**Best Advertisement Using MAB**

**E0123049**

**Code:**

import pandas as pd

try:

    df = pd.read\_csv('Ads\_CTR\_Optimisation.csv')

    print("Dataset loaded successfully.")

    print(df.head())

except FileNotFoundError:

    print("Error: Ads\_CTR\_Optimisation.CSV not found. Please make sure the file is in the correct directory.")

    df = None

import random

num\_ads = df.shape[1]

num\_users = df.shape[0]

ads\_selected = [0] \* num\_ads

rewards\_sum = [0] \* num\_ads

print(f"Number of ads: {num\_ads}")

print(f"Number of users: {num\_users}")

print(f"Epsilon value: {epsilon}")

import random

selected\_ads = []

total\_reward = 0

for user in range(num\_users):

    ad\_to\_select = -1

    if random.random() < epsilon:

        ad\_to\_select = random.randrange(num\_ads)

    else:

        max\_reward = -1

        for ad in range(num\_ads):

            if ads\_selected[ad] > 0:

                average\_reward = rewards\_sum[ad] / ads\_selected[ad]

            else:

                average\_reward = 0

            if average\_reward > max\_reward:

                max\_reward = average\_reward

                ad\_to\_select = ad

        if ad\_to\_select == -1:

             ad\_to\_select = random.randrange(num\_ads)

    ads\_selected[ad\_to\_select] += 1

    reward = df.values[user, ad\_to\_select]

    rewards\_sum[ad\_to\_select] += reward

    total\_reward += reward

    selected\_ads.append(ad\_to\_select)

print("Epsilon-greedy simulation completed.")

print(f"Total reward obtained: {total\_reward}")

most\_selected\_ad = selected\_ads.count(max(selected\_ads, key=selected\_ads.count))

best\_ad\_index = rewards\_sum.index(max(rewards\_sum))

print(f"Ad selection counts: {ads\_selected}")

print(f"Sum of rewards for each ad: {rewards\_sum}")

print(f"The ad selected most often was Ad {selected\_ads.count(max(selected\_ads, key=selected\_ads.count))} with {max(selected\_ads, key=selected\_ads.count)} selections.")

print(f"The ad with the highest total reward is Ad {best\_ad\_index} with a total reward of {rewards\_sum[best\_ad\_index]}.")

average\_rewards = [rewards\_sum[i] / ads\_selected[i] if ads\_selected[i] > 0 else 0 for i in range(num\_ads)]

print(f"Average reward for each ad: {average\_rewards}")

best\_ad\_average\_reward = average\_rewards.index(max(average\_rewards))

print(f"The ad with the highest average reward is Ad {best\_ad\_average\_reward} with an average reward of {average\_rewards[best\_ad\_average\_reward]:.4f}.")

import matplotlib.pyplot as plt

plt.figure(figsize=(10, 6))

plt.bar(range(num\_ads), ads\_selected)

plt.title('Number of Times Each Ad Was Selected (Epsilon-Greedy)')

plt.xlabel('Ad Number')

plt.ylabel('Number of Selections')

plt.xticks(range(num\_ads))

plt.show()

plt.figure(figsize=(10, 6))

plt.bar(range(num\_ads), average\_rewards)

plt.title('Average Reward for Each Ad (Epsilon-Greedy)')

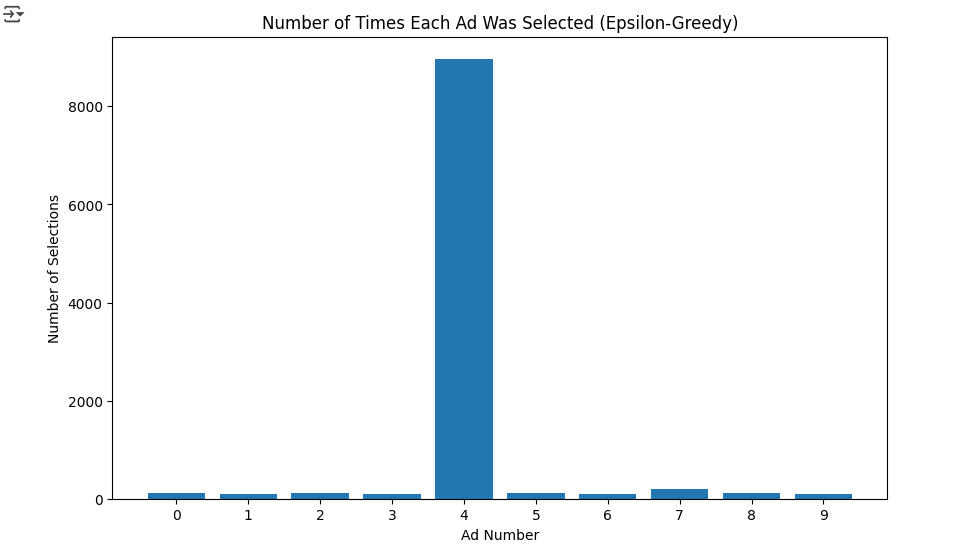
plt.xlabel('Ad Number')

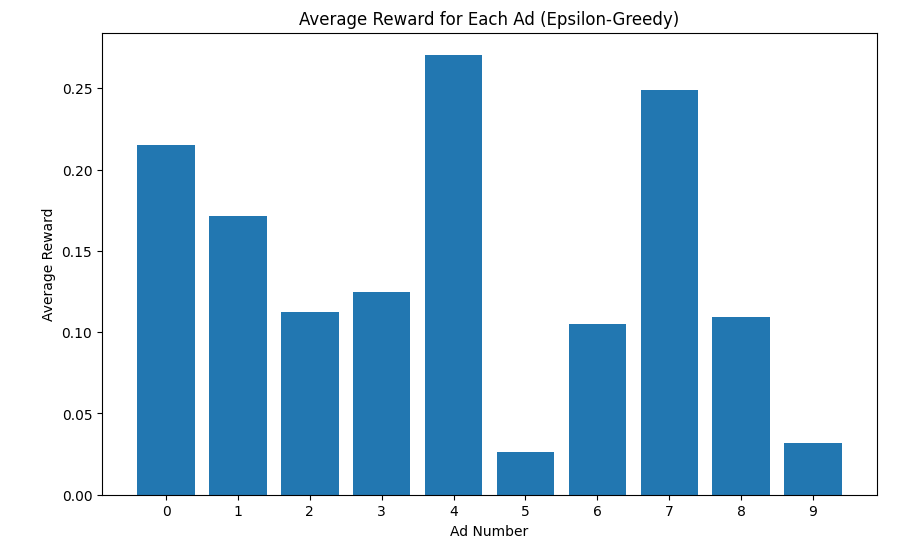
plt.ylabel('Average Reward')

plt.xticks(range(num\_ads))

plt.show()

**Output:**

****

****