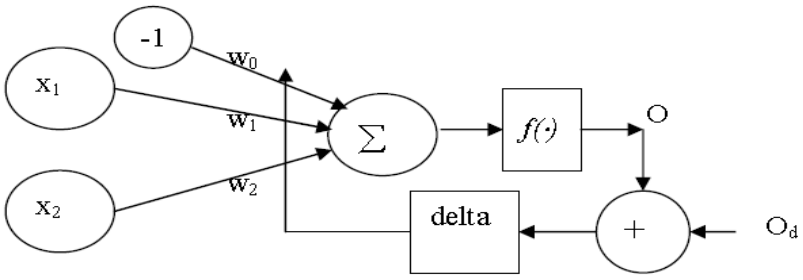
The network structure of Single layer perceptron to solve the AND, OR, and XOR Boolean operations are as follows:



The Boolean operation for AND, OR and XOR gates are as follows:

AND operation			OR operation			XOR operation		
X1	X2	O	X1	X2	O	X1	X2	O
0	0	0	0	0	0	0	0	0
0	1	0	0	1	1	0	1	1
1	0	0	1	0	1	1	0	1
1	1	1	1	1	1	1	1	0

I have used the **bipolar sigmoid activation function** *f(.)*, with learning parameter η=0.05 and random initialization of the weight vectors W. It has been observed that using *Single Layer perceptron* only AND and OR operations are possible not the XOR operation. The outputs of the three Boolean operations using single layer perceptron are as follows:

	AND operation			OR operation			XOR operation		
bias	X1	X2	O	X1	X2	O	X1	X2	O
-1	0	0	0.0000	0	0	0.0172	0	0	0.500
-1	0	1	0.0169	0	1	0.9423	0	1	0.500
-1	1	0	0.0169	1	0	0.9423	1	0	0.500
-1	1	1	0.8891	1	1	0.9999	1	1	0.500

Reduction of output error corresponding to increasing the number of iterations shown as follows:

	AND	OR	XOR
Epoch	error	error	error
1000	0.03595	0.025573	0.25000
2000	0.01821	0.011210	0.25000
3000	0.01186	0.006884	0.25000
4000	0.0087	0.004902	0.25000
5000	0.00682	0.003784	0.25000
6000	0.0056	0.003072	0.25000
7000	0.00473	0.002581	0.25000
8000	0.0041	0.002223	0.25000
9000	0.00361	0.001951	0.25000
10000	0.00322	0.001737	0.25000

Updated weights after 1000 iterations			
Weight	AND	OR	XOR
W1	6.1474	6.8417	1.0e-007 * 0.3418
W2	6.1474	6.8417	0.3418
W_{bias}	10.2137	4.0483	0.3615
			(Each value is very small)