11_Clustering_NeuroImages_neurons

July 4, 2024

1 Nibabel Library

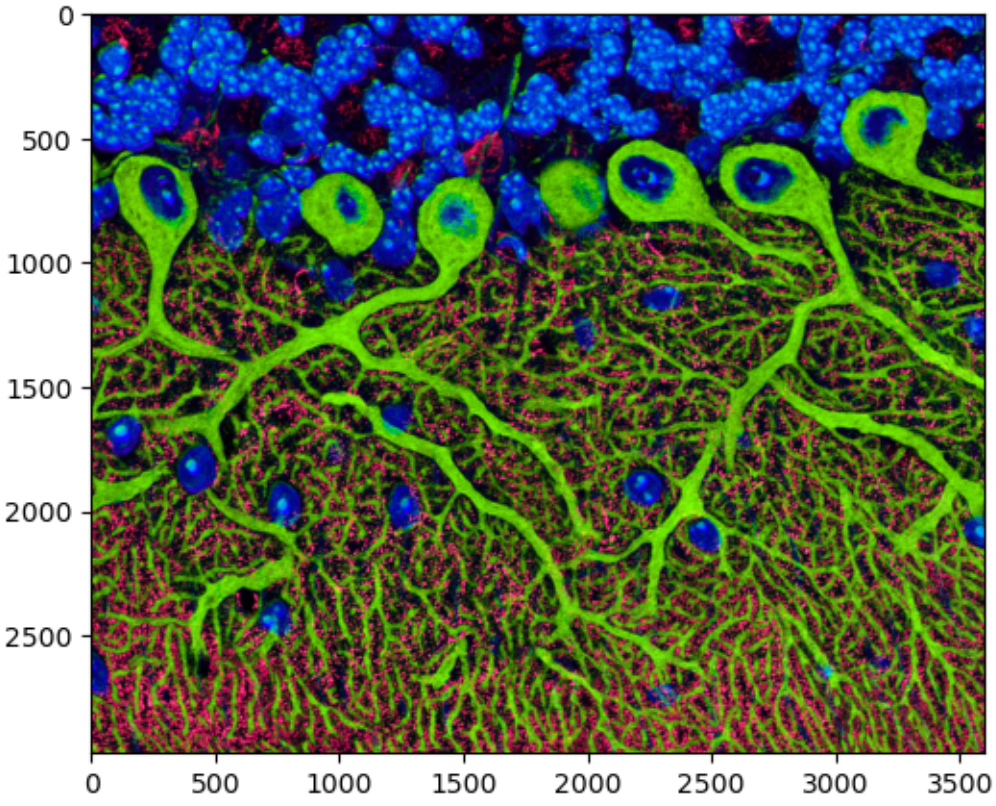
https://nipy.org/nibabel/

```
conda install -c conda-forge nibabel
```

[1]:
```
from numpy import concatenate, zeros, linspace

from matplotlib.pyplot import subplots

from matplotlib.image import imread
```

1.1 Load images and get data

[2]:
```
img = imread('rat_cerebellum.jpg')

fig, ax = subplots(figsize=(6, 5))

ax.imshow(img, cmap='gray');
```



[82]:
```
downsample = 3

img_r = img[::downsample, ::downsample, 0].reshape(-1, 1)
img_g = img[::downsample, ::downsample, 1].reshape(-1, 1)
img_b = img[::downsample, ::downsample, 2].reshape(-1, 1)

img_reshaped = concatenate((img_r, img_g, img_b), axis = 1)

img_reshaped.shape
```

[82]:
```
(1191392, 3)
```

1.2 Visualise and Concatenate

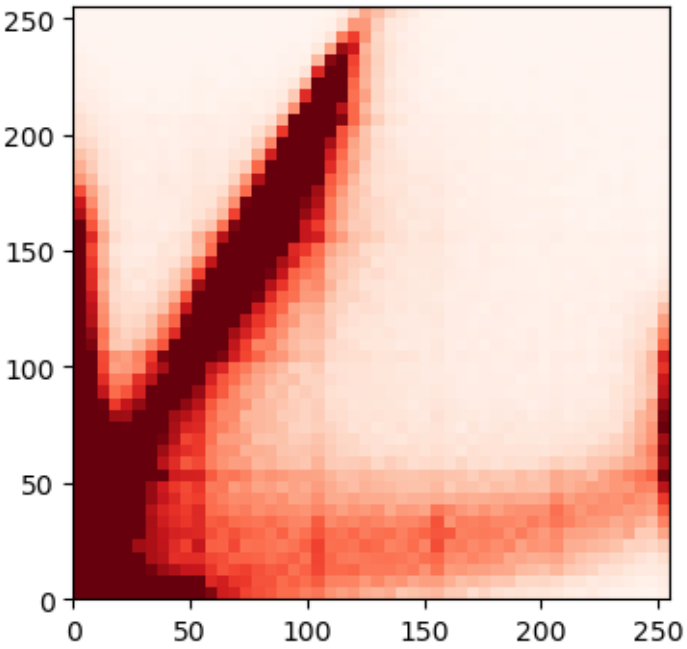
Seaborn: https://seaborn.pydata.org

c.f. pair grid example https://seaborn.pydata.org/examples/pair_grid_with_kde.html

kdeplot documentation https://seaborn.pydata.org/generated/seaborn.kdeplot.html

[76]:
```
fig, ax = subplots(figsize=(4, 4))
```

```
# 2D Histogram
ax.hist2d(img_reshaped[:, 0], img_reshaped[:, 1], bins=50, vmax=1000,␣
 ↪cmap='Reds');
```



2 GMM clustering

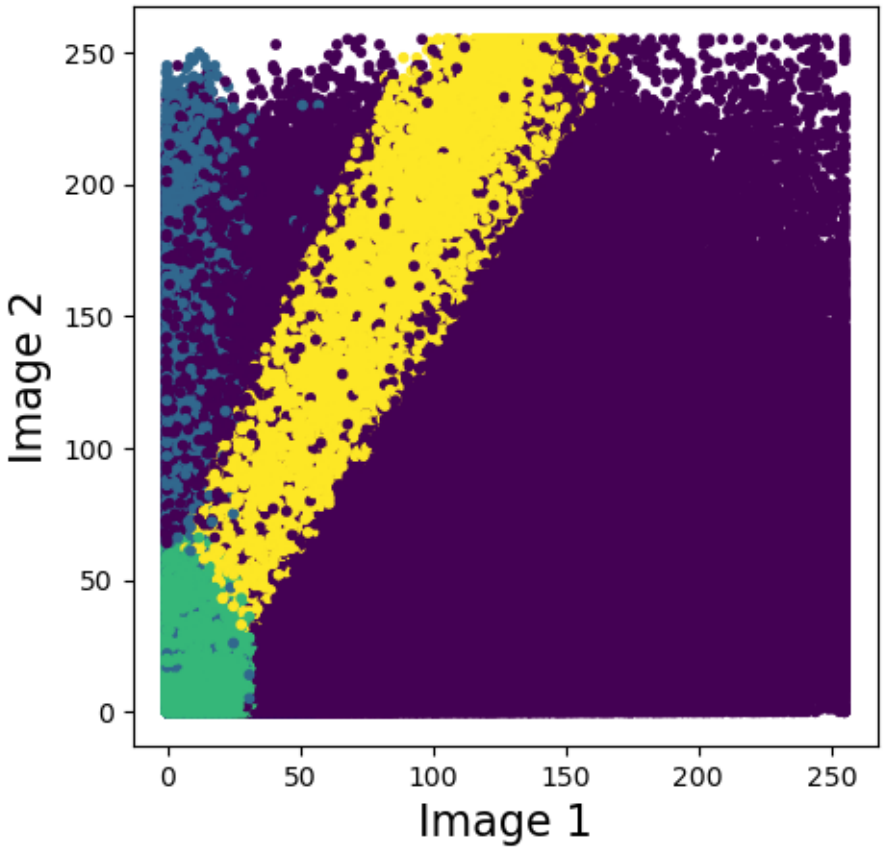
[77]:
```
from sklearn.mixture import GaussianMixture
```

[78]:
```
n_components = 4

SEED = 12345

gmm = GaussianMixture(n_components=n_components, random_state=SEED)

all_img_labels = gmm.fit_predict(img_reshaped)

all_img_labels[0]
```

[78]: 2

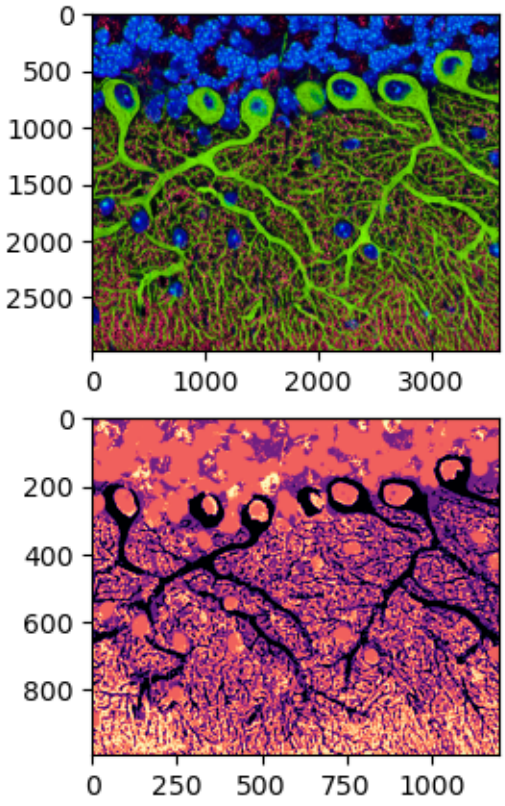
[79]:
```
fig, ax = subplots(figsize=(5, 5))

ax.scatter(img_reshaped[:, 0], img_reshaped[:, 1], c=all_img_labels, s=10)
```

```
ax.set_xlabel('Image 1', fontsize=16)
ax.set_ylabel('Image 2', fontsize=16);
```



[83]:
```
all_img_labels_mapped = zeros(img[::downsample, ::downsample, 0].shape)

mask = all_img_labels_mapped>-1

all_img_labels_mapped[mask] = all_img_labels
```

[84]:
```
fig, ax = subplots(nrows=2, figsize=(5, 5))

ax[0].imshow(img, cmap='gray');
ax[1].imshow(all_img_labels_mapped, cmap='magma_r');
```


0
500
1000
1500
2000
2500
0
1000
2000
3000
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200
400
600
800
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250
500
750
1000

[ ]: