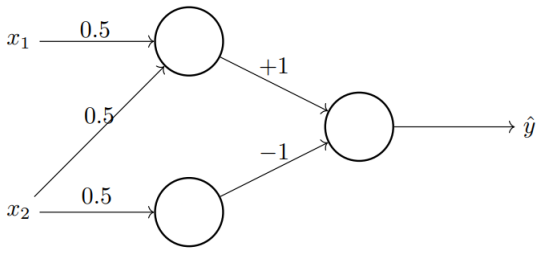
Exercise 1. *Consider the next Neural Network illustrated in the Figure below,*



and assume that our input data is $x = (1, 2)$ *and the target is* $y = 1$.

1. *Perform the forward phase.*
2. *Suppose that learn rate* $\eta = 1$. *Update all the weights once via back-propagation, using*
   (a) *the mean absolute function.*
   (b) *the mean square function.*
   (c) *the log-likelihood objective function.*
3. *Compare the obtained results*
4. *implement your computation into a jupyter notebook.*

Exercise 2. *In this exercise we recall the basic logic operation*

x_1	x_2	y
0	0	0
0	1	0
1	0	0
1	1	1

(AND)

x_1	x_2	y
0	0	0
0	1	1
1	0	1
1	1	1

(OR)

x_1	x_2	y
0	0	1
0	1	1
1	0	1
1	1	0

(NAND)

x_1	x_2	y
0	0	1
0	1	0
1	0	0
1	1	0

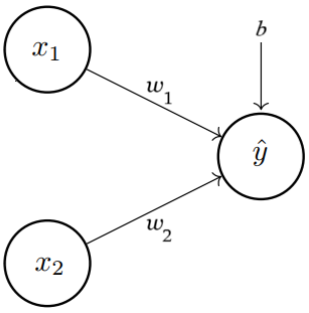
(NOR)

x_1	x_2	y
0	0	0
0	1	1
1	0	1
1	1	0

(XOR)

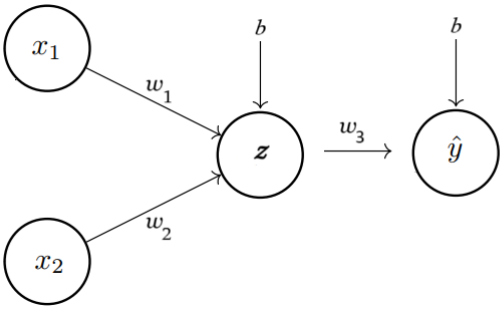
I. We look forward to create simple networks learning these logic operation.

1. *Start with* $w_1 = w_2 = 0.5$ *and* $b = -1$. *Perform two iteration of network update using back-propagation of learning AND and OR operations with a learning rate* $\eta = 0.5$.
2. *Change the learning rate to* $\eta = 0.05$ *and compare the results.*
3. *Now, repeat the same thing for NAND and NOR.*
4. *Explore the results for XOR.*



II. Now we add one hidden layer into the networks

Repeat the same questions in the first part and make some conclusions.



Implement all the computation into jupyter notebooks.