Lab Experiment – 5

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
f = pd.read_csv('/content/Ads_CTR_Optimisation.csv')
display(df.head())
```

	Ad 1	Ad 2	Ad 3	Ad 4	Ad 5	Ad 6	Ad 7	Ad 8	Ad 9	Ad 0
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

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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

```
num_of_ads = df.shape[1]
num_of_selections = [0] * num_of_ads
sum_of_rewards = [0] * num_of_ads
epsilon = 0.1
total_reward = 0
print(f"Number of ads: {num_of_ads}")
print(f"Initial num_of_selections: {num_of_selections}")
print(f"Initial sum_of_rewards: {sum_of_rewards}")
print(f"Epsilon value: {epsilon}")
print(f"Initial total_reward: {total_reward}")
```

```
Number of ads: 10
Initial num_of_selections: [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
Initial sum_of_rewards: [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
```

```
Epsilon value: 0.1
Initial total_reward: 0
```

```
import random
chosen_ads = []
for user_index in range(len(df)):
    if random.random() < epsilon:
        ad_index = random.randrange(num_of_ads)
    else:
        max_average_reward = -1
        ad_index = 0
        for i in range(num_of_ads):
            if num_of_selections[i] > 0:
                average_reward = sum_of_rewards[i] /
num_of_selections[i]
                if average_reward > max_average_reward:
                    max_average_reward = average_reward
                    ad_index = i
            else:
                ad_index = i
                break
    chosen_ads.append(ad_index)

print(f"Chosen ads for the first 10 users: {chosen_ads[:10]}")
```

```
Chosen ads for the first 10 users: [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
```

```
for user_index, ad_index in enumerate(chosen_ads):
    num_of_selections[ad_index] += 1
    reward = df.values[user_index, ad_index]
    if reward == 1:
        sum_of_rewards[ad_index] += 1
        total_reward += 1
print(f"Updated num_of_selections: {num_of_selections}")
print(f"Updated sum_of_rewards: {sum_of_rewards}")
print(f"Total reward: {total_reward}")
```

```
Updated num_of_selections: [9105, 91, 112, 100, 107, 96, 89, 115, 88, 97]
Updated sum_of_rewards: [1557, 11, 16, 12, 32, 1, 9, 28, 7, 3]
Total reward: 1676
```

```
average_rewards = [0] * num_of_ads
for i in range(num_of_ads):
    if num_of_selections[i] > 0:
        average_rewards[i] = sum_of_rewards[i] / num_of_selections[i]
best_ad_index = average_rewards.index(max(average_rewards))
print(f"Average rewards for each ad: {average_rewards}")
print(f"The best ad is Ad {best_ad_index + 1}")
```

```
Average rewards for each ad: [0.17100494233937397, 0.12087912087912088,
0.14285714285714285, 0.12, 0.29906542056074764, 0.010416666666666666,
0.10112359550561797, 0.24347826086956523, 0.07954545454545454,
0.030927835051546393]

The best ad is Ad 5
```

```python
import matplotlib.pyplot as plt
plt.figure(figsize=(12, 5))
plt.subplot(1, 2, 1)
plt.bar(range(num_of_ads), num_of_selections)
plt.xlabel('Ad Index')
plt.ylabel('Number of Selections')
plt.title('Number of Times Each Ad Was Selected')
plt.subplot(1, 2, 2)
plt.bar(range(num_of_ads), sum_of_rewards)
plt.xlabel('Ad Index')
plt.ylabel('Total Rewards')
plt.title('Total Rewards for Each Ad')
plt.tight_layout()
plt.show()
```