COURSE PROJECT

EE675
INTRODUCTION TO REINFORCEMENT LEARNING
2023-2024 (even)

Instructions:

1. Projects are to be done in groups of TWO

2. Project 1 is open for all PG students irrespective of their Quiz 1 marks. For UG students to opt for Project 1, both the students in that group should have greater than or equal to 15 marks in Quiz 1.

3. Other two projects can be chosen by any group irrespective of their marks in Quiz 1.

Project 1: Self-defined Projects

This project option is open to all PG students (including dual degree). If UG students want to choose this option, then all the members of that group should have Quiz 1 marks greater than or equal to 15.
For this project, you can choose from one of the following options:

1. A field from one of the thirteen given in the Key papers in Deep RL

2. Any chapter from the Multi-agent RL book

3. Any topic from RL-theory book, which is not covered in our class.

4. Any topic listed on hello iitk Resources under the heading "Few interesting topics/references not covered in class".

5. Any other topic or application of RL in the student's field of interest. This has to be finalized after discussing it with the instructor and the TAs.

The task will be to understand and present an in-depth analysis of the topic selected. This reading part will cover only 10 per cent weightage.
The remaining 10 per cent weightage can either be covered through the end sem exam or by doing additional work as follows:
Implement one of the papers in the selected topic area and do a comparative study of different algorithms.

Project 2: Optimization on Graphs using Decentralized/Distributed RL

Finding MAXIMUM independent sets on graphs is a well-known NP-Hard problem. In recent years, it has been shown that Reinforcement learning can be used to design efficient heuristics for that problem. For example, see these paper1, paper2. The algorithm in this paper gives a centralized solution for an independent set problem. This project aims to study whether distributed solutions can be obtained for the independent set problem using RL? An example of a distributed algorithm (that does not use RL) is here.
A few variants of this problem that may also be considered are (i) Weighted Maximum Independent set and (ii) Graph Coloring Problem.
Check out if Multi-agent RL can be useful for this problem.

Project 3: Theory problem: Cost-aware Cascading Bandits

Consider a bandit problem called the Cascading bandit problem (widely used in recommendation systems) defined in this paper. In this paper, they have analyzed how many samples are required to identify the best arm with a high probability. This project's goal is to answer this question for a variant of this problem called **cost-aware** cascading bandits.

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