✨ Member-only story

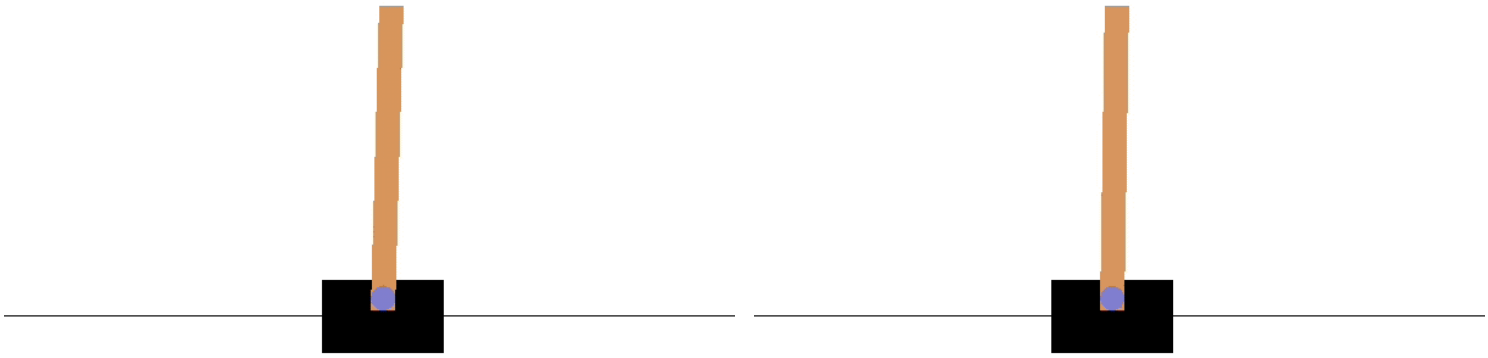
Cartpole - Introduction to Reinforcement Learning (DQN - Deep Q-Learning)

Solving OpenAI Gym Environment

Greg Surma · Follow

6 min read · Sep 26, 2018

In today's article, I am going to introduce you to the hot topic of Reinforcement Learning. After this post, you will be able to create an agent that is capable of learning through trial and error and ultimately solving the cartpole problem.

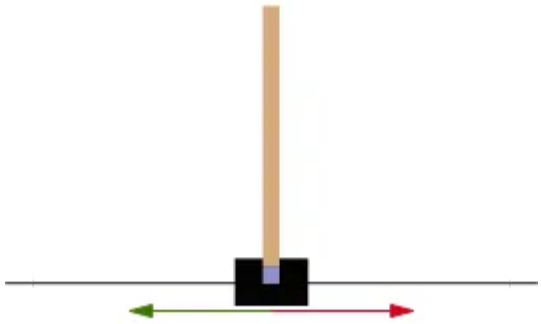


Before and after training / Before and after reading this article

Table of Contents

Cartpole Problem

Cartpole - known also as an Inverted Pendulum is a pendulum with a center of gravity above its pivot point. It's unstable, but can be controlled by moving the pivot point under the center of mass. The goal is to keep the cartpole balanced by applying appropriate forces to a pivot point.



Cartpole schematic drawing

- Violet square indicates a pivot point
- Red and green arrows show possible horizontal forces that can be applied to a pivot point

> *A pole is attached by an un-actuated joint to a cart, which moves along a frictionless track. The system is controlled by applying a force of +1 or -1 to the cart. The pendulum starts upright, and the goal is to prevent it from falling over. A reward of +1 is provided for every timestep that the pole remains upright. The episode ends when the pole is more than 15 degrees from vertical, or the cart moves more than 2.4 units from the center.*

Take a look at a video below with a real-life demonstration of a cartpole problem learning process.

Cart-Pole Swing-up

Marc-André Giroux
Sr. Software Developer
Netflix

Carlos Arguelles
Sr. Staff Engineer
Google

Tony Yiu
Director
Nasdaq

Brandeis Marshall
CEO
DataedX

Cassie Kozyrkov
Chief Decision Scientist
Google

Memo Akten
Asst. Professor
UCSD

Vitali Zaidman
Software Architect
Meta

Camille Fournier
Head of Engineering
JPMorgan Chase

Upgrade

Follow

Written by Greg Surma

1.8K Followers

https://gsurma.github.io

More from Greg Surma

Greg Surma

Jetson - Self-Driving Toy Car (Part: 1)

Car Assembly, System Design and Basic AI Autopilot Motion 🤖 🚙

· 10 min read · Dec 5, 2020

Greg Surma

Image Classifier - Cats 😾 vs Dogs 🐶

Leveraging Convolutional Neural Networks (CNNs) and Google Colab's Free GPU

✨ · 8 min read · Nov 18, 2018

2.5K 14

Greg Surma

CNN Explainer - Interpreting Convolutional Neural Networks (1/N)

Generating Area Importance Heatmaps with Occlusions

✨ · 9 min read · Jan 9, 2021

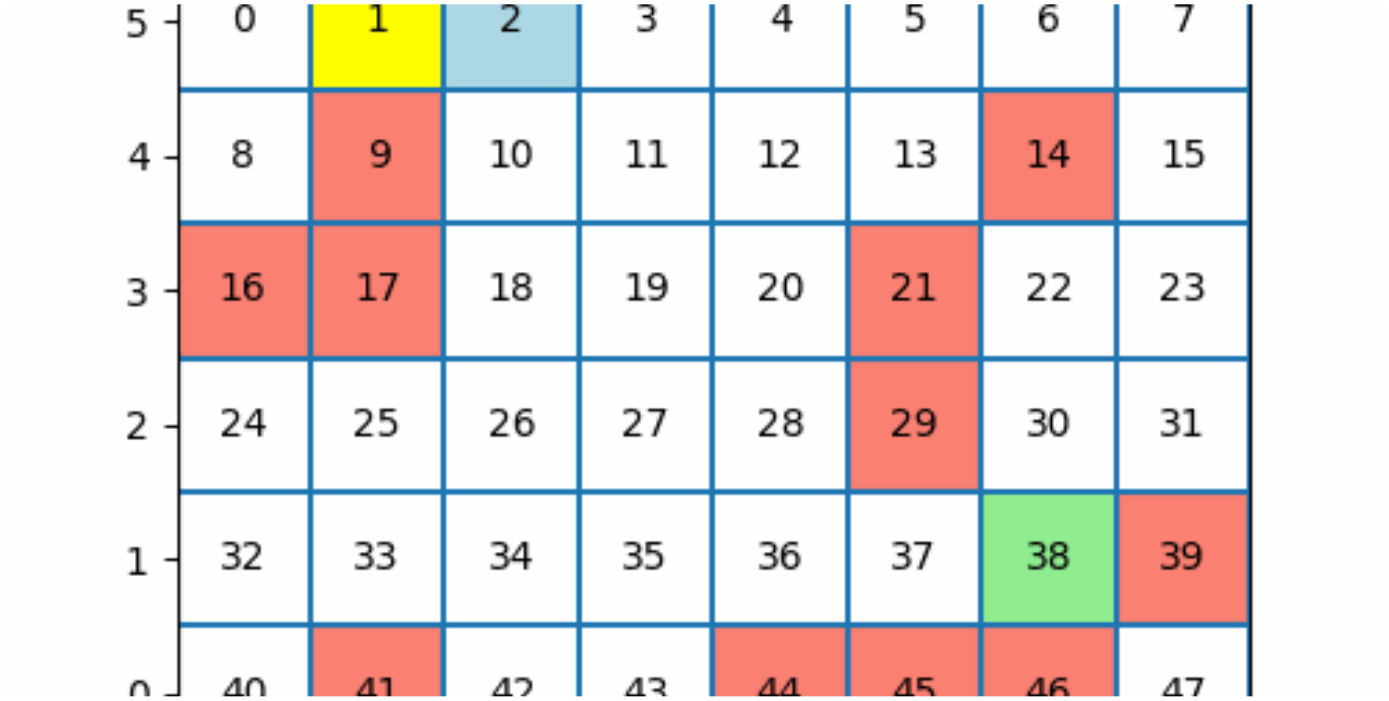
130 3

Greg Surma

Digit Recognizer - Introduction to Kaggle Competitions

Solving MNIST Digit Recognition Task (0.995)

· 5 min read · Dec 2, 2018

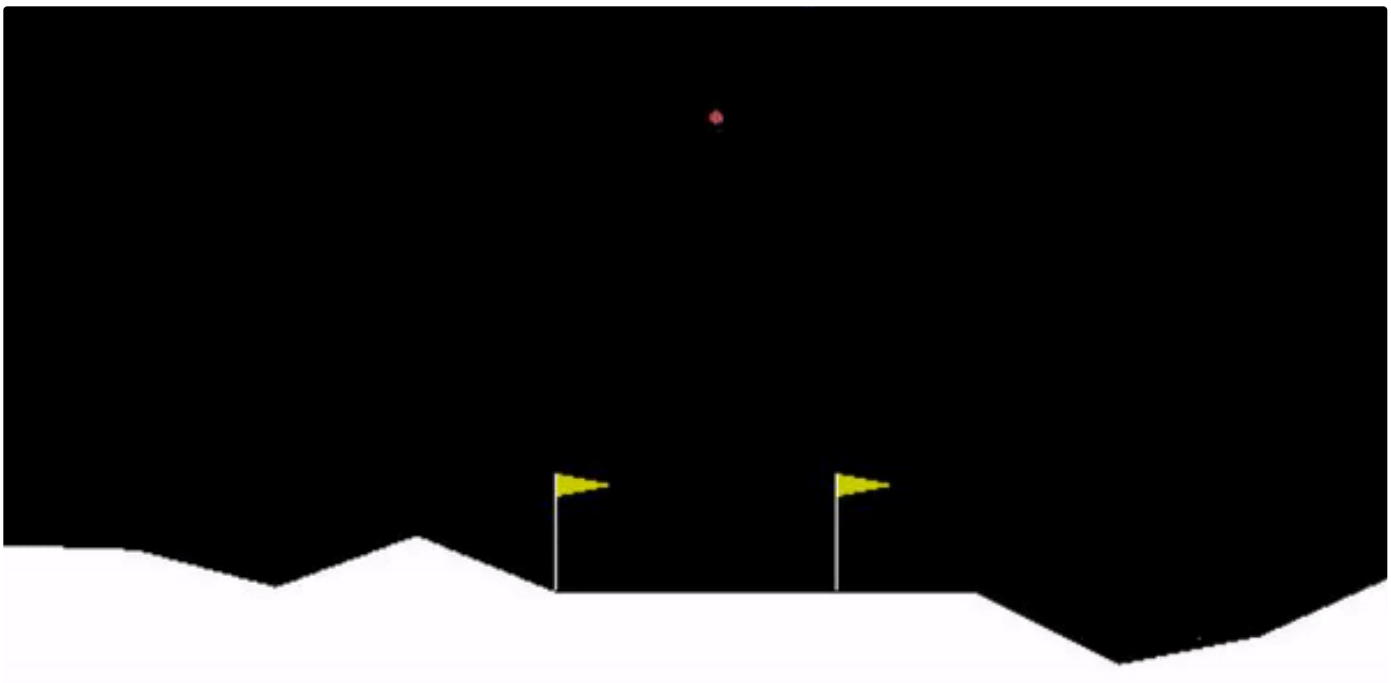


Eligijus Bujokas in Towards Data Science

The Values of Actions in Reinforcement Learning using Q-learning

The Q-learning algorithm implemented from scratch in Python

· 10 min read · Feb 14

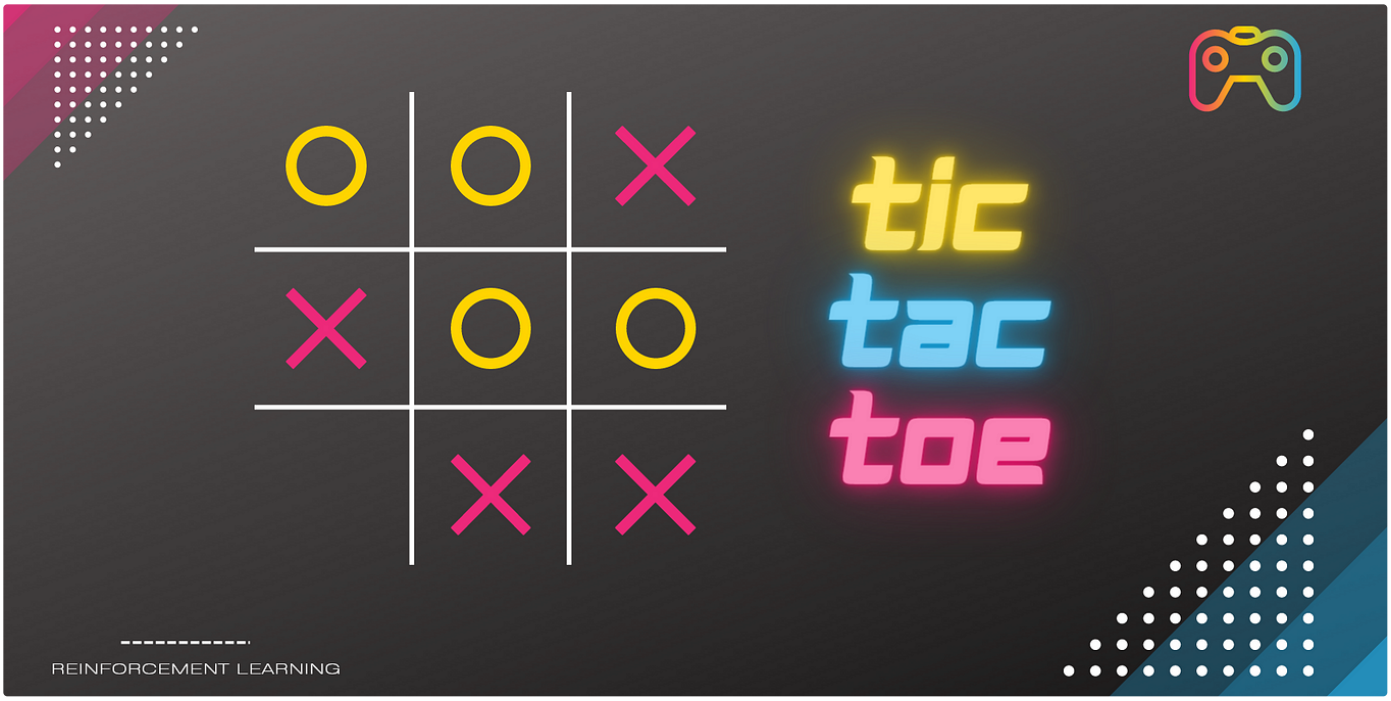


Mehul Gupta in Data Science in your pocket

Training OpenAI gym environments using REINFORCE algorithm in reinforcement learning

Policy gradient methods explained with codes

8 min read · Mar 26

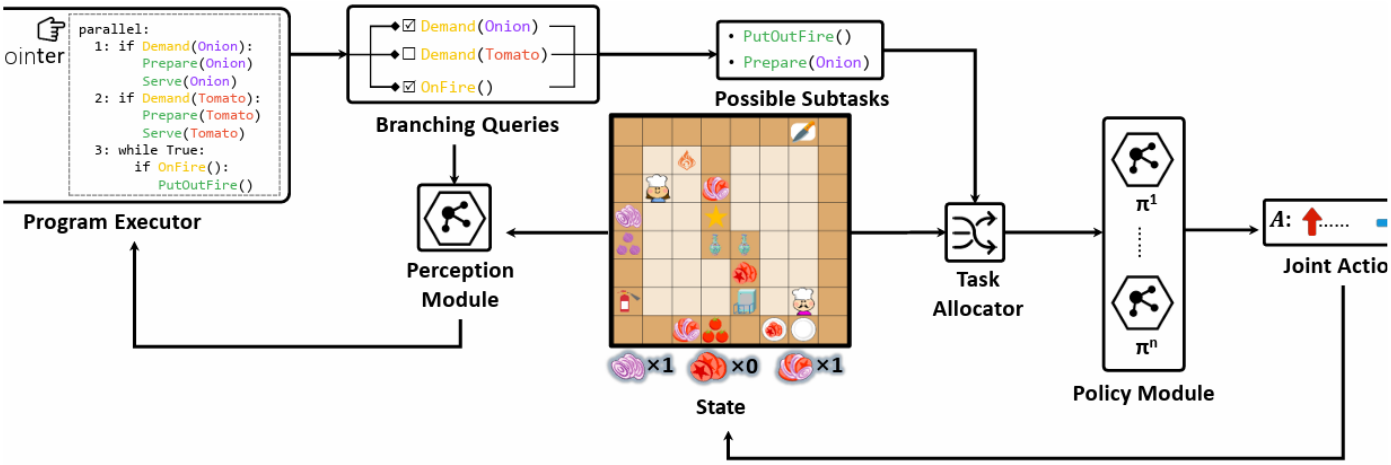


Waleed Mousa in Artificial Intelligence in Plain English

Building a Tic-Tac-Toe Game with Reinforcement Learning in Python: A Step-by-Step Tutorial

Welcome to this step-by-step tutorial on how to build a Tic-Tac-Toe game using reinforcement learning in Python. In this tutorial, we will...

9 min read · Mar 13



gure 1: **The overall framework of E-MAPP.** E-MAPP includes four components: 1) A percepti odule that maps a query q and the current state s to boolean responses. 2) A program executor th aintains a pool of possible subtasks and updates them according to the perceptive results. 3) A ta ocator that chooses proper subtasks from the subtask pool and assigns those to agents. 4) A poli odule that instructs agents in taking actions to accomplish specific subtasks.

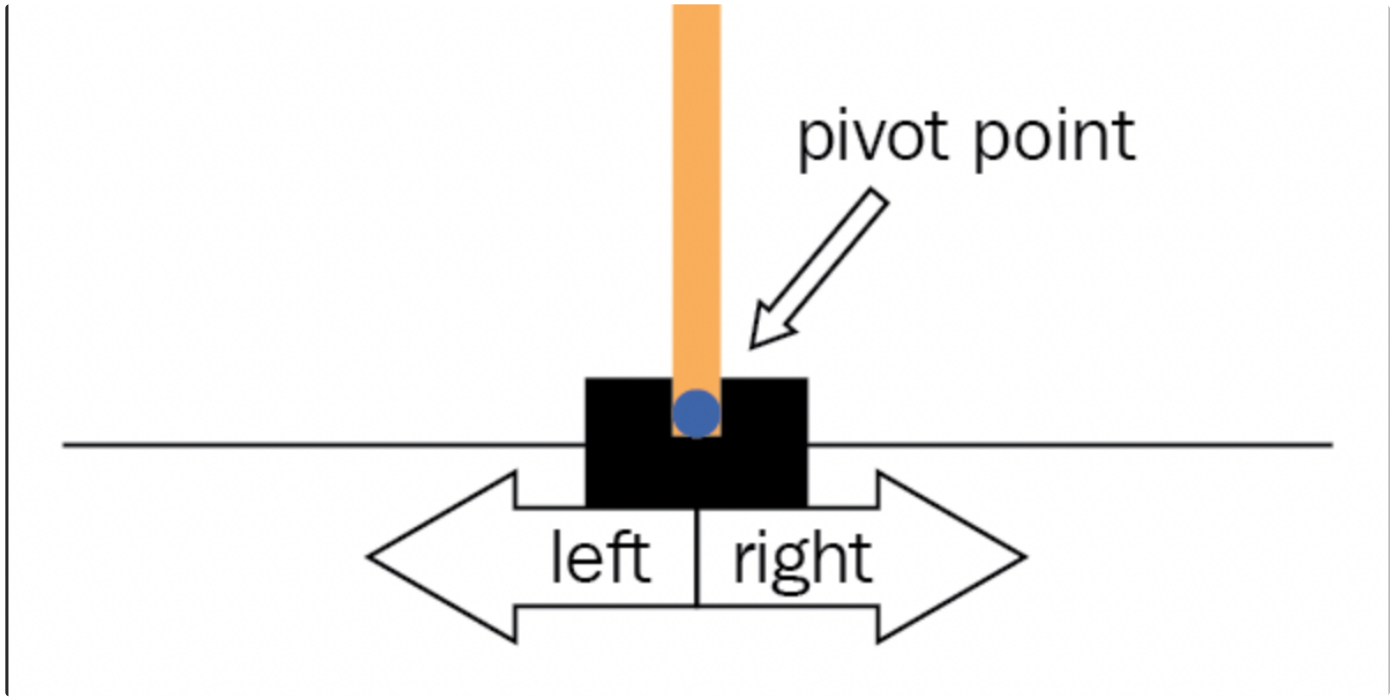
Ming-Hao Hsu

[RL] E-MAPP: Efficient Multi-Agent Reinforcement Learning with Parallel Program Guidance...

Paper Link: E-MAPP: Efficient Multi-Agent Reinforcement Learning with Parallel Program Guidance

3 min read · Jul 21


50

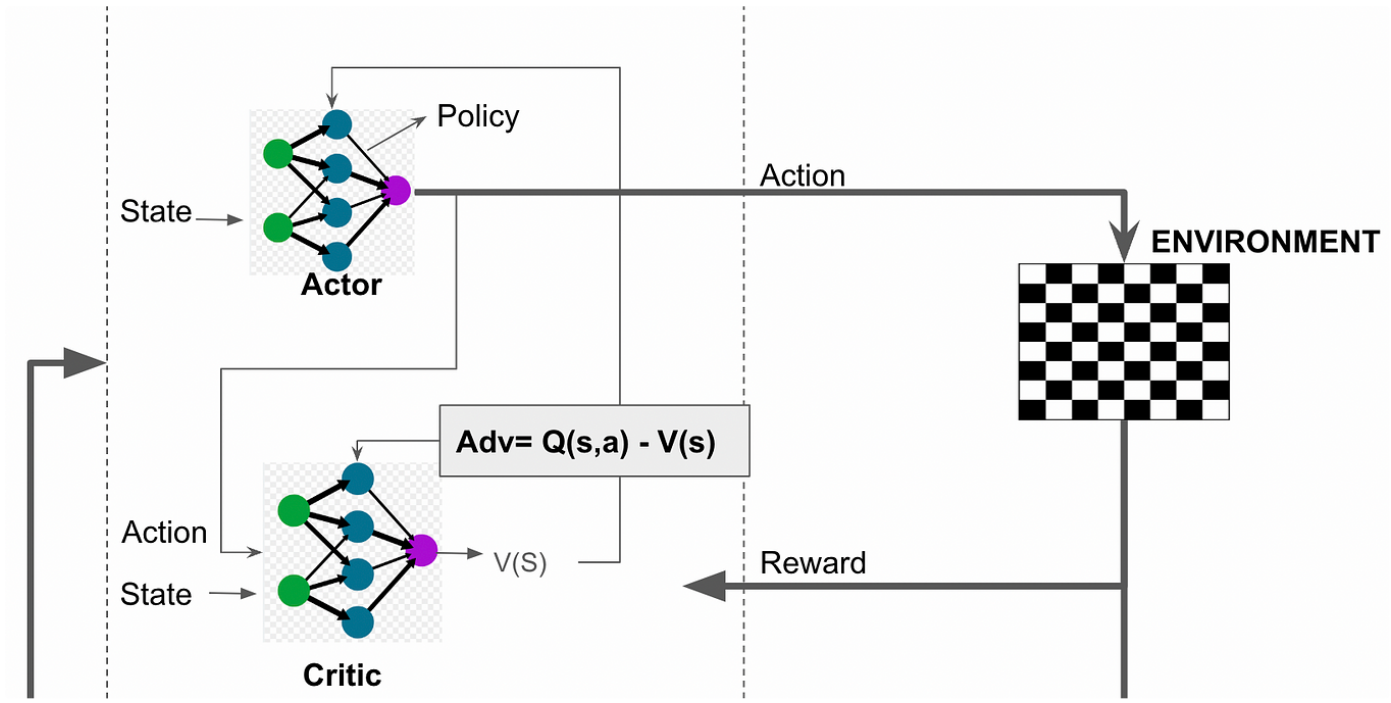


Samandar Xamidov

Cart Pole Gym using Reinforcement Learning

Welcome to CartPole prooject!

4 min read · Feb 16



Renu Khandelwal

Unlocking the Secrets of Actor-Critic Reinforcement Learning: A Beginner's Guide

Understanding Actor-Critic Mechanisms, Different Flavors of Actor-Critic Algorithms, and a Simple Implementation in PyTorch

· 6 min read · Feb 20