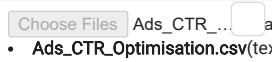
Import library

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

Load Dataset from Local Directory

```
from google.colab import files
uploaded = files.upload()
```



- Ads_CTR_Optimisation.csv(text/csv) - 210050 bytes, last modified: 4/17/2023 - 100% done

```
Saving Ads_CTR_Optimisation.csv to Ads_CTR_Optimisation.csv
```

Importing the Dataset

```
dataset = pd.read_csv('Ads_CTR_Optimisation.csv')
print(dataset.shape)
print(dataset.head(5))
```

```
(10000, 10)
   Ad 1  Ad 2  Ad 3  Ad 4  Ad 5  Ad 6  Ad 7  Ad 8  Ad 9  Ad 10
0     1     0     0     0     1     0     0     0     1      0
1     0     0     0     0     0     0     0     0     1      0
2     0     0     0     0     0     0     0     0     0      0
3     0     1     0     0     0     0     0     1     0      0
4     0     0     0     0     0     0     0     0     0      0
```

```
import math
observations = 10000
no_of_Ads = 10
ads_selected = []
numbers_of_selections_of_each_ads = [0] * no_of_Ads
sums_of_rewards_of_each_ads = [0] * no_of_Ads
total_reward = 0
for n in range(0, observations):
  ad = 0
  max_upper_bound = 0
  for i in range(0, no_of_Ads):
    if (numbers_of_selections_of_each_ads[i] > 0):
      average_reward = sums_of_rewards_of_each_ads[i] / numbers_of_selections_of_each_ads[i]
      delta_i = math.sqrt(3/2 * math.log(n+1)/ numbers_of_selections_of_each_ads[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_of_each_ads[ad] = numbers_of_selections_of_each_ads[ad] + 1
  reward = dataset.values[n, ad]
  sums_of_rewards_of_each_ads[ad] = sums_of_rewards_of_each_ads[ad] + reward
  total_reward = total_reward + reward

print("Rewards by Ads = ",sums_of_rewards_of_each_ads)
print("Total Rewards by UCB = ",total_reward)
print("Ads selected at each round: ",ads_selected)
```

```
Rewards by Ads =  [120, 47, 7, 38, 1675, 1, 27, 236, 20, 7]
Total Rewards by UCB =  2178
Ads selected at each round:  [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 0, 1, 2, 3, 4, 5, 6, 7, 8, 8, 9, 0, 8, 1, 2, 3, 4
```

Visualizing Result

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