Worksheet 2 (DLFA)

Instructions

- Exam Time:10:00 AM to 10:55 AM
- Total Questions: 30
- Marks per question: 1
- Total Marks: 30
- **Weightage of marks in final evaluation : 1/3 (30 marks will be rescaled to 10 marks for grade calculations)**
- ALL QUESTIONS ARE MANDATORY.
- No negative marks.
- **The exam portal will be closed at 11:00 AM.**

Best of luck.!!!!

1

Consider a 3-channel input being provided to a 2D convolutional layer:

$$X[0;:;:]=\begin{bmatrix}2&1&0&3&2\\2&3&1&0&2\\1&0&1&1&0\\2&0&2&2&2\\3&2&1&0&2\end{bmatrix}\quad X[1;:;:]=\begin{bmatrix}1&0&1&1&0\\2&0&2&2&0\\3&0&3&3&0\\3&2&1&2&3\\1&2&3&2&1\end{bmatrix}\quad X[2;:;:]=\begin{bmatrix}1&2&3\\0&1&2\\3&0&1\\2&0&3\\1&0&1\end{bmatrix}$$

The convolutional kernel used is:

$$H[0;:;:]=\begin{bmatrix}1&0&1\\0&1&0\\1&0&1\end{bmatrix}\quad H[1;:;:]=\begin{bmatrix}0&1&0\\1&0&1\\0&1&0\end{bmatrix}\quad H[2;:;:]=\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$$

The bias is -5. Compute the output and fill the blanks appropriately (3)

$$\begin{bmatrix}y_{11}&y_{12}&y_{13}\\y_{21}&y_{22}&y_{23}\\y_{31}&y_{32}&y_{33}\end{bmatrix}$$

.

2

Y11 *
(1 Point)

9

3

Y12 *
(1 Point)

11

4

Y13 *
(1 Point)

11

5

Y21 *
(1 Point)

13

6

Y22 *
(1 Point)

9

7

Y23 *
(1 Point)

14

8

Y31 *
(1 Point)

11

9

Y32 *
(1 Point)

14

10

Y33 *
(1 Point)

11

11

$$\begin{bmatrix} m_1 & m_2 \\ m_3 & m_4 \end{bmatrix}$$

Q2: Consider the convolutional layer provided in the previous question. On the output obtained, a max pooling operation is performed with a kernel of size 2x2 and a stride of 1. Fill the below blanks appropriately to indicate the output

.

12

m1 *
(1.5 Points)

13

13

m2 *
(1.5 Points)

14

14

m3 *
(1.5 Points)

14

15

m4 *
(1.5 Points)

14

16

Q3: Consider a 1 channel input as mentioned below:

$$\begin{bmatrix} 1 & 2 & 3 & 2 & 0 \\ 3 & 1 & 2 & 0 & 3 \\ 2 & 0 & 1 & 0 & 2 \\ 3 & 0 & 2 & 1 & 0 \\ 0 & 3 & 3 & 2 & 1 \end{bmatrix}$$

which is operated with a 2D vector convolution using the kernel below

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

We consider the neuron to operate with a bias of 10. Compute the vector convoluted ou orientation pooling, considering Θ = 0,90,180,270 in clockwise direction and fill the belo appropriately. In case of a tie consider the angle corresponding to the lowest Θ. (3).

$$\begin{bmatrix} v_{11} & v_{12} & v_{13} \\ v_{21} & v_{22} & v_{23} \\ v_{31} & v_{32} & v_{33} \end{bmatrix}$$ where each $v_{ij} = \{value, angle$

.

17

V11 *
(1 Point)

{22,270}

18

V12 *
(1 Point)

{17,180}

19

V13 *
(1 Point)

{20,0}

20

V21 *
(1 Point)

{19,270}

21

V22 *
(1 Point)

{16,0}

22

V23 *
(1 Point)

{19,90}

23

V31 *
(1 Point)

{21,180}

24

V32 *
(1 Point)

{17,0}

25

V33 *
(1 Point)

{19,90}

26

Q4: On the output of 2D vector convolution obtained earlier, perform a spatial pooling operation with a kernel of size 2x2 and stride of 1. Fill the blanks appropriately to indicate the output.

$$\begin{bmatrix} n_1 & n_2 \\ n_3 & n_4 \end{bmatrix} \quad \text{where each } n_i = \{value, a$$

.

27

n1 *
(1.5 Points)

{22,270}

28

n2 *
(1.5 Points)

{20,0}

29

n3 *
(1.5 Points)

{21,180}

30

n4 *
(1.5 Points)

{19,90}