Reinforcement Learning

0. Class info

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CS-UPC

March 17, 2018
Second part of the URL course:

- Mario Martin
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- Web page for course:
  http://www.cs.upc.edu/~mmartin/url-RL.html
1. Basic concepts of Reinforcement Learning
2. Basic RL algorithms: Model based methods
   - Value iteration and Policy iteration
   - Asynchronous versions
3. Basic RL algorithms: Model free methods
   - Backups and Role of exploration
   - Monte Carlo, Q-learning and Sarsa
   - Temporal Differences: $TD(\lambda)$
4. Function approximation in RL
   - Non-parametric methods and linear methods
   - Deep Learning for RL
5. Policy gradient methods
   - Actor-Critic methods
   - REINFORCE and TRPO
6. State of the art applications of RL.
Resources

- Slides: On the web page of the course.
- Books:
- Recommended courses with materials:
  - (Basic) David Silver’s course Reinforcement Learning, 2015.
  - (Advanced) Sergey Levine’s course CS 294 (Berkeley): Deep Reinforcement Learning, Fall 2017.
- Software: See Lab section in web page of the course.
The evaluation for this part of the course will consist on:

1. A test questionnaire about the topics of the course (20%)
2. One of these two options (80%):
   - **Option A:** Write a paper about the current state of the art of one topic related to RL.
   - **Option B:** Implementation of a domain and/or a reinforcement learning algorithm (f.i. in the OpenGym framework and python).
You will have to write brief paper about the current state of the art of the research in a subject related to RL.

1. You will have to look for papers related to the topic
2. You will have to collect relevant bibliography on the topic
3. You will have to choose the more relevant papers
4. You will have to summarize the problems described and to summarize the approaches presented on those papers
5. You will have to situate the problem in the area and to describe the relation of the topic with other areas

You will find a list of topics in the web page of the course. Choose the topic and send me and e-mail. Each student should choose a different topic. Topics will be assigned using the first-to-choose-first-to-assign policy.

You can work also on a topic not in the list after my approval.

The deadline for delivering this report is June 22th 2018.
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Work could consist in implementing an algorithm, an environment or a exploration technique. You will have to write a report about the algorithms comparing

- **algorithm**: with other algorithms in different environments.
- **environment**: results of different algorithms in that environment.
- **technique**: with different techniques in different algorithms.

The implementation must be in the python language and one of the platforms proposed.

The deadline for delivering this report is **June 22th 2018**.
Lab classes

- Bring your laptop. Any OS is Ok.
- I will assume some knowledge of python. I will assume also you have python 3.x installed in your computer. Install Anaconda distribution if you don’t have any installed.
- Don’t worry. We will install the different platforms to play with different algorithms and environments. Instructions will be available also in the web page of the course.