Reinforcement Learning (COMP0089)

**Description**

**Aims:**
The module aims to introduce students to the foundations of reinforcement learning, and to equip students with the ability to successfully implement, apply and test relevant learning algorithms.

**Learning outcomes:**
On successful completion of the module, a student will be able to:
1. understand the basics of reinforcement learning paradigms;
2. understand the theoretical foundations, formalisms and algorithms in reinforcement learning;
3. understand how to apply reinforcement learning algorithms to environments with complex dynamics;
4. understand how to combine reinforcement learning with function approximation, and specifically with modern deep learning methods (deep reinforcement learning).

**Content:**
The module is about prediction and control using reinforcement learning, including aspects of deep reinforcement learning, i.e., the application of neural networks-based functional approximation to reinforcement learning problems;
The module will cover the following topics:
1. Markov decision processes,
2. Planning by dynamic programming,
3. Model-free prediction and control,
4. Value function approximation,
5. Policy gradient methods, Actor-critic algorithms
6. Integration of Learning and Planning,
7. Exploration vs exploitation trade-offs.
In addition, it will cover the theory of reinforcement learning, concrete algorithms for complex domains, and deep reinforcement learning. Possible applications to be discussed may include learning to play classic board games as well as video games.

**Key information**

- **Year**: 2019/20
- **Credit value**: 15 (150 study hours)
- **Delivery**: PGT L7, Campus-based
- **Reading List**: View on UCL website
- **Tutor**: Prof Thore Graepel
- **Term**: Term 2
- **Timetable**: View on UCL website

**Assessment**

**Find out more**

For more information about the department, programmes, relevant open days and to browse other modules, visit [ucl.ac.uk](http://ucl.ac.uk)

**Disclaimer:** All information correct as of August 2019. Please note that aspects of the module may be subject to change. UCL will make best efforts to inform applicants of major changes.
Requisites:
In order to be eligible to select this module, a student must be registered on a programme for which it is a formally-approved option or elective choice AND have (i) a strong understanding of probability, calculus, and linear algebra; (ii) excellent coding skills in Python (in order to complete assessments); and (iii) have taken COMP0078. Recommended: to have taken COMP0090 in Term 1.
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