

在此处键入公式。

Problem 3

Part a:

(1) trace of confusion matrix

k =1, trace=0.9480

k =2, trace=0.9930

k =3, trace=0.9380

k =4, trace=0.9460

k =5, trace=0.9460

(2) misclassified

k=1:

index, yp, yt

457, 6, 9

487, 4, 9

493, 4, 9

k=3:

index, yp, yt

456, 1, 9

457, 6, 9

493, 4, 9

k=5:

index, yp, yt

448, 2, 8

456, 1, 9

457, 6, 9

Part b:

(1) confusion matrix

C =

48	0	0	1	0	1	0	0	0	0
0	49	0	0	0	0	0	0	1	0
0	0	48	0	1	0	1	0	0	0
0	0	1	47	0	0	0	0	2	0
0	0	0	0	48	0	0	0	1	1
0	0	0	1	0	45	2	0	1	1
0	0	0	0	1	5	43	0	0	1

0	0	2	0	2	0	0	46	0	0
0	0	1	0	0	1	0	0	47	1
1	0	0	0	2	0	0	0	0	47

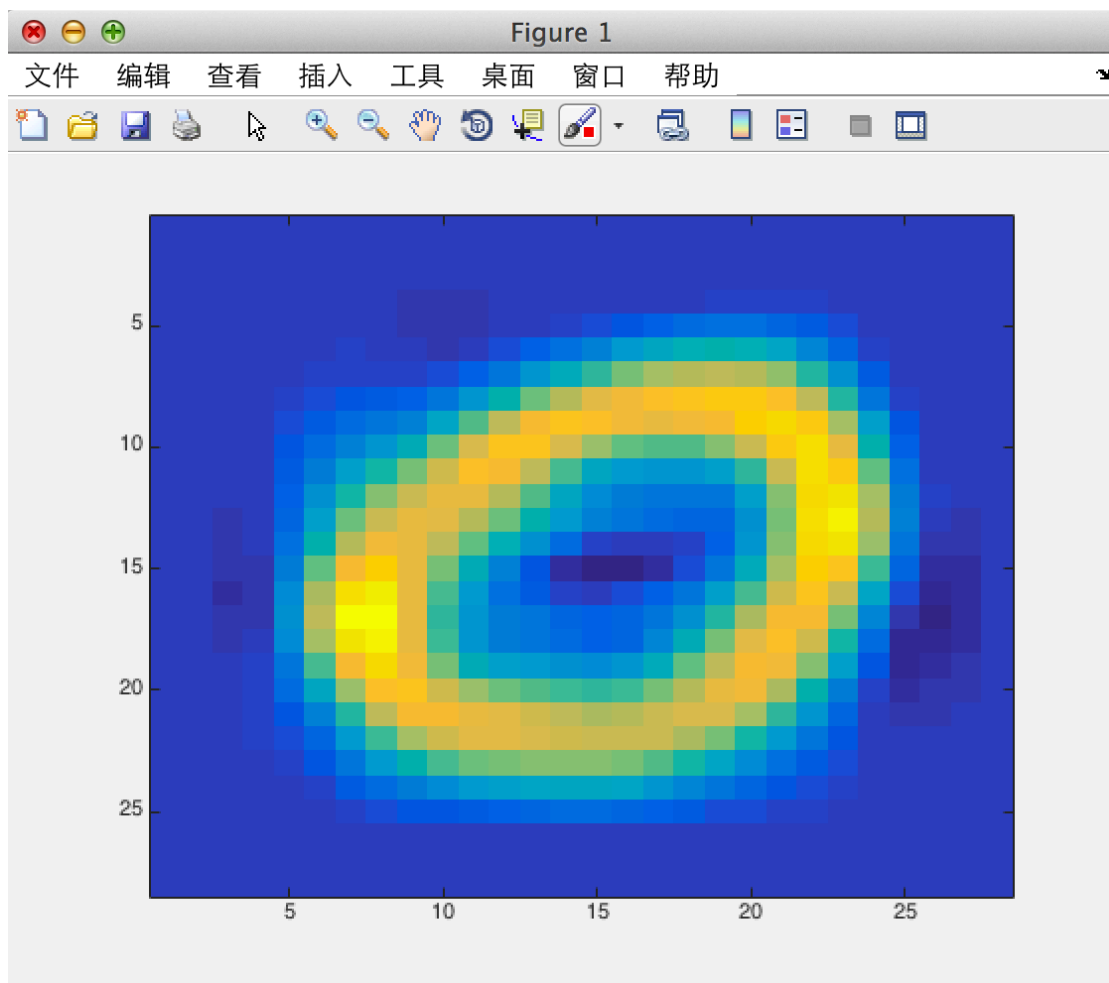
accuracy:

ans =

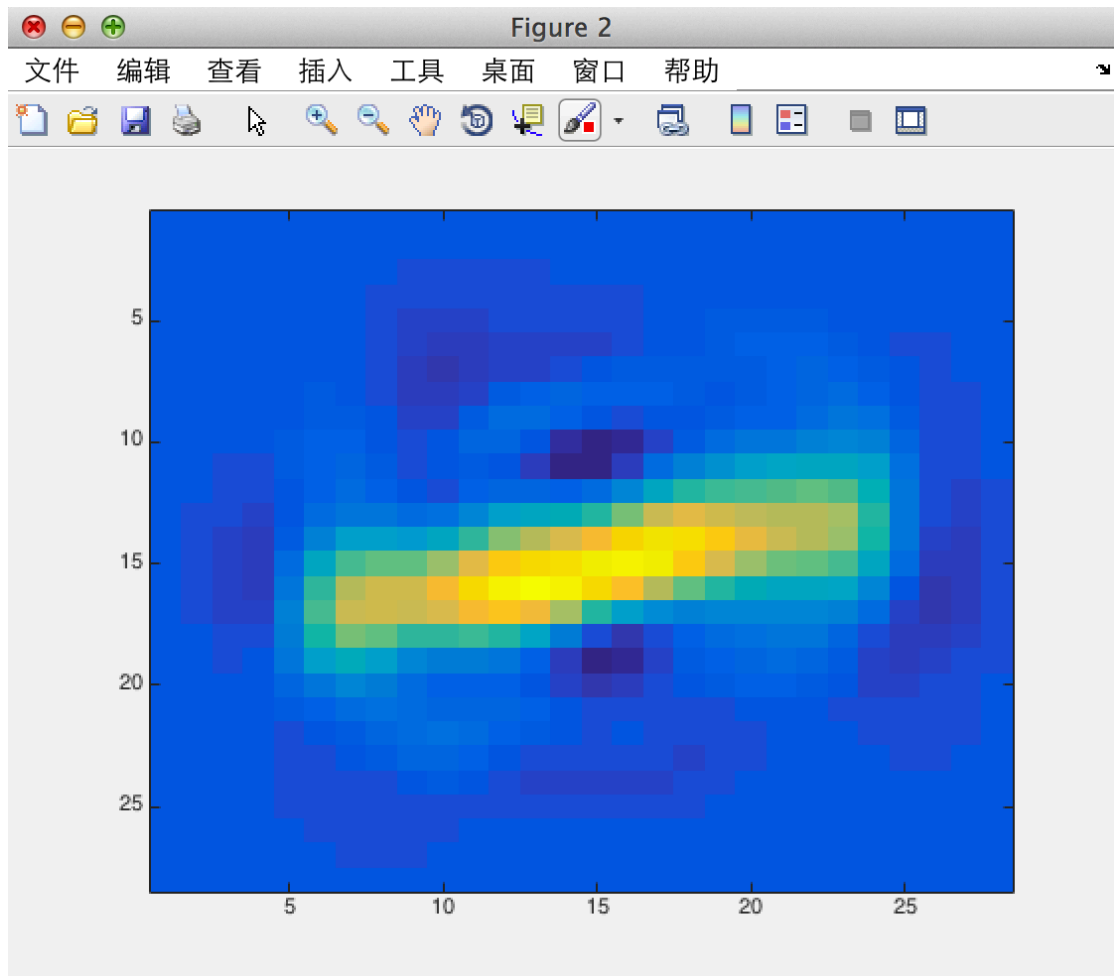
0.9360

(2) image of each Gaussian

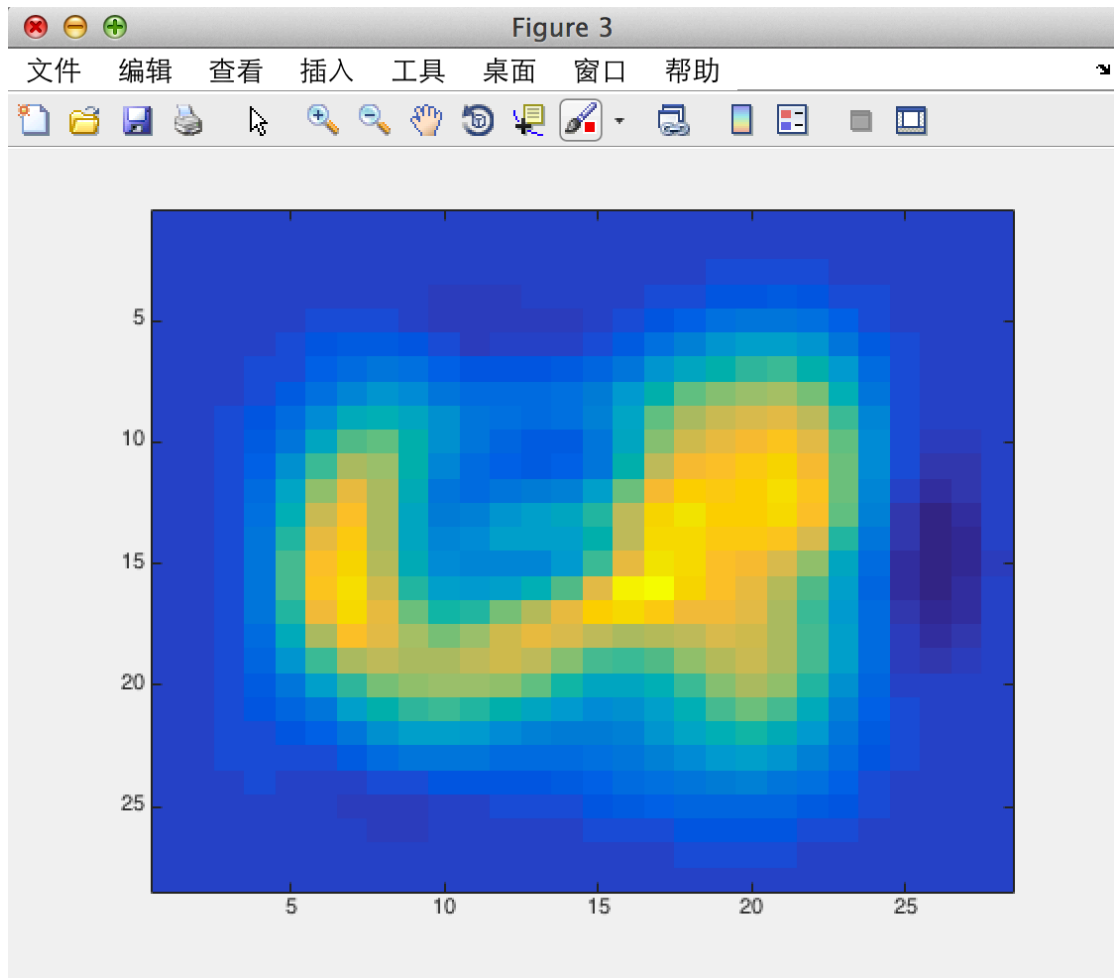
class 1:



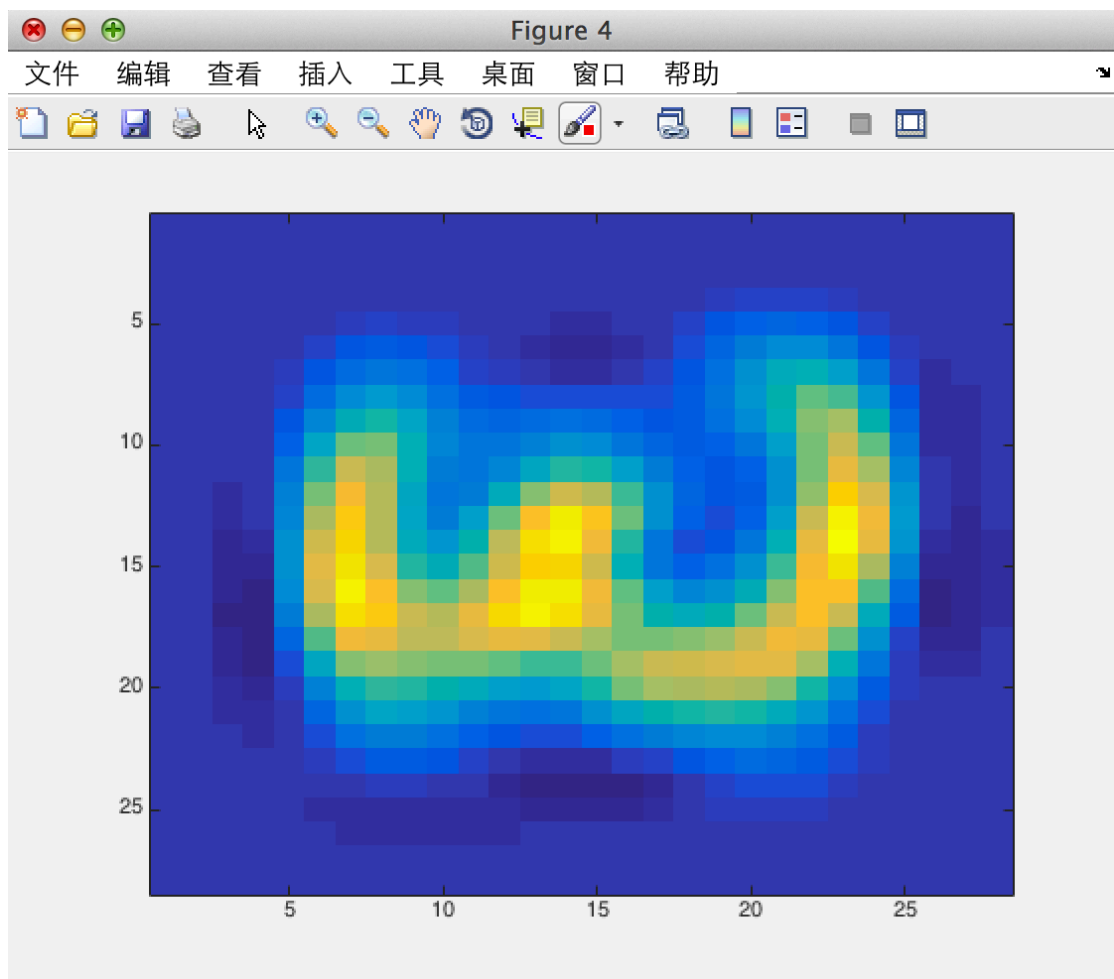
class 2:



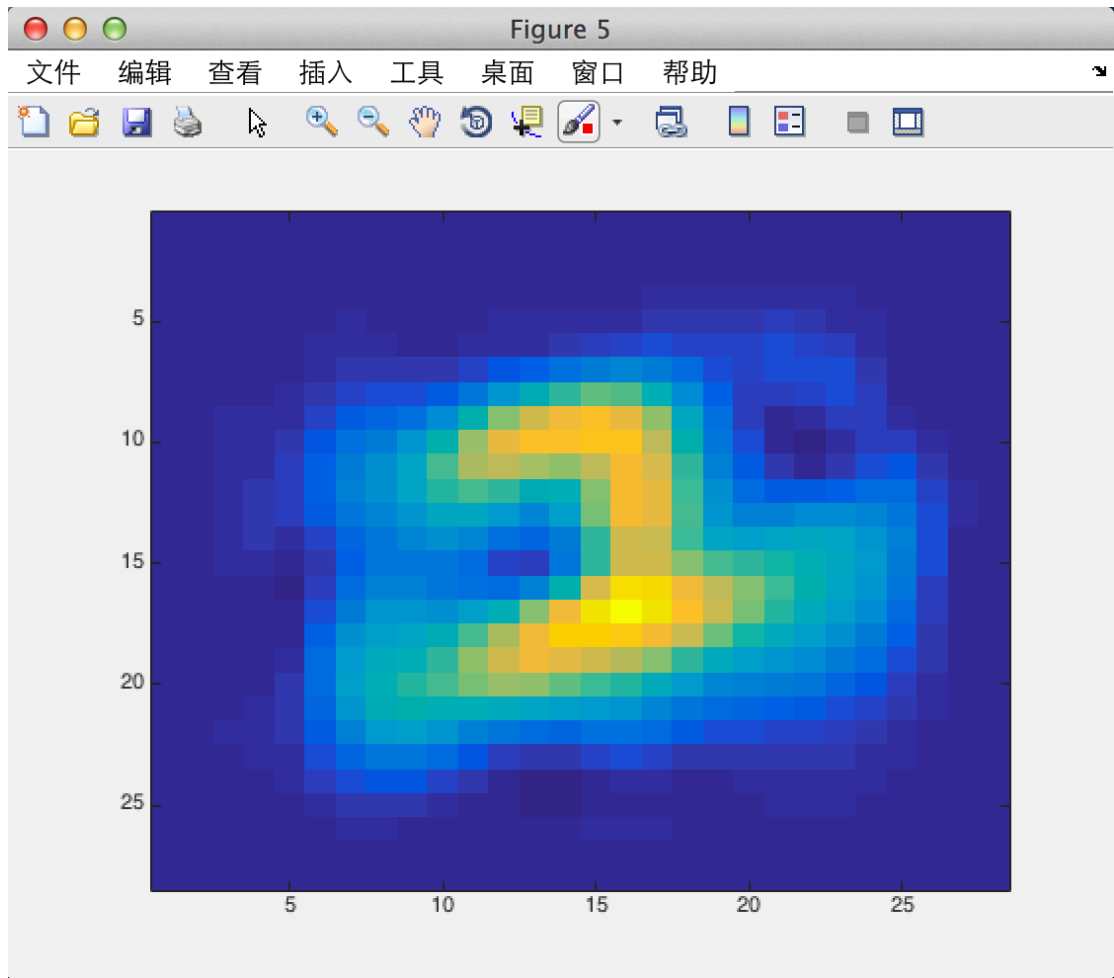
class 3:



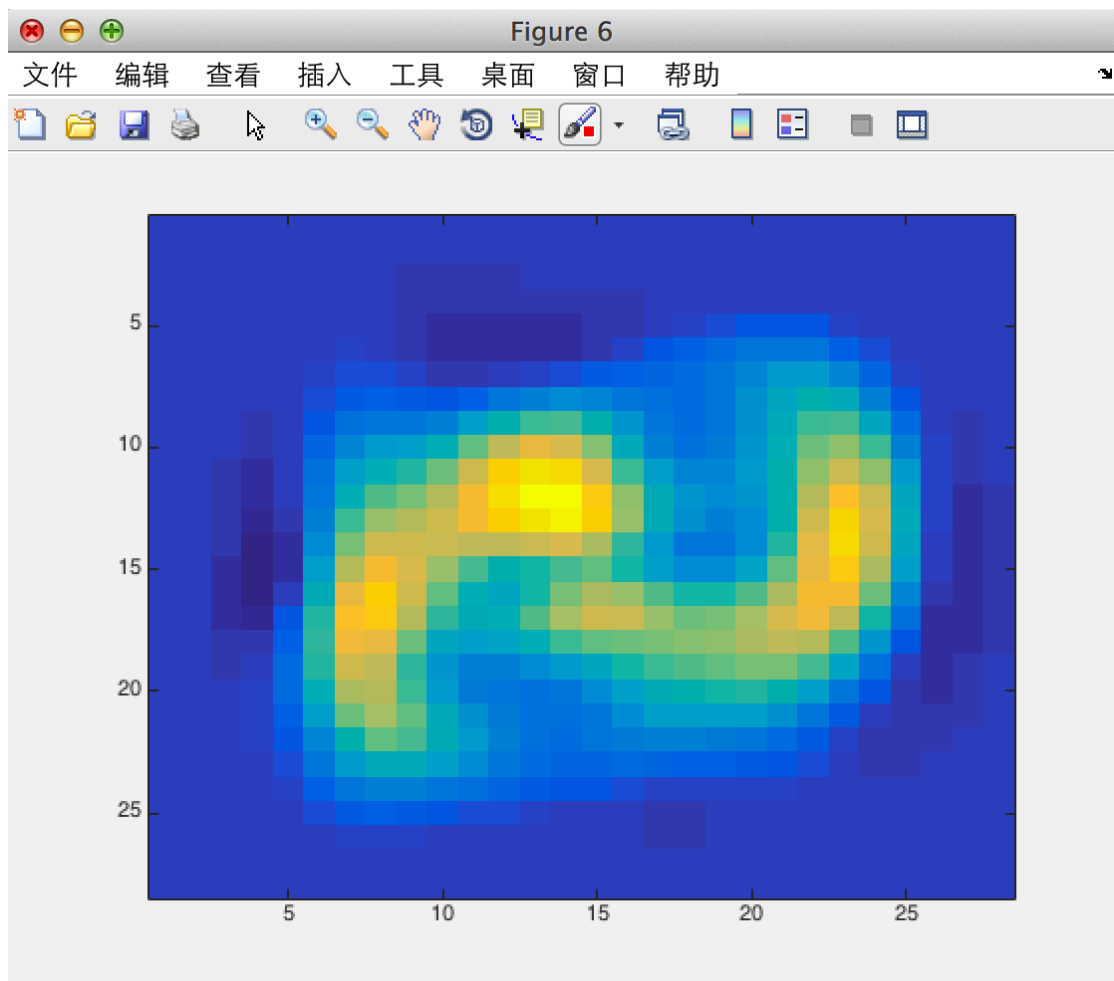
class 4:



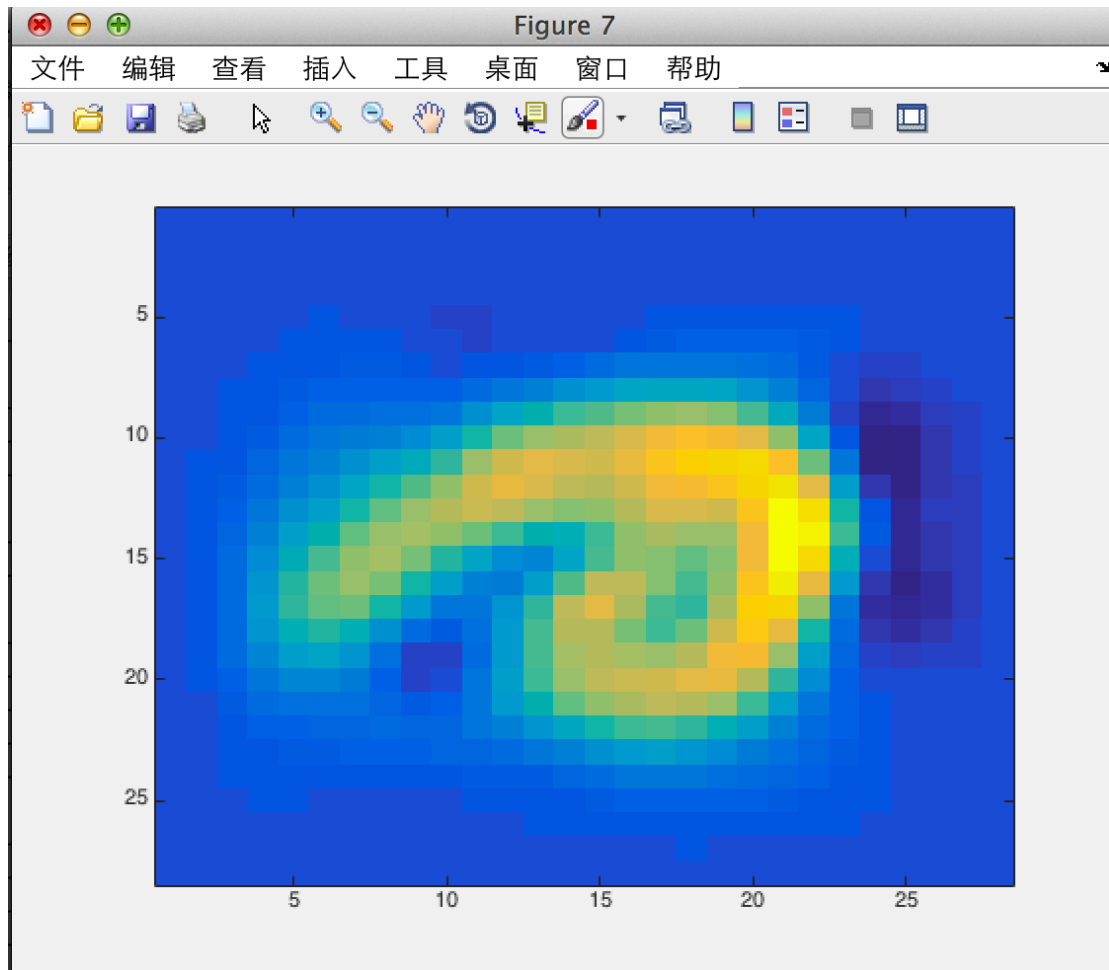
class 5:



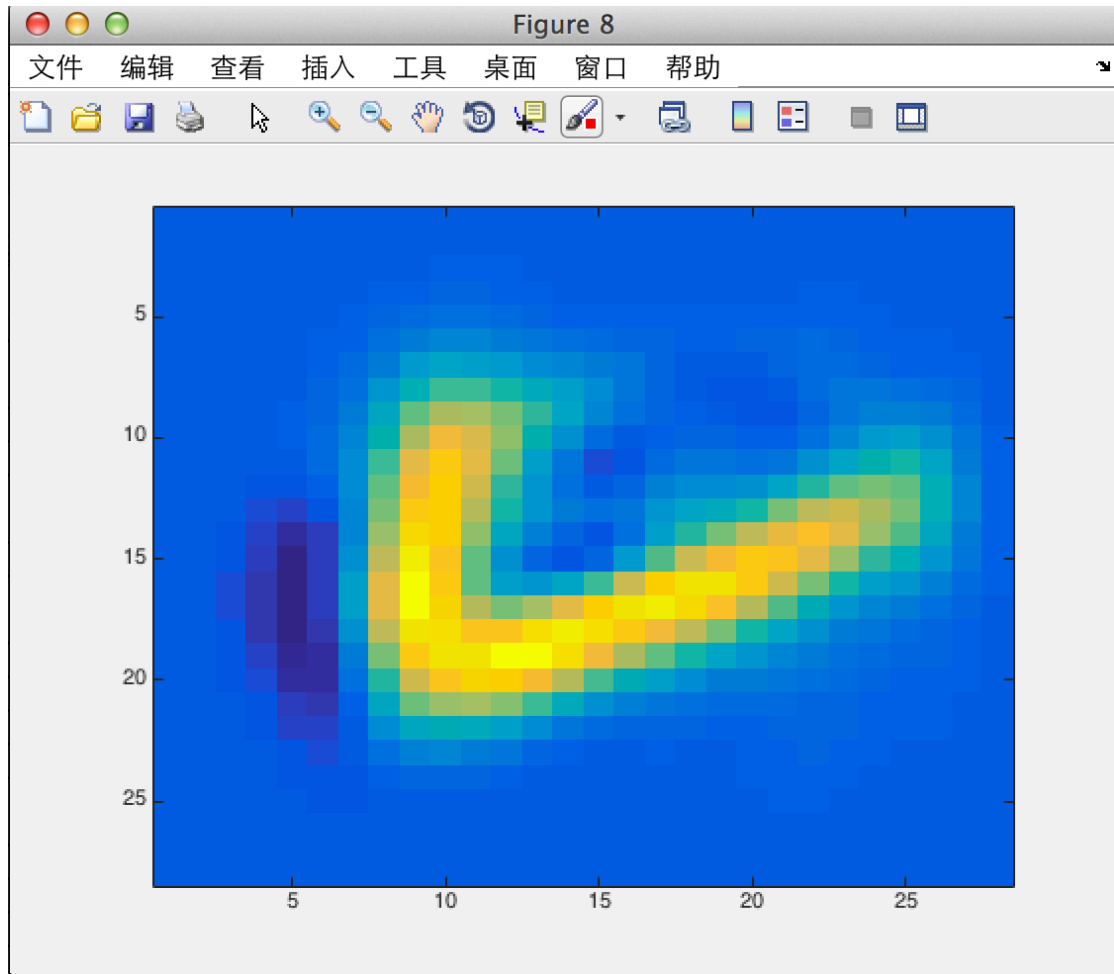
class 6:



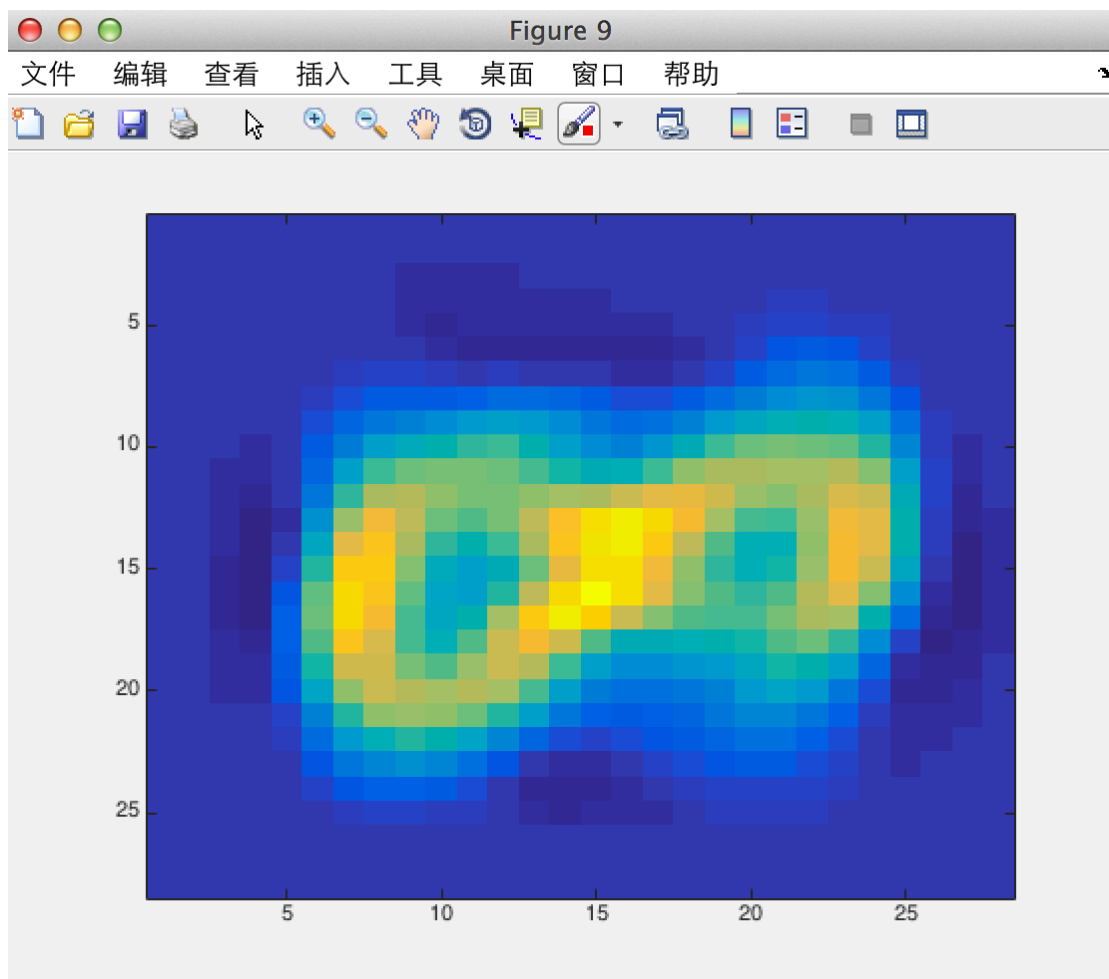
class 7:



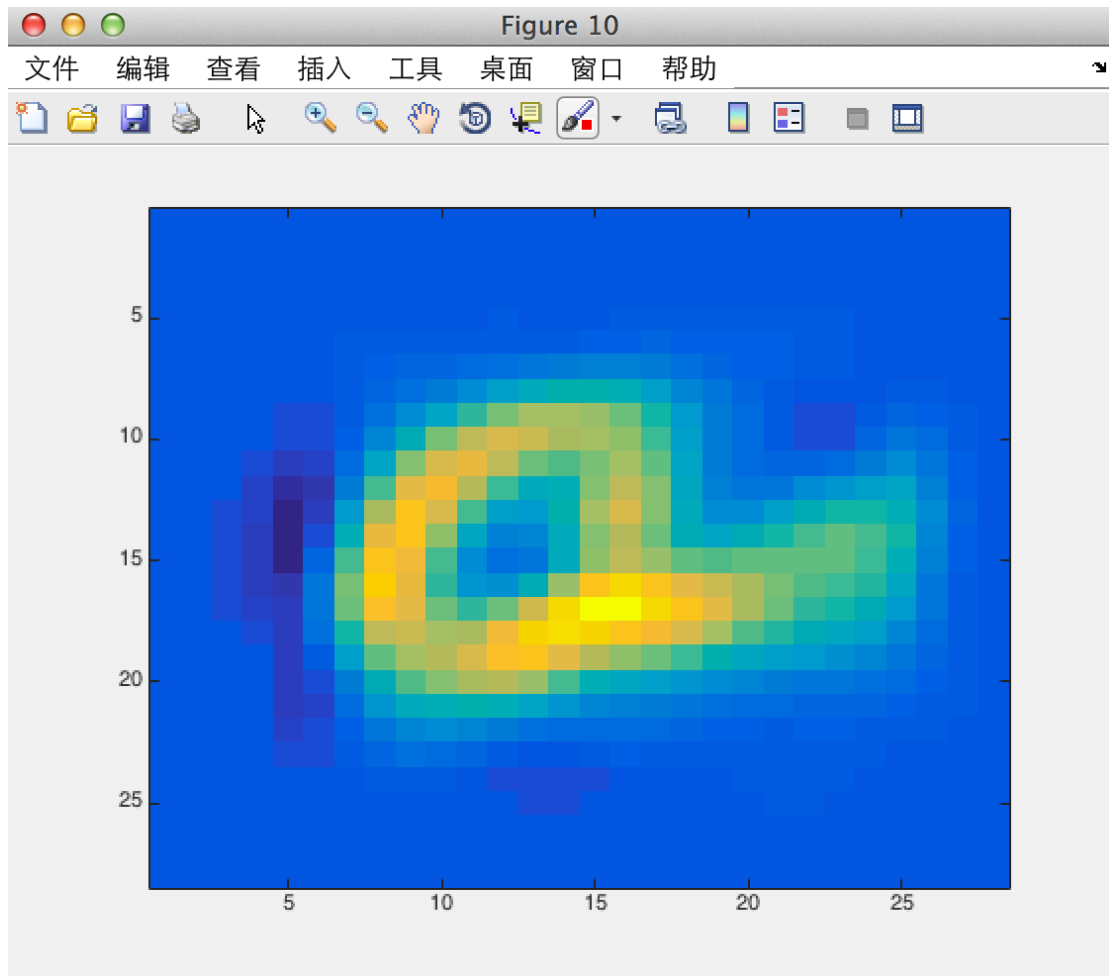
class 8:



class 9:



class 10:



(3) misclassified
index, yp, yt
452, 4, 9
457, 0, 9
481, 4, 9

Part c:

Dear TA,

I got big problems in coding this part of the problem. I struggled several days, and unfortunately miss the office hour to consult you deeply. So I attach the remaining code in the attachment. The confusion matrix part and finding incorrect examples are OK. Would you please see if there maybe some credits for labour. Thank you very much!

Source Code Attachment

Problem 3, part a

```
Xtest=importdata('Xtest.txt');
Xtrain=importdata('Xtrain.txt');
label_test=importdata('label_test.txt');
label_train=importdata('label_train.txt');
yt=label_test;
yp=zeros(500,1);
distance=zeros(500,5000);
minValue=0;
maxVector=zeros(500,1);
k=5;
Majority=zeros(500,k);
disSquare=0;
minPosition=zeros(500,k);
C=zeros(10,10);
% [x,y]= find(a==min(min(a)))
for i=1:500
    for j=1:5000
        for m=1:20
            disSquare=disSquare+(Xtest(i,m)-Xtrain(j,m))^2;
        end
        distance(i,j)=disSquare;
        disSquare=0;
    end
end

for i=1:k
    for j=1:500
        [x,y]=min(transpose(distance(j,:)));
        Majority(j,i)=label_train(y,1);
        distance(j,y)=1000;
    end
end

for i=1:500
    yp(i,:)=mode(Majority(i,:));
end

for i=1:500
    C(yt(i,1)+1,yp(i,1)+1)=C(yt(i,1)+1,yp(i,1)+1)+1;
end
% C
```

```

k
trace(C)

for i=1:500
    if (yp(i,1)~=yt(i,1))
        i,yp(i,1),yt(i,1)
    end
end
end

```

Problem 3, part b

```

Xtest=importdata('Xtest.txt');
Xtrain=importdata('Xtrain.txt');
label_test=importdata('label_test.txt');
label_train=importdata('label_train.txt');
Q=importdata('Q.txt');
yt=label_test;
yp=zeros(500,1);
classifier=zeros(500,10);
miu=zeros(20,10);
sigma=zeros(20,20,10);
y=zeros(784,10);
index=1;
C=zeros(10,10);

for class=1:10
    for i=1:500

miu(:,class)=miu(:,class)+transpose(Xtrain((class-1)*500+i,:));
        end
        miu(:,class)=miu(:,class)/500;
        for i=1:500

sigma(:, :, class)=sigma(:, :, class)+(transpose(Xtrain((class-1)*500+i,:))-miu(:,class))*(Xtrain((class-1)*500+i,:)-transpose(miu(:,class)));
            end
            sigma(:, :, class)=sigma(:, :, class)/500;
        end

% miu
% sigma(:, :, 1)

for i=1:500

```

```

        for class=1:10

classifier(i,class)=1/10*(det(sigma(:,:,class)))^(-1/2)*exp(-1/2*(Xtest(i,:)-transpose(miu(:,class)))*inv(sigma(:,:,class))*(transpose(Xtest(i,:))-miu(:,class))));
        end
end

classifier(474,:)

for i=1:500
    for j=1:10
        if (classifier(i,j)>classifier(i,index))
            index=j;
        end
    end
    yp(i,1)=index-1;
    index=1;
end

for i=1:500
    C(yp(i,1)+1,yp(i,1)+1)=C(yp(i,1)+1,yp(i,1)+1)+1;
end

C
trace(C)/500

for class=1:10
    figure(class)
    y(:,class)=Q*miu(:,class);
    imagesc(reshape(y(:,class),28,28))
end

for i=1:500
    if (yp(i,1)~=yt(i,1))
        i,yp(i,1),yt(i,1)
    end
end
end

```

Problem 3 part c

```

Xtest=importdata('Xtest.txt');
Xtrain=importdata('Xtrain.txt');

```

```

label_test=importdata('label_test.txt');
label_train=importdata('label_train.txt');
Q=importdata('Q.txt');
yt=label_test;
yp=zeros(500,1);
sigma=zeros(20,10);
wiL=zeros(20,10);

for class=1:10
    for i=1:500

sigma(1,class)=sigma(:,class)+transpose(Xtrain((class-1)*500+i,:));
        end
        miu(:,class)=miu(:,class)/500;
        for i=1:500
%             transpose(Xtrain((class-1)*500+i,:)-miu(:,class))
%             Xtrain((class-1)*500+i,:)-transpose(miu(:,class))

sigma(:, :, class)=sigma(:, :, class)+(transpose(Xtrain((class-1)*500+i, :
))-miu(:,class))*(Xtrain((class-1)*500+i,:)-transpose(miu(:,class)));
            end
            sigma(:, :, class)=sigma(:, :, class)/500;
        end

% miu
% sigma(:, :, 1)

for i=1:500
    for class=1:10
%         disp('1');
%         transpose(Xtrain((class-1)*50+i,:)-miu(:,class))
%         disp('2');
%         inv(sigma(:, :, class))
%         disp('3');
%         Xtrain((class-1)*50+i,:)-transpose(miu(:,class))

classifier(i,class)=1/10*(det(sigma(:, :, class)))^(-1/2)*exp(-1/2*(Xte
st(i,:)-transpose(miu(:,class)))*inv(sigma(:, :, class))*(transpose(Xte
st(i,:)-miu(:,class))));
            end
        end

classifier(474,:)
% [x,y]=max(transpose(classifier(474,:)));

```

```

% [x,y]=max(classifier(474,:));
% data=max(transpose(classifier(474,:)));
% data

for i=1:500
%     transpose(classifier(i,:))
%     [x,y]=find(z==max(max(classifier(i,:))))
%     [x,y]=max(classifier(i,:));
    for j=1:10
%         [x,y]=max(transpose(classifier(i,:)));
        if (classifier(i,j)>classifier(i,index))
            index=j;
        end
    end
    yp(i,1)=index-1;
    index=1;
end

for i=1:500
    C(yp(i,1)+1,yp(i,1)+1)=C(yp(i,1)+1,yp(i,1)+1)+1;
end

C
trace(C)/500

for i=1:500
    if (yp(i,1)~=yt(i,1))
        i,yp(i,1),yt(i,1)
    end
end
end

```