Lab 10

CPS592 – Visual Computing and Mixed Reality

Objective

- Image matching
- Input: a query image
- Output: an image which is similar to the input image

Preparation

- Open MATLAB
- Create Lab10 folder
- Copy *query1.jpg, query2.jpg, query3.jpg* to Lab10 folder
- Copy *datasets.zip1* to Lab10 folder
- Rename *datasets.zip1* to *datasets.zip* and unzip it.

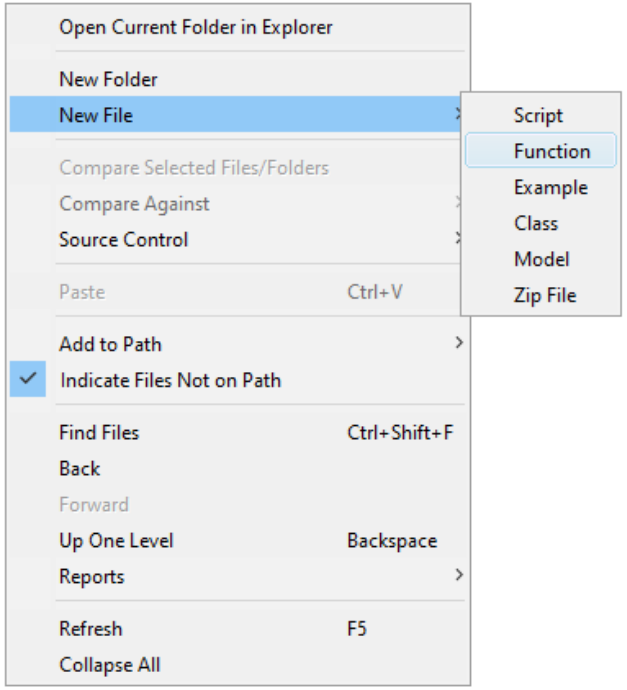
Copy lbp function from Lab9 to Lab10 folder

```
function feat = lbp(img)
img_gray = rgb2gray(img);
[height, width] = size(img_gray);
feat = zeros(1,256);
for i = 2:height - 1
    for j = 2:width – 1
        neighbors = img_gray(i-1:i+1,j-1:j+1);
        bits = double(neighbors(:));
        threshold = bits(5);
        bits(5) = [];
        bits = bits - threshold;
        bits = sign(bits);
        bits(bits < 0) = 0;
        byte = sum(bits.*2.^(length(bits)-1 : -1 : 0)');
        feat(byte + 1) = feat(byte + 1) + 1;
    end
end
feat = feat./sum(feat);
end
```

Create new function “distChiSq”

```
function D = distChiSq( X, Y )
m = size(X,1);
n = size(Y,1);
mOnes = ones(1,m);
D = zeros(m,n);
for i=1:n
        yi = Y(i,:);
        yiRep = yi(mOnes, : );
        s = yiRep + X;
        d = yiRep - X;
        D(:,i) = sum( d.^2 ./ (s+eps), 2 );
end
D = D/2;
```

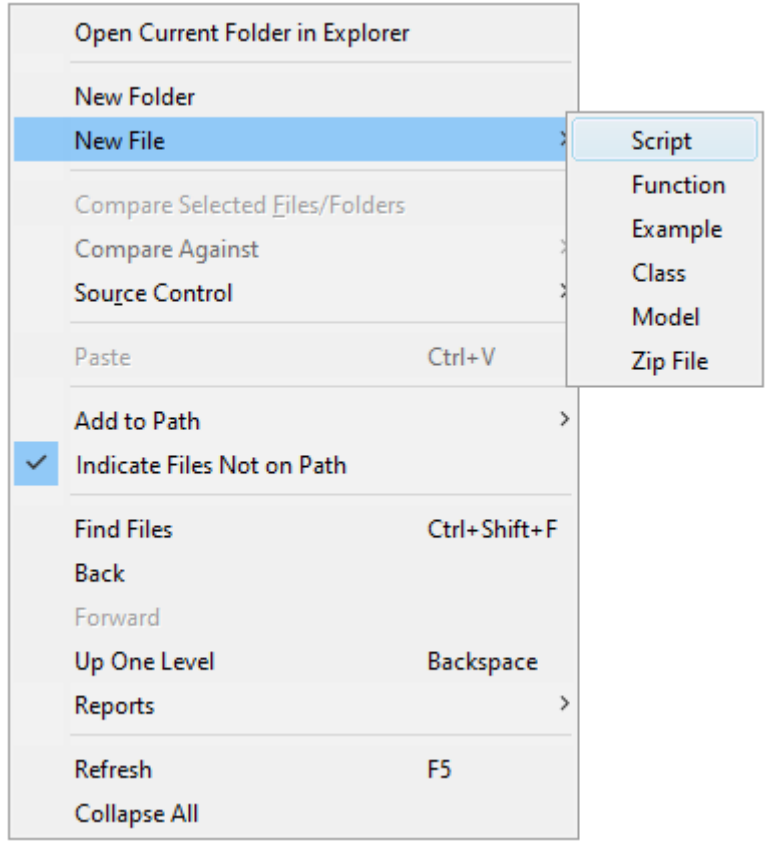
$$\chi^2(lbp_1, lbp_2) = \frac{1}{2}\sum_{m=1}^{256}\frac{[lbp_1(m) - lbp_2(m)]^2}{lbp_1(m) + lbp_2(m)}$$



Source: http://www.cs.columbia.edu/~mmerler/project/code/pdist2.m

Create new script “Lab10”

```
close all;
clear all;
clc;
```



Extract features from dataset

```
close all;
clear all;
clc;

folder = './Datasets/';
files = dir(fullfile(folder, '*.jpg'));
feats = zeros(length(files), 256);
for i = 1:length(files)
    disp(i);
    filename = files(i,1).name;
    img = imread([folder filename]);
    img = imresize(img,[320,480]);
    feat = lbp(img);
    feats(i,:) = feat;
end
```

Extract feature from the query image

```
folder = './Datasets/';
files = dir(fullfile(folder, '*.jpg'));
feats = zeros(length(files), 256);
for i = 1:length(files)
    disp(i);
    filename = files(i,1).name;
    img = imread([folder filename]);
    img = imresize(img,[320,480]);
    feat = lbp(img);
    feats(i,:) = feat;
end
```

```
query = imread('query1.jpg');
query = imresize(query,[320,480]);
feat = lbp(query);
```

Compute the distance between the query image with all images in the dataset

```
query = imread('query1.jpg');
query = imresize(query,[320,480]);
feat = lbp(query);

dists = distChiSq(feat,feats);
```

Get the most similar image from the dataset

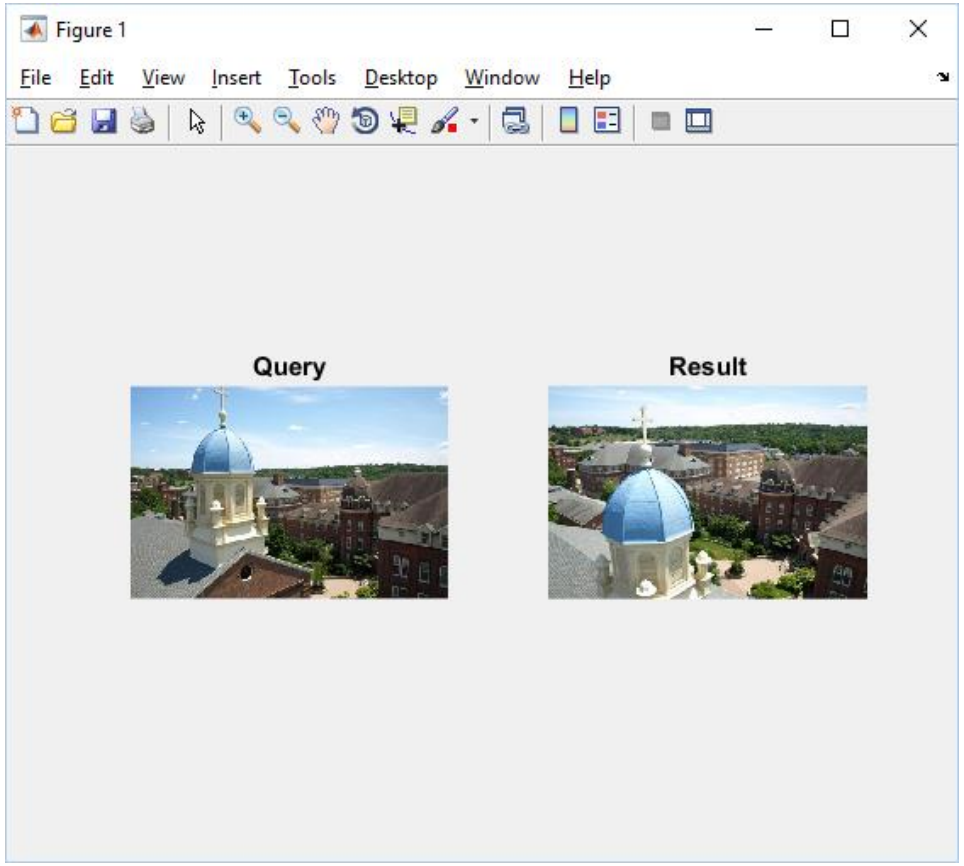
```
query = imread('query1.jpg');
query = imresize(query,[320,480]);
feat = lbp(query);

dists = distChiSq(feat,feats);
[val, idx] = min(dists);
```

Display the result

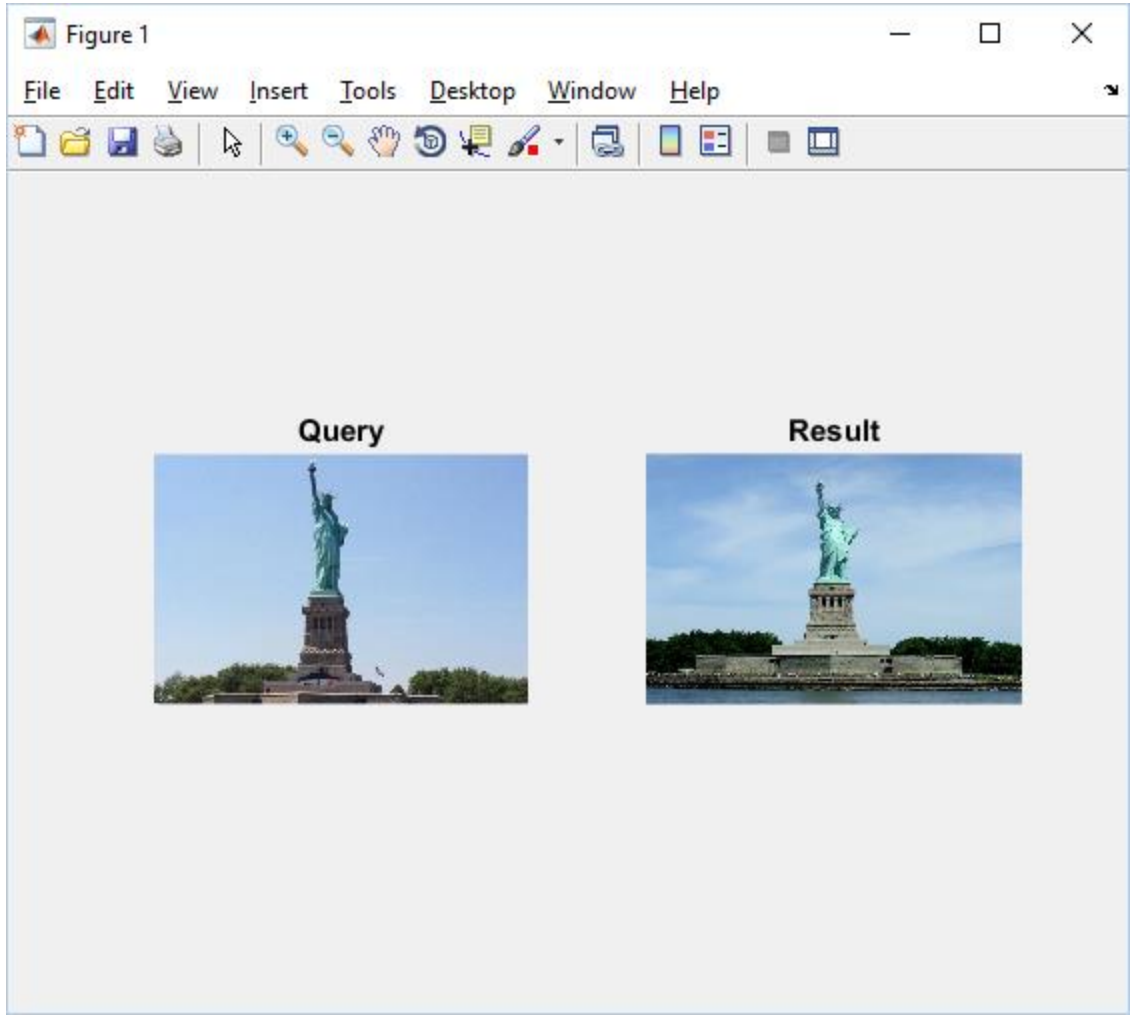
```
dists = distChiSq(feat,feats);
[val, idx] = min(dists);
```

```
img_result = imread([folder  files(idx,1).name]);
img_result = imresize(img_result,[320,480]);
subplot(1,2,1); imshow(query); title('Query');
subplot(1,2,2); imshow(img_result); title('Result');
```



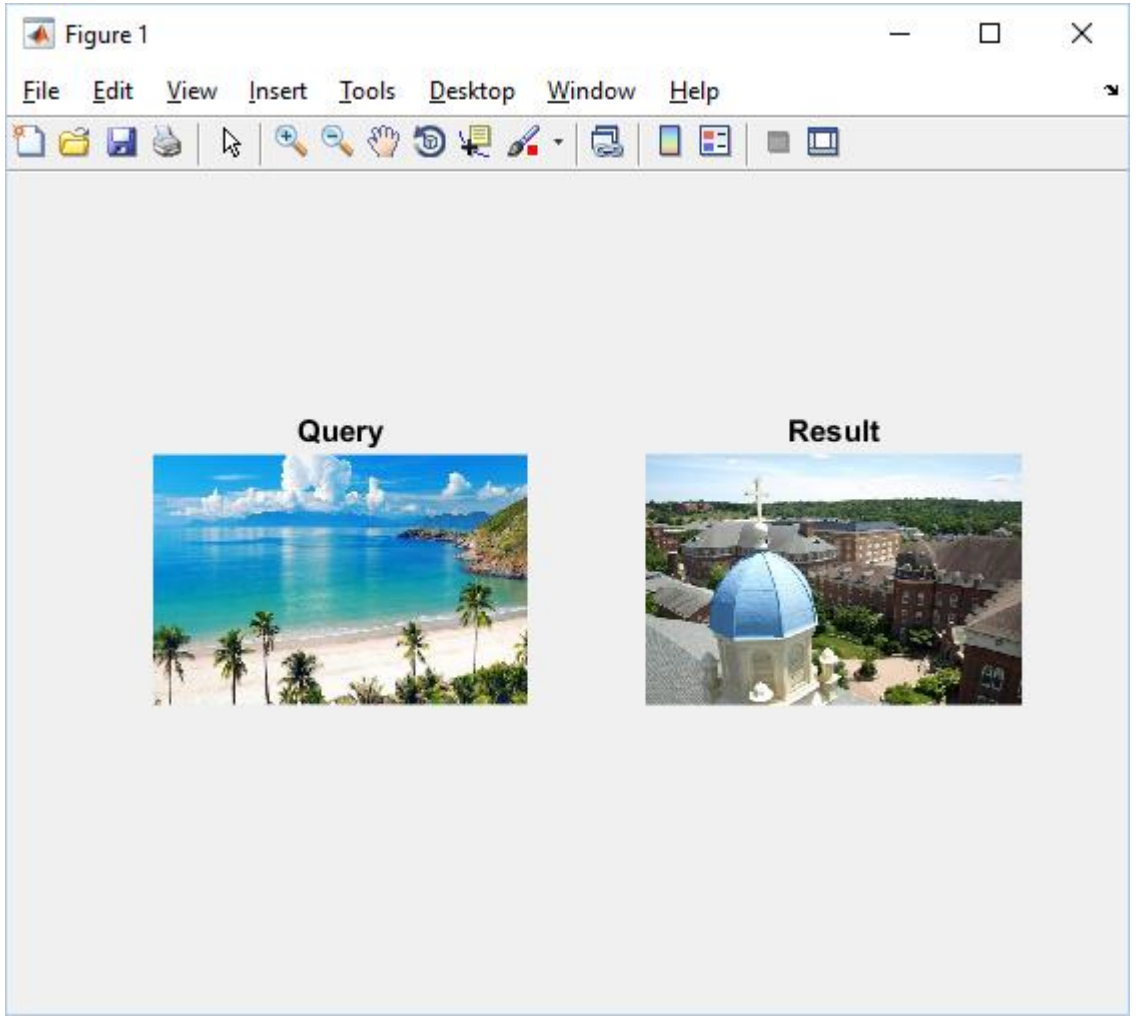
Change the query image

```
query = imread('query2.jpg');
```



Change the query image

```
query = imread('query3.jpg');
```



Q&A