**https://archive.ics.uci.edu/ml/datasets/Iris**

**ASSIGNMENT**

Using Perceptron to model AND function using

**X0=1,**

**W0=W1=W2=0.1,**

**r=0.1**

Input (1 or -1).

**Solution:**

Truth Table for Desired Output.

|  |  |  |
| --- | --- | --- |
| **X1** | **X2** | **d(t) i.e. (AND)** |
| 1 | 1 | 1 |
| 1 | -1 | -1 |
| -1 | 1 | 1 |
| -1 | -1 | -1 |

To remember

Y(t) = 1 if ∑ [X**i**(t)W**i**(t)] > 0

-1 otherwise ………………………………(1)

Change the weights if d(t) ≠ y(t)

W**i**(t+1)=W**i**(t) + r [d(t) – y(t)] X**i**(t) …………...…………………(2)

**Step 1:**

Desired Target Output

Let X1 = 1 , X2 = 1 🡺 d(t)=1 AND 1=1

(1) => Y (t) = ∑ [X**i** (t) Wi (t)]

= X0W0+X1W1+X2W2

= (1)(0.1)+(1)(0.1)+(1)(0.1)

= 0.3 > 0

So by Equation 1

Y (t) = 1

=> d (t) = y(t)

=> 1 = 1

Hence No change of weights

**Step 2:**

Desired Target Output

Let X1 = 1 , X2 = -1 🡺 d(t)=1 AND -1= -1

(1) => Y (t) = ∑ [X**i** (t) Wi (t)]

= X0W0+X1W1+X2W2

= (1) (0.1) + (1) (0.1) + (-1) (0.1)

= 0.1 > 0

So by Equation 1

Y (t) = 1

=> d (t) ≠ y(t)

=> 1 ≠ 1

So we have to calculate the weights W0, W1 and W2 by using equation 2

Now

X0=1, X1=1, X2=-1

W0=W1=W2=0.1, r = 0.1, d (t) = -1, y (t) = 1

W0 (t+1) = W0 (t) + r [d (t) - y (t)] X0(t)

= 0.1 + (0.1) [-1-1] (1)

= 0.1 + (0.1) [-2] (1)

= 0.1 + (-0.2)

W0 (t+1) = -0.1

W1 (t+1) = W1 (t) + r [d (t) - y (t)] X1(t)

= 0.1+ (0.1)[-1-1](1)

= 0.1+ 0.1[-2](1)

= 0.1+ (-0.2)

W1 (t+1) = -0.1

W2 (t+1) = W2 (t) + r [d (t)-y (t)] X2(t)

= 0.1+ (0.1) [-1-1] (-1)

= 0.1+0.2

W1 (t+1) = -0.3

**Hence:**

W0 (t+1) = -0.1

W1 (t+1) = -0.1

W1 (t+1) = -0.3

**Step 3:**

Desired Target Output

Let X1 = -1, X2 = -1 🡺 d (t) = -1 AND -1=-1

(1) => Y (t) = ∑ [X**i** (t) Wi (t)]

= X0W0+X1W1+X2W2

= (1) (-0.1) + (-1) (-0.1) + (-1) (0.1)

= -0.3 < 0

So by Equation 1

Y (t) = -1

=> d (t) = y(t)

=> -1 = -1

Hence No change of weights

**Step 4:**

Desired Target Output

Let X1 = -1, X2 = 1 🡺 d (t) = -1 AND 1= -1

(1) => Y (t) = ∑ [X**i** (t) Wi (t)]

= X0W0+X1W1+X2W2

= (1) (-0.1) + (-1) (-0.1) + (1) (0.3)

= 0.3 > 0

So by Equation 1

Y (t) = 1

=> d (t) ≠ y(t)

=> -1 ≠ 1

So we have to calculate the weights W0, W1 and W2 by using equation 2

Now

X0=1, X1= -1, X2=1

W0= -0.1, W1= -0.1, W2= 0.3, r = 0.1, d (t) = -1, y (t) = 1

W0 (t+1) = W0 (t) + r [d (t) - y (t)] X0(t)

= -0.1 + (0.1) [-1-1] (1)

= -0.1 + (0.1) [-2] (1)

= -0.1 + (-0.2)

W0 (t+1) = -0.3

W1 (t+1) = W1 (t) + r [d (t) - y (t)] X1(t)

= -0.1+ (0.1)[-1-1](-1)

= -0.1+ 0.1[-2] (-1)

= -0.1+ (0.2)

W1 (t+1) = 0.1

W2 (t+1) = W2 (t) + r [d (t)-y (t)] X2(t)

= 0.3+ (0.1) [-1-1] (1)

= 0.3+0.2

W1 (t+1) = 0.1

**Hence:**

W0 (t+1) = -0.3

W1 (t+1) = 0.1

W1 (t+1) = 0.1

**Step 5:**

Desired Target Output

Let X1 = 1, X2 = 1 🡺 d (t) = 1 AND 1= 1

(1) => Y (t) = ∑ [X**i** (t) Wi (t)]

= X0W0+X1W1+X2W2

= (1) (-0.3) + (1) (0.1) + (1) (0.1)

= - 0.1 < 0

So by Equation 1

Y (t) = -1

=> d (t) ≠ y(t)

=> 1 ≠ -1

So we have to calculate the weights W0, W1 and W2 by using equation 2

Now

X0=1, X1= 1, X2=1

W0= -0.3, W1= 0.1, W2= 0.1, r = 0.1, d (t) = 1, y (t) = -1

W0 (t+1) = W0 (t) + r [d (t) - y (t)] X0(t)

= -0.3 + (0.1) [1+1] (1)

= -0.3 + (0.1) [2] (1)

= -0.3 + (0.2)

W0 (t+1) = -0.1

W1 (t+1) = W1 (t) + r [d (t) - y (t)] X1(t)

= 0.1+ (0.1)[1+1](1)

= 0.1+ 0.1[2](1)

= 0.1+ (0.2)

W1 (t+1) = 0.3

W2 (t+1) = W2 (t) + r [d (t)-y (t)] X2(t)

= 0.1+ (0.1) [1+1] (1)

= 0.1+0.2

W1 (t+1) = 0.3

**Hence:**

W0 (t+1) = -0.1

W1 (t+1) = 0.3

W1 (t+1) = 0.3

**Step 6:**

Desired Target Output

Let X1 = 1, X2 = -1 🡺 d (t) = 1 AND -1= -1

(1) => Y (t) = ∑ [X**i** (t) Wi (t)]

= X0W0+X1W1+X2W2

= (1) (-0.1) + (1) (0.3) + (-1) (0.3)

= -0.1 < 0

So by Equation 1

Y (t) = -1

=> d (t) = y(t)

=> -1 = -1

Hence No change of weights

**Step 7:**

Desired Target Output

Let X1 = -1, X2 = -1 🡺 d (t) = -1 AND -1= -1

(1) => Y (t) = ∑ [X**i** (t) Wi (t)]

= X0W0+X1W1+X2W2

= (1) (-0.1) + (-1) (0.3) + (-1) (0.3)

= -0.7 < 0

So by Equation 1

Y (t) = -1

=> d (t) = y(t)

=> -1 = -1

Hence No change of weights

**Step 8:**

Desired Target Output

Let X1 = -1, X2 = 1 🡺 d (t) = -1 AND 1= -1

(1) => Y (t) = ∑ [X**i** (t) Wi (t)]

= X0W0+X1W1+X2W2

= (1) (-0.1) + (-1) (0.3) + (1) (0.3)

= -0.1 < 0

So by Equation 1

Y (t) = -1

=> d (t) = y(t)

=> -1 = -1

Hence No change of weights

**Hence the final weights are:**

W0 (t+1) = -0.1

W1 (t+1) = 0.3

W1 (t+1) = 0.3

**ASSIGNMENT**

**Using Preceptron to model OR function**

**X0=1,**

**W0=W1=W2=0.1,**

**r=0.1**

**Input (-1 or 1)**

**Solution**

Truth table for desired output

|  |  |  |
| --- | --- | --- |
| **X1** | **X2** | **d(t) i.e. (OR)** |
| 1 | 1 | 1 |
| 1 | -1 | 1 |
| -1 | 1 | 1 |
| -1 | -1 | -1 |

**Step 1**

X1=1, X2=1 => d (t) =1

Y (t) = X0W0+X1W1+X2W2

= 1(0.1) +1(0.1) +1(0.1)

= 0.3>0

=> Y (t) =1

=> Y (t) =d (t) = > no change of weights

**Step 2**

X1= -1, X2= -1 = > d (t) =1

Y (t) = X0 W0+ X1 W1+ X2 W2

= (1) (0.1) + (1) (0.1) + (-1) (0.1)

= 0.1>0

=> Y (t) = 1

=> d (t) = y(t)

No change in weights

**Step 3**

X1=-1, X2=-1 = > d (t) = -1

Y (t) = X0 W0+ X1 W1+ X2 W2

= (1) (0.1) + (-1) (0.1) + (-1) (0.1)

= -0.1<0

Y (t) = -1

d (t) = y(t)

No change in weights

**Step 4**

X1=-1, X2=1 = > d (t) =1

Y (t) = X0 W0+ X1 W1+ X2 W2

= (1) (0.1) + (-1) (0.1) + (1) (0.1)

= 0.1<0

=> Y (t) =1

=> d (t) = y(t)

Hence no change in weights, therefore the final weights become

W0=0.1

W1=0.1

W2=0.1