Exercise 4
Deep Learning

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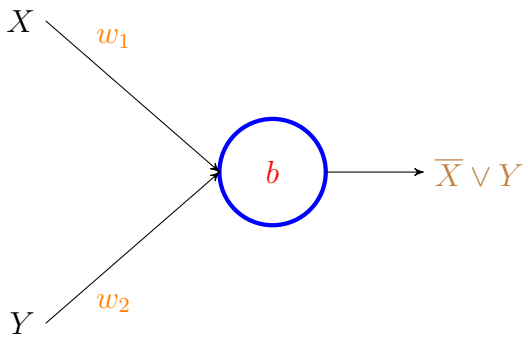
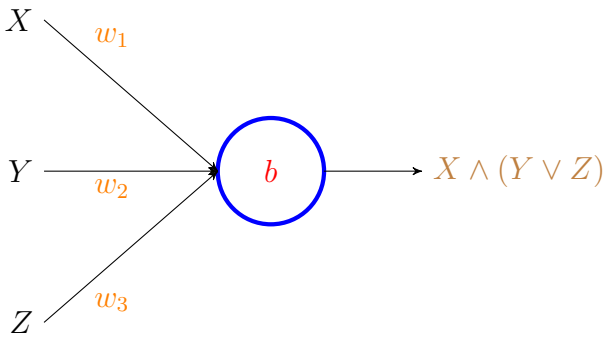
Deadline: 19-June-2021

1. What is the Boolean gate for the $\overline{X} \vee Y$, i.e., find weights w_1, w_2 and bias b such that the following gate model $\overline{X} \vee Y$,



$$\overline{X} \vee Y = \begin{cases} 1 & \text{if } w_1 X + w_2 Y \geq b \\ 0 & \text{else} \end{cases}$$

2. What is the Boolean gate for the $X \wedge (Y \vee Z)$, i.e., find weights w_1, w_2, w_3 and bias b such that the following gate model $X \wedge (Y \vee Z)$,



$$X \wedge (Y \vee Z) = \begin{cases} 1 & \text{if } w_1X + w_2Y + w_3Z \geq b \\ 0 & \text{else} \end{cases}$$

3. You have been asked to design an image processing system that opens a gate when at least seven people are present in front of the gate. Your system can recognize maximum 50 people's faces with high accuracy. The main part of the system which is a Boolean gate will decide are there at least seven people in front of the gate? Complete the code below by fill in proper values for w and b to achieve this goal. Note that $gate(x)$ has to return 1 for the given x which represents the presence of people in front of the gate.

```
import numpy as np
```

```
def gate(x):
    w=None
    b=None
    if np.dot(x,w)>=b:
        return 1
    else:
        return 0
```

```
x=np.array([0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1,
       0, 1, 1, 1, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1, 0, 1,
       0, 1, 1, 0, 1, 1])
```