Assignment: Image Restoration
Deadline: 12/05/2023

In this assignment, you will compare image restoration techniques for reducing the noise in corrupted images. Given a grayscale-level image I corrupted with noise N:

1. You will characterize the type of noise affecting the image (i.e., Gaussian, Salt-and-Pepper, Uniform)
2. You will devise a sequence of image processing steps you feel are appropriate to reduce the image noise;
3. You will use a MRF to denoise the image.

To solve **task 1)**, you may want to analyze the histogram of gray levels in constant areas of the image and infer the type of noise. Please, motivate your intuitions and estimate the noise parameters.

To solve **task 2)**, you may select a spatial filtering you believe may be more appropriate or implement an adaptive filter. Please, motivate your implementation choices.

To solve **task 3)**, you will adapt the iterated conditional modes (ICM) algorithm to train a MRF and recover the denoised grayscale image.

Expected Results:

You will have to prepare a Jupiter notebook to solve each of the above tasks. The code must be properly commented, and implementation details clearly stated.

With this assignment, a set of 10 corrupted images and the corresponding original images are provided.

For each corrupted image you will have to solve each of the above task. To compare the effectiveness of your solutions, you will estimate the MSE (mean squared error) and PSNR (Peak signal-to-noise ratio) of the following pairs of images: (uncorrupted original image, corrupted image), and (denoised image, corrupted image). You will compare these metrics for both the techniques.

The assignment must be developed in groups of four-five students where 2-3 students are from UB and the others are from Unipa. The students will submit a zip file (including also all data used to develop and test their methods) via email by **May 12, 2023.**