

## ASSIGNMENT-2

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**DEEP EIGEN** || COURSE: RL-1.0Y: Reinforcement Learning | YEAR: 2022 | INSTRUCTOR: SANJEEV SHARMA

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### 1 Problem Statement

Consider a multi-armed bandit with 15 arms. True action value ( $q^*(a)$ ) for each arm is sampled from a Gaussian distribution with mean = 0 and variance = 1. Rewards are sampled from normal distribution with mean =  $q^*(a)$  and variance 0.1. Following sample averages method for bandit problems, implement following problems

#### 1.1 Tasks

- Draw a violin plot for reward distribution of each arm with mentioned reward statistics and true action values.
- Consider epsilon-greedy methods for action selection, implement greedy action selection with different values of epsilon=0, 0.01, 0.1. Compare average performance and optimal action selection for each of these methods for number of steps = 10000.
- Compare Incremental Implementation for epsilon-greedy Bandit problem with Sample Averages method by estimating optimal action values for each arm. Mention differences in magnitude following each method.
- Implement an Optimistic Initial Values method for greedy and epsilon-greedy method, where optimistic initial value of  $q^*(a) = 5$  is provided for greedy bandit and  $q^*(a) = 0$  for epsilon-greedy. Compare the differences between both of these methods.

### 2 To Submit

- **violin\_plot.jpg** : Rewards Distribution for all arms
- **average\_performance\_epsilon\_greedy.jpg** : Average Performance for Epsilon-Greedy Bandits for epsilon=0, 0.10, 0.01
- **optimal\_actions\_epsilon\_greedy.jpg** : Optimal Action Selection for Epsilon-Greedy Bandits for epsilon=0, 0.10, 0.01
- **incremental\_vs\_sample\_averages.txt** file with comments on comparison of both methods.
- **optimal\_actions\_epsilon\_greedy.jpg** : Optimal Action Selection for Epsilon-Greedy Bandits for epsilon=0, 0.10, 0.01
- **optimistic\_initials\_vs\_epsilon\_greedy.jpg** : Plot of average performance for epsilon greedy method and optimistic initials greedy method.

**You should share with us:**

Put all files in a folder named **username** where username is your username with which you signed up in Deep Eigen, e.g. **username\_assignment\_rl10y\_2.zip**