should take the noisy image as an input and should output the image after filtering. Apply your function to the provided image "BarCode2.jpg".

Deliverables:

- Your code.
- The output image after filtering using the weighted median filter above. Name the image "BarCodeWeightedMedian.jpg".
- The output image after filtering using the regular median filter (not weighted). Name the image "BarCodeMedian.jpg".
- Comment on the output of the weighted median filter compared to that of the original median filter. Which one is better? And why?

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General guidelines:

- Submission will be on the MET website. Submit a .zip file containing your code (for example, notebook) and a text file containing the names, IDs and tutorial numbers of group members.
- Assignment will be done in groups of maximum (2) students. **The students must be from groups of the same TA**
- Predefined libraries and functions are not allowed with the exception of those mentioned in tutorial 1 on CMS
- Late submissions will not be considered
- Plagiarism and cheating are absolutely prohibited