BÁO CÁO THỰC HÀNH
MÔN NHẬN DANG THỊ GIÁC VÀ ỨNG DỤNG

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Github: https://github.com/lehoangdung0612/VRA.LeHoangDung.CH1501022

BÀI TẬP THỰC HÀNH 4

Q1.

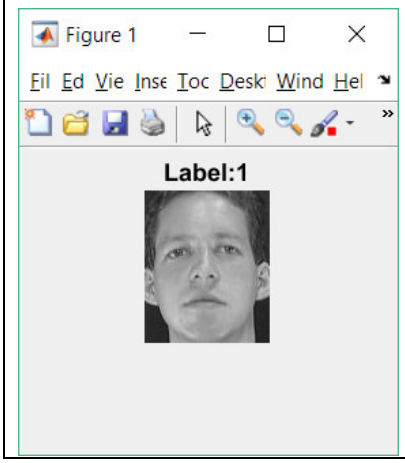
```
function showTrainImageAtN(n)
     if ~exist('n','var')
         disp('Wrong parameters...');
         return
    end
    fprintf('\n Load du lieu Train');
    load('./imgTrainImagesAll.mat');
    load('./lblTrainLabelsAll.mat');

    figure,
    img = imgTrainImagesAll(:, n);
    img2D = reshape(img, 112, 92); % reshape
    strLabelImage = ['Label:', num2str(lblTrainLabelsAll(n))];
    imshow(img2D); % show image
    title(strLabelImage);
end
```

N = 1	N = 5	N = 100
		

Q2.

```
function showTestImageAtN(n)
    if ~exist('n','var')
        disp('Wrong parameters...');
        return
    end
    fprintf('\n Load du lieu Test');
    load('./imgTestImagesAll.mat');
    load('./lblTestLabelsAll.mat');

    figure,
    img = imgTestImagesAll(:, n);
    img2D = reshape(img, 112, 92); % reshape
    strLabelImage = ['Label:', num2str(lblTestLabelsAll(n))];
    imshow(img2D); % show image
    title(strLabelImage);
end
```

N = 1



N = 50

N = 100

Q3.

```
function thongKeImageTrain()
    fprintf('\n Load du lieu');
    lblAll = loadMNISTLabels('./train-labels.idx1-ubyte');

    nCol = 10;
    A = zeros([2 nCol]);

    for i=1:nCol
        label = i - 1;
        A(1, i) = label;
        A(2, i) = sum(lblAll == label);
    end

    % print A
    A
    % write csv file
    strFileName = ['D:\Q3', '.csv'];
    csvwrite(strFileName, A);

end
```

1	2	3	4	5	6	7	8	9	10
7	7	7	7	7	7	7	7	7	7

11	12	13	14	15	16	17	18	19	20
7	7	7	7	7	7	7	7	7	7

21	22	23	24	25	26	27	28	29	30
7	7	7	7	7	7	7	7	7	7

31	32	33	34	35	36	37	38	39	40
7	7	7	7	7	7	7	7	7	7

Q4.

```
function thongKeImageTest()
    fprintf('\n Load du lieu');
    load('./lblTestLabelsAll.mat');

    nCol = 40;
    A = zeros([2 nCol]);

    for i=1:nCol
        label = i;
        A(1, i) = label;
        A(2, i) = sum(lblTestLabelsAll == label);
    end

    % print A
    A
    % write csv file
    strFileName = ['D:\Q4', '.csv'];
    csvwrite(strFileName, A);
end
```

1	2	3	4	5	6	7	8	9	10
3	3	3	3	3	3	3	3	3	3

11	12	13	14	15	16	17	18	19	20
3	3	3	3	3	3	3	3	3	3

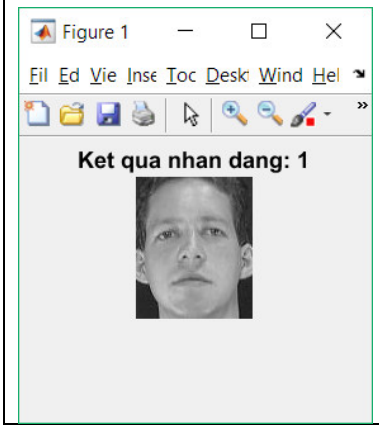
21	22	23	24	25	26	27	28	29	30
3	3	3	3	3	3	3	3	3	3

31	32	33	34	35	36	37	38	39	40
3	3	3	3	3	3	3	3	3	3

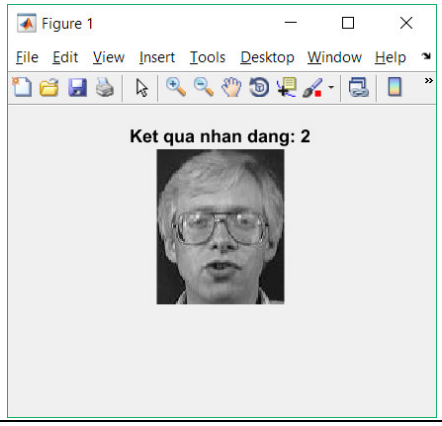
Q5.

```
function lblPredictTest = recognizeImageAtN(n)
    if ~exist('n','var')
        disp('Wrong parameters...');
        return
    end

    load('./imgTrainImagesAll.mat');
    load('./lblTrainLabelsAll.mat');
    Mdl = fitcknn(double(imgTrainImagesAll'), lblTrainLabelsAll);

    load('./imgTestImagesAll.mat');

    imgTest = imgTestImagesAll(:, n);
    lblPredictTest = predict(Mdl, double(imgTest'));

    figure;
    img2D = reshape(imgTest, 112, 92);
    imshow(img2D);

    strLabelImage = ['Ket qua nhan dang: ', num2str(lblPredictTest)];
    title(strLabelImage);
end
```

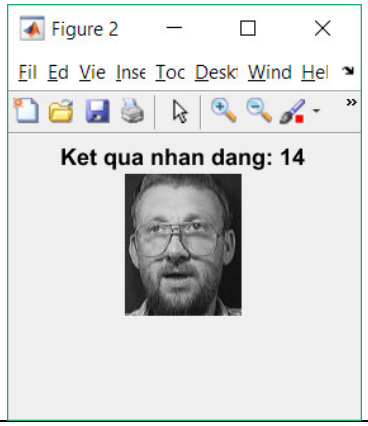
N = 1



N = 5



N = 40



Q6.

```
function countNumOfLabelWrongKnn(n)
    if ~exist('n','var')
        disp('Wrong parameters...');
        return
    end

    load('./imgTrainImagesAll.mat');
    load('./lblTrainLabelsAll.mat');
    Mdl = fitcknn(double(imgTrainImagesAll'), lblTrainLabelsAll);

    load('./imgTestImagesAll.mat');
    load('./lblTestLabelsAll.mat');
    nNumbers = size(imgTestImagesAll, 2);
    counter = 0;

    for i=1:nNumbers
        lblTest = lblTestLabelsAll(i);
        if num2str(lblTest) == num2str(n)
            imgTest = imgTestImagesAll(:, i);
            lblPredictTest = predict(Mdl, double(imgTest'));
            if lblPredictTest ~= lblTest
                counter = counter + 1;
            end
        end
    end

    fprintf('So luong anh co label nhan dang sai: %d\n', counter);
end
```

Q7.

```
function countNumOfLabelWrongKnn(n)
    if ~exist('n','var')
        disp('Wrong parameters...');
        return
    end

    load('./imgTrainImagesAll.mat');
    load('./lblTrainLabelsAll.mat');
    Mdl = fitcknn(double(imgTrainImagesAll'), lblTrainLabelsAll);

    load('./imgTestImagesAll.mat');
    load('./lblTestLabelsAll.mat');
    nNumbers = size(imgTestImagesAll, 2);
    counter = 0;

    for i=1:nNumbers
        lblTest = lblTestLabelsAll(i);
        if num2str(lblTest) == num2str(n)
            imgTest = imgTestImagesAll(:, i);
            lblPredictTest = predict(Mdl, double(imgTest'));
            if lblPredictTest ~= lblTest
                counter = counter + 1;
            end
        end
    end

    fprintf('So luong anh co label nhan dang sai: %d\n', counter);
end
```

1	2	3	4	5	6	7	8	9	10
1	0	0	0	0	0	0	0	0	0

11	12	13	14	15	16	17	18	19	20
1	0	0	0	0	1	0	0	1	1

21	22	23	24	25	26	27	28	29	30
0	0	0	0	0	0	0	1	0	0

31	32	33	34	35	36	37	38	39	40
0	1	0	0	0	0	0	0	0	1

Q7*.

```
function createConfusionMatrixKnn()
    load('./imgTrainImagesAll.mat');
    load('./lblTrainLabelsAll.mat');
    Mdl = fitcknn(double(imgTrainImagesAll'), lblTrainLabelsAll);

    load('./imgTestImagesAll.mat');
    load('./lblTestLabelsAll.mat');
    nNumbers = size(imgTestImagesAll, 2);

    nCol = 40;
    confusionMatrix = zeros(nCol, nCol);

    for i=1:nNumbers
        lblTest = lblTestLabelsAll(i);
        imgTest = imgTestImagesAll(:, i);
        lblPredictTest = predict(Mdl, double(imgTest'));
        confusionMatrix(lblTest, lblPredictTest) = confusionMatrix(lblTest,
lblPredictTest) + 1;
    end

    disp('Confusion matrix');
    confusionMatrix

    % write csv file
    strFileName = ['.\Q71', '.csv'];
    csvwrite(strFileName, confusionMatrix);
end
```

Q8.**

```
function calculatePrecisionOfKnn(NumNeighbors, Distance)
% NumNeighbors    Number of neighbors to predict
% Distance        'euclidean'/ 'seuclidean'/ 'cityblock'/ 'chebychev'/
'minkowski'
%                 / 'mahalanobis'/  'cosine'/ 'correlation'/ 'spearman'/
'hamming'/ 'jaccard'
    if ~exist('NumNeighbors','var')
        NumNeighbors = 1;
    end
    if ~exist('Distance','var')
        Distance = 'euclidean';
    end

    load('./imgTrainImagesAll.mat');
    load('./lblTrainLabelsAll.mat');
    Mdl = fitcknn(double(imgTrainImagesAll'), lblTrainLabelsAll,
'NumNeighbors', NumNeighbors, 'Distance', Distance);

    load('./imgTestImagesAll.mat');
    load('./lblTestLabelsAll.mat');
    nNumbers = size(imgTestImagesAll, 2);

    nCol = 40;
    confusionMatrix = zeros(nCol, nCol);

    for i=1:nNumbers
        lblTest = lblTestLabelsAll(i);
        imgTest = imgTestImagesAll(:, i);
        lblPredictTest = predict(Mdl, imgTest');
        confusionMatrix(lblTest, lblPredictTest) = confusionMatrix(lblTest,
lblPredictTest) + 1;
    end

    accuracy = 0;

    for i=1:nCol
        accuracy = accuracy + confusionMatrix(i, i);
    end

    accuracy = 100 * accuracy / nNumbers;
    fprintf('\nAccuracy= %s', num2str(accuracy));
end
```

```
>> calculatePrecisionOfKnn(1, 'euclidean')
        Accuracy= 94.1667

>> calculatePrecisionOfKnn(1, 'cosine')
        Accuracy= 90.8333

>> calculatePrecisionOfKnn(3, 'euclidean')
        Accuracy= 90.8333

>> calculatePrecisionOfKnn(3, 'cosine')
        Accuracy= 85.8333
```