
RL Project Proposal:

How successful are different RL-Algorithm on the blackjack-env and how does the exploration-strategy affect the result.

rl_ckps
https://github.com/cako2025/rl_ckps_final_project/

1 Motivation

Understanding how various RL algorithms perform in this setting is crucial for identifying their strengths and limitations, especially in environments with stochastic outcomes and partial observability. The choice of exploration strategy plays a significant role in how quickly and effectively an agent learns optimal policies, making it an important factor to investigate. This project aims to provide insights into both algorithm selection and the impact of exploration on learning performance in Blackjack, contributing to a deeper understanding of practical reinforcement learning challenges.

2 Related Topics

RL-Algorithm: Q-Learning, Monte Carlo, DQN, PPO
exploration-strategy: epsilon-greedy, etc.

3 Idea

Briefly describe your idea. We do not necessarily need details at this stage, but a rough notion of what you want to accomplish and why.

Algorithm 1 A great RL algorithm.

Require: environment e , algorithm A **return** policy π
 while T **do** RUE
 Train A on e
 end while

$$\pi \in \Pi, \pi : \mathcal{S} \mapsto \mathcal{A} \tag{1}$$

4 Experiments

We want to know roughly what you are planning to show in terms of experiments.

Environments & Metrics

ENV: Blackjack (Gymnasium - Toy Text)

How good is the learned strategy and the win/loss rate.

Experimental Scope How many experiments are you running? Include seeds, hyperparameter optimization, different environments, ablations, etc. here.

Estimated Computational Load How long will your experiments take and how will you run them? These do not need to be exact numbers, but we want to see that you know roughly how much time, memory and other resources you will need.

5 Timeline

Please tell us how long you think it will take to accomplish all parts of your project. This includes:

- Research
- Implementation
- Experiments
- Analysis
- Reporting