

## Assignment 2

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**Deadline: Tuesday, March 7, 2023 (end of day)**

### Objective

In the previous assignment, you wrote a program to up-scale an image. In this assignment, you will evaluate qualitatively and quantitatively your up-scaling algorithm.

### Task: Evaluate your Up-scaling algorithm

- (a) In ILIAS you will find a folder with images at the original size from which you got a down-scale version. Do you observe difference between the two versions? If yes, comment them showing some zooming view.
- (b) To evaluate the quality of your algorithm, we ask you first to write your own algorithm to subtract two images. And then, applied it on the original image and your own up-scaling image version. Provide an output image. What do you observe?
- (c) To evaluate quantitatively your algorithm, use the Signal Noise Ratio. Write a function to calculate the Signal Noise Ratio (SNR), using the formula below. Comment the result.

$$\text{SNR} = 10\log_{10}(P_{\text{signal}}/P_{\text{noise}})$$

where:

- $P_{\text{signal}}$  is the mean pixel value original image:  $P_{\text{signal}} = \frac{\sum_{M,N} I_1(m,n)}{M*N}$
- $P_{\text{noise}}$  is the standard deviation, i.e. the root of the mean squared difference between the original image and your own image:  $P_{\text{noise}} = \sqrt{\frac{\sum_{M,N} [I_1(m,n) - I_2(m,n)]^2}{M*N}}$

and  $I_1$  = original image,  $I_2$  = your up-scaling image, M and N are the number of rows and columns, m and n are the index of a row and a column.

- (d) Optional task: can you improve your up-scaling algorithm? Compare the result with the original image and your previous results.

### Hand-in

Submit on ILIAS:

- A text file, with your name, github link and the response of questions a), b), c), (d)).
- The subtraction of the original image and your up-scaling version.

If you have any questions you can contact us.