Minimal cluster analysis

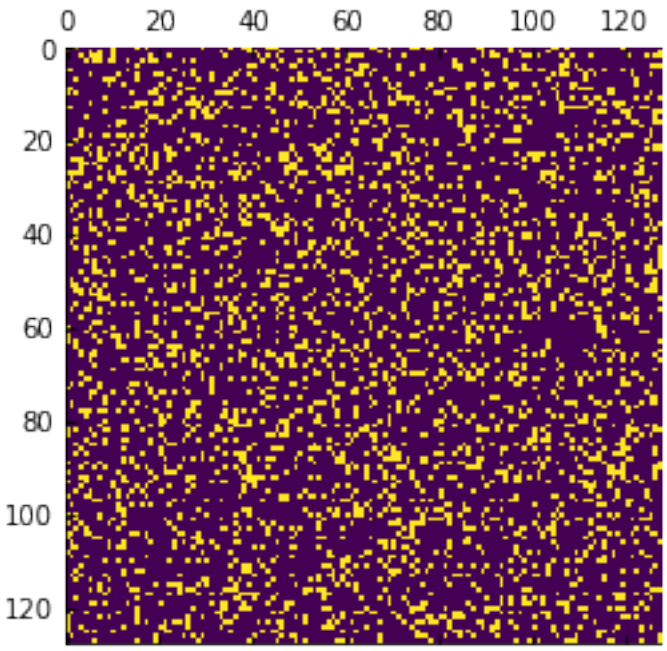
```
from scipy import ndimage
import numpy as np
import matplotlib.pyplot as plt
```

I create a random binary image (through thresholding).

```
image = np.random.uniform(0, 1, (128, 128))
im = (image > 0.8).astype(int)

plt.matshow(im)
```

```
<matplotlib.image.AxesImage at 0x1272e1130>
```

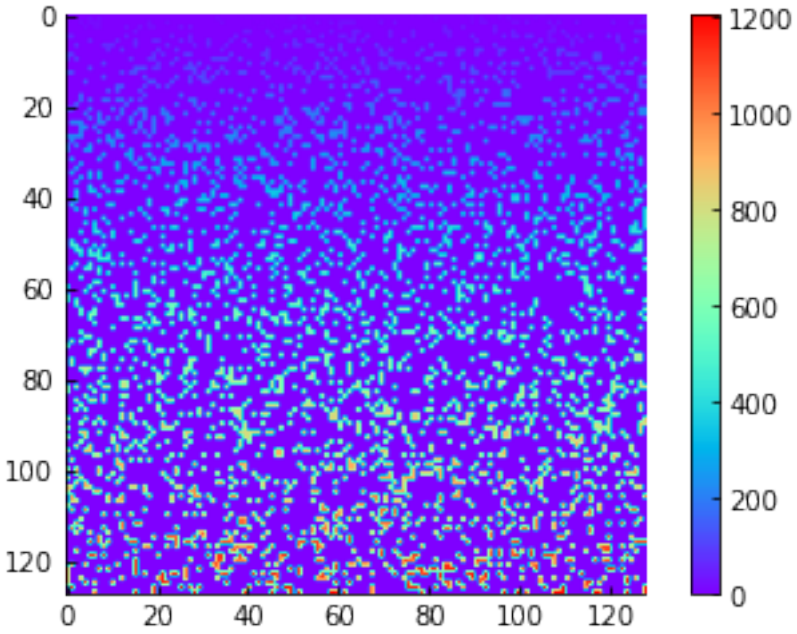


I can then label connected regions, by specifying the structuring element (kernel).

```
kernel = [[1, 1, 1], [1, 1, 1], [1, 1, 1]]
labelled, nlabels = ndimage.label(im, structure=kernel)
```

```
plt.imshow(labelled, cmap=plt.cm.rainbow)
plt.colorbar()
```

```
<matplotlib.colorbar.Colorbar at 0x12736cc70>
```



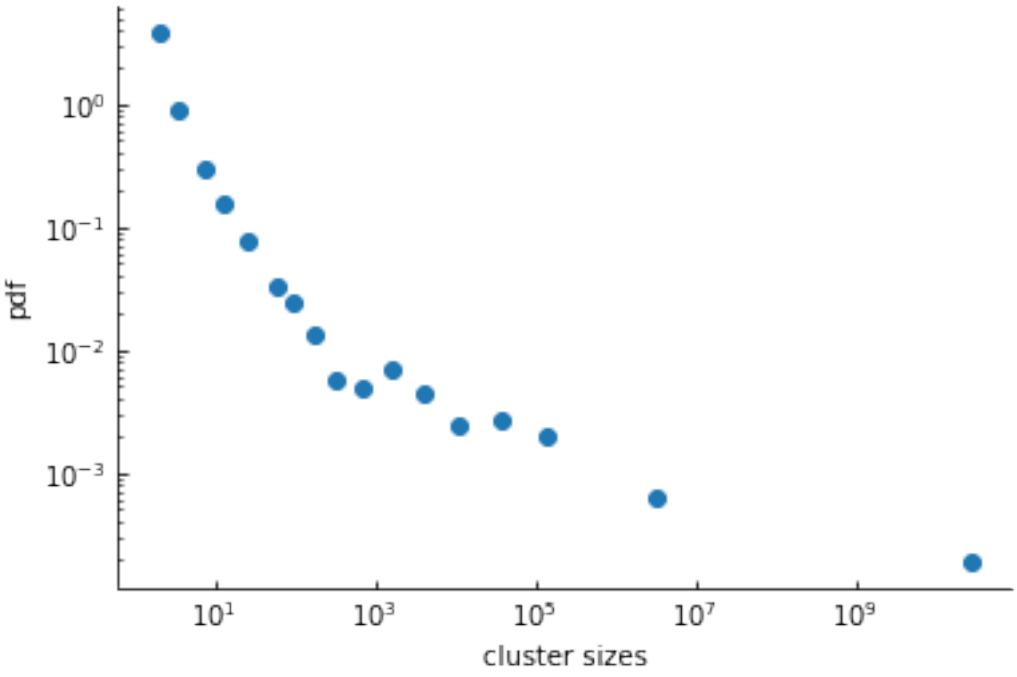
I count the number of pixels with a certain label (ignoring label 0 because it is the background)

```
cluster_sizes = np.bincount(labelled.flatten())[1:]
```

And plot the probability distribution with logarithmically spaced bins

```
minimum = cluster_sizes.min()
maximum = cluster_sizes.max()
bin_edges = np.logspace(np.log2(minimum), np.log2(maximum), 32, base=2)
hist, edges = np.histogram(cluster_sizes, bins=bin_edges, density=True)
plt.plot(2 ** bin_edges[:-1], hist, "o")
plt.yscale("log")
plt.xscale("log")
plt.xlabel("cluster sizes")
plt.ylabel("pdf")
```

```
Text(0, 0.5, 'pdf')
```


pdf
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{1}
10^{3}
10^{5}
10^{7}
10^{9}
cluster sizes