upper_confidence_bound

November 7, 2024

1 Upper Confidence Bound (UCB)

1.1 Importing the libraries

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

1.2 Importing the dataset

[ ]:
```
dataset = pd.read_csv('Ads_CTR_Optimisation.csv')
```

1.3 Implementing UCB

[ ]:
```
import math
N = 10000
d = 10
ads_selected = []
numbers_of_selections = [0] * d
sums_of_rewards = [0] * d
total_reward = 0
for n in range(0, N):
    ad = 0
    max_upper_bound = 0
    for i in range(0, d):
        if (numbers_of_selections[i] > 0):
            average_reward = sums_of_rewards[i] / numbers_of_selections[i]
            delta_i = math.sqrt(3/2 * math.log(n + 1) /␣
 ↪numbers_of_selections[i])
            upper_bound = average_reward + delta_i
        else:
            upper_bound = 1e400
        if upper_bound > max_upper_bound:
            max_upper_bound = upper_bound
            ad = i
    ads_selected.append(ad)
    numbers_of_selections[ad] = numbers_of_selections[ad] + 1
    reward = dataset.values[n, ad]
```

```
    sums_of_rewards[ad] = sums_of_rewards[ad] + reward
    total_reward = total_reward + reward
```

1.4 Visualising the results

[4]:
```
plt.hist(ads_selected)
plt.title('Histogram of ads selections')
plt.xlabel('Ads')
plt.ylabel('Number of times each ad was selected')
plt.show()
```