**Homework 1**

**Digital Halftoning**

The objective of this assignment is to understand and implement the concept of digital halftoning to enhance the application of image rasterization.

You will need to apply both the Ordered Dithering and Error Diffusion algorithms to the same grayscale image, implement them in Python, and document any observations in your report (e.g., the effects of using different sizes of Error kernels, etc.).

In this assignment, the ordered dithering matrix(Bayer matrix) will be provided, and the dithering matrix can be expanded based on requirements. The threshold values need to be calculated by everyone and placed into the matrix. You can use images provided by TA, or you can use your own images

Bonus: Implementing any digital halftoning algorithms mentioned in the course (such as DBS, Dot Diffusion, etc.) will provide additional credit.

The report must contain the following(Submit the PDF)：  
1. Screenshots：Display the original image, the image after orderly dithering, and the image after error diffusion

2. Explain：Your method (if you have other try) with experiment or you can also calculate HPSNR as experimental comparison

3. Discussion：interesting finding, difficulties you encountered, insights you observe