

IASD M2 at Paris Dauphine

Deep Reinforcement Learning

10: Applying Deep RL in practice with Kaggle

Eric Benhamou Thérèse Des Escotais



This final Kaggle enables
you to measure the
interest of DRL in practice

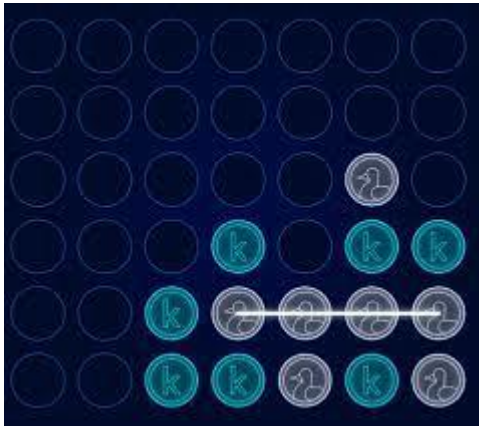
3. Kaggle Connect-X

A Deep RL challenge

Introduction to Kaggle Connect X

kaggle is a well know platform for data science competitions.

Connect X as a game competition on Kaggle where participants develop AI agents to play a Connect Four-like game.



Understanding Connect X 1/2

Game Objective: The primary goal in Connect X is to align a series of X tokens in a row on the game board. This can be achieved **vertically, horizontally, or diagonally.**

Winning Condition: Players take turns dropping their tokens into the grid, aiming to form an unbroken line of X tokens before their opponent does. The required number of tokens in a row (X) is typically predefined and is **the central challenge of the game.**

Understanding Connect X 1/2

Connect Four Variant: Connect X is a modern twist on the beloved game Connect Four. While maintaining the core mechanics of strategy and foresight, Connect X introduces

- variable game board sizes**
- and **variable winning line length.**

Strategic Depth: Just like in Connect Four, players **must not only focus on creating their own line of X tokens but also block their opponent's attempts to do the same.**

This dual focus requires careful planning and adaptability.

Setting Up Your Agent 1/2

Create a Kaggle Account: To participate in Connect X or any Kaggle competition, individuals must first create a Kaggle account. This account provides access to the competition details, submission platform, and community forums.

Understanding Kaggle Competitions: Familiarize yourself with how Kaggle competitions work, including rules, submission guidelines, and evaluation criteria. Kaggle provides extensive documentation and community support to help newcomers.

API Setup for Submissions: Kaggle offers an API that enables participants to submit their agents and interact with Kaggle's systems programmatically. Understanding the basic commands and how to use the API for submissions is crucial.

Setting Up Your Agent 2/2

Development Environment: Participants can use Kaggle Kernels (Kaggle's code execution environment) or their local development environment to develop their agents. It's important to set up the necessary software and dependencies for agent development.

Exploring Existing Solutions: Kaggle's community is known for sharing knowledge and solutions. Before starting your agent, review existing notebooks and discussions on Connect X to gain insights and strategies.

Developing Your Agent 1/2

Basics of AI in Connect X: Agents must evaluate the game board and make optimal moves based on current and predicted future states.

Deep Reinforcement Learning (RL): A popular approach in which the AI learns optimal strategies through trial and error. Agents are rewarded for wins and learn over time to adjust their strategies to maximize success. RL models can evolve to predict opponent moves and counteract them effectively.

Minimax Algorithm: This classic game strategy algorithm is widely used in two-player zero-sum games. It involves minimizing the possible loss for a worst-case scenario. When applied to Connect X, the algorithm evaluates potential moves to ensure the best outcome while considering the opponent's best possible responses.

Developing Your Agent 2/2

Monte Carlo Tree Search (MCTS): An advanced strategy that simulates multiple game scenarios by exploring possible future moves at random. This technique is beneficial for understanding the potential outcomes of different strategies and is known for its success in complex games like Go.

Evolutionary Algorithms: These involve generating multiple agents and iteratively improving them through processes mimicking natural selection. Agents that perform better are more likely to "reproduce," leading to a gradual evolution of more effective strategies.

Evaluation of Submissions

Submission Cap: Participants in the Kaggle Connect X competition are allowed only **two** submissions per day. This rule is designed to encourage thoughtful participation and strategy refinement.

Encouragement for Strategy Planning: Due to the submission limit, participants are encouraged to thoroughly test and refine their strategies before making a submission. This involves analyzing past performances, adjusting tactics, and potentially running simulations to predict outcomes.

Quality over Quantity: Prefer quality submissions over frequent, less considered attempts

Getting Started and Resources

Kaggle's Connect X Competition Page:

<https://www.kaggle.com/c/connectx/>

KAGGLE · GETTING STARTED SIMULATION COMPETITION · ONGOING

Connect X
Connect your checkers in a row before your opponent!

Submit Agent ...

Overview Data **Code** Models **Discussion** Leaderboard Rules Team Submissions

Discussion

Follow New Topic

Discussion

Also look at Arxiv, youtube, etc...

<https://arxiv.org/pdf/2210.08263.pdf>

Enjoy!

