Perceptron and Neural-Network

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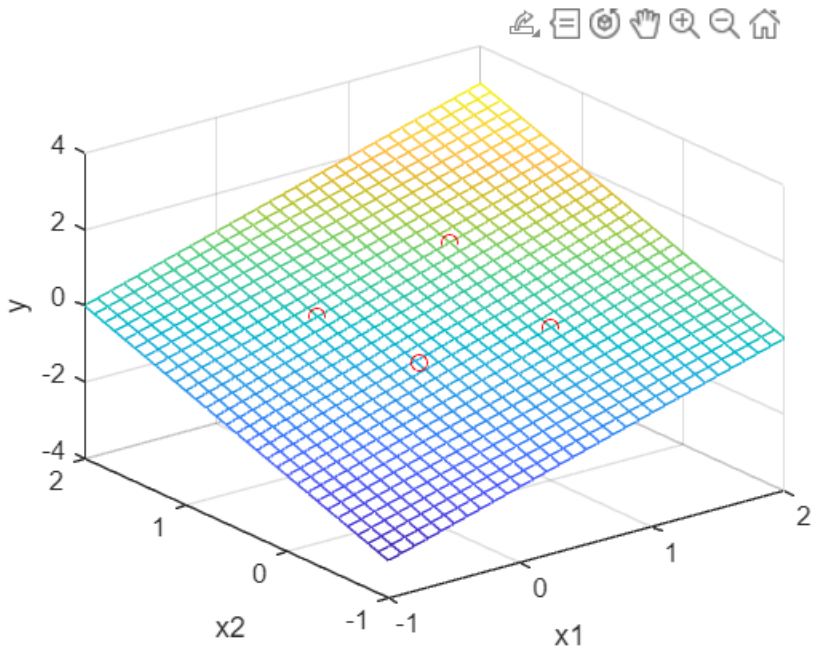
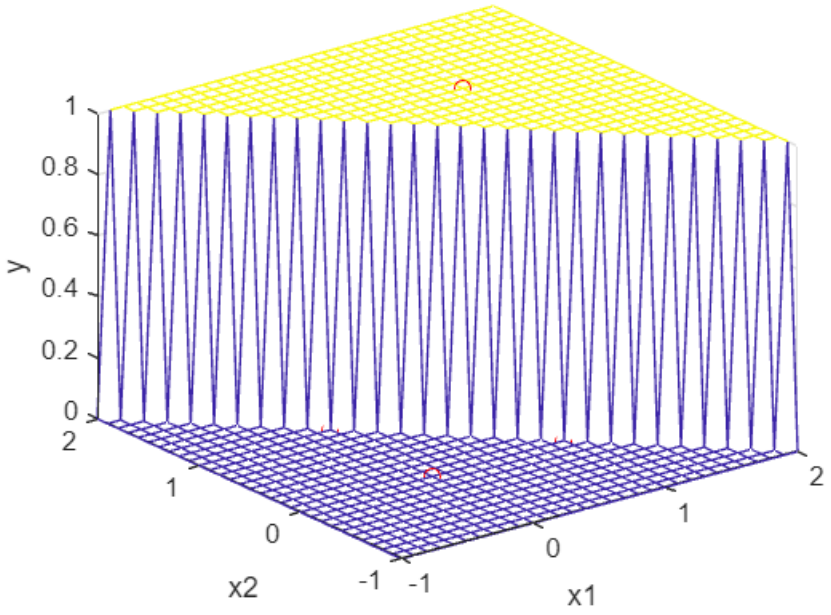
Exercise-1

```
[X1, X2] = meshgrid(-1:0.1:2, -1:0.1:2);
Y = 1 * X1 + 1 * X2 - 1;

mesh(X1, X2, Y)
xlabel('x1'), ylabel('x2'), zlabel('y')
grid on
hold on
x1=[0 0 1 1];
x2=[0 1 0 1];
y =[0 0 0 1];
plot3(x1, x2, y, 'or')
hold off
```



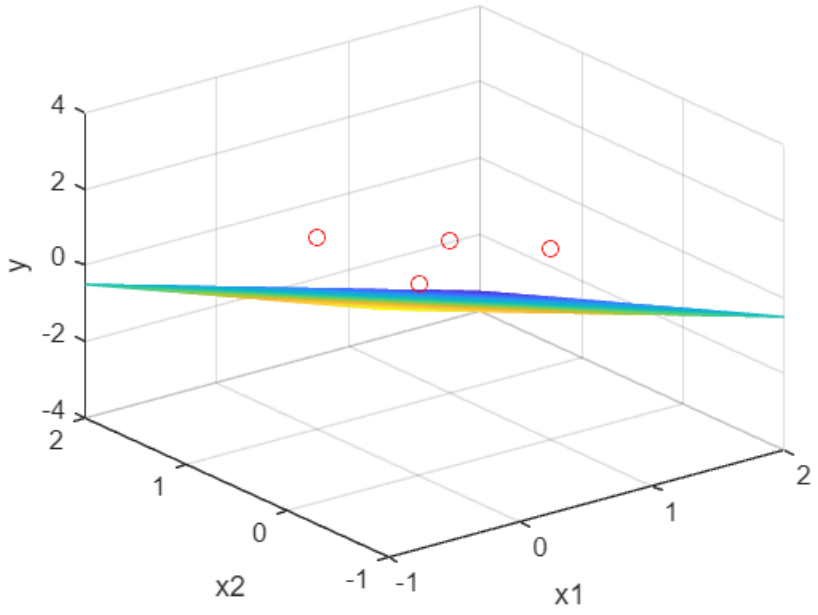

```
% Activation
Y(Y > 0) = 1;
Y(Y <= 0) = 0;

mesh(X1, X2, Y)
xlabel('x1'), ylabel('x2'), zlabel('y')
grid on
```

```
hold on
plot3(x1, x2, y, 'or')
hold off
```

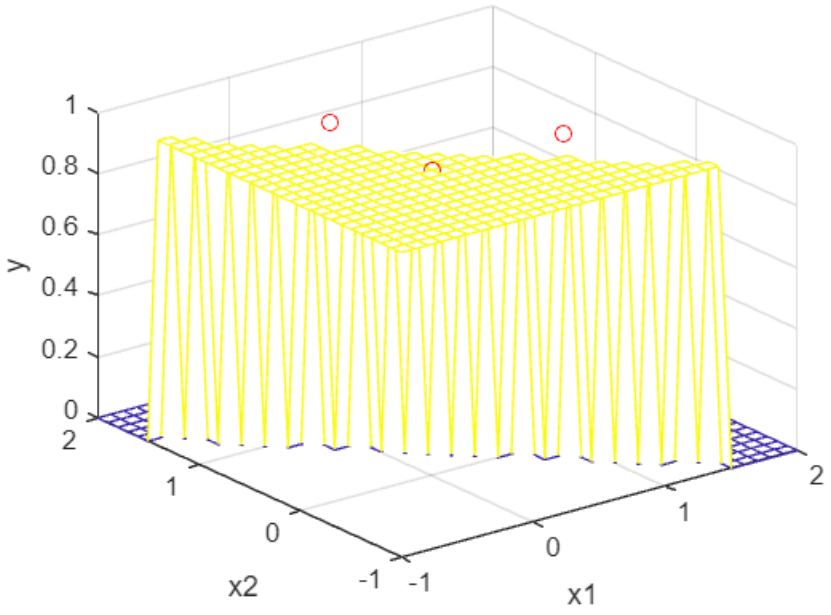


Exercise-2

```
[X1, X2] = meshgrid(-1:0.1:2, -1:0.1:2);
Y = -1 * X1 + -1 * X2 + 0.5;

mesh(X1, X2, Y)
xlabel('x1'), ylabel('x2'), zlabel('y')
grid on
hold on
x1=[0 0 1 1];
x2=[0 1 0 1];
y =[1 1 1 0];
plot3(x1, x2, y, 'or')
hold off
```

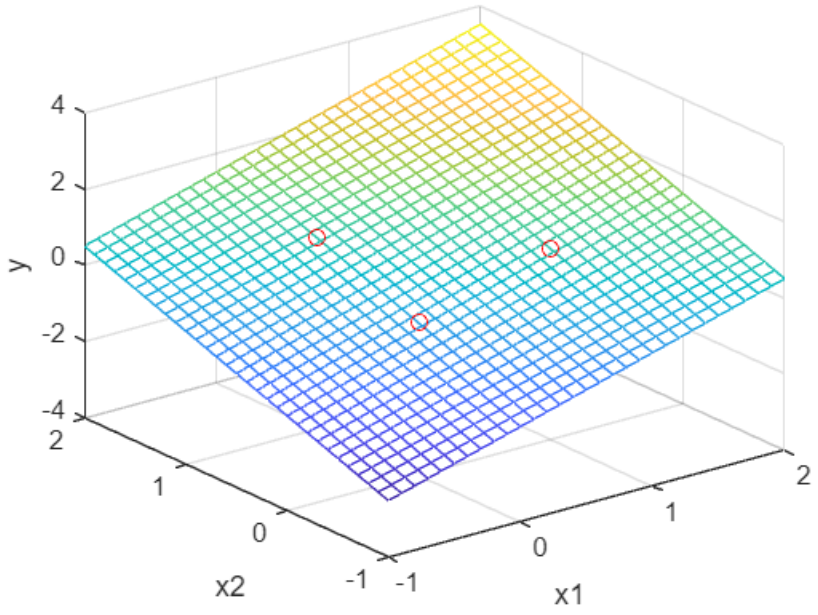



```
% Activation
Y(Y > 0) = 1;
Y(Y <= 0) = 0;

mesh(X1, X2, Y)
xlabel('x1'), ylabel('x2'), zlabel('y')
grid on
hold on
plot3(x1, x2, y, 'or')
hold off
```

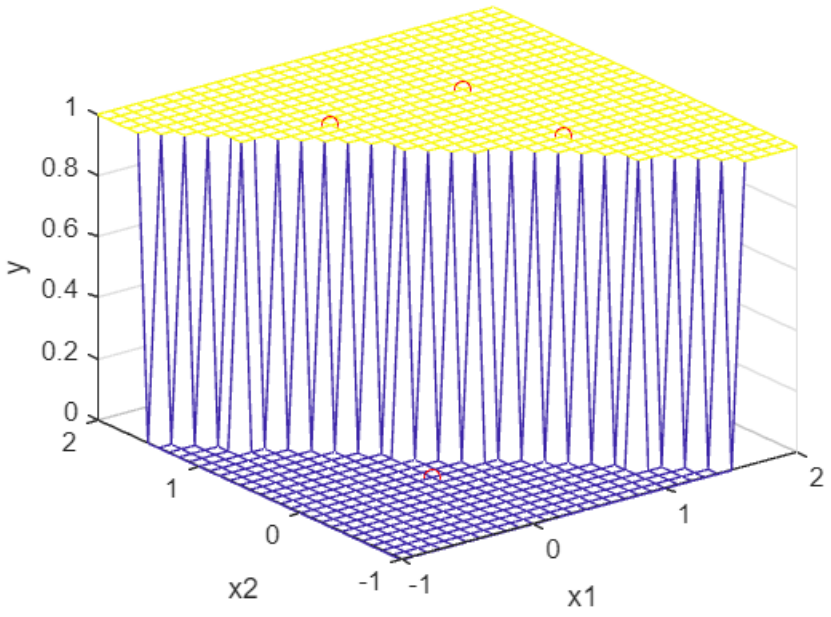


Exercise-3

```
[X1, X2] = meshgrid(-1:0.1:2, -1:0.1:2);
Y = 1 * X1 + 1 * X2 - 0.5;

mesh(X1, X2, Y)
xlabel('x1'), ylabel('x2'), zlabel('y')
grid on
hold on
x1=[0 0 1 1];
x2=[0 1 0 1];
y =[0 1 1 1];
plot3(x1, x2, y, 'or')
hold off
```

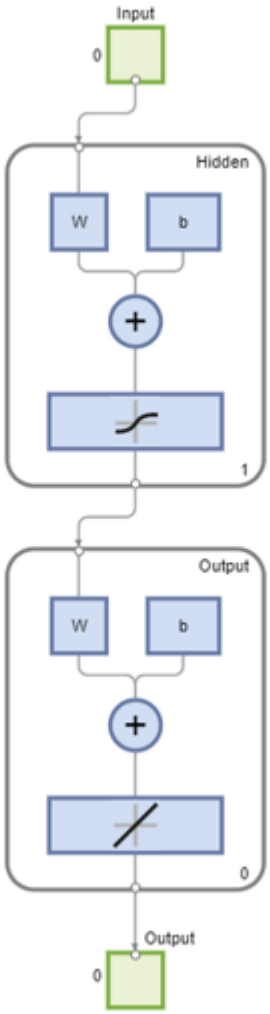



```
% Activation
Y(Y > 0) = 1;
Y(Y <= 0) = 0;

mesh(X1, X2, Y)
xlabel('x1'), ylabel('x2'), zlabel('y')
grid on
hold on
plot3(x1, x2, y, 'or')
hold off
```

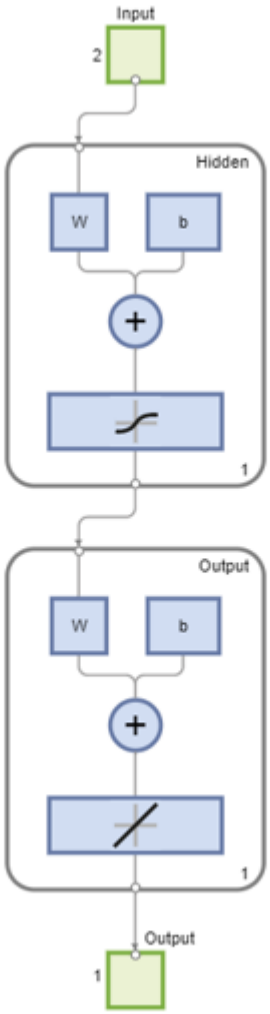


Exercise-4-1

```
net = feedforwardnet(1);
view(net);
```




```
a = [0 0 1 1];
b = [0 1 0 1];
c = [0 1 1 0];

n = 600;

x = zeros(2, n);
y = zeros(1, n);

for k = 1:n
    j = randi([1 4]);
    x(:, k) = [a(j); b(j)];
    y(k) = c(j);
end

net = configure(net, x, y);
view(net);
```




```
net.name = 'XOR';
net = train(net, x, y);
```

Network Diagram

Training Results

Training finished: Reached minimum gradient

Training Progress

Unit	Initial Value	Stopped Value	Target Value
Epoch	0	16	1000
Elapsed Time	-	00:00:00	-
Performance	0.349	0.167	0
Gradient	0.284	9.9e-09	1e-07
Mu	0.001	1e-12	1e+10
Validation Checks	0	0	6

Training Algorithms

Data Division: Random dividerand
Training: Levenberg-Marquardt trainlm
Performance: Mean Squared Error mse
Calculations: MEX

Training Plots

Performance | Training State
Error Histogram | Regression

```
% 只有一個 neuron 無法正確分類 XOR
c = sim(net, [a;b])
```

```
c = 1×4
    0.0000    0.6688    0.6688    0.6688
```

Exercise-4-2

```
net = feedforwardnet([2 2]);
view(net);

a = [0 0 1 1];
b = [0 1 0 1];
c = [0 1 1 0];

n = 600;

x = zeros(2, n);
```

```
y = zeros(1, n);

for k = 1:n
    j = randi([1 4]);
    x(:, k) = [a(j); b(j)];
    y(k) = c(j);
end

net = configure(net, x, y);
view(net);
net.name = 'XOR';
net = train(net, x, y);

% 可以正確分類 XOR
c = sim(net, [a;b])
```

```
c = 1×4
   -0.0000    1.0000    1.0000    0.0000
```