

## HW4\_Question4\_HMM

April 11, 2021

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[22]: import numpy as np
import matplotlib.pyplot as plt

from hmmlearn import hmm

zip = np.load('HMM_data.npz')
X1_train = zip['arr_0'] # training sequence for 1st HMM
X2_train = zip['arr_1'] # training sequence for 2nd HMM
test_1 = zip['arr_2'] # two test sequences
test_2 = zip['arr_3']

# Create two models to be trained ...
testHMM1 = hmm.MultinomialHMM(n_components=3,n_iter=100) # number of states is 3
↳ actually unknown, we assume we know it
testHMM2 = hmm.MultinomialHMM(n_components=3,n_iter=100) # number of states is 3
↳ actually unknown, we assume we know it
```

```
[23]: # Perform HMM training
testHMM1.fit(X1_train)
testHMM2.fit(X2_train)
```

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[23]: MultinomialHMM(n_components=3, n_iter=100,
random_state=RandomState(MT19937) at 0x7FA72C925240)
```

```
[24]: # Perform HMM test and print the class of each test sequence here ...
print('test1 score in HMM1:',testHMM1.score(test_1))
print('test1 best state sequence in HMM1:',testHMM1.predict(test_1))
print('test2 score in HMM1:',testHMM1.score(test_2))
print('test2 best state sequence in HMM1:',testHMM1.predict(test_2))
print('test1 score in HMM2:',testHMM2.score(test_1))
print('test1 best state sequence in HMM2:',testHMM2.predict(test_1))
print('test2 score in HMM2:',testHMM2.score(test_2))
print('test2 best state sequence in HMM2:',testHMM2.predict(test_2))
```

```
test1 score in HMM1: -70.11427560700874
test1 best state sequence in HMM1: [2 0 2 0 0 2 0 2 2 2 0 2 2 0 1 0 0 2 0 2 0 1
0 2 0 0 2 2 0 2 2 2 0 2 2 2 2
2 0 1 0 1 0 2 2 2 2 2 2 0 2 0 2 2 2 0 2 0 2 2 0 1 0 1 0 0 2 0 1 0 1 0 0 2
```

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2 0 2 2 0 2 0 2 2 2 2 0 1 0 0 2 0 1 0 2 0 0 1 0 2 0]
test2 score in HMM1: -53.49819411441823
test2 best state sequence in HMM1: [2 0 1 0 2 0 2 0 0 2 2 2 2 2 0 2 2 0 2 2 2 0
2 2 0 2 2 0 1 0 0 2 0 2 2 2 2
0 1 0 0 2 2 2 0 2 0 2 0 1 0 2 2 2 2 2 2 2 2 0 2 2 2 2 0 0 2 2 2 2 0 2 0 2
2]
test1 score in HMM2: -72.55343352860794
test1 best state sequence in HMM2: [0 0 2 0 0 2 0 2 2 2 0 2 2 0 0 0 0 2 0 2 0 0
0 2 0 0 2 2 0 2 2 2 0 2 2 2 2
2 0 0 0 0 0 2 2 2 2 2 0 2 0 2 2 2 0 2 0 2 2 0 0 0 0 0 0 2 0 0 0 0 0 2
2 0 2 2 0 2 0 2 2 2 2 0 0 0 0 2 0 0 0 2 0 0 0 0 2 0]
test2 score in HMM2: -50.355379429247876
test2 best state sequence in HMM2: [0 0 0 0 2 0 2 0 0 2 2 2 2 2 0 2 2 0 2 2 2 0
2 2 0 2 2 0 0 0 0 2 0 2 2 2 2
0 0 0 0 2 2 2 0 2 0 2 0 0 0 2 2 2 2 2 2 2 2 0 2 2 2 2 0 0 2 2 2 2 0 2 0 2
2]

```