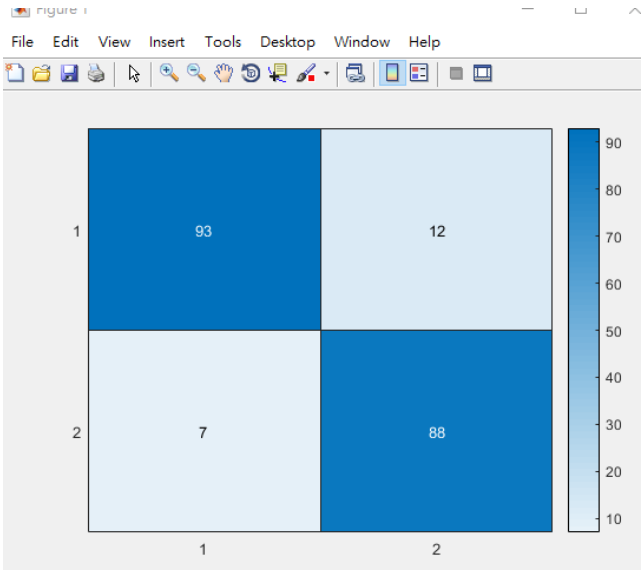
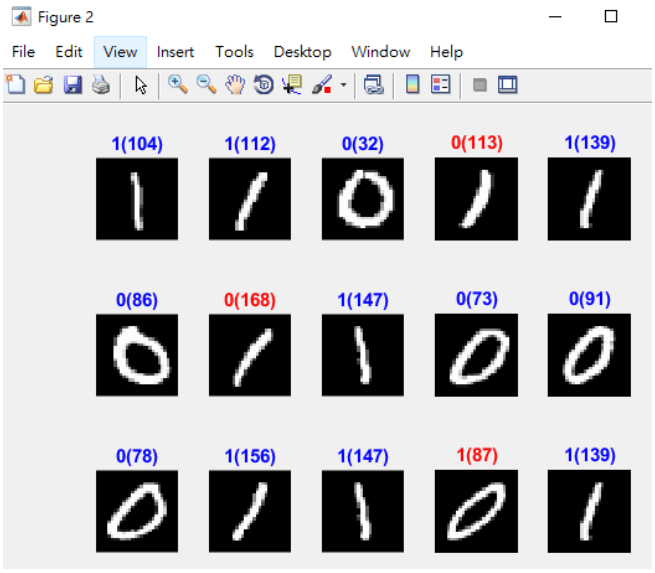
作業 3 手寫數字辨識

輸入辨識的影像是**訓練影像** 0 和 1。

■ 混淆矩陣



■ 辨識結果



■ 程式碼

```
clear,clc;

% 2021/01/06 finish
I=cell(1,200); %store image information
K=cell(1,200); %store image information
L=cell(1,200); %store image information
total=cell(1,200);%store image information
Y(200)=0;% Output
Y(101:200)=1; % label 0 img(1-100),and label 1 img(101-200).
Y=Y';%trans
M(2,2)=0;
filter1=[1 1 -1;
          -1 0 1;
         -1 1 1];
% filter2=[1 1 -1;
%            1 0 -1;
%          1 -1 -1];
filter2=[1 1 -1;
          1 0 -1;
         1 -1 -1];
for b=1:200
    m1=imread(['C:/HW3 readme/train1000/',int2str(b),'.png']);
    I{b}=imresize(m1,[8 8]); %I{1}¡C¡C¡CI{200} every img
    total{b}=m1;%store
    I{b}=cat(3,I{b},I{b});%merge 2 feature map
    %convolution
    I{b}(:,:,1)=imfilter(I{b}(:,:,1),filter1);
    I{b}(:,:,2)=imfilter(I{b}(:,:,2),filter2);
    %uint no minus number,so is zeros.
    K{b}=I{b}(:,:,1);
    L{b}=I{b}(:,:,2);

    fun=@(block_struct)max_matrix(block_struct.data);%Maxpooling 2x2
    K{b}=blockproc(K{b},[2 2],fun); %Seperaetely pooling feature1
    L{b}=blockproc(L{b},[2 2],fun); %Seperaetely pooling feature2
```

```
    I{b}=cat(3,K{b},L{b});%merge two feature map
    K{b}=imfilter(K{b},filter1); %convolution
    L{b}=imfilter(L{b},filter2); %convolution
    %============================================================%
    K{b}=blockproc(K{b},[2 2],fun); %Seperaetely to pooling feature1
    L{b}=blockproc(L{b},[2 2],fun); %Seperaetely to pooling feature2

    I{b}=cat(3,K{b},L{b});% merge feature become result

    I{b}=reshape(I{b},8,1); %flatten
    I{b}(9,1)=1;
    X=[I{:}];% Cell transfer to matrix 9x200 ;01/06 make
    X=double(X');

%max2 blkproc A = inv(X'*X)*(X'*Y) or X\Y is least square function
end

 A= X\Y; %    A= inv(X'*X)*(X'*Y); least square
 Yp=X*A;
 aa=0;cc=0; %four counter set 0
 bb=0;dd=0;
 char(1,200)=0;
 label(1,200)=0;
% Judge '0' or '1'
for i=1:200
 if i<101
  if Yp(i)<0.5
      aa=aa+1;
      char(i)=0;% true
      label(i)=i;
  else
      bb=bb+1;
      char(i)=1;% '0'Recognize to '1'¡@¡@
      label(i)=i;
  end
else
 if Yp(i)>0.5
      cc=cc+1; % true is 1
```

```
        char(i)=1;
        label(i)=i;
  else
        dd=dd+1; % 1 recognize to '0'
        char(i)=0;
        label(i)=i;
    end
  end
end
M(1,1)=aa;M(2,1)=bb;
M(2,2)=cc;M(1,2)=dd;

final=cell(1,15); %store image information
% label2=cell(1,15);%store label2 information

%randly choose 15 img
  for i=1:15
     rr=randi(200,1);
     final{i}=total{rr};% store location
     labels(i)=label(rr);
     label2(i)=char(rr);
     true(i)=Y(rr);
  end


  figure()
  h=heatmap(M); % confusion Matrix

  figure()
  for j=1:15
          if true(j)==label2(j)
          subplot(3,5,j);
          imshow(final{j});
          txta=num2str(label2(j)); txtb='(';
          txtc=num2str(labels(j)); txtd=')';

          str = strcat(txta,txtb,txtc,txtd);
          title(str,'Color','blue');    % correct is blue
```

```
        else
        subplot(3,5,j);
        imshow(final{j});
        txta=num2str(label2(j));
        txtc=num2str(labels(j));
        str = strcat(txta,txtb,txtc,txtd);
        title(str,'Color','red');    % wrong is red
        end
end
```