Reinforcement Learning

Coursework Introduction

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11 February 2020

THE UNIVERSITY of EDINBURGH
informatics

Lecture Outline

- Coursework Outline
- Marking Details
- Submission Instructions
- Getting Started
- Contact
- Demonstration Session

Coursework Outline

Material Covered

- Dynamic Programming (20 Marks)
- Tabular Reinforcement Learning (30 Marks)
- Deep Reinforcement Learning (30 Marks)
- N-Step Actor Critic (20 Marks)

Question 1 - Dynamic Programming

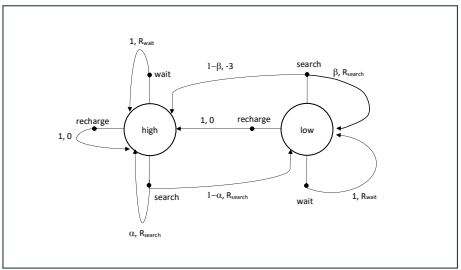

Figure 1: Example MDP for Exercise 1

- Implement functions for **Value Iteration** & **Policy Iteration**
- Marked based on correctness of your implementation
- Create your own MDPs to debug your implementation

Question 2 - Tabular Reinforcement Learning

Figure 2: FrozenLake Environment

	R	P	S
R	0	-1	1
P	1	0	-1
S	-1	1	0

Figure 3: Payoff Matrix for RPS

- Implement functions for **Q-Learning**, **Monte Carlo with ϵ-soft policy**, and **Wolf-PHC**
- Marked based on :
  - Correctness of Implementation
  - Average returns of QL and MC
  - Convergence Plots (Only Wolf-PHC)
- Wolf-PHC will be covered in Multiagent RL lecture (pseudocode provided in document)

Question 3 - Deep Reinforcement Learning

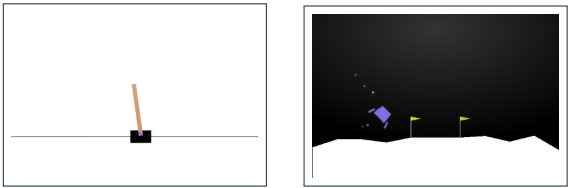

Figure 4: Rendering of the Cartpole and LunarLander environments

- Implement deep reinforcement learning algorithms
- Value-based: **DQN**
- Policy gradient: **REINFORCE**
- Marking based on correctness and plots showing average returns

Question 4 - N-Step Actor Critic

- Implement *n*-step actor critic from scratch
- Pseudocode provided in coursework document
- Marking based on :
  - Average return plots on both environments
  - Write-up related to performance comparison between different values of *n*.

Marking Details

- Unit tests to evaluate correctness
  - Read documentations for desired outputs of each function
- Plots to evaluate performance measured by average returns
  - See coursework document for expected performance of each environment
- Write-up
  - At most 1 A4-Page (Including plots)
  - Must use standard font sizes

Submission Details

- Organize submission files as instructed in coursework document
- Submit as zip file through LEARN (Assignment name : Coursework 1)
- LEARN assignment submission guidelines :

  https://blogs.ed.ac.uk/ilts/2019/09/27/assignment-hand-ins-for-learn-guidance-for-students/

- **Deadline : March 31st 2020, 4:00 PM**

Getting Started

Getting Started

- Read the coursework description (download from Learn page)
- Read the code base documentation
- Understand the training script for each question
- Read the cited papers for each question

Codebase Setup

- Install Python3
- Set up virtual environment
- Download code base

```
git clone https://github.com/semitable/uoe-rl2020.git
```

- Install package dependencies

```
pip install -e .
```

Support

Contact Us

- Questions should be posted on Piazza
- Clarification will be posted by TA team (Arrasy, Lukas, Filippos)
- Use tags in Piazza to organize posts for easy search

Demonstration Session

- Quick walkthrough of assignment codes
- Brief tutorial on PyTorch
- Tutorials will be held on :
  - Flexible Learning Week
  - Week 8

Any Questions?

Codebase introduction