

Assignment 6: CartPole Control with Reinforcement Learning

Submission: Thursday 08/11/2018 16h moodle
Groups of maximum 2 students

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Introduction to Artificial Intelligence, 2018-2

The objective in this task is to apply forces to a cart moving along a track so as to keep its pole from falling over.

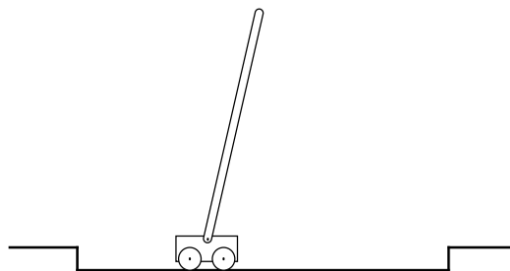


Figure 1: CartPole, Barto, Sutton, and Anderson

A failure occurs if:

- The pole falls past $\pm 15^\circ$ from vertical
- The cart runs off the track ± 2.4 from the center

This task could be treated as episodic, where the natural episodes are the repeated attempts to balance the pole. The reward is $+1$ for every step taken, so that the return at each time would be the number of steps until failure.

The following table presents the variables that conform the observation of the environment, and their lower and upper bounds.

<i>Num</i>	<i>Observation</i>	<i>Min</i>	<i>Max</i>
0	Cart Position	-4.8	4.8
1	Cart Velocity	-0.5	0.5
2	Pole Angle	-24°	24°
3	Pole Velocity At Tip	-50°	50°

Apply reinforcement learning so the CartPole learns to keep the pole balanced for as long as possible.

Use the gym environment *CartPole-v0* and consult its documentation [here](#)

Evaluation

Each group is going to explain in front of the class how they solve the CartPole task with RL.

The group has to present:

- Slides with information about:
 - Discretization of the state space
 - Size of the state-action space
 - RL method: Q-learning or SARSA
 - Exploration strategy: ϵ -greedy, softmax, ϵ -soft, other.
 - Step-size (learning) rate α
 - Discounting factor
 - Statistics about how much the state-action space was explored
 - Learning curves
- Show the learned policy working in the gym environment. (Bring a ready python script, so to test the policy is just running the script)

Date of evaluation: november 8th