CSE/ECE 344/544 **Assignment-1**
Computer Vision (CV) **Total Marks: 220**

Question 1: For image_1, perform average filtering with kernel size as 3x3, 5x5, 11x11, and 15x15. What is the effect of increasing the kernel size on the average filtering operation? **[20 marks]**

Question 2: For image_2,

(a) Add salt and pepper noise as:
  (i) 10% of all pixels
  (ii) 20% of all pixels

(b) Perform median filtering with kernel size as 3x3, 5x5, 11x11. What is the effect of increasing the kernel size on the median filtering operation? **[20 marks]**

Question 3: For image_3, perform Gaussian filtering with kernel size as 3x3, 5x5, 11x11, and 15x15. What is the effect of increasing the kernel size on the Gaussian filtering operation? For one of the filters, vary the σ parameter and show its effect. **[20 marks]**

Question 4: For image_3, generate a 3 level Gaussian and Laplacian pyramid. Choose an appropriate kernel size. **[30 marks]**

Question 5: For questions 1-3, perform the task using in-built function (for the largest sized kernel). Let the output from in-built function be B and the output for self-implemented be A. Compare your results A with the output B by performing: (A-B). Explain the difference, if there is any! **[30 marks]**

Question 6: Let image_3 be I. Perform the following operation to image I:

$$I' = I + SP + L(I),$$

where, SP is salt and pepper noise while L(I) signifies the Laplacian filtering output of I. Perform wavelet decomposition using either of the following wavelet filters:

(a) Haar
(b) db 9/7

and, remove the high frequency components to obtain a smooth image in spatial domain.
[30 marks]

Question 7: Perform watermarking for image_3 using discrete wavelet transformation.
[20 marks]

[VIVA+Report: 25+25]

Submission Policy and Requirements

1. This is a graded assignment.
2. Apart from Questions 5-7, each task needs to be implemented from scratch. You may still use in-built functions to load and display the images.
3. Recommended programming languages: python+opencv.