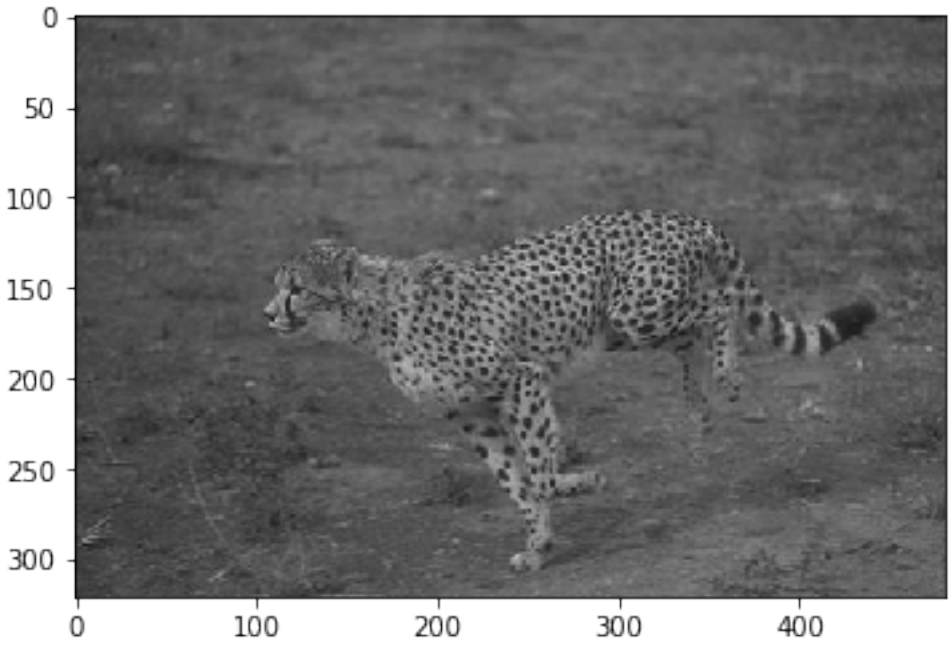
mammogram- k- means

April 20, 2019

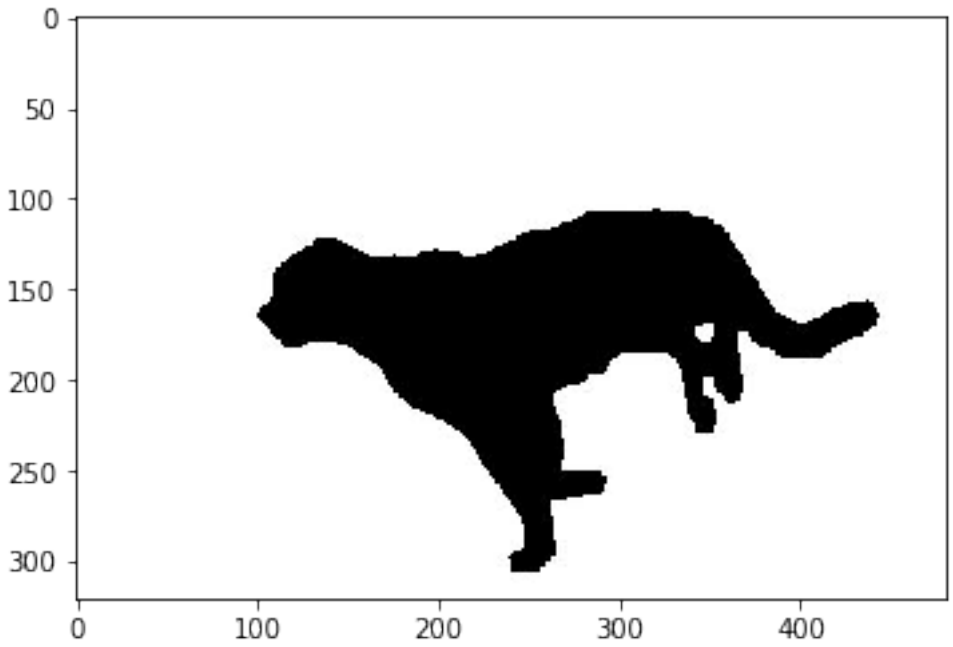
In [3]:
```
im = Image.open('input1.jpg').convert('L')
plt.imshow(im)
```

Out[3]:
```
<matplotlib.image.AxesImage at 0x11661fe80>
```



In [4]:
```
out = Image.open('out1.jpg').convert('L')
plt.imshow(out)
```

Out[4]:
```
<matplotlib.image.AxesImage at 0x1062fb9e8>
```



In [2]:
```
import math
from PIL import Image
from pylab import *
import matplotlib.cm as cm
import scipy as sp
import random

im = Image.open('input1.jpg').convert('L')
arr = np.asarray(im)

out = Image.open('out1.jpg').convert('L')
arr_out = np.asarray(out)

rows,columns = np.shape(arr)

rand_points = [ random.randint(0, 255) for i in range(2) ]

'''finding the histogram of the image to obtain total number of pixels in each level''

hist,bins = np.histogram(arr,256,[0,256])

#print hist,bins

centroid1_avg = 0
centroid2_avg = 0
def kmeans(histogram):
```

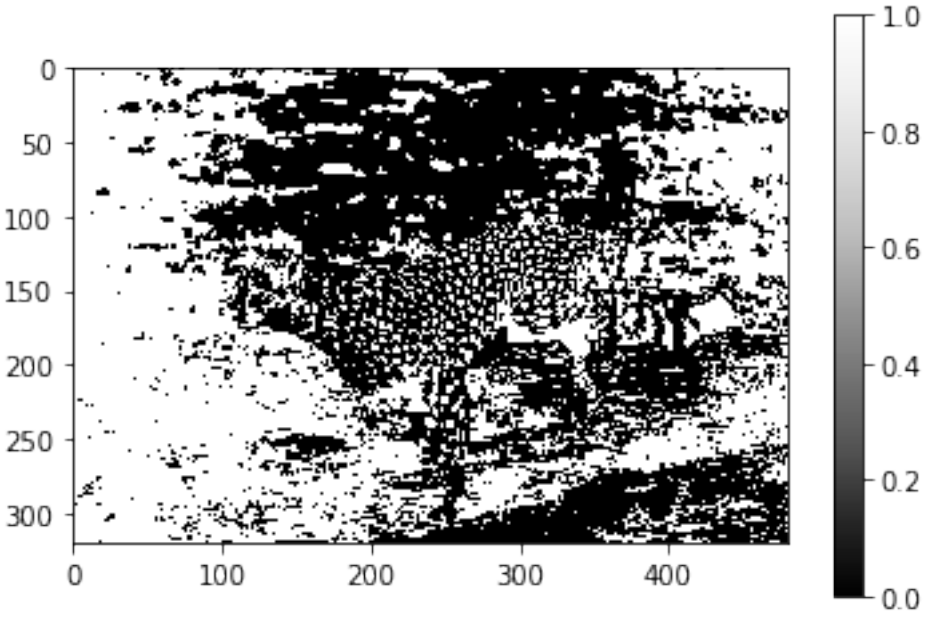
```
        for k in range(0,10):
                print('\niteration',k)
                ''' First iteration assign random centroid points '''
                if k == 0:
                        cent1 = rand_points[0]
                        cent2 =         rand_points[1]
                else:
                        #print '\n selecting centroid values'
                        cent1 = centroid1_avg
                        cent2 = centroid2_avg

                #print histogram
                point1_centroid = []
                point2_centroid = []
                w1_centroid = []
                w2_centroid = []
                sum1 = 0
                sum2 = 0
                for i,val in enumerate(histogram):
                        ''' computing absolute distance from each of the cluster and a
                        #print '\n\n','i',i,'val',val,'cent1', cent1,'cent2', cent2
                        if  abs(i - cent1) <  abs(i - cent2):
                                point1_centroid.append(i)
                                w1_centroid.append(val)
                                sum1 = sum1 + (i * val)
                                #print '\nselection 1'
                        else:
                                point2_centroid.append(i)
                                w2_centroid.append(val)
                                sum2 = sum2 + (i * val)
                                #print '\nselection 2'


                centroid1_avg = int(sum1)/sum(w1_centroid)
                centroid2_avg = int(sum2)/sum(w2_centroid)
                #print '\n\n','sum1',sum1,'sum2',sum2,'cent1', centroid1_avg,'cent2',
        return [point1_centroid,point2_centroid]

res = kmeans(hist)
#print res

end = np.zeros((rows,columns))

if len(res[1]) > len(res[0]):
        '''bacground is res1'''
        print ('flag 1')
        flag = 1
else:
```

```
        print ('flag 0')
        flag = 0


for i in range(rows):
        for j in range(columns):
                if flag == 1:
                        if (arr[i][j] in res[1]):
                                end[i][j] = int(0)

                        else:
                                end[i][j] = int(1)
                else:
                        if (arr[i][j] in res[1]):
                                end[i][j] = int(1)

                        else:
                                end[i][j] = int(0)

ground_out = np.zeros((rows,columns))

for i in range(rows):
        for j in range(columns):
                if arr_out[i][j] >125:
                        ground_out[i][j] = int(1)

                else:
                        ground_out[i][j] = int(0)



''' ********************************** Calculation of Tpr, Fpr, F-Score **************

tp = 0
tn = 0
fn = 0
fp = 0

for i in range(rows):
        for j in range(columns):
                if ground_out[i][j] == 1 and end[i][j] == 1:
                        tp = tp + 1
                if ground_out[i][j] == 0 and end[i][j] == 0:
                        tn = tn + 1
                if ground_out[i][j] == 1 and end[i][j] == 0:
                        fn = fn + 1
                if ground_out[i][j] == 0 and end[i][j] == 1:
                        fp = fp + 1
```

```
        print ('\n************Calculation of Tpr, Fpr, F-Score********************')

        #TP rate = TP/TP+FN
        tpr= float(tp)/(tp+fn)
        print ("\nTPR is:",tpr)

        #fp rate is
        fpr= float(fp)/(fp+tn)
        print ("\nFPR is:",fpr)

        #F-score as 2TP/(2TP + FP + FN)
        fscore = float(2*tp)/((2*tp)+fp+fn)
        print ("\nFscore:",fscore)



        plt.imshow(end, cmap="Greys_r")
        plt.colorbar()
        plt.show()
```

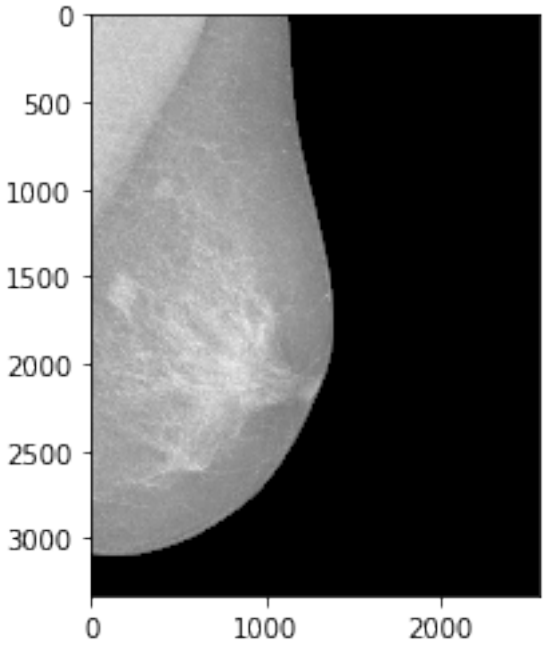
```
iteration 0

iteration 1

iteration 2

iteration 3

iteration 4

iteration 5

iteration 6

iteration 7

iteration 8

iteration 9
flag 0

************Calculation of Tpr, Fpr, F-Score********************

TPR is: 0.5596533341646662
```

```
FPR is: 0.3693710956961637

Fscore: 0.6846877771103292
```



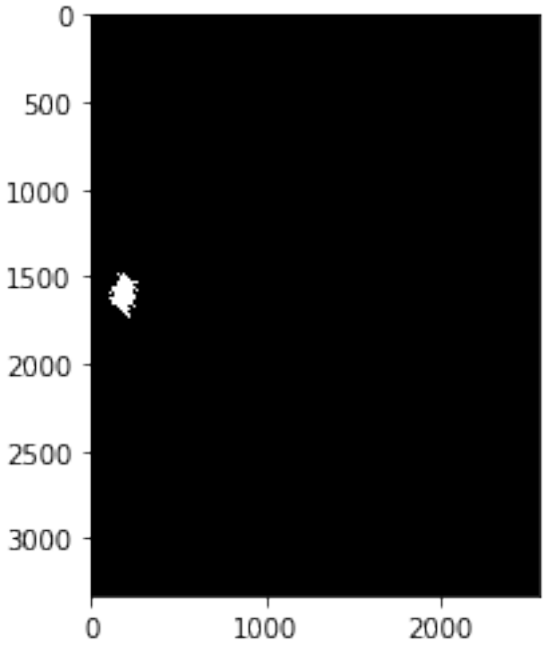

```
In [5]: im = Image.open('input.png').convert('L')
        plt.imshow(im)
```

```
Out[5]: <matplotlib.image.AxesImage at 0x1165e8668>
```



In [6]:
```
out = Image.open('out.png').convert('L')
plt.imshow(out)
```

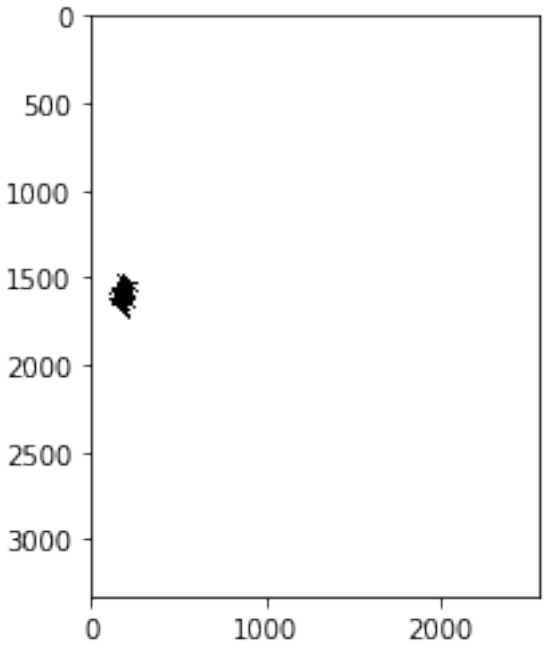
Out[6]: <matplotlib.image.AxesImage at 0x114029940>



In [45]:
```
from PIL import Image
import PIL.ImageOps

image = Image.open('out.png')
if image.mode == 'RGBA':
    r,g,b,a = image.split()
    rgb_image = Image.merge('RGB', (r,g,b))

    inverted_image = PIL.ImageOps.invert(rgb_image)

    r2,g2,b2 = inverted_image.split()

    final_transparent_image = Image.merge('RGBA', (r2,g2,b2,a))

    final_transparent_image.save('outnew.png')

else:
    inverted_image = PIL.ImageOps.invert(image)
    inverted_image.save('outnew.png')
```

In [7]:
```
out = Image.open('outnew.png').convert('L')
plt.imshow(out)
```

Out[7]: <matplotlib.image.AxesImage at 0x116f47ba8>



In [46]:
```
import math
from PIL import Image
from pylab import *
import matplotlib.cm as cm
import scipy as sp
import random

im = Image.open('input.png').convert('L')
arr = np.asarray(im)

out = Image.open('outnew.png').convert('L')
arr_out = np.asarray(out)

rows,columns = np.shape(arr)

rand_points = [ random.randint(0, 255) for i in range(2) ]

'''finding the histogram of the image to obtain total number of pixels in each level'

hist,bins = np.histogram(arr,256,[0,256])
```

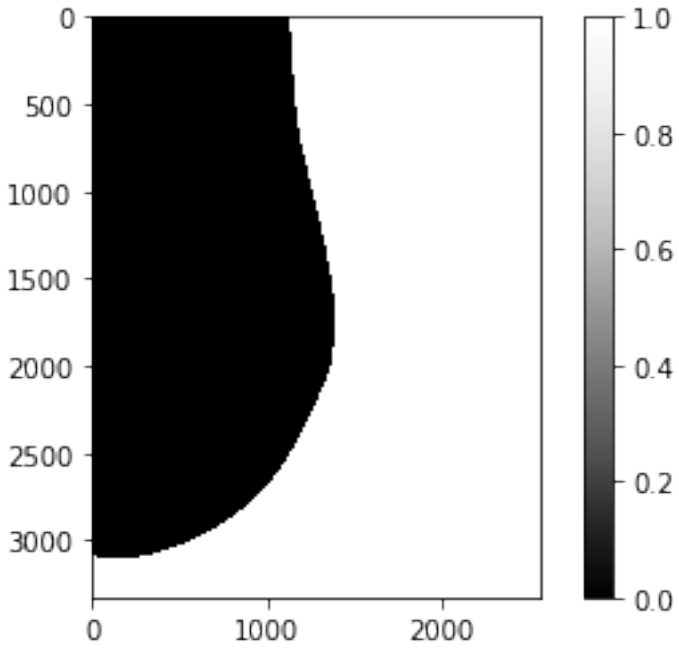
```
#print hist,bins

centroid1_avg = 0
centroid2_avg = 0
def kmeans(histogram):
        for k in range(0,10):
                print('\niteration',k)
                ''' First iteration assign random centroid points '''
                if k == 0:
                        cent1 = rand_points[0]
                        cent2 =         rand_points[1]
                else:
                        #print '\n selecting centroid values'
                        cent1 = centroid1_avg
                        cent2 = centroid2_avg

                #print histogram
                point1_centroid = []
                point2_centroid = []
                w1_centroid = []
                w2_centroid = []
                sum1 = 0
                sum2 = 0
                for i,val in enumerate(histogram):
                        ''' computing absolute distance from each of the cluster and
                        #print '\n\n','i',i,'val',val,'cent1', cent1,'cent2', cent2
                        if  abs(i - cent1) <  abs(i - cent2):
                                point1_centroid.append(i)
                                w1_centroid.append(val)
                                sum1 = sum1 + (i * val)
                                #print '\nselection 1'
                        else:
                                point2_centroid.append(i)
                                w2_centroid.append(val)
                                sum2 = sum2 + (i * val)
                                #print '\nselection 2'


                centroid1_avg = int(sum1)/sum(w1_centroid)
                centroid2_avg = int(sum2)/sum(w2_centroid)
                #print '\n\n','sum1',sum1,'sum2',sum2,'cent1', centroid1_avg,'cent2',
        return [point1_centroid,point2_centroid]

res = kmeans(hist)
#print res

end = np.zeros((rows,columns))
```

```
if len(res[1]) > len(res[0]):
        '''bacground is res1'''
        print ('flag 1')
        flag = 1
else:
        print ('flag 0')
        flag = 0


for i in range(rows):
        for j in range(columns):
                if flag == 1:
                        if (arr[i][j] in res[1]):
                                end[i][j] = int(0)

                        else:
                                end[i][j] = int(1)
                else:
                        if (arr[i][j] in res[1]):
                                end[i][j] = int(1)

                        else:
                                end[i][j] = int(0)

ground_out = np.zeros((rows,columns))

for i in range(rows):
        for j in range(columns):
                if arr_out[i][j] >125:
                        ground_out[i][j] = int(1)

                else:
                        ground_out[i][j] = int(0)



''' ********************************** Calculation of Tpr, Fpr, F-Score ************

tp = 0
tn = 0
fn = 0
fp = 0

for i in range(rows):
        for j in range(columns):
                if ground_out[i][j] == 1 and end[i][j] == 1:
                        tp = tp + 1
                if ground_out[i][j] == 0 and end[i][j] == 0:
```

```
                        tn = tn + 1
                if ground_out[i][j] == 1 and end[i][j] == 0:
                        fn = fn + 1
                if ground_out[i][j] == 0 and end[i][j] == 1:
                        fp = fp + 1


        print ('\n************Calculation of Tpr, Fpr, F-Score********************')

        #TP rate = TP/TP+FN
        tpr= float(tp)/(tp+fn)
        print ("\nTPR is:",tpr)

        #fp rate is
        fpr= float(fp)/(fp+tn)
        print ("\nFPR is:",fpr)

        #F-score as 2TP/(2TP + FP + FN)
        fscore = float(2*tp)/((2*tp)+fp+fn)
        print ("\nFscore:",fscore)



        plt.imshow(end, cmap="Greys_r")
        plt.colorbar()
        plt.show()
```

```
iteration 0

iteration 1

iteration 2

iteration 3

iteration 4

iteration 5

iteration 6

iteration 7

iteration 8

iteration 9
flag 1
```

```
**********Calculation of Tpr, Fpr, F-Score********************

TPR is: 0.5732161509287402

FPR is: 0.0

Fscore: 0.7287188738691056
```



In [ ]: