Multiple animals PCA

April 16, 2020

Analysis of PCA of several animals

[1]:
```
cd ../utilities/
```

```
/home/gustav/Documents/DD142X/code/utilities
```

[2]:
```
from features import ffv
from matlab_util import str_lfp, gp_lfp
from plotting import rasterize
```

[3]:
```
cd ../_data/matlabData
```

```
/home/gustav/Documents/DD142X/code/_data/matlabData
```

[4]:
```
files = !ls
print(files)
```

```
['NPR-075.b11.mat', 'NPR-075.b13.mat', 'NPR-075.c013.mat', 'NPR-075.c08.mat',
'NPR-075.d07.mat', 'NPR-076.b05.mat', 'NPR-076.b09.mat', 'NPR-076.c09.mat',
'NPR-076.d07.mat']
```

[5]:
```
import numpy as np
import matplotlib.pyplot as plt

ep = 2 ** 11

str_epochs = np.concatenate([
    str_lfp(filename, ep).reshape((-1, ep)) for filename in files
], axis = 0)

gp_epochs = np.concatenate([
    gp_lfp(filename, ep).reshape((-1, ep)) for filename in files
], axis = 0)

print(str_epochs.shape)
print(gp_epochs.shape)
```

```
(65872, 2048)
(97678, 2048)
```

[6]:
```
strides = 10

incr_str = int(str_epochs.shape[0] / strides)
strs = [
    ffv(
        str_epochs[i * incr_str : (i + 1) * incr_str],
        epoch_size = ep,
        lo = 1,
        hi = 45,
        fft_n = 2 ** 12
    ) for i in range(0, strides)
]

incr_gp = int(gp_epochs.shape[0] / strides)
gps = [
    ffv(
        gp_epochs[i * incr_gp : (i + 1) * incr_gp],
        epoch_size = ep,
        lo = 1,
        hi = 45,
        fft_n = 2 ** 12
    ) for i in range(0, strides)
]

for str_, _ in strs:
    print(str_.shape)
for gp_, _ in gps:
    print(gp_.shape)
```

```
(6587, 11)
(6587, 11)
(6587, 11)
(6587, 11)
(6587, 11)
(6587, 11)
(6587, 11)
(6587, 11)
(6587, 11)
(6587, 11)
(9767, 11)
(9767, 11)
(9767, 11)
(9767, 11)
(9767, 11)
(9767, 11)
(9767, 11)
(9767, 11)
```

```
(9767, 11)
(9767, 11)
```

[7]:
```
frqs = strs[0][1]
print(frqs)
```

```
[ 3.90625  7.8125  11.71875 15.625   19.53125 23.4375  27.34375 31.25
 35.15625 39.0625  42.96875]
```

[8]:
```
strs = [str_ for str_, _ in strs]
gps = [ gp_ for gp_, _ in gps]
```

[11]:
```
strs = np.array(strs)
gps = np.array(gps)
features = strs.shape[2]
print(strs.shape)
print(gps.shape)
```

```
(10, 6587, 11)
(10, 9767, 11)
```

[12]:
```
strs = strs.reshape((-1, features))
gps = gps.reshape((-1, features))
print(strs.shape)
print(gps.shape)
```

```
(65870, 11)
(97670, 11)
```

[13]:
```
from sklearn.decomposition import PCA

all_lfp = np.concatenate((strs, gps), axis = 0)
print(all_lfp.shape)
```

```
(163540, 11)
```

[14]:
```
pca = PCA(n_components = 2).fit(all_lfp.copy())
```

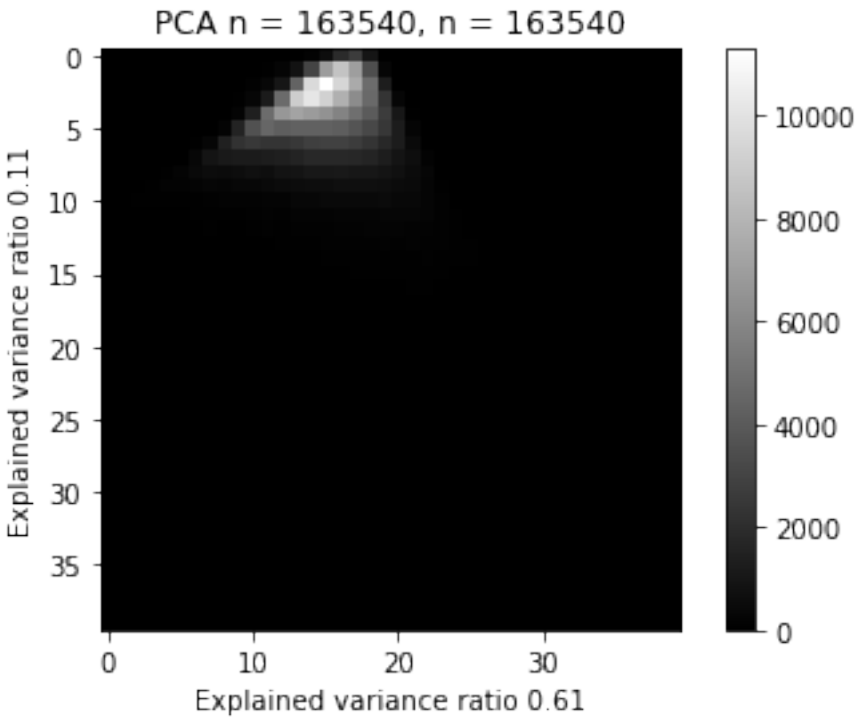
[15]:
```
pca_all = pca.transform(all_lfp.copy())
pca_str = pca.transform(strs.copy())
pca_gp  = pca.transform(gps.copy())

print(pca_all.shape)
print(pca_str.shape)
print(pca_gp.shape)
```

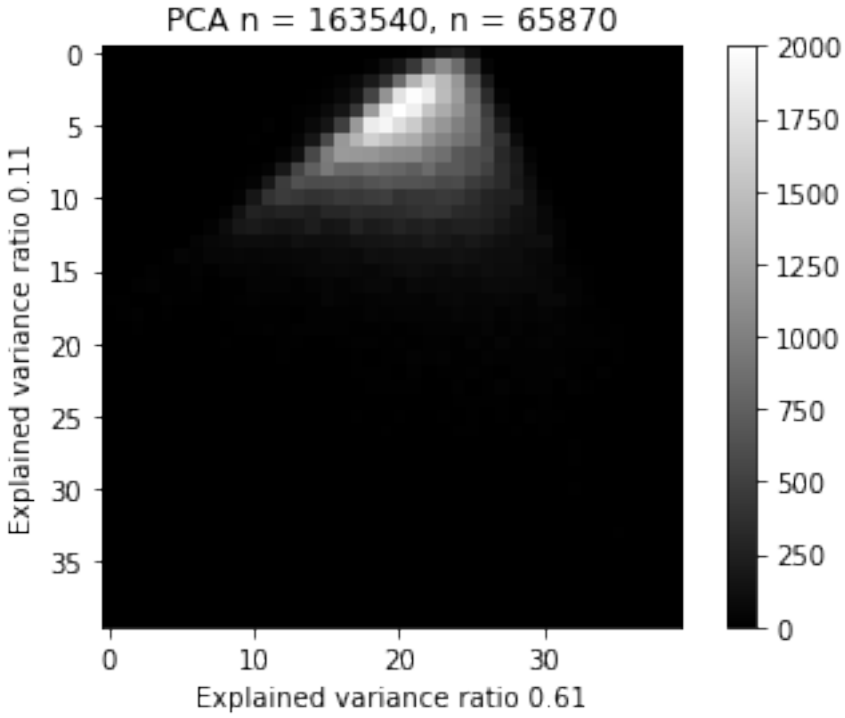
```
(163540, 2)
(65870, 2)
```

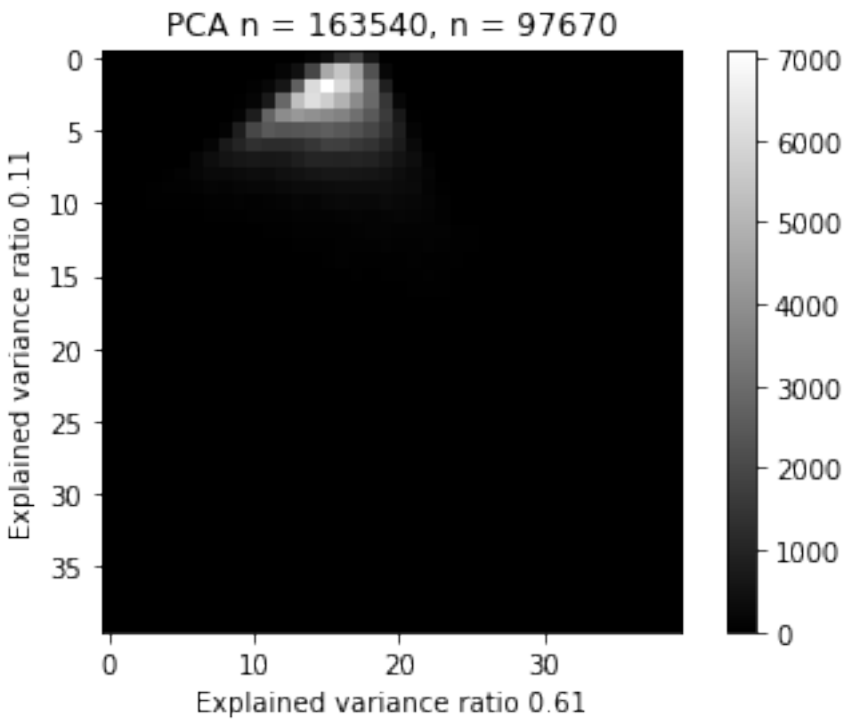
```
(97670, 2)
```

[16]:
```
print("PCA n = " + str(pca_all.shape[0]))
x1var, x2var = pca.explained_variance_ratio_
x1var = round(x1var, 2)
x2var = round(x2var, 2)

raster_all = rasterize(pca_all)
plt.imshow(raster_all, cmap = 'gray', vmin = np.min(raster_all), vmax = np.
 ↪max(raster_all))
plt.title("PCA n = " + str(pca_all.shape[0]) + ", n = " + str(pca_all.shape[0]))
plt.xlabel("Explained variance ratio " + str(x1var))
plt.ylabel("Explained variance ratio " + str(x2var))
plt.colorbar()
plt.show()

raster_str = rasterize(pca_str)
plt.imshow(raster_str, cmap = 'gray', vmin = np.min(raster_str), vmax = np.
 ↪max(raster_str))
plt.title("PCA n = " + str(pca_all.shape[0]) + ", n = " + str(pca_str.shape[0]))
plt.xlabel("Explained variance ratio " + str(x1var))
plt.ylabel("Explained variance ratio " + str(x2var))
plt.colorbar()
plt.show()

raster_gp = rasterize(pca_gp)
plt.imshow(raster_gp, cmap = 'gray', vmin = np.min(raster_gp), vmax = np.
 ↪max(raster_gp))
plt.title("PCA n = " + str(pca_all.shape[0]) + ", n = " + str(pca_gp.shape[0]))
plt.xlabel("Explained variance ratio " + str(x1var))
plt.ylabel("Explained variance ratio " + str(x2var))
plt.colorbar()
plt.show()
```

```
PCA n = 163540
```


PCA n = 163540, n = 163540
Explained variance ratio 0.11
Explained variance ratio 0.61
0
5
10
15
20
25
30
35
0
10
20
30
10000
8000
6000
4000
2000
0


PCA n = 163540, n = 65870
Explained variance ratio 0.11
Explained variance ratio 0.61
0
5
10
15
20
25
30
35
0
10
20
30
2000
1750
1500
1250
1000
750
500
250
0


PCA n = 163540, n = 97670
Explained variance ratio 0.11
Explained variance ratio 0.61
0
5
10
15
20
25
30
35
0
10
20
30
7000
6000
5000
4000
3000
2000
1000
0