IE613: Online Machine Learning **Jan-Apr 2018**

Assignment 3: April 18

Instructions: *You are free to code in Python/Matlab/C/R. Discussion among the class participants is highly encouraged. But please make sure that you understand the algorithms and write your own code. If you share any code with any other student then you will be penalized and can be given 0 mark for that question.*

Submit the code and report by 11:59PM, 18^{th} April on Moodle. Late submission will not be evaluated and given 0 mark.

Question 1 *Consider a K-armed bandit where each arm is a Bernoulii random variable. Fix a bandit instance for each* $K = 10, 25, 50$ *as follows:*

$$\mu_i = \begin{cases} \frac{1}{2} \text{ if } i = 1 \\ \frac{1}{2} - \frac{i}{70} \text{ if } i = 2, 3, \cdots, K, \end{cases}$$

where μ_i *denotes the mean of* i^{th} *arm. Generate plots for cumulative regret vs number of samples (T) for following algorithms.*

1. ϵ_t-*greedy with* $\epsilon_t = \frac{1}{t}$
2. *UCB with* $\alpha = 1.5$
3. *Thompson Sampling*
4. *KL-UCB with* $c = 0$
5. *UCB-V with* $\beta = 1.2$ *and* $c = 1$

The averages should be taken over at-least 20 sample paths (more is better). Display 95 confidence intervals for each plot for $T = 25000$.

Question 2 *Will be added soon.*

Submission Format and Evaluation: You should submit a report along with your code. Please zip all your files and upload via moodle. The zipped folder should named as YourRegistrationNo.zip e.g. '154290002.zip'. The report should contain four figures: one figure for each K which should have five plots corresponding to each algorithm in Q.1 and one figure for Q.2. For each figure, write a brief summary of your observations. We may also call you to a face-to-face session to explain your code.