**Image Processing Task: Applying filter in image using Matrix Multiplication**

Imagine you are working on an image editing application, and you have been assigned the task of applying a filter to an image. You have a grayscale image represented as a matrix(‘I’), where each entry corresponds to the intensity of a pixel. Let’s say

I = [ [120, 125, 130] ,

[110, 115, 120] ,

[100, 105, 110] ]

Matrix 'I' represents the original grayscale image, and matrix 'F' represents the filter kernel or mask, which specifies the coefficients used to calculate the new intensity values for each pixel.

F = [ [0.25, 0.5, 0.25],

[0.5, 1.0, 0.5] ,

[0.25, 0.5, 0.25] ]

To apply the filter to the image, you need to perform matrix multiplication between the image matrix 'I' and the filter matrix 'F'. This will help you convolve the filter over the image and obtain the filtered output.

Your task is to write a function matrix\_multiply() that takes in two parameters which are matrices 'I' and 'F' as input and outputs the filtered image matrix .

Therefore the filter image should have the following values:

Result = [ [121.25, 124.375, 127.5] ,

[114.375, 117.5, 120.625],

[107.5, 110.625, 113.75] ]

**Matrix Multiplication Explanation:**

Matrices are multiplied with a row of one with a column of another matrix. Let’s say we have two matrices which are:-

Matrix A = [a11, a12, a13] Matrix B = [b11, b12, b13]

[a21, a22, a23] [b21, b22, b23]

[a31, a32, a33] [b31, b32, b33]

To multiply these matrices and obtain the resulting matrix C, follow these steps:

**Step 1:** Identify the dimensions

Matrix A is a 3x3 matrix, meaning it has 3 rows and 3 columns. Matrix B is also a 3x3 matrix. Since the number of columns in Matrix A is equal to the number of rows in Matrix B, multiplication is possible.

**Step 2:** Set up the resulting matrix

Matrix C will also be a 3x3 matrix, just like the input matrices. Initialize Matrix C with zeros or an empty matrix. For our case matrix C will be our ‘result’ matrix in the driver code

**Step 3:** Perform element-wise multiplication and summation

To calculate each element of Matrix C, follow these steps for each position (i, j) in C:

* Take the i-th row of Matrix A and the j-th column of Matrix B.
* Multiply the corresponding elements and sum them up.
* Assign the result to position (i, j) in Matrix C.

For example, let's calculate C[1,1]:

C[1,1] = a11 \* b11 + a12 \* b21 + a13 \* b31

Similarly, calculate C[1,2]:

C[1,2] = a11 \* b12 + a12 \* b22 + a13 \* b32

Continue this process for all positions (i, j) in Matrix C.