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']

```
[15]: 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)

```
[16]: strides = 10

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

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

```
(6587, 18)
(6587, 18)
(6587, 18)
(6587, 18)
(6587, 18)
(6587, 18)
(6587, 18)
(6587, 18)
(6587, 18)
(6587, 18)
(9767, 18)
(9767, 18)
(9767, 18)
(9767, 18)
(9767, 18)
(9767, 18)
(9767, 18)
(9767, 18)
(9767, 18)
(9767, 18)
```

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

```
[12.6953125 13.671875   14.6484375 15.625      16.6015625 17.578125
```

```
    18.5546875 19.53125    20.5078125 21.484375   22.4609375 23.4375
    24.4140625 25.390625   26.3671875 27.34375    28.3203125 29.296875 ]
```

[18]:
```python
strs = [str_ for str_, _ in strs]
gps = [ gp_ for gp_, _ in gps]
```

[19]:
```python
strs = np.array(strs)
gps = np.array(gps)
print(strs.shape)
print(gps.shape)
```

```
(10, 6587, 18)
(10, 9767, 18)
```

[20]:
```python
strs = strs.reshape((-1, 18))
gps = gps.reshape((-1, 18))
print(strs.shape)
print(gps.shape)
```

```
(65870, 18)
(97670, 18)
```

[21]:
```python
from sklearn.decomposition import PCA

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

```
(163540, 18)
```

[22]:
```python
pca = PCA(n_components = 2).fit(all_lfp.copy())
```

[23]:
```python
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)
```

[24]:
```python
print("PCA n = " + str(pca_all.shape[0]))
x1var, x2var = pca.explained_variance_ratio_
x1var = round(x1var, 2)
x2var = round(x2var, 2)
```

3

```python
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

PCA n = 163540, n = 65870

PCA n = 163540, n = 97670