

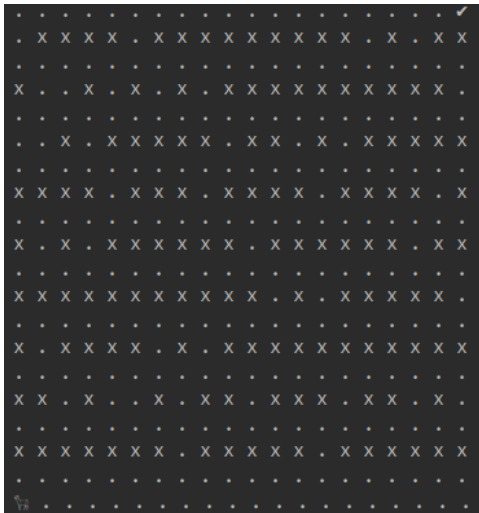
SARSA & Q-Learning

Machine Learning and Deep Learning

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We have an agent stuck in a maze.

- state is (x,y) position
- reward is -1 for each time step
- when the exit of the labirinth is reached, the episode terminates
- allowed actions are N,S,W,E

Guide him out with reinforcement learning!

Initialize $Q(s, a), \forall s \in S, a \in \mathcal{A}(s)$, arbitrarily, and $Q(\text{terminal-state}, \cdot) = 0$

for each episode **do**

 Initialize S

for each step of episode **do**

 Choose A from S using policy derived from Q (e.g., ϵ -greedy)

 Take action A , observe R, S'

$Q(S, A) \leftarrow Q(S, A) + \alpha(R + \gamma \max_{a'} Q(S', a') - Q(S, A))$

$S \leftarrow S'$

end for

end for

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for each episode **do**

 Initialise S

 Choose A from S using policy derived from Q (e.g., ϵ -greedy)

for each step of episode **do**

 Take action A , observe R, S'

 Choose A' from S' using policy derived from Q (e.g., ϵ -greedy)

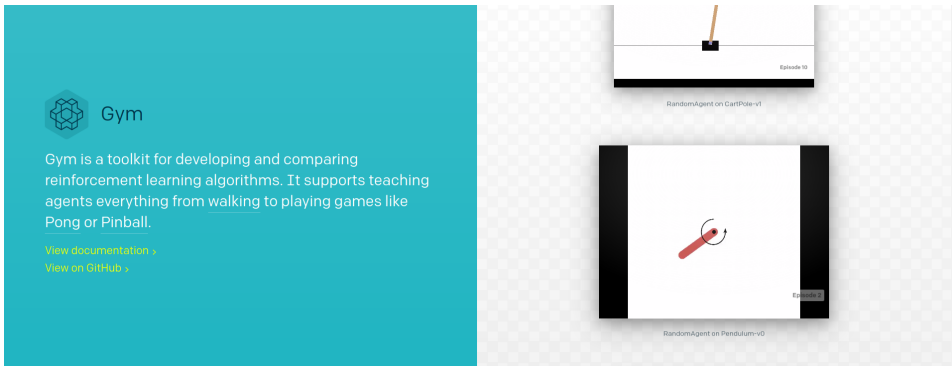
$Q(S, A) \leftarrow Q(S, A) + \alpha(R + \gamma Q(S', A') - Q(S, A))$

$S \leftarrow S'; A \leftarrow A'$

end for

end for

If you are curious about RL, try **OpenAI gym**:



The screenshot shows the OpenAI Gym website. On the left, a teal box contains the Gym logo (a hexagon with a cube inside) and the word "Gym". Below the logo, it says "Gym is a toolkit for developing and comparing reinforcement learning algorithms. It supports teaching agents everything from walking to playing games like Pong or Pinball." There are two links: "View documentation >" and "View on GitHub >". On the right, there are two game environment visualizations. The top one is "CartPole-v1" showing a pole on a cart, with "Episode 10" and "RandomAgent on CartPole-v1" text. The bottom one is "Pendulum-v0" showing a pendulum, with "Episode 20" and "RandomAgent on Pendulum-v0" text.

pip install gym