BÁO CÁO MÔN NHẬN DẠNG THỊ GIÁC VÀ ỨNG DỤNG (VRA)

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Đường dẫn tài khoản Github	**https://github.com/lamkbd/VRA**

Báo cáo bài thực hành [TH1]

Code bài thực hành :

```
function Example001()
    a=rand();
    fprintf('\nSo ngau nhien trong khoang [0-1], cach le 8 & lay 3 chu so thap phan ben
phai:[%8.3f]',a);
    r=randi([1 10]);
    fprintf('\nSo ngau nhien trong khoang [1 10]: [%d]',r);
    rArray=randi([-10 10],1,10);
    fprintf('\nsize :%d',size(rArray));
    fprintf('\nMang 1 dong 10 cot co gia tri trong khoang [-10 10],
        \nchen 1 khoang trang vao truoc neu gia tri chi co 1 chu so: ');
    fprintf('[%d]',rArray);
end


function Example002()
    m=input('\nNhap m: ');
    n=input('\nNhap n: ');
    a=ones(m,n);
    b=zeros(m,n);
    c=eye(m,n);
    d=randi([-10 10],m,n);
    a(1,1)=5;
    e=size(a);
    fprintf('a :\n');
    disp(a);
    fprintf('b :\n');
    disp(b);
    fprintf('c :\n');
    disp(c);
    fprintf('d :\n');
    disp(d);
    fprintf('e :\n');
    disp(e);
end

function Example003()
    n=input('\nNhap n: ');
    s=0;
    i=1;
    while i<=n
```

```matlab
        s=s+i;
        i=i+1;
    end
    fprintf('tong 1-%d = %d',n,s);
end

function Example004()
    n=input('\nNhap n: ');
    s=0;
    for i=1:n
        s=s+i;
        i=i+1;
    end
    fprintf('tong 1-%d = %d',n,s);
end

function primeArray = findnprime(n)
    count=0;
    i=2;
    primeArray=[];
    while(count<n)
        if(isprime(i)==1)
            count=count+1;
            primeArray=[primeArray,i];
        end
        i=i+1;
    end
end

function m = isprime(n)
    count=0;
    for i=1:n
        if(mod(n,i)==0)
            count=count+1;
        end
    end
    m=(count==2);
end

function loadnprime(n)
    strFileName=['prime',num2str(n),'.mat'];
    load(strFileName);
    rArray
end
```

```matlab
function savenprime(n)
    rArray=findnprime(n);
    strFileName=['prime',num2str(n),'.mat'];
    save(strFileName,'rArray');
end
```

Code bài thực hành :

```matlab
TatCaAnh = loadMNISTImages('train-images.idx3-ubyte');
Anh00001=reshape(TatCaAnh(:,1),28,[]);
imshow(Anh00001);

function Recognition001_Digits()
    fprintf('\nLoad du lieu train');
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll = loadMNISTLabels('train-labels.idx1-ubyte');
    fprintf('\nLoad du lieu test');
    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll = loadMNISTLabels('t10k-labels.idx1-ubyte');
    fprintf('\nKet thuc.');
end

function Recognition002_Digits()
    fprintf('\nLoad du lieu train');
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll = loadMNISTLabels('train-labels.idx1-ubyte');
    fprintf('\nLoad du lieu test');
    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll = loadMNISTLabels('t10k-labels.idx1-ubyte');

    nTrainImages=size(imgTrainAll,2);
    nTrainLabels=size(lblTrainAll,1);
    nTestImages=size(imgTestAll,2);
    nTestLabels=size(lblTestAll,1);

    nSizeOfImage=size(imgTrainAll,1);

    fprintf('\nSo luong anh train :[%d].',nTrainImages);
    fprintf('\nSo luong nhan anh train :[%d].',nTrainLabels);
    fprintf('\nSo luong anh test :[%d].',nTestImages);
    fprintf('\nSo luong nhan anh test :[%d].',nTestLabels);

    fprintf('\nSize cua 1 anh :[%d].',nSizeOfImage);
end
```

```matlab
function Recognition003_Digits()
    fprintf('\nLoad du lieu train');
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll = loadMNISTLabels('train-labels.idx1-ubyte');
    fprintf('\nLoad du lieu test');
    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll = loadMNISTLabels('t10k-labels.idx1-ubyte');

    nTrainImages=size(imgTrainAll,2);
    nTrainLabels=size(lblTrainAll,1);
    figure;
    imgFirst=reshape(imgTrainAll(:,1),28,28);
    imgFirstLabel=num2str(lblTrainAll(1));
    imshow(imgFirst);
    title(imgFirstLabel);

    figure;
    imgLast=reshape(imgTrainAll(:,nTrainImages),28,28);
    imgLastLabel=num2str(lblTrainAll(nTrainImages));
    imshow(imgLast);
    title(imgLastLabel);

end

function Recognition004_Digits()
    fprintf('\nLoad du lieu train');
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll = loadMNISTLabels('train-labels.idx1-ubyte');
    fprintf('\nLoad du lieu test');
    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll = loadMNISTLabels('t10k-labels.idx1-ubyte');

    nTrainImages=size(imgTrainAll,2);
    nTestImages=size(imgTestAll,2);
    nNumber=randi([1 nTrainImages]);
    figure;
    imgTrain=reshape(imgTrainAll(:,nNumber),28,28);
    imgTrainLabel=num2str(lblTrainAll(nNumber));
    imshow(imgTrain);
    title(imgTrainLabel);

    nNumber=randi([1 nTestImages]);
    figure;
    imgTest=reshape(imgTestAll(:,nNumber),28,28);
    imgTestLabel=num2str(lblTestAll(nNumber));
```

```matlab
        imshow(imgTest);
        title(imgTestLabel);

end
function Recognition005_Digits()

    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

    mdl=fitcknn(imgTrainAll',lblTrainAll);

    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

    nTestImages=size(imgTestAll,2);
    nNumber=randi([1 nTestImages]);

    imgTest=imgTestAll(:,nNumber);
    lblImgTest=imgTestAll(nNumber);

    lblPredict=predict(mdl,imgTest');

    figure;
    img2D=reshape(imgTest,28,28);
    imshow(img2D);

    message=['Anh test ban dau co nhan: ',num2str(lblTestAll(nNumber)),'.'];
    message=[message,'Du doan cua chuong trinh : '];
    message=[message,num2str(lblPredict)];

    if(num2str(lblPredict)==num2str(lblTestAll(nNumber)))
        message=[message,'. => Ket qua dung'];
    else
        message=[message,'. => Ket qua sai'];
    end
    title(message);
end

function images = loadMNISTImages(filename)
%loadMNISTImages returns a 28x28x[number of MNIST images] matrix containing
%the raw MNIST images

fp = fopen(filename, 'rb');
assert(fp ~= -1, ['Could not open ', filename, '']);

magic = fread(fp, 1, 'int32', 0, 'ieee-be');
```

```matlab
assert(magic == 2051, ['Bad magic number in ', filename, '']);

numImages = fread(fp, 1, 'int32', 0, 'ieee-be');
numRows = fread(fp, 1, 'int32', 0, 'ieee-be');
numCols = fread(fp, 1, 'int32', 0, 'ieee-be');

images = fread(fp, inf, 'unsigned char');
images = reshape(images, numCols, numRows, numImages);
images = permute(images,[2 1 3]);

fclose(fp);

% Reshape to #pixels x #examples
images = reshape(images, size(images, 1) * size(images, 2), size(images, 3));
% Convert to double and rescale to [0,1]
images = double(images) / 255;

end

function labels = loadMNISTLabels(filename)
%loadMNISTLabels returns a [number of MNIST images]x1 matrix containing
%the labels for the MNIST images

fp = fopen(filename, 'rb');
assert(fp ~= -1, ['Could not open ', filename, '']);

magic = fread(fp, 1, 'int32', 0, 'ieee-be');
assert(magic == 2049, ['Bad magic number in ', filename, '']);

numLabels = fread(fp, 1, 'int32', 0, 'ieee-be');

labels = fread(fp, inf, 'unsigned char');

assert(size(labels,1) == numLabels, 'Mismatch in label count');

fclose(fp);

end
```

Trả lời câu hỏi :
Q1: randi([1 200]);
Q2: A(3,5)
Q3: zeros(100,200);
Q4: size(A,1);
Q5: A(:,10)
Q6: A(10,:)
Q7: reshape(A,28,28)

**Báo cáo bài thực hành [TH3]**

(Github : https://github.com/lamkbd/VRA/tree/master/Lecture%2003)

Q1 :

```
function Q1(n)
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

    img=imgTrainAll(:,n);
    img=reshape(img,28,28);
    imgLabel=num2str(lblTrainAll(n));
    figure;
    imshow(img);
    title(imgLabel);
end
```

1	5
500	8
5000	2
10000	7
59000	4

Q2:

```
function Q2(n)
    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

    img=imgTestAll(:,n);
    img=reshape(img,28,28);
    imgLabel=num2str(lblTestAll(n));
    figure;
    imshow(img);
```

```
    title(imgLabel);
end
```

1	7
500	6
5000	0
9000	0

Q3:

```
function Q3()
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');
    m=zeros(10,2);
    for i=1:10
    m(i,1)=i-1;
    end
    for i=1:size(lblTrainAll,1)
    k=lblTrainAll(i);
    m(k+1,2)=m(k+1,2)+1;
    i=i+1;
    end
    disp(table(m));
    writetable(table(m),'Q3.csv','Delimiter',',','QuoteStrings',true);
end
```

m_1	m_2
0	5923
1	6742
2	5958
3	6131
4	5842
5	5421
6	5918
7	6265
8	5851
9	5949

Q4:

```matlab
function Q4()
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');
    m=zeros(10,2);
    for i=1:10
    m(i,1)=i-1;
    end
    for i=1:size(lblTestAll,1)
    k=lblTestAll(i);
    m(k+1,2)=m(k+1,2)+1;
    i=i+1;
    end
    disp(table(m));
    writetable(table(m),'Q4.csv','Delimiter',',','QuoteStrings',true);
end
```

m_1	m_2
0	980
1	1135
2	1032
3	1010
4	982
5	892
6	958
7	1028
8	974
9.0	1009

Q5:

```matlab
function Q5(n)
    if(n<0||n>10000)
    disp('Tham so khong hop le');
    return;
    end
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

    mdl=fitcknn(imgTrainAll',lblTrainAll);

    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

    imgTest=imgTestAll(:,n);
    lblImgTest=num2str(lblTestAll(n));

    lblPredict=predict(mdl,imgTest');

    figure;
    img2D=reshape(imgTest,28,28);
    imshow(img2D);

    message=['Anh test: ',lblImgTest,'.'];
```

```matlab
        message=[message,'Du doan : '];
        message=[message,num2str(lblPredict)];

        if(num2str(lblPredict)==lblImgTest)
        message=[message,'. => Ket qua dung'];
        else
        message=[message,'. => Ket qua sai'];
        end
        title(message);
end
```

Tham số n	Kết quả
5	Anh test: 4.Du doan : 4. => Ket qua dung 4
500	Anh test: 6.Du doan : 6. => Ket qua dung 6
900	Anh test: 8.Du doan : 8. => Ket qua dung 8

```matlab
function Q6(n)
    if(n<0||n>10000)
    disp('Tham so khong hop le');
    return;
    end
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

    mdl=fitcknn(imgTrainAll',lblTrainAll);

    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

    imgTest=imgTestAll(:,n);
    lblImgTest=num2str(lblTestAll(n));

    lblPredict=predict(mdl,imgTest');

    figure;
    img2D=reshape(imgTest,28,28);
    imshow(img2D);

    message=['Anh test: ',lblImgTest,'.'];
    message=[message,'Du doan : '];
```

```matlab
        message=[message,num2str(lblPredict)];

        if(num2str(lblPredict)==lblImgTest)
        message=[message,'. => Ket qua dung'];
        else
        message=[message,'. => Ket qua sai'];
        end
        title(message);
end
```

Q7:

```matlab
function Q7(n)
    m=zeros(length(n),2);
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

    mdl=fitcknn(imgTrainAll',lblTrainAll);

    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

    for i=1:length(n)
    m(i,1)=n(i);
     for j=1:size(lblTestAll,1)
         k=lblTestAll(j);
         if(k==n(i))
              imgTest=imgTestAll(:,j);
             lblPredict=predict(mdl,imgTest');
              if(num2str(lblPredict)~=num2str(k))
              m(i,2)=m(i,2)+1;
              end
         end
         j=j+1;
    end
    i=i+1;
    end
    disp(m);
    writetable(table(m),'Q7.csv','Delimiter',',','QuoteStrings',true);
end
```