Q1 Let

*A* =

5 8 3 4 6 2 3 7

3 2 1 1 9 5 1 0

0 9 5 3 0 4 8 3

4 2 7 2 1 9 0 6

9 7 9 8 0 4 2 4

5 2 1 8 4 1 0 9

1 8 5 4 9 2 3 8

3 7 1 2 3 4 4 6

and

*B* =

2 1 0

1 1 −1

0 −1 −2

Calculate the convoluation *A* ∗ *B?*

Q2: Convolution

Please show 2D convolution, on the below data.

Data =

255 255 255

127 127 127

1 1 1

When the kernel is as shown below

Kernel =

1/9 1/9 1/9

1/9 1/9 1/9

1/9 1/9 1/9.

Note that the step-by-step calculation is required. If only the answer is given, you will get the maximum of only 5 points.

Question 3: Transformation

Perform 45 degree counter clockwise rotation on the below image(data).

Image =

255 255 255

127 127 127

1 1 1

Question 4: Write the tensorflow code on Lenet

Question 5:

Calculate the total precision, recall, and accuracy (F1 score) of this helmet detection system:

|  |  |  |
| --- | --- | --- |
|  | Actual | Prediction |
| Wearing helmet | 200 | 190 |
| Not wearing helmet | 149 | 115 |

Question 6:

Please compute the feed forward and back propagation. We assume that all node apply non-linear RELU functions and step function alpha is 1

0.1

0.2

0.1

0.4

0.2

1

0.3

0.4

-0.3

0.2

0.3

0.1

-0.3

1

0.2

Assume that the actual output is 1, calculate the backward propagation to modify all the weight values (20 points).