Q7

March 20, 2021

0.1 Problem 7 Jupyter Notebook

Imports:

[1]:
```
import numpy as np
from scipy.stats import uniform

import matplotlib.pyplot as plt
plt.rcParams.update({'font.size' : 16}) # change font size
```

Constants:

[2]:
```
n = 1000
ITER = 20000
```

Random Number Generation:

[3]:
```
p = uniform.rvs(size=ITER)
```

Coin Flipping:

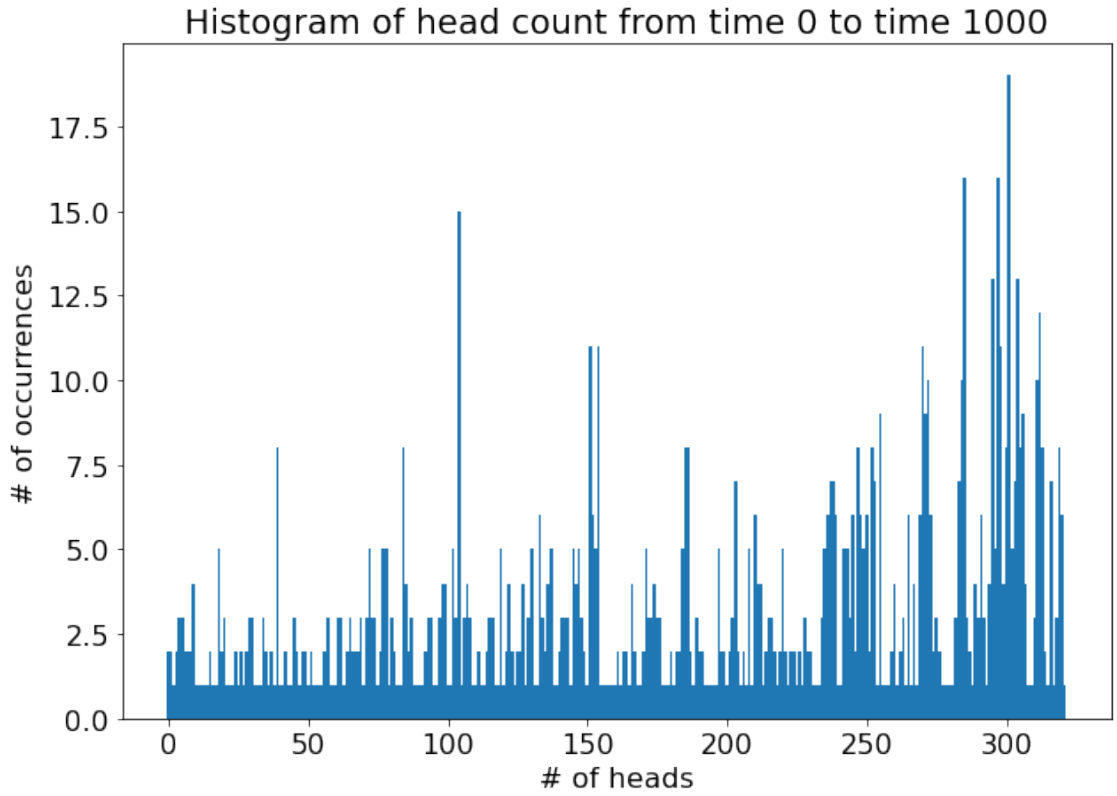
[4]:
```
# Number of heads in each iteration
h = [0]

for i in range(ITER):
    # P_ii
    if p[i] < 0.5:
        h.append(h[-1])
    # P_i,i-1
    elif p[i] < 0.5 + h[-1]/(2 * n):
        h.append(h[-1] - 1)
    # P_i,i+1
    else:
        h.append(h[-1] + 1)
```

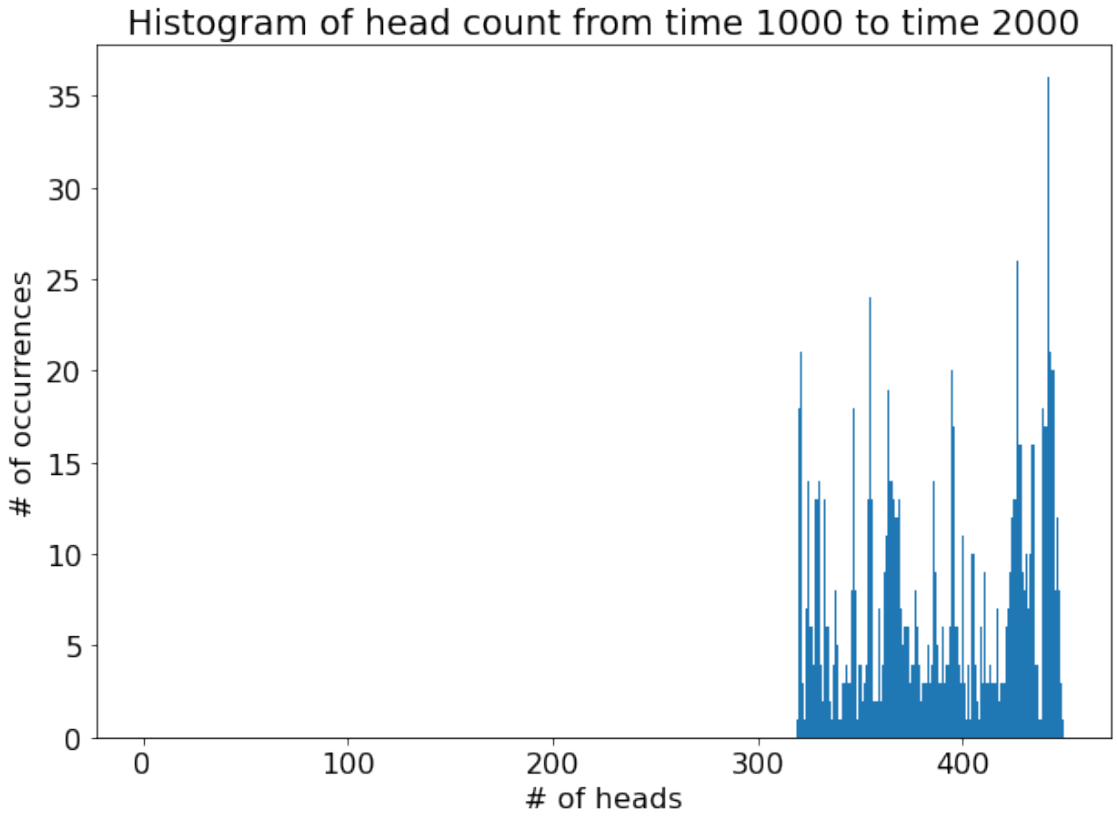
Histogram plotting:

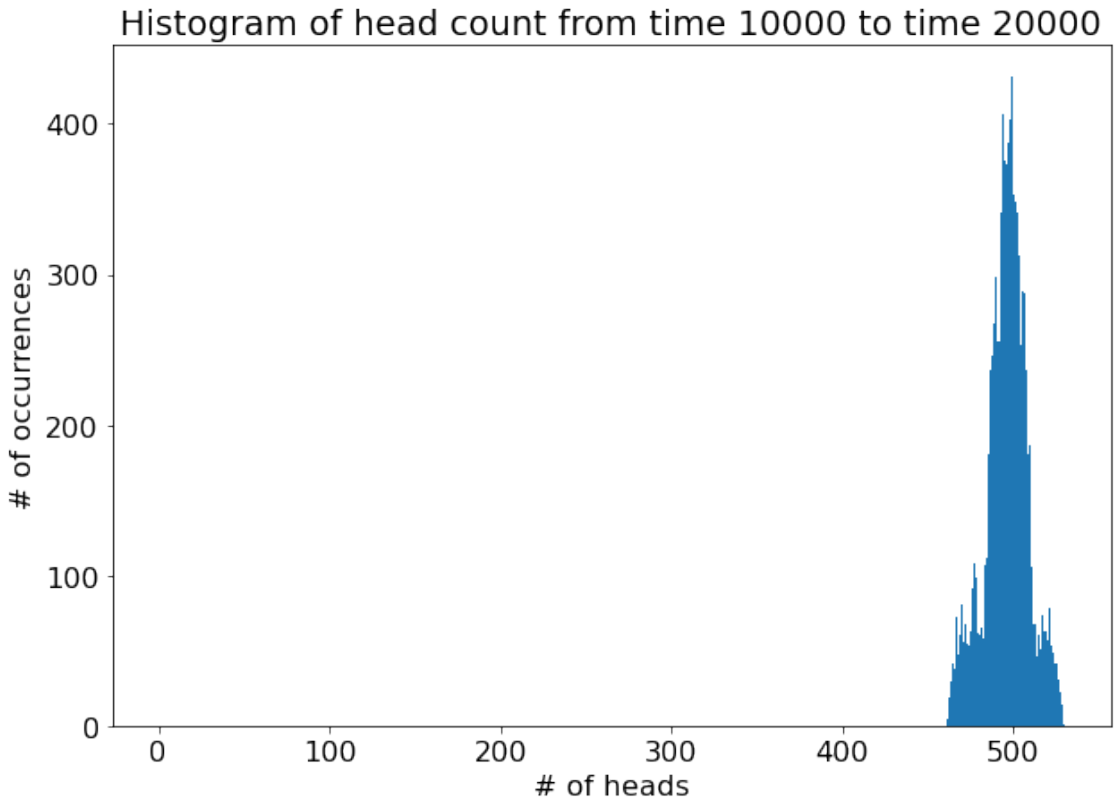
[5]:
```
def hist(start, end):

    # Generate histogram data
    hist = np.bincount(h[start:end+1])
```

```
    bins = np.arange(hist.shape[0])

    # Plot histogram data
    plt.figure(figsize=(10, 7))
    plt.bar(bins, hist, width=1.0)
    plt.xlabel('# of heads')
    plt.ylabel('# of occurrences')
    plt.title(f'Histogram of head count from time {start} to time {end}')
    plt.show()
```

[6]:
```
hist(0, 1000)
hist(1000, 2000)
hist(10000, 20000)
```




Histogram of head count from time 1000 to time 2000
# of occurrences
# of heads
0
5
10
15
20
25
30
35
0
100
200
300
400


Histogram of head count from time 10000 to time 20000
# of occurrences
0
100
200
300
400
0
100
200
300
400
500
# of heads