SIT796

Reinforcement Learning

Learning Summary Report

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SELF-ASSESSMENT DETAILS

The following checklists provide an overview of my self-assessment for this unit.

	Pass (D)	Credit (C)	Distinction (B)	High Distinction (A)
Self-Assessment			✓	

SELF-ASSESSMENT STATEMENT

DECLARATION

I declare that this portfolio is my individual work. I have not copied from any other student's work or from any other source except where due acknowledgment is made explicitly in the text, nor has any part of this submission been written for me by another person.

Signature: **Prateek Singh**

REFLECTIONS

This portfolio contains all the work that demonstrates that I have achieved all the Unit Learning Outcomes for, SIT796 – Reinforcement Learning, to minimum Pass level and aiming for a Distinction Level.

I started learning this unit while having a Machine Learning Engineer background, while I have previously worked on supervised and unsupervised learning problems, this unit introduced me to the domain of reinforcement learning. This journey has allowed me to learn building blocks of RL as well as set me up to explore this domain in a professional setting. The following table summarizes the completed tasks and my learnings throughout the unit.

Tasks	Learning Outcomes
Task 1.1P.: Reinforcement Learning Environments	In this task, I learned about the OpenAI environments and how they are used in the reinforcement learning domain to simulate real-world problems.
Task 2.1P: Difference Between Supervised, Unsupervised and Reinforcement Learning	This task helped me to learn how reinforcement learning differs from other machine learning paradigms.
Task 3.1D: Exact policy iteration implementation for MDPs	In this task, I got the chance to explore policy iteration algorithm implementation and the prerequisites required. I presented the arguments which restricted implementation of policy iteration for the CarRacing-v0 environment.
Task 4.1C: Essay on dynamic programming vs exact policy iteration methods	In this task, I got the chance to compare DP methods and policy iteration methods. I also summarized my understanding of impact of DP techniques on RL problems and compared them with policy iteration methods.
Task 5.1HD: Reinforcement Learning Literature Review	In this HD task, I learned how to perform literature survey of Reinforcement Learning specific methods. I also presented the evidence of summarizing the understanding from literature survey.
Task 6.1P: Eligibility Traces	In this task, I learned how eligibility traces can be used to optimize the computations involved in solving RL problems.

Task 7.1D: Function approximation implementation	-
Task 8.1HD: Practical Reinforcement Learning	-
Task 11.1 C: Week 11 Credit Quiz	In this Credit grade quiz, I achieved 80% marks of the total and presented my understanding of the course.
Task 11.1 D: Week 11 Distinction Quiz	In this Distinction grade quiz, I achieved 80% marks of the total and presented my understanding of the course.

While completing these tasks, I understood the concepts related to Reinforcement learning and I have displayed a strong research temperament to look for methods beyond the coursework by conducting an independent literature survey. I believe this makes me a suitable candidate to achieve Distinction.

MEETING OF UNIT LEARNING OUTCOMES

This section discusses the ULOs for this unit.

ULO1	Exhibit advanced knowledge of the reinforcement learning problems and the techniques to solve them	Throughout the unit, I have explored core concepts related to reinforcement learning and explored different methodologies starting from DP, Monte Carlo, Temporal Difference and moving to learning state of the art deep reinforcement learning techniques.
ULO2	Research and communicate professionally on the application of reinforcement learning approaches used in real-world problems.	The tasks, specially 5.1D, allowed me to explore the reinforcement learning methods and summarise the understanding of those methods. This helped in communicating the approaches that are used in real-world problems.
ULO3	Devise, develop and apply appropriate techniques to solve real world reinforcement learning problems	As most of tasks as well as workshop sessions applied RL approaches to real world problems, this allowed me to

		strengthen the practical aspects of these approaches.
ULO4	Analyse the performance of software agents across multiple problems	The combination of OpenAI environments and the environments used in workshops allowed us to study performance of agents across multiple platforms.
ULO5	Analyse and identify social and ethical challenges in the utilisation of reinforcement learning techniques in real world problems	In task 5.1HD, during literature survey I explored the implications of reinforcement learning algorithms on real world scenario. This also allowed me to explore what are the challenges which are faced while developing a RL baseline solution.

LESSONS LEARNT

In this unit I have learned the building blocks of traditional reinforcement learning and how they are used in real world scenarios. Staring from exploring OpenAI environment CarRacing-v0 where the state and action spaces mimic real world setting to using algorithms such as policy iteration and eligibility traces on test environment such as grid world, the applications of RL algorithms allowed me to understand the theoretical as well as practical applications of such algorithms.

The progression of the unit from traditional RL algorithms to deep RL algorithms also allowed me to learn the evolution of the domain. This was complemented by the research-based tasks like 5.1D which allowed me to go beyond the coursework and explore how RL algorithms impact real world problems.

This unit also taught me the importance of managing my time and developing solution estimation skills. At the end of this unit, I find myself perfectly placed to further explore this domain and use RL algorithms to solve relevant business problems. The research skills learned in solving Ontrack tasks will also allow me to lead the efforts in my workplace to write such solutions. Although there were some tasks which I could not fulfil, I would be using my learnings to develop capstone projects and further boost my skills to grow into an efficient RL practitioner.