Analysis of RL Algorithms for a Simulated Hill Climb Racing Agent

July 28, 2025

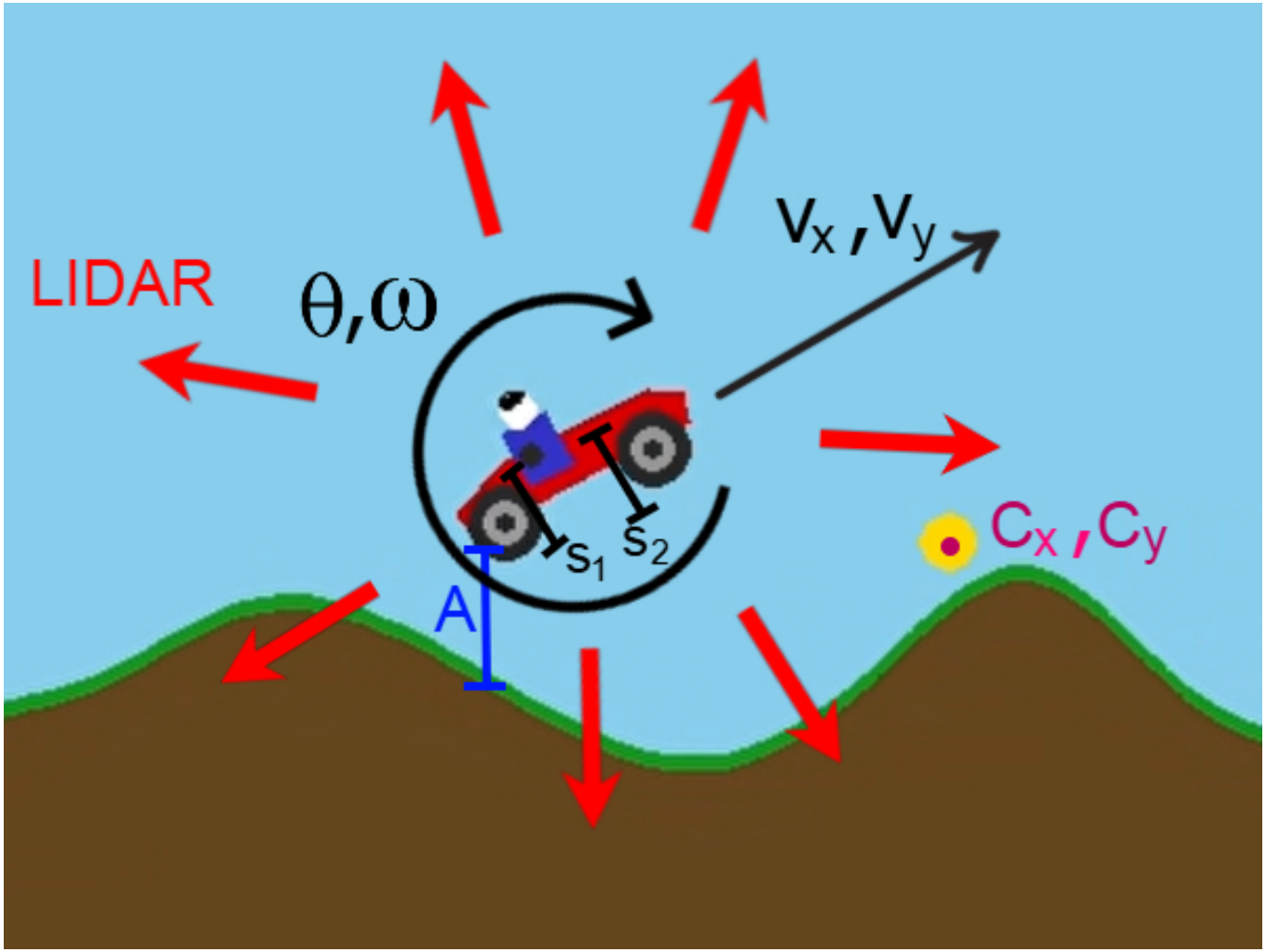
Markov Decision Process

A MDP is a **stochastic model for sequential decision making** defined by a tuple:

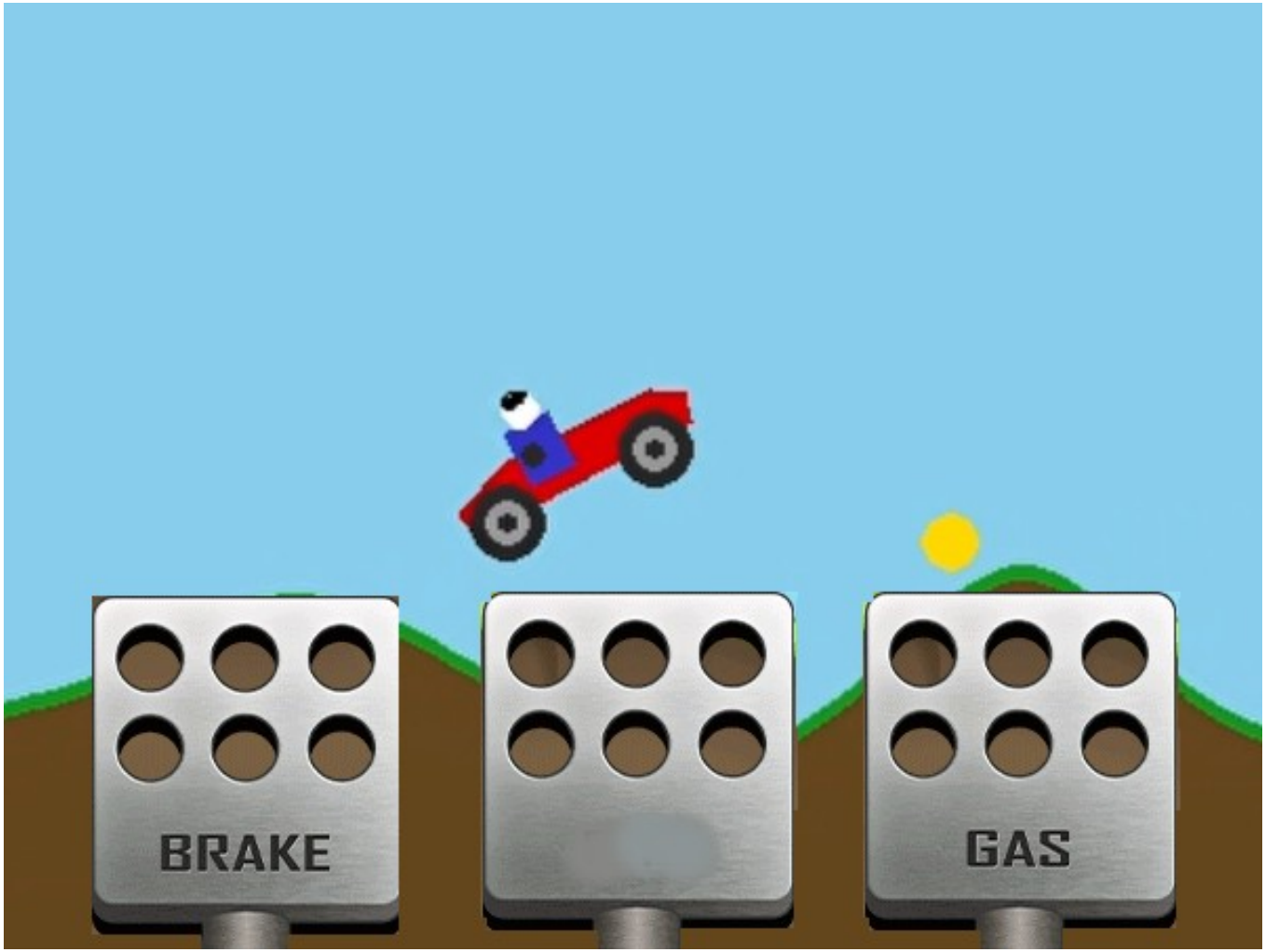
$$(\mathcal{S}, \mathcal{A}, \mathcal{P}, \mathcal{R}, \gamma)$$

.

State Space ($\mathcal{S}$)



Action Space ($\mathcal{A}$)



Transition Dynamics ($\mathcal{P}$)

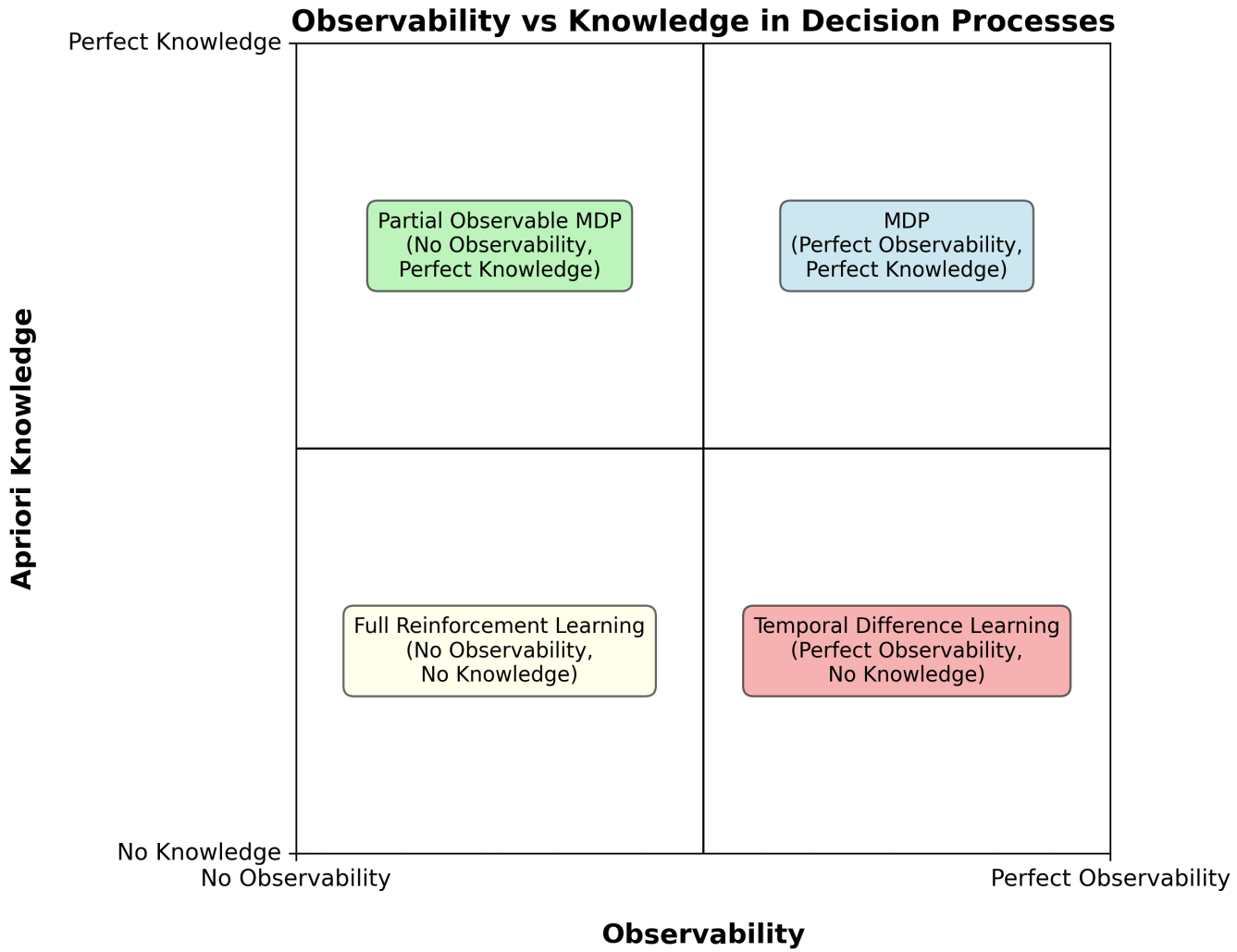
Reward Function ($\mathcal{R}$)

Event	**Value**
Forward Progress (per meter)	+5.0
Coin Collection	+20.0
Air Time (per second)	+5.0
Time Penalty (per step)	-0.1
Crash (Episode End)	-50.0

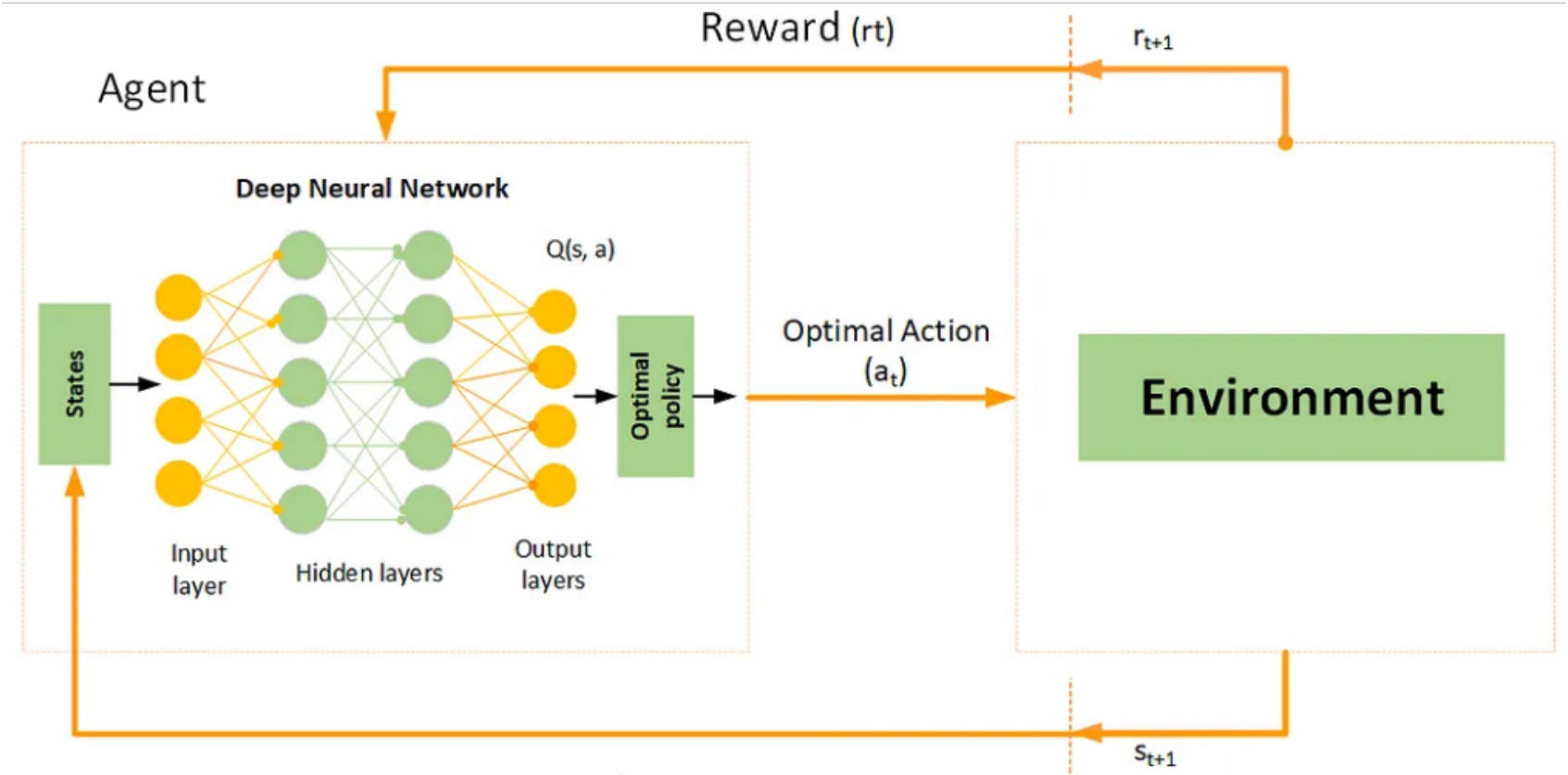
Discount Factor (γ)

policy (π)

Problem Classification

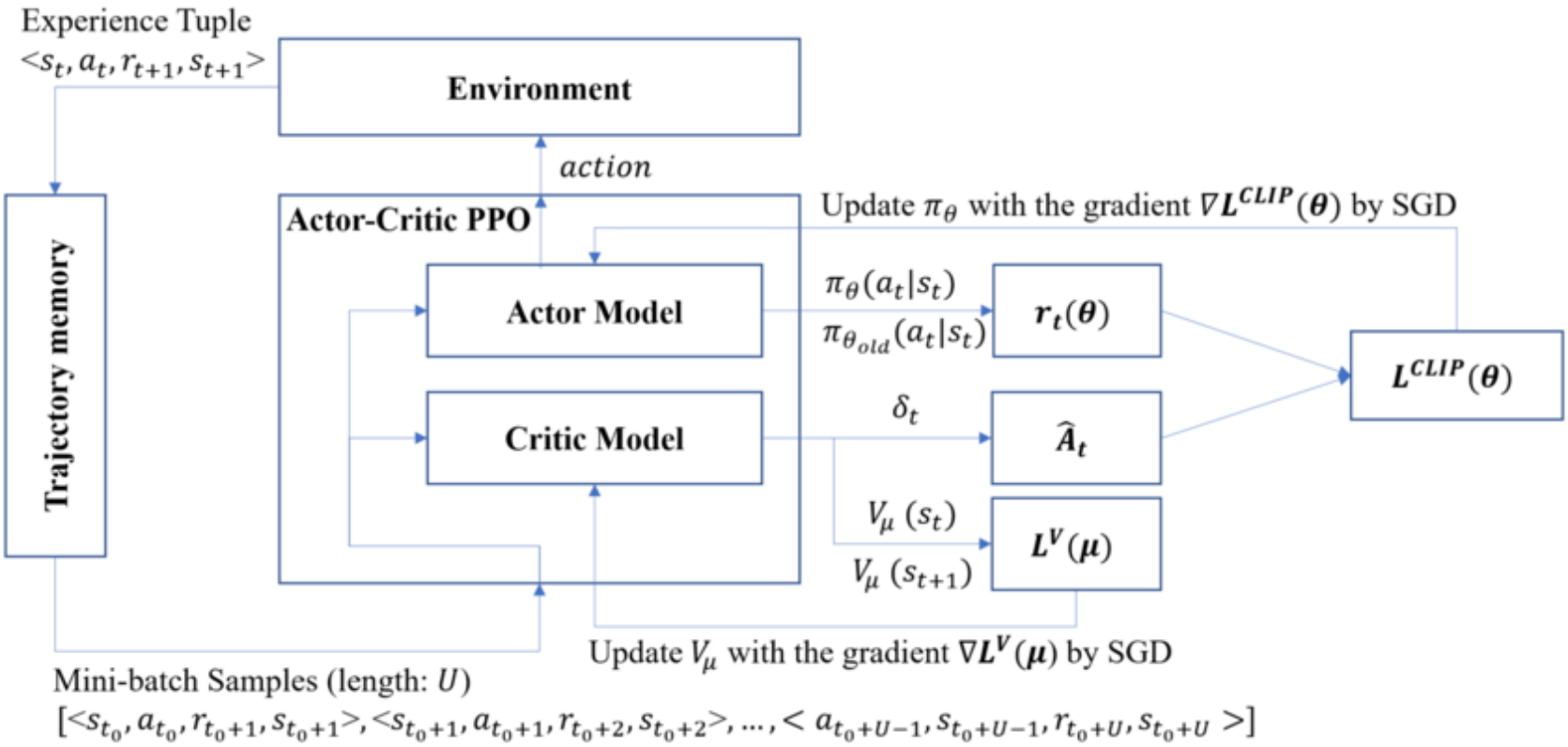


DQN Algorithm



Exprected SARSA Algorithm

PPO Algorithm



Thank you!