Computer Exercise 3 - Group 17

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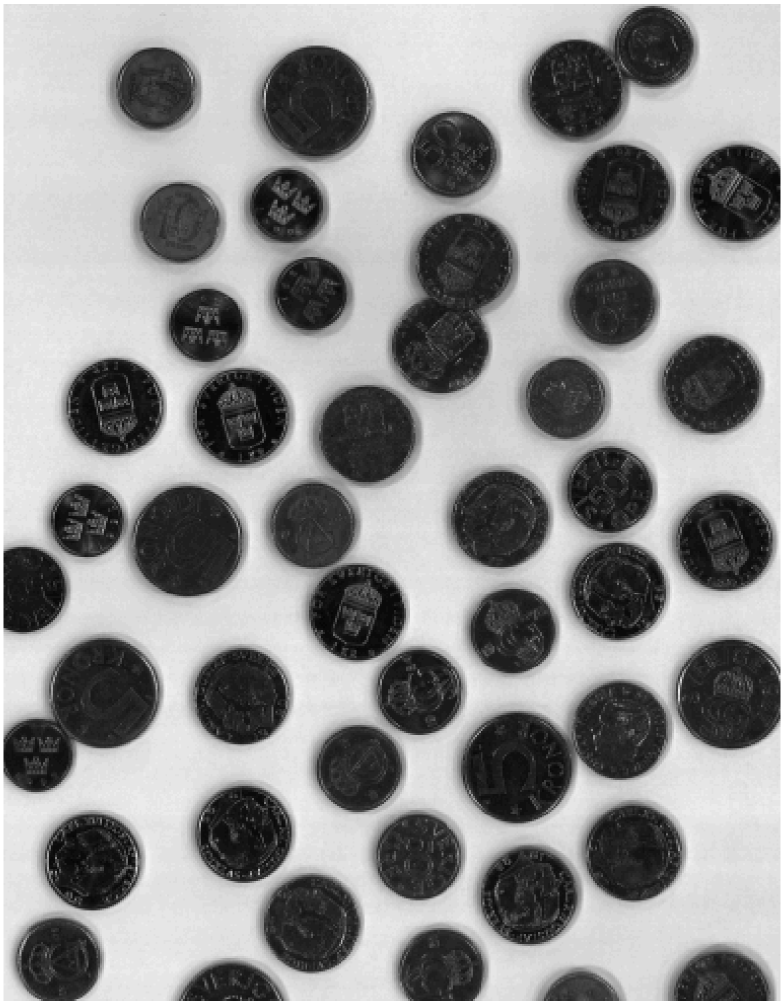
Load Image

Let's read the image and plot it.

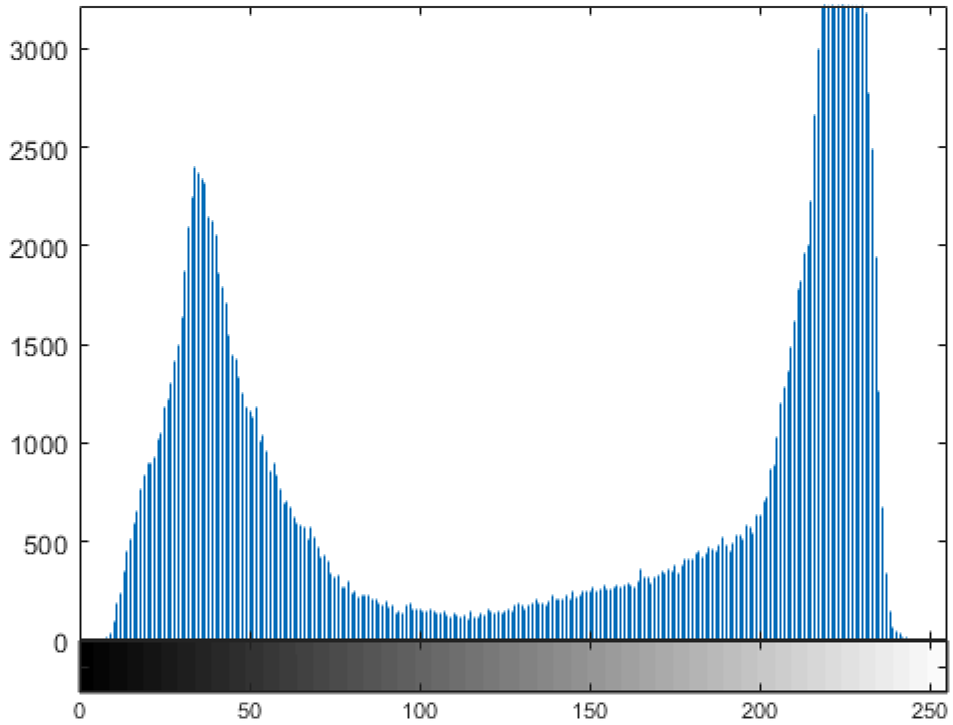
```
clear;
I = imread('lab3/images/coins.tif');
figure; imshow(I);
```



Plot image histogram

Let's plot the histogram as well.

```
figure; imhist(I);
```

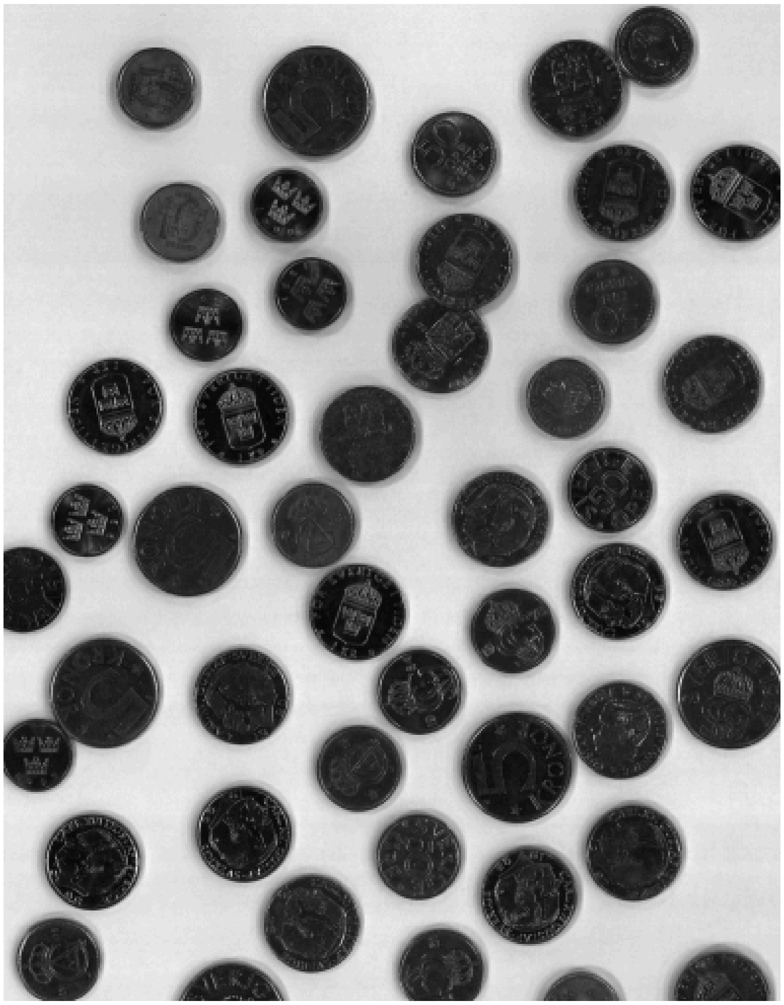


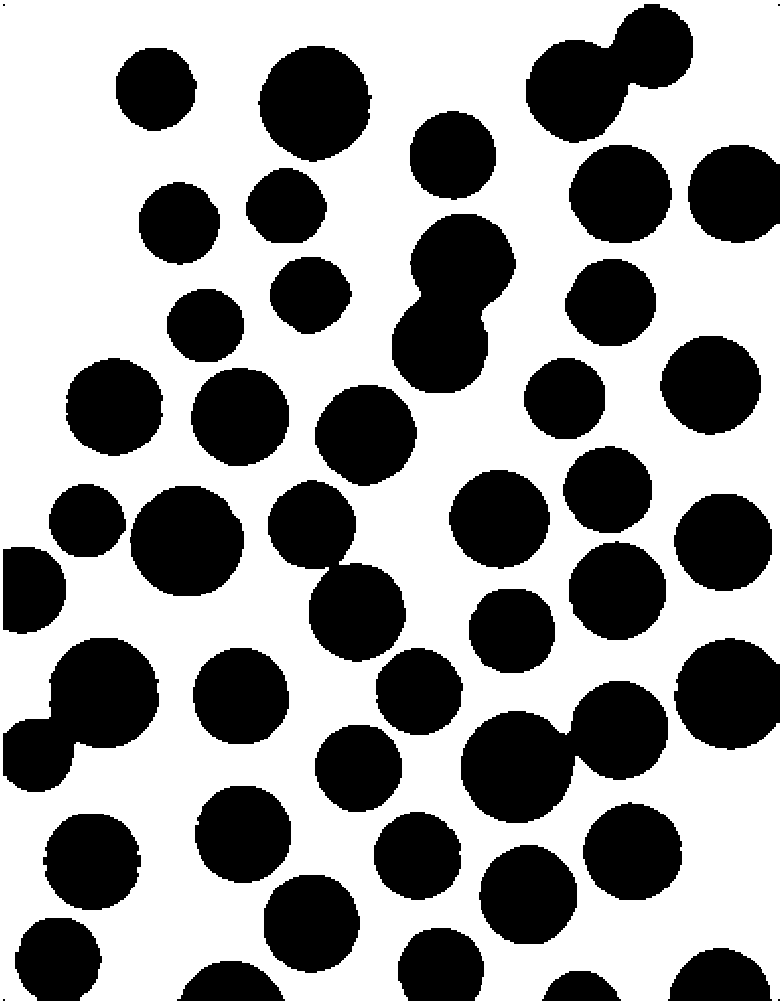
Segment foreground and background.

To start segmenting, we will have to distinguish background and foreground pixels. From the histogram, a simple threshold should be able to do a OK job and we will implement that first. The function **graythresh** will find an appropriate thresholdvalue T and we use the function **im2bw** to calculate the binary image.

Additionally, we apply a median filter with medfilt2 to remove the white noise in the coins.

```
T = graythresh(I);
bI = medfilt2(im2bw(I, T));
figure; imshow(bI);
```

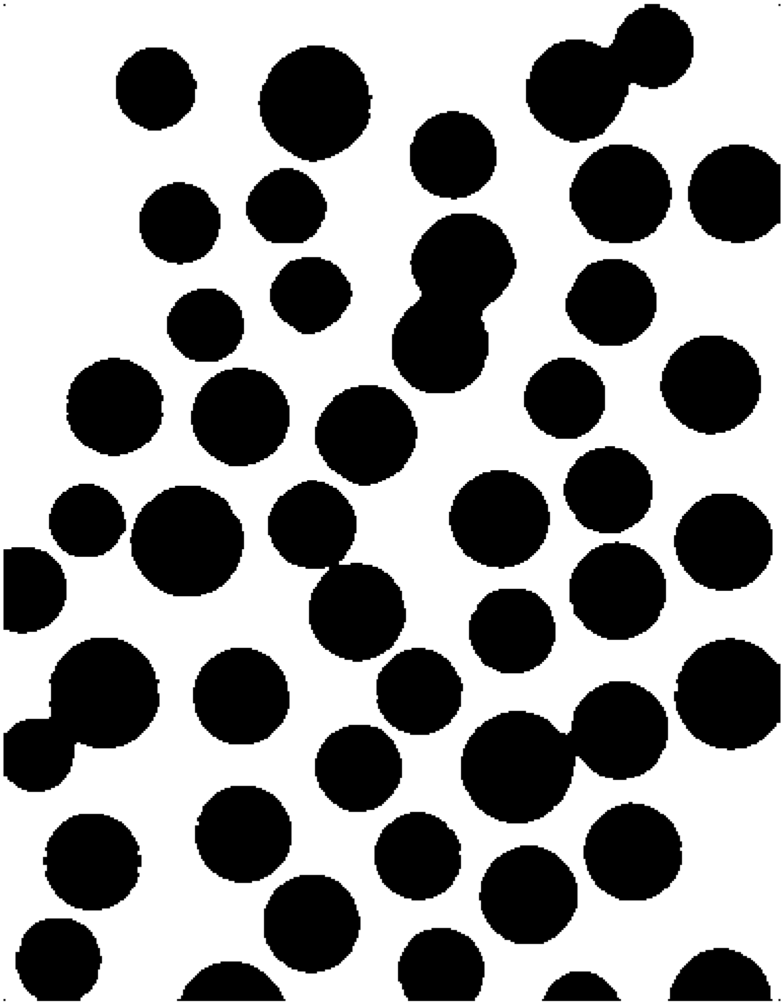


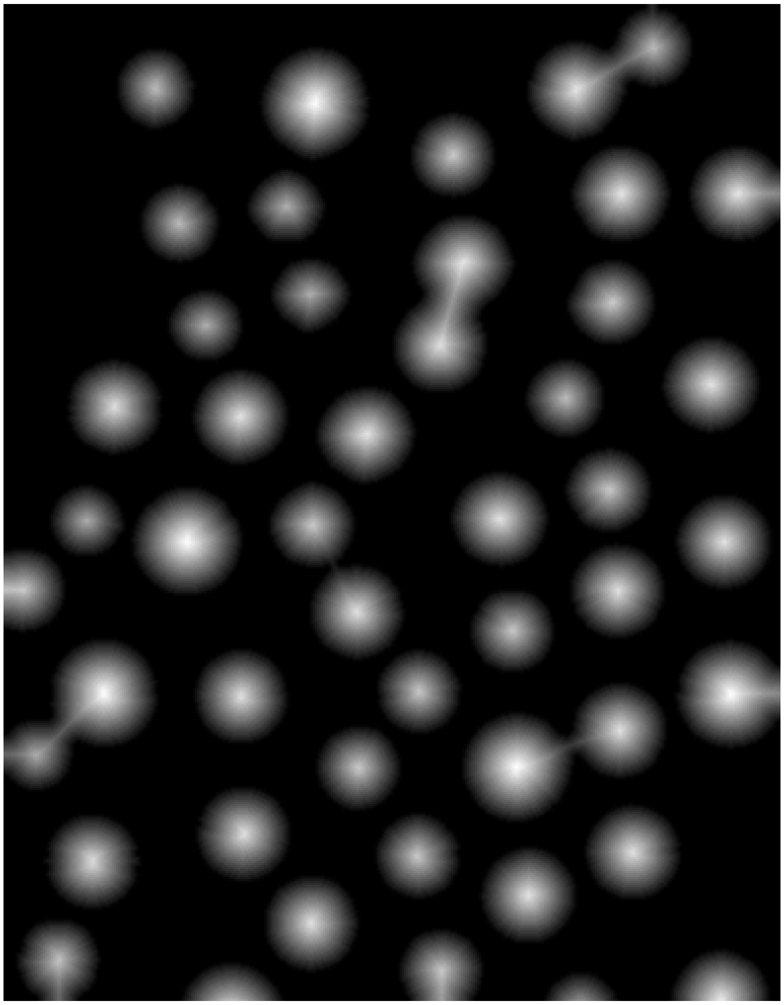


Apply dist transform to detect coins centers

To try to identify coin centers. We will use the dist transform. The function bwdist gives us a distance transformed binary image. Since we dont pass any other arguments to the method. Euclidean distance is used.

```
figure;
Idist = bwdist(bI);
imshow(mat2gray(Idist));
```

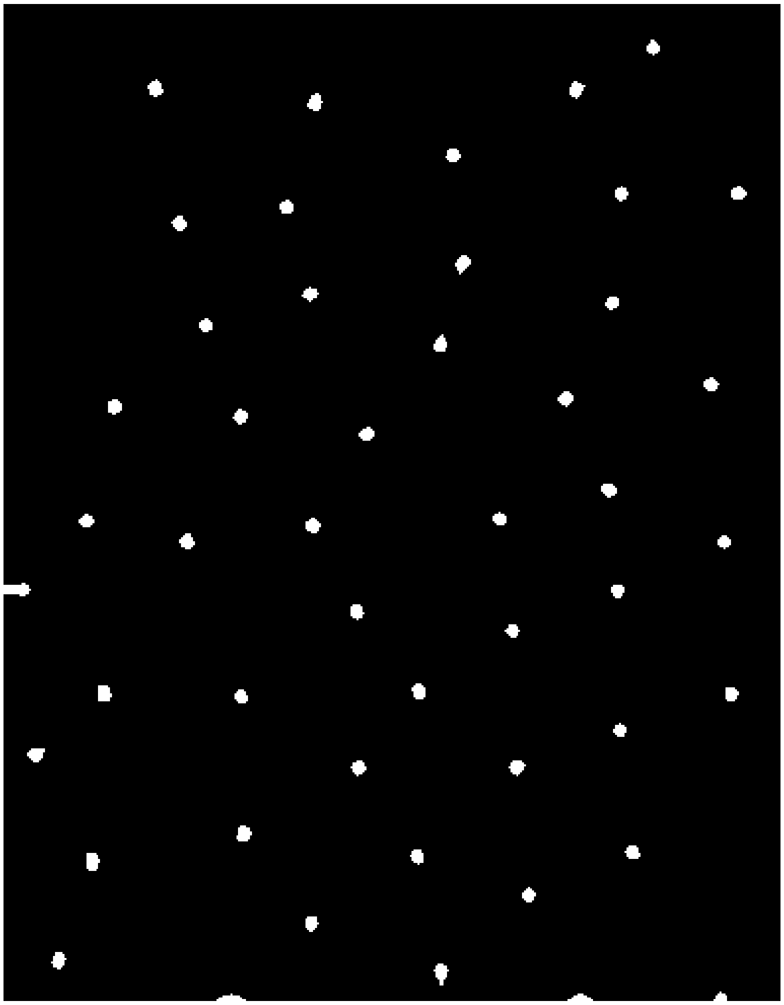




Remove small noisy max values for watershed

(Not 100% certain on what to add here)

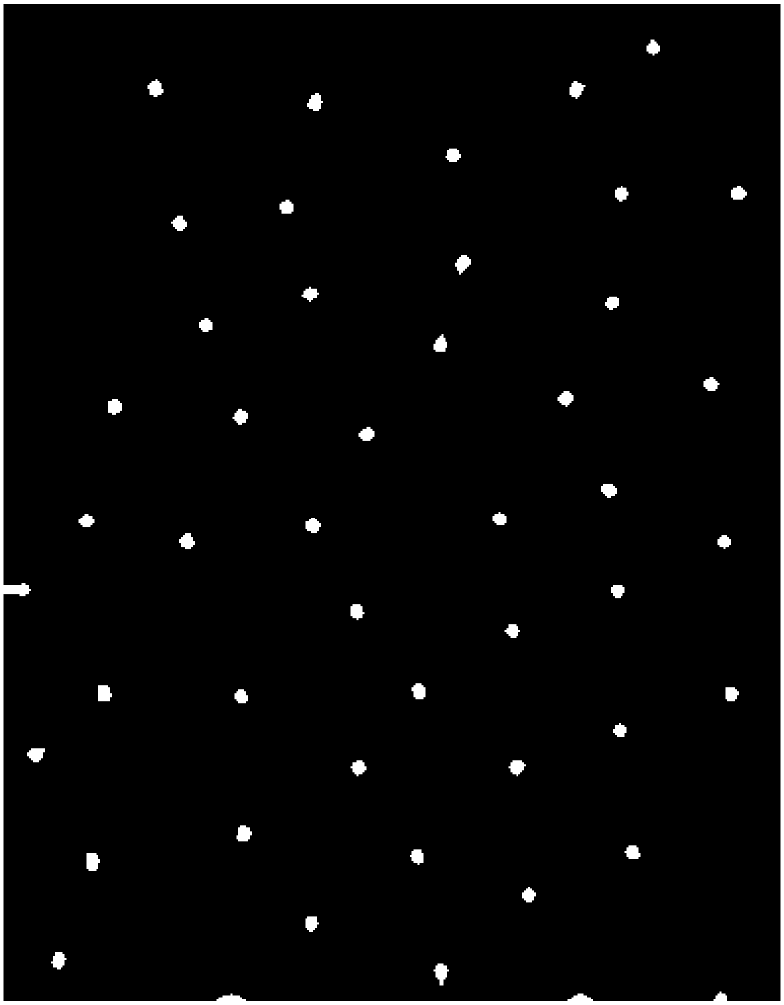
```
figure;
Idistext = imextendedmax(Idist, 3);
imshow(Idistext);
```

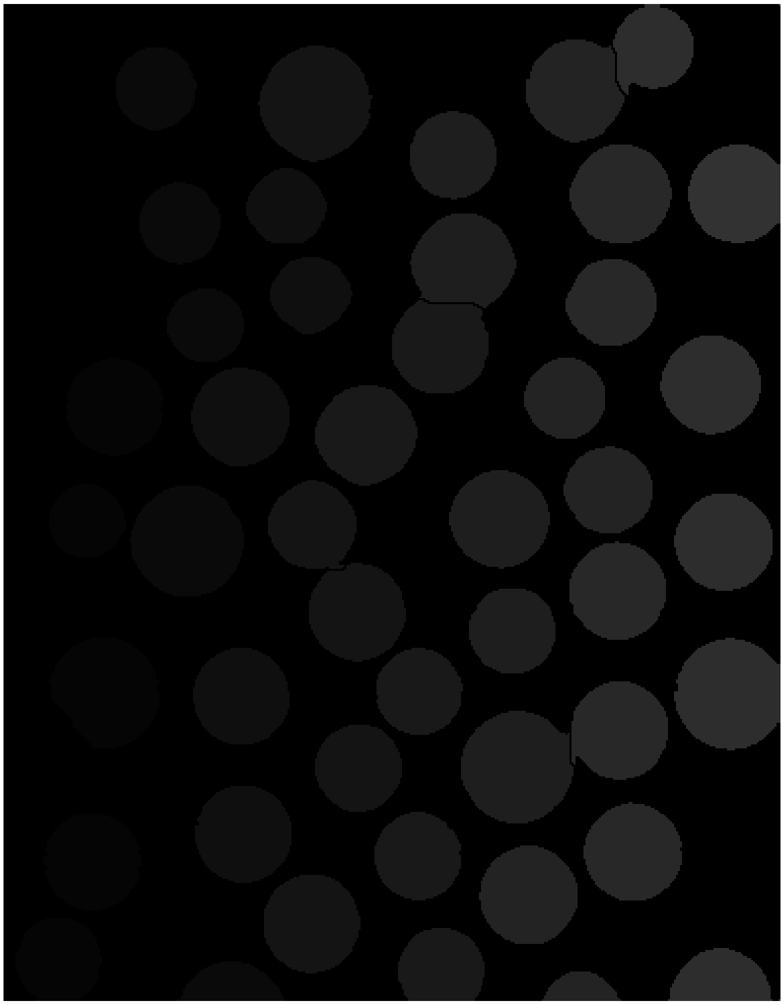


Apply watershed filter to isolate objects.

(Not 100% certain what to add here)

```
figure;
Idistext = -Idistext;
Idistext(bI) = Inf;
Iwshed = watershed(Idistext,8);
Iwshed(bI) = 0;
imshow(Iwshed);
```

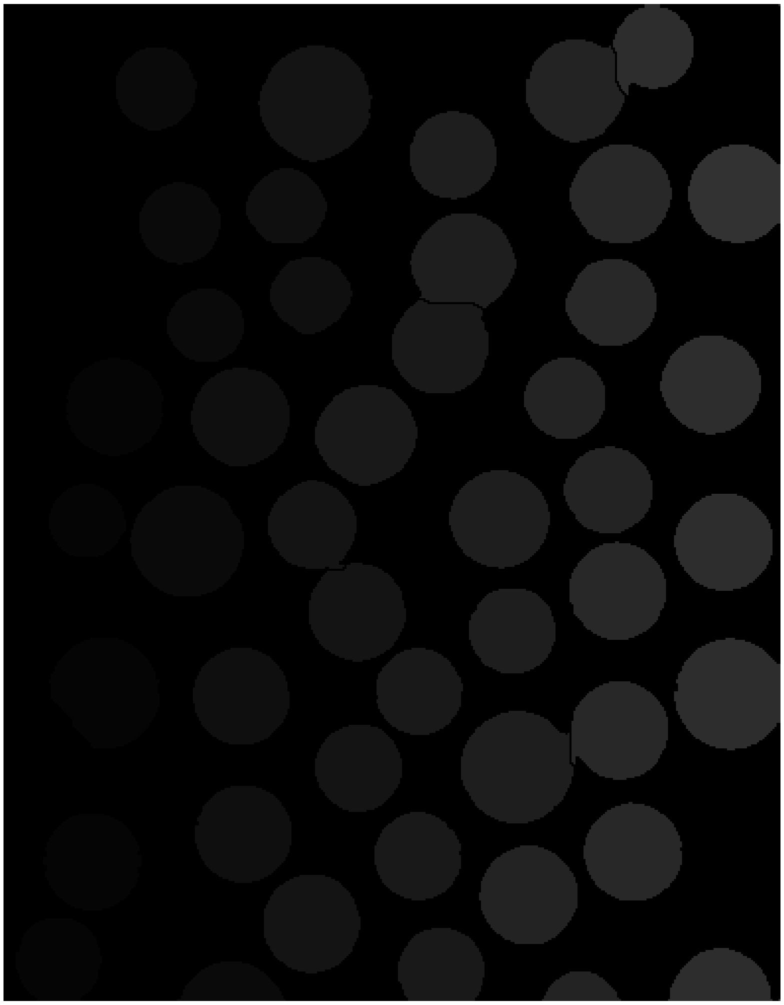


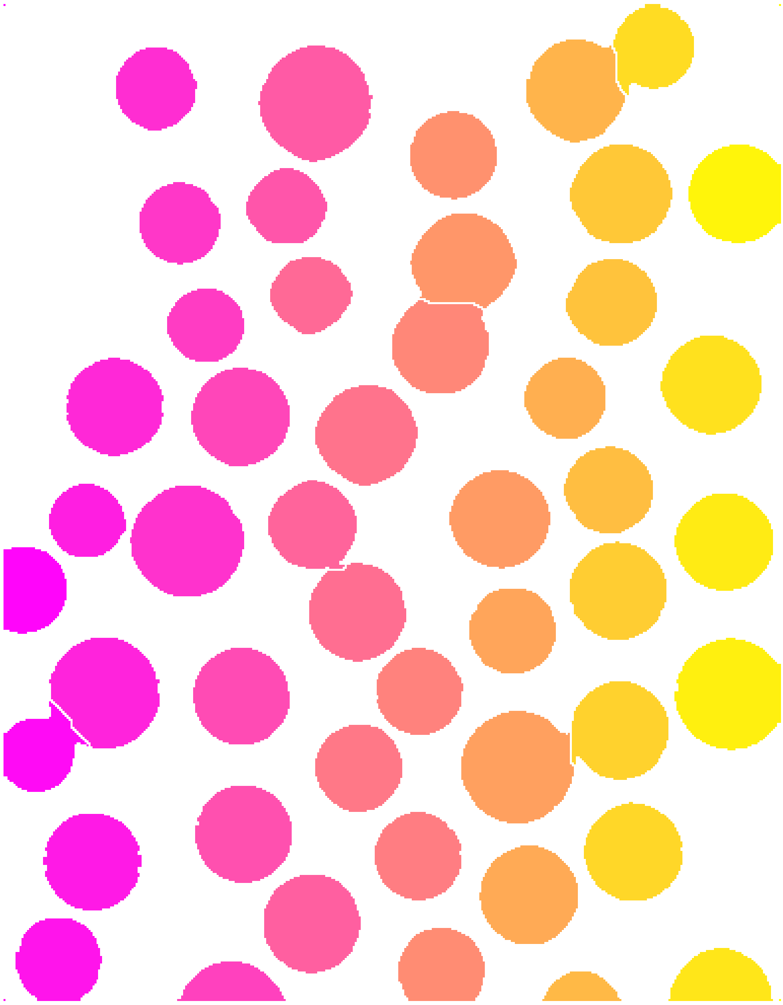


Label Objects

Now we have to label the coins in the image. This can be done with bwlabel.

```
figure;
Ilabel = bwlabel(Iwshed);
Irgb = label2rgb(Ilabel,'spring');
imshow(Irgb);
```

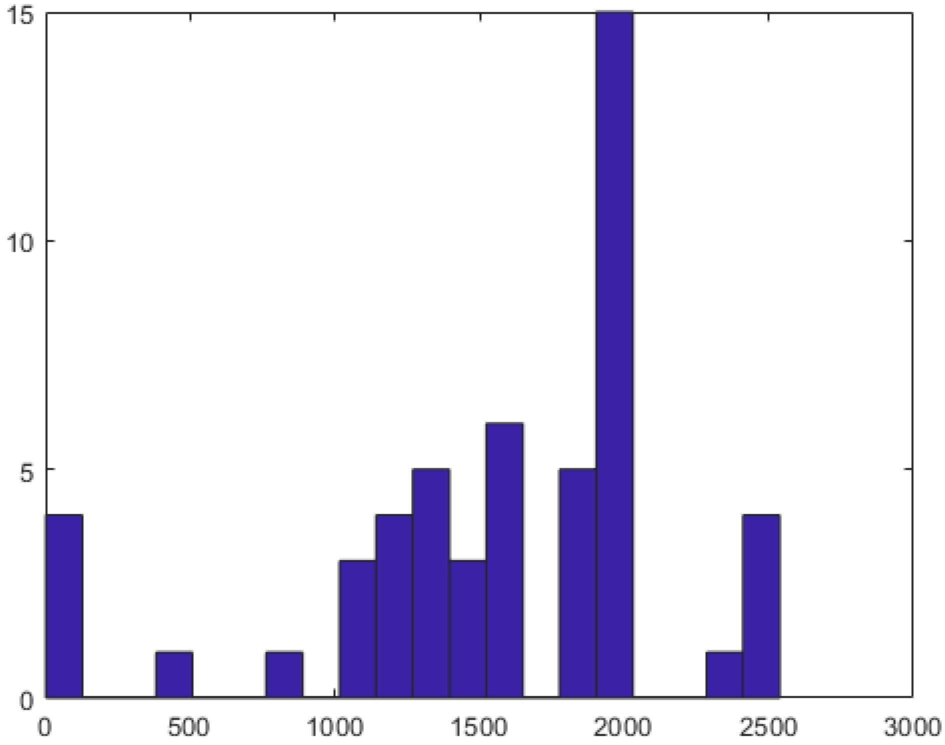




Lastly, find properties of objects

We use regionprops on the labeled image. We select area as the only property that we are interested in.

```
figure;
F = regionprops(Ilabel,'Area');
Areas = [F.Area];
hist(Areas, 20);
```



Count the number of coins in the image.

Since the regionprops method retuns attributes for all the identified regions in the image. This would be equivalent to the number of coins in our method. We find that there are 52 objects in the image. I.e 52 coins.

```
size(F)


ans =

    52     1
```

Errors and Limitations

Our algorithm performs quite well on identifying the coins in the image. Which makes it quite easy to do a simple count of the number of objects in the image. The harder part is estimating the amount of money in the image. One approach is to use the area to estimate what value the object has if you know which coin has which area you can use a histogram to calculate the number of objects in a certain area range and multiply this number with the corresponding monetary value.

A problem with this method in our implementation is that we have objects on the border, where the coins are cut in half and their area not correct with respect to their value. This makes estimating the amount of money hard and this is one of the main disadvantages to our method.