# Classes 9 - morphological operations

### Exercise 1

```matlab
L=imread('bacteria.bmp');
figure; imshow(L);
SE=ones([3, 3]);
E=imdilate(L,SE);
figure; imshow(E)
L2=E-L;
figure;
imshow(L2);
```

### Exercise 2

```matlab
L=imread('bacteria.bmp');
figure; imshow(L);
SE=ones([3, 3]);
res = imerode(imdilate(L,SE),SE);
figure; imshow(res)
res_2 = imdilate(imerode(L,SE),SE);
figure;
imshow(res_2);
figure;
imshow(imabsdiff(res,L));
title('Difference between original and dilate+erode');
figure;
imshow(imabsdiff(res_2,L));
title('Difference between original and erode+dilate');
```

### Exercise 3

```matlab
L=imread('krakow.jpg');
figure; imshow(L);
SE=ones([3, 3]);
L1 = L;
for i=1:5
 L1 = imdilate(L1,SE);
end
imshow(L1);
figure;
imshow(L1-L);
title('Difference');
```

## Exercise 4

```matlab
L1 = imread('money.jpg');
figure; imshow(L1);
SE=strel('disk',3);
L2=imclose(L1,SE);
figure; imshow(L2);
L2=imopen(L1,SE);
figure; imshow(L2);
```

## Exercise 5

```matlab
L = imread('vessels.jpg');
figure; imshow(L);
L1 = im2bw(L, 0.3);
figure; imshow(L1);
L2a = bwmorph(L1, 'thin', 5);
figure; imshow(L2a);
L2b = bwmorph(L1, 'thicken', 5);
figure; imshow(L2b);
```