Assignment 7

Q1..You are working as a data scientist developing a computer vision model to detect edges in grayscale images. One of the key steps involves applying convolution to extract important features from the image.

A segment of the image is represented by the following 5x6 matrix of pixel intensity values:

252 251 246 207 90 41

250 242 236 144 41 43

252 244 228 102 43 52

250 243 214 59 52 54

248 243 201 44 54 60

You have designed a 3x3 filter (kernel) to highlight specific patterns in the image. The kernel is given by:

diff

1 2 3

-4 7 4

2 -5 1

**Task:**

Perform the convolution operation by sliding the kernel over the input matrix with stride 1 and max pooling.

**Q2. Scenario: Multichannel Convolution Operation**

**Background:**

You are tasked with developing a feature extraction module for a computer vision application. The goal is to apply convolution operations using multiple kernels over an input image matrix, simulating how convolutional neural networks (CNNs) handle multi-channel data.

**Input:**

A 5x5 matrix representing the pixel intensities of an image:

| 1 | 2 | 3 | 4 | 5 |

| 6 | 7 | 8 | 9 | 10 |

| 11 | 12 | 13 | 14 | 15 |

| 16 | 17 | 18 | 19 | 20 |

| 21 | 22 | 23 | 24 | 25 |

**Kernels:**

Two 3x3 kernels will be applied to perform the convolution.

**Kernel 1:**

| 0.1 | 0.2 | 0.3 |

| 0.1 | 0.2 | 0.3 |

| 0.1 | 0.2 | 0.3 |

**Kernel 2:**

| -0.1 | -0.1 | -0.1 |

| 0.1 | 0.1 | 0.1 |

| 0.0 | 0.0 | 0.0 |

**Task:**

Perform the convolution operation using both kernels over the input matrix by sliding the kernel over the input matrix with stride 1 and max pooling.

After convolution, flatten the resulting feature maps to generate a single output vector.