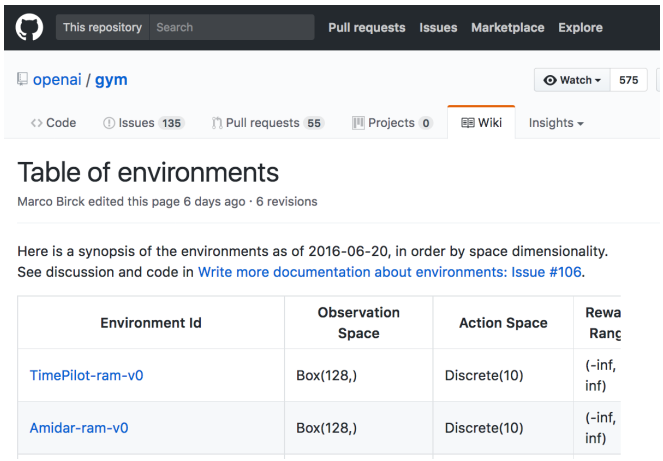
Finite MDPs

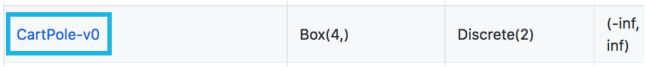
Please use **this link** to peruse the available environments in OpenAI Gym.



The environments are indexed by **Environment Id**, and each environment has corresponding **Observation Space**, **Action Space**, **Reward Range**, **tStepL**, **Trials**, and **rThresh**.

CartPole-v0

Find the line in the table that corresponds to the **CartPole-v0** environment. Take note of the corresponding **Observation Space** (`Box(4,)`) and **Action Space** (`Discrete(2)`).



As described in the **OpenAI Gym documentation**,

valid actions and observations.

- The `Discrete` space allows a fixed range of non-negative numbers.
- The `Box` space represents an n-dimensional box, so valid actions or observations will be an array of n numbers.

Observation Space

The observation space for the CartPole-v0 environment has type `Box(4,)`. Thus, the observation (or state) at each time point is an array of 4 numbers. You can look up what each of these numbers represents in **this document**. After opening the page, scroll down to the description of the observation space.

Observation

Type: Box(4)

Num	Observation	Min	Max
0	Cart Position	-2.4	2.4
1	Cart Velocity	-Inf	Inf
2	Pole Angle	~ -41.8°	~ 41.8°
3	Pole Velocity At Tip	-Inf	Inf

Notice the minimum (-Inf) and maximum (Inf) values for both **Cart Velocity** and the **Pole Velocity at Tip**.

Since the entry in the array corresponding to each of these indices can be any real

Action Space

The action space for the CartPole-v0 environment has type `Discrete(2)`. Thus, at any time point, there are only two actions available to the agent. You can look up what each of these numbers represents in **this document** (note that it is the same document you used to look up the observation space!). After opening the page, scroll down to the description of the action space.

> **Actions**
>
> Type: Discrete(2)
>
> | Num | Action |
> | --- | --- |
> | 0 | Push cart to the left |
> | 1 | Push cart to the right |

In this case, the action space $\mathcal{A}$ is a finite set containing only two elements.

Finite MDPs

Recall from the previous concept that in a finite MDP, the state space $\mathcal{S}$ (or $\mathcal{S}^+$, in the case of an episodic task) and action space $\mathcal{A}$ must both be finite.

Thus, while the CartPole-v0 environment does specify an MDP, it does not specify a **finite** MDP. In this course, we will first learn how to solve finite MDPs. Then, later in this course, you will learn how to use neural networks to solve much more complex

Finite MDPs