

Scilab Manual for
Neural Network
by Dr Nadir N. Charniya
Electronics Engineering
VESIT¹

Solutions provided by
Nandan Hegde
Electronics Engineering
V.E.S.I.T

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Contents

List of Scilab Solutions	3
1 Generate the activation functions- Logistic,Hyperbolic,Identity that are used in Neural networks	5
2 program for perceptron net for an AND function with bipolar inputs and targets	8
3 Generate Or function with bipolar inputs and targets using Adaline network	10
4 Generate XOR function for bipolar inputs and targets using Madaline network	13
5 Find the weight matrix of an auto associative net to store the vector(1 1 -1 -1).Test the response by presenting same pattern.	16
6 Find weight matrix in Bipolar form for BAM network on binary i/p o/p pairs	18

List of Experiments

Solution 1.1	Activation functions in Neural network	5
Solution 2.1	Bipolar AND function	8
Solution 3.1	Bipolar OR function	10
Solution 4.1	Bipolar XOR function	13
Solution 5.1	Auto associative net	16
Solution 6.1	BAM network	18

List of Figures

1.1	Activation functions in Neural network	6
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Experiment: 1

Generate the activation functions-
Logistic, Hyperbolic, Identity
that are used in Neural
networks

Scilab code Solution 1.1 Activation functions in Neural network

```
1 //Illustrations of various activation functions used
   in Neural networks
2
3 x= -10:0.1:10;
4 tmp=exp(-x);
5 y1=1 ./ (1+tmp); //Logistic function
6 y2=(1-tmp) ./ (1+tmp); //Hyperbolic Tangent
   function
7 y3=x; //Identity function
8 subplot(2,3,1);
9 plot(x,y1);
```

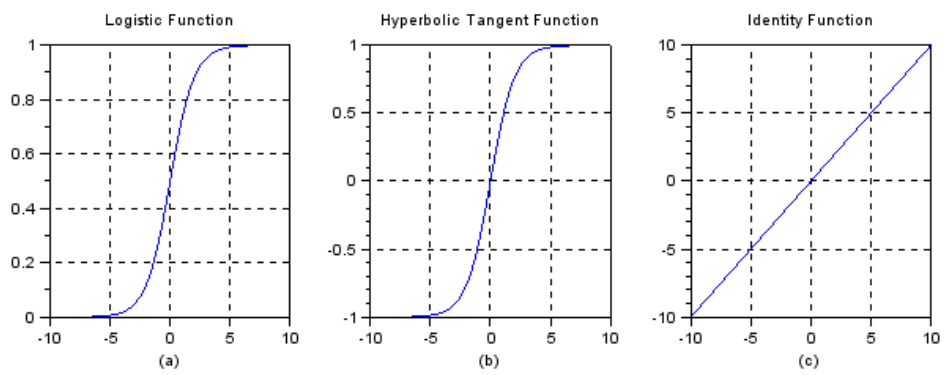


Figure 1.1: Activation functions in Neural network

```
10 set(gca(),"grid",[1 1]);
11 ([min(x) max(x) -2 2]);
12 title('Logistic Function');
13 xlabel('(a)');
14 ('square');
15 subplot(2,3,2);
16 plot(x,y2);
17 set(gca(),"grid",[1 1]);
18 ([min(x) max(x) -2 2]);
19 title('Hyperbolic Tangent Function');
20 xlabel('(b)');
21 ('square');
22 subplot(2,3,3);
23 plot(x,y3);
24 set(gca(),"grid",[1 1]);
25 ([min(x) max(x) -2 2]);
26 title('Identity Function');
27 xlabel('(c)');
28 ('square');
```

Experiment: 2

program for perceptron net for an AND function with bipolar inputs and targets

Scilab code Solution 2.1 Bipolar AND function

```
1 // Generate perceptron net for an AND function with
  bipolar inputs and targets
2 //      Truth table for AND gate
3 //      X1    X2    Y
4 //      -1    -1    -1
5 //      -1    1    -1
6 //      1    -1    -1
7 //      1    1    1          (Bipolar (1,-1))
8
9 clc;
10 clear;
11 x=[1 1 -1 -1;1 -1 1 -1]; //input
12 t=[1 -1 -1 -1]; //target
13 w=[0 0]; //Weights
14 b=0; //bias
15 alpha=input('Enter learning rate='); //learning
  rate
```

```

16 theta=input('Enter threshold value=');    //
    threshold value
17 con=1;
18 epoch=0;
19 while con
20     con=0;
21     for i=1:4
22         yin=b+x(1,i)*w(1)+x(2,i)*w(2);
23         if yin>theta then
24             y=1;
25         end
26         if yin<=theta & yin>= -(theta) then
27             y=0;
28         end
29         if yin<-(theta) then
30             y=-1;
31         end
32         if y-t(i) then
33             con=1;
34             for j=1:2
35                 w(j)=w(j)+alpha*t(i)*x(j,i);
36                 //upgrading of weight
37             end
38             b=b+alpha*t(i)           //upgrading of bias
39         end
40     end
41     epoch=epoch+1;
42     disp('perceptron for AND function');
43     disp('Final Weight matrix');
44     disp(w);
45     disp('Final Bias');
46     disp(b);

```

Experiment: 3

Generate Or function with bipolar inputs and targets using Adaline network

Scilab code Solution 3.1 Bipolar OR function

```
1 //Generate OR function with bipolar inputs and
  targets using Adaline network
2 //      Truth table for OR gate
3 //      X1      X2      Y
4 //      -1      -1      -1
5 //      -1      1       1
6 //      1       -1      1
7 //      1       1       1          (Bipolar (1,-1))
8
9
10 clc;
11 clear;
12 disp('Adaline network for OR function Bipolar inputs
  and targets');
13 //input pattern
14 x1=[1 1 -1 -1];
15 x2=[1 -1 1 -1];
```

```

16 //bias pattern
17 x3=[1 1 1 1];
18 //target vector
19 t=[1 1 1 -1];
20 //initial weights and bias
21 w1=0.1;w2=0.1;b=0.1;
22 //initialize learning rate
23 alpha=0.1;
24 //error convergence
25 e=2;
26 //change in weights and bias
27 delw1=0;delw2=0;delb=0;
28 epoch=0;
29 while(e>1.018)
30     epoch=epoch+1;
31     e=0;
32     for i=1:4
33         nety(i)=w1*x1(i)+w2*x2(i)+b;
34         //net input calculated and target
35         nt=[nety(i) t(i)];
36         delw1=alpha*(t(i)-nety(i))*x1(i);
37         delw2=alpha*(t(i)-nety(i))*x2(i);
38         delb=alpha*(t(i)-nety(i))*x3(i);
39         //weight changes
40         wc=[delw1 delw2 delb]
41         //updating of weights
42         w1=w1+delw1;
43         w2=w2+delw2;
44         b=b+delb;
45         //new weights
46         w=[w1 w2 b];
47         //input pattern
48         x=[x1(i) x2(i) x3(i)];
49         //printing the results obtained
50         disp([x nt wc w]);
51     end
52     for i=1:4
53         nety(i)=w1*x1(i)+w2*x2(i)+b;

```

```
54         e=e+(t(i)-nety(i))^2;  
55     end  
56     end
```

Experiment: 4

Generate XOR function for bipolar inputs and targets using Madaline network

Scilab code Solution 4.1 Bipolar XOR function

```
1 //Generate XOR function for bipolar inputs and
  targets using madaline network
2 //      Truth table for XOR gate
3 //      X1      X2      Y
4 //      -1      -1      -1
5 //      -1      1       1
6 //      1       -1      1
7 //      1       1       -1          (Bipolar (1,-1))
8
9
10 clc;
11 clear;
12 x=[1 1 -1 -1;1 -1 1 -1]; //input
13 t=[-1 1 1 -1]; //target
14 //assuming initial weight matrix and bias
15 w=[0.05 0.1;0.2 0.2];
16 b1=[0.3 0.15];
```

```

17 v=[0.5 0.5];
18 b2=0.5;
19 con=1;
20 alpha=0.5;
21 epoch=0;
22 while con
23     con=0;
24     for i=1:4
25         for j=1:2
26             zin(j)=b1(j)+x(1,i)*w(1,j)+x(2,i)*w(2,j)
27                 ; //neural functin output
28             if zin(j)>=0 then
29                 z(j)=1;
30             else
31                 z(j)=-1;
32             end
33         end
34         yin=b2+z(1)*v(1)+z(2)*v(2);
35         if yin>=0 then
36             y=1;
37         else
38             y=-1;
39         end
40         if y~=t(i) then
41             con=1;
42             if t(i)==1 then
43                 if abs(zin(1))>abs(zin(2)) then
44                     k=2;
45                 else
46                     k=1;
47                 end
48                 b1(k)=b1(k)+alpha*(1-zin(k));
49                 //upgrading bias
50                 w(1:2,k)=w(1:2,k)+alpha*(1-zin(k))*x
51                     (1:2,i); //upgrading weight
52             else
53                 for k=1:2
54                     if zin(k)>0 then

```

```

52         b1(k)=b1(k)+alpha*(-1-zin(k)
           );           //upgrading bias
53         w(1:2,k)=w(1:2,k)+alpha*(-1-
           zin(k))*x(1:2,i);           //
           upgrading weight
54         end
55     end
56     end
57     end
58     end
59     epoch=epoch+1;
60     end
61
62     disp('Weight matrix of hidden layer');
63     disp(w);
64     disp('Bias');
65     disp(b1);
66     disp('Total epoch');
67     disp(epoch);

```

Experiment: 5

Find the weight matrix of an auto associative net to store the vector(1 1 -1 -1).Test the response by presenting same pattern.

Scilab code Solution 5.1 Auto associative net

```
1 //Find the weight matrix of an Auto associative net
  to store the vector (1 1 -1 -1).Test the respnse
  of the network by presenting the same pattern and
  recognize whether it is a known vector or
  unknown vector
2 //Auto associative net has the same inputs and
  targets
3 clc;
4 clear;
5 x=[1 1 -1 -1]; //Given vector
6 w=zeros(4,4);
7 w=x'*x;
8 yin=x*w;
```

```
9 for i=1:4
10     if yin(i)>0 then
11         y(i)=1;
12     else
13         y(i)=-1;
14     end
15 end
16 disp('weight matrix');
17 disp(w);
18 if x==y then
19     disp('The vector is a known vector');
20 else
21     disp('The vector is unknown vector');
22 end
```

Experiment: 6

Find weight matrix in Bipolar form for BAM network on binary i/p o/p pairs

Scilab code Solution 6.1 BAM network

```
1 //Find the weight matrix in bipolar form for Bi-
   directional Associative Memory (BAM) network
   based on the following binary input output pairs
2 // s(1)=(1 1 0)      t(1)=(1 0)
3 // s(2)=(1 0 1)      t(2)=(0 1)
4
5 clc;
6 clear;
7 s=[1 1 0;1 0 1];      // s(1),s(2)
8 t=[1 0;0 1];         //t(1),t(2)
9 x=2*s-1;
10 y=2*t-1;
11 w=zeros(3,2);
12 for i=1:2
13     w=w+x(i,:)'*y(i,:);
14 end
15 disp('The calculated weight matrix');
```

16 `disp(w);`
