

2_cell_counting

April 8, 2022

1 Blob detection and counting

```
[1]: import cv2  
from matplotlib import pyplot as plt  
import numpy as np
```

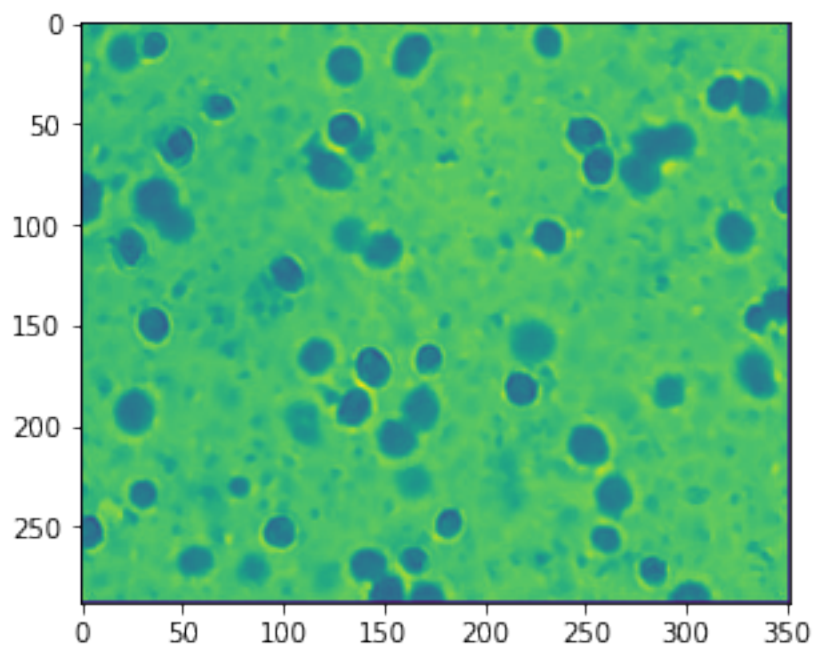
```
[2]: image_path = 'samples/cells/0.jpg'  
image = cv2.imread(image_path)
```

```
[3]: image.shape
```

```
[3]: (288, 352, 3)
```

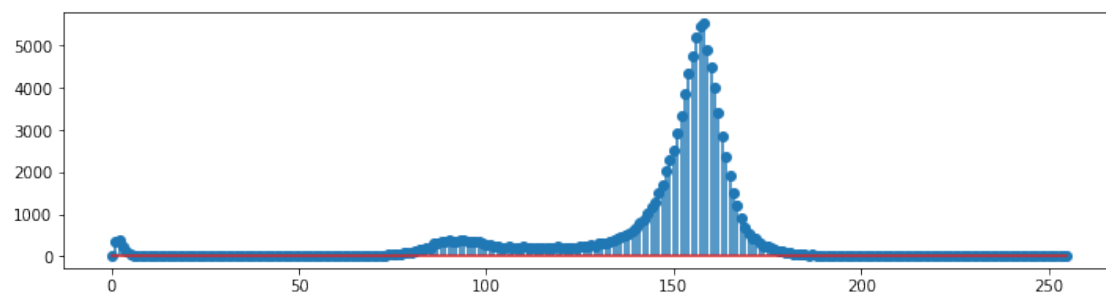
```
[4]: gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)  
plt.imshow(gray)
```

```
[4]: <matplotlib.image.AxesImage at 0x7feee016ca90>
```



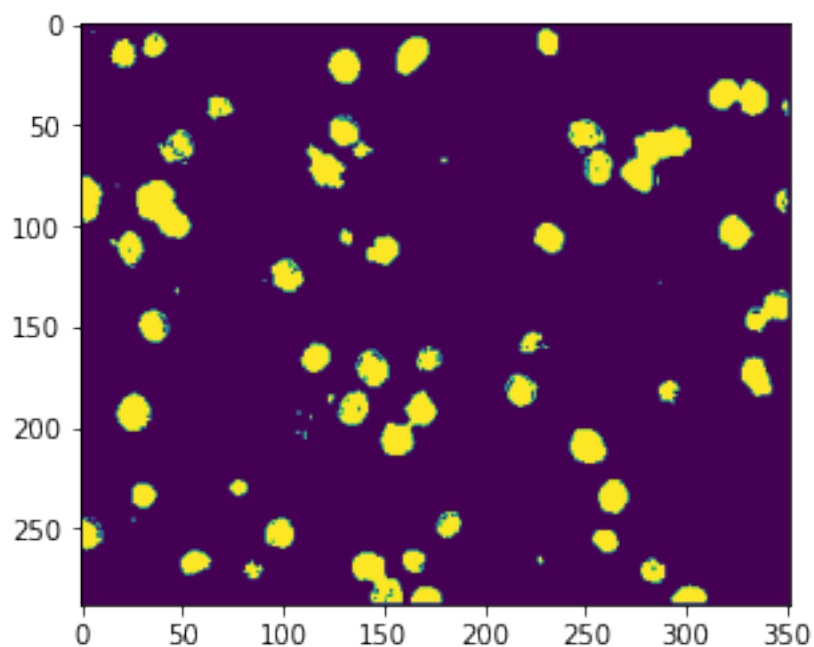
```
[5]: hist = cv2.calcHist([gray], [0], None, [256], [0, 256])
```

```
[6]: plt.figure(figsize=(12, 3))  
plt.stem(hist)  
plt.show()
```



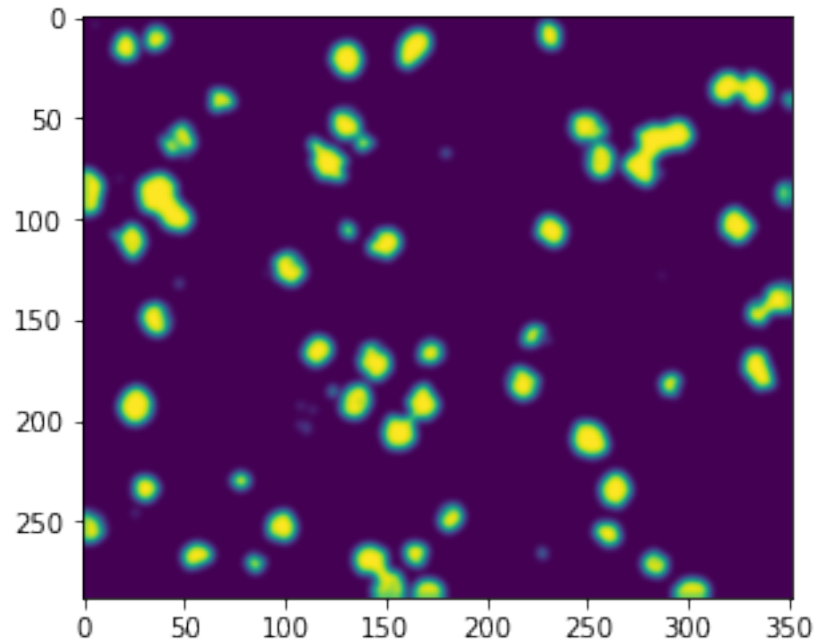
```
[7]: mask = cv2.inRange(gray, 75, 110)  
plt.imshow(mask)
```

```
[7]: <matplotlib.image.AxesImage at 0x7feed2747100>
```



```
[8]: blur = cv2.GaussianBlur(mask, (11, 11), 0)
plt.imshow(blur)
```

```
[8]: <matplotlib.image.AxesImage at 0x7feed272e2b0>
```



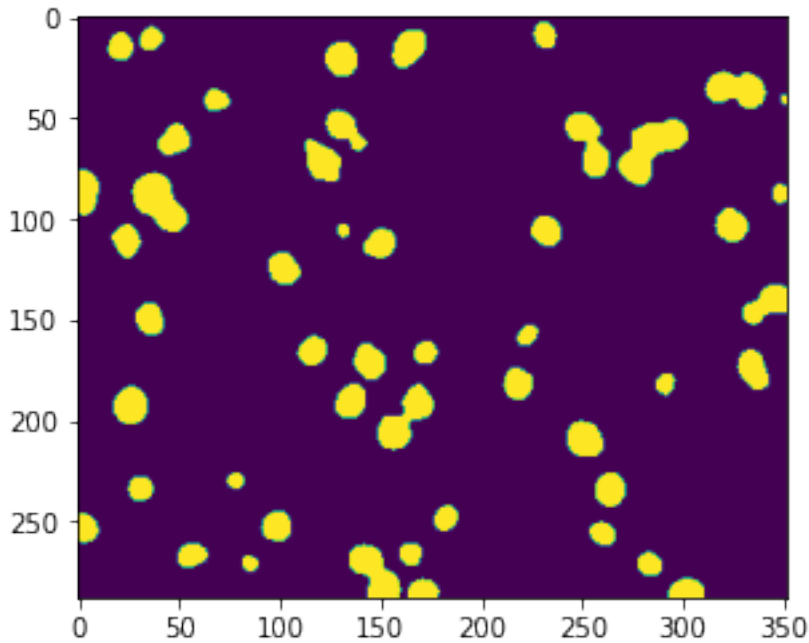
```
[9]: threshold, thresholded = cv2.threshold(blur, 0, 255, cv2.THRESH_BINARY + cv2.
↪THRESH_OTSU)
```

```
[10]: threshold
```

```
[10]: 97.0
```

```
[11]: plt.imshow(thresholded)
```

```
[11]: <matplotlib.image.AxesImage at 0x7feed2699490>
```



1.1 Simple blob detector

```
[12]: params = cv2.SimpleBlobDetector_Params()
      #params.filterByArea = True
      params.minArea = 200
      #params.filterByCircularity = True
      #params.minCircularity = 0.75
      #params.filterByConvexity = True
      #params.minConvexity = 0.87
      #params.filterByInertia = True
      #params.minInertiaRatio = 0.01
```

```
[13]: detector = cv2.SimpleBlobDetector_create(params)
```

```
[14]: keypoints = detector.detect(image)
```

```
[15]: keypoints
```

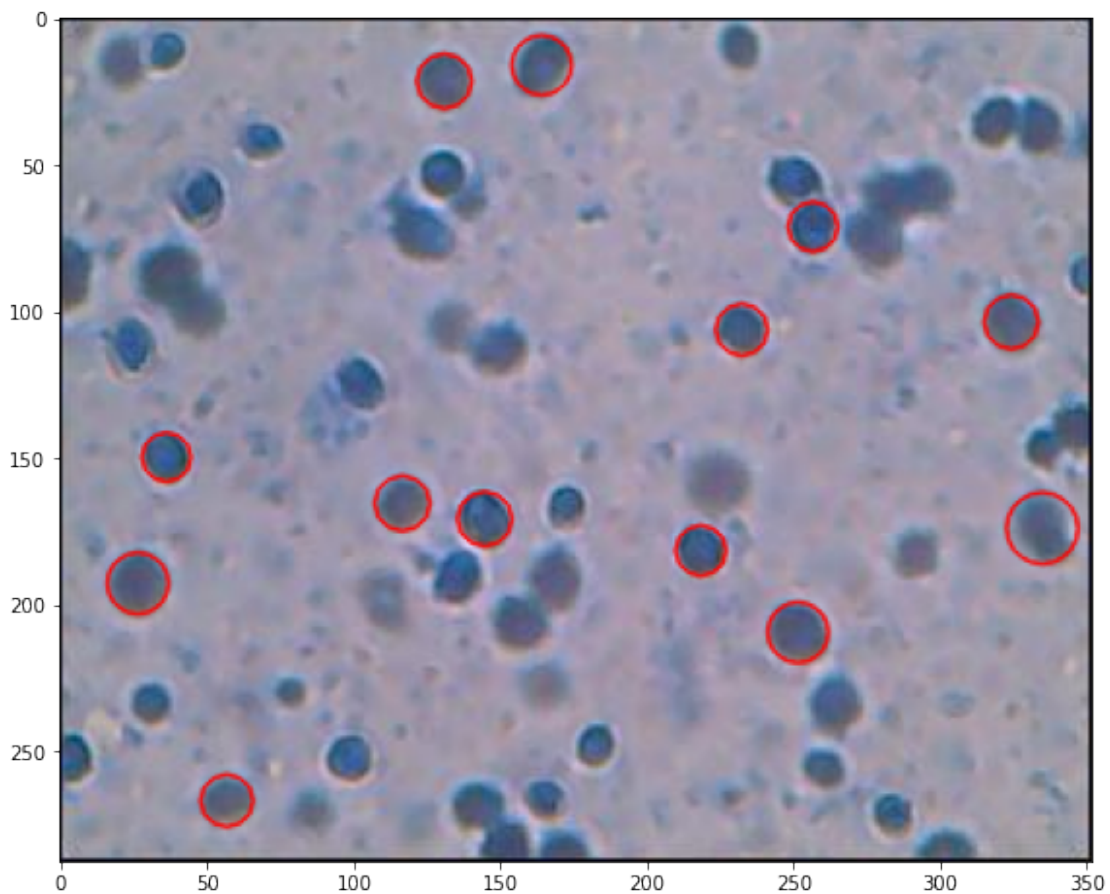
```
[15]: (<KeyPoint 0x7feed27474e0>,
      <KeyPoint 0x7feed2643180>,
      <KeyPoint 0x7feed26431e0>,
      <KeyPoint 0x7feed2643060>,
      <KeyPoint 0x7feed26bbd80>,
      <KeyPoint 0x7feed26bbc60>,
      <KeyPoint 0x7feed26bbde0>,
```

```
<KeyPoint 0x7feed26bbc90>,  
<KeyPoint 0x7feed26bbfc0>,  
<KeyPoint 0x7feed26bbcc0>,  
<KeyPoint 0x7feed26bbea0>,  
<KeyPoint 0x7feed26bbf90>,  
<KeyPoint 0x7feed26bbe70>)
```

```
[16]: bgr_image = cv2.imread(image_path)
```

```
[17]: blank = np.zeros((1, 1))  
blobs = cv2.drawKeypoints(bgr_image, keypoints, blank, (0, 0, 255), cv2.  
    ↳DRAW_MATCHES_FLAGS_DRAW_RICH_KEYPOINTS)
```

```
[18]: plt.figure(figsize=(12, 8))  
result = cv2.cvtColor(blobs, cv2.COLOR_BGR2RGB)  
plt.imshow(result)  
plt.show()
```



```
[19]: print(f'Blob count: {len(keypoints)}')
```

Blob count: 13

[]: