DMET 1001 – Image Processing

Assignment #1
(Due on 9th of April @11:59 PM)

The main aim of this assignment is to experiment with various Morphological operator applications applied to grayscale images. As discussed in class, Morphological operators can be utilized with binary images, achieving various results. Hence, the aim of this assignment is to evaluate the performance of such operators in the grayscale domain. Therefore, tests will be performed for Morphological operators on grayscale images with and without applying a threshold (using a **pre-defined** thresholding function e.g. Otsu). Accordingly, the following functions are required to be implemented (as discussed in class):

1. Dilation
2. Erosion.
3. Opening.
4. Closing.

The following requirements are to be fulfilled:

1. There is a separate function for each operation.
2. Each function takes both the image and the structuring elements set as input.
3. The same function is applicable for both binary and grayscale images.
4. For dilation, the maximum value of the pixels selected by the structuring elements set is taken as the output per pixel.
5. For erosion, the minimum value of the pixels selected by the structuring elements set is taken as the output per pixel.
6. Each function returns an image equal in dimensions to the input.

7. You are **NOT allowed** to use any of the morphological operation pre-defined functions.

The following test scenarios are to be applied (on both binary and grayscale):

1. Dilation.
2. Erosion.
3. Opening.
4. Closing.
5. Absolute subtraction of Dilation and Erosion.

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6. Absolute subtraction of Opening and Closing.
7. Absolute subtraction of Opening and Dilation.
8. Absolute subtraction of Opening and Erosion.
9. Absolute subtraction of Closing and Dilation.
10. Absolute subtraction of Closing and Erosion.

Guidelines:

- This assignment should be done **<u>individually</u>** or in a **<u>team of 2.</u>** All work done in this assignment must be done by your hands and your hands only. This means that copying code from other teams or ChatGPT is not allowed. A cheating detector will be used to confirm that.
- You should submit **a .ZIP file** to the course email containing the following items:
    - A .ipynb file containing your assignment's implementation (the notebook should be submitted showing the cells being ran before and representing the output).
    - A .txt file with the team members' names, IDs and tutorial group.

    - The .zip file should have the following format:
      [Assignment_1]_[IDNumber1]_[IDNumber2] (e.g
      Assignment_1_49-12345_49-6789)

- Please use the following link to submit your **.zip** file:
  https://forms.gle/NcB19c4bhub7aHgN6