

Consider the Handwritten Digits Data Set

<https://archive.ics.uci.edu/ml/datasets/Optical+Recognition+of+Handwritten+Digits>

[https://scikit-](https://scikit-learn.org/stable/modules/generated/sklearn.datasets.load_digits.html#sklearn.datasets.load_digits)

[learn.org/stable/modules/generated/sklearn.datasets.load_digits.html#sklearn.datasets.load_digits](https://scikit-learn.org/stable/modules/generated/sklearn.datasets.load_digits.html#sklearn.datasets.load_digits)

Develop four Python Functions, according the specification below.

All of them will take as input two images $I_1(x, y)$, $I_2(x, y)$ from the above dataset, where x , y represent the two indices (column, row) to access the image array. N_x and N_y are the number of columns and rows respectively.

- a) The 1st function will return as outcome the following mathematical formula:

$$\max_y \left\{ \max_x \{ |I_1(x, y) - I_2(x, y)| \} \right\}$$

- b) The 2nd function will return as outcome the following mathematical formula:

$$\frac{1}{N_y} \sum_y \left\{ \frac{1}{N_x} \sum_x \{ |I_1(x, y) - I_2(x, y)| \} \right\}$$

- c) The 3rd function will return as outcome the following mathematical formula:

$$\frac{1}{N_y} \sum_y \left\{ \max_x \{ |I_1(x, y) - I_2(x, y)| \} \right\}$$

- d) The 4th function will return as outcome the following mathematical formula:

$$\max_x \left\{ \frac{1}{N_x} \sum_x \{ |I_1(x, y) - I_2(x, y)| \} \right\}$$