



REINFORCEMENT LEARNING

Q - Learning



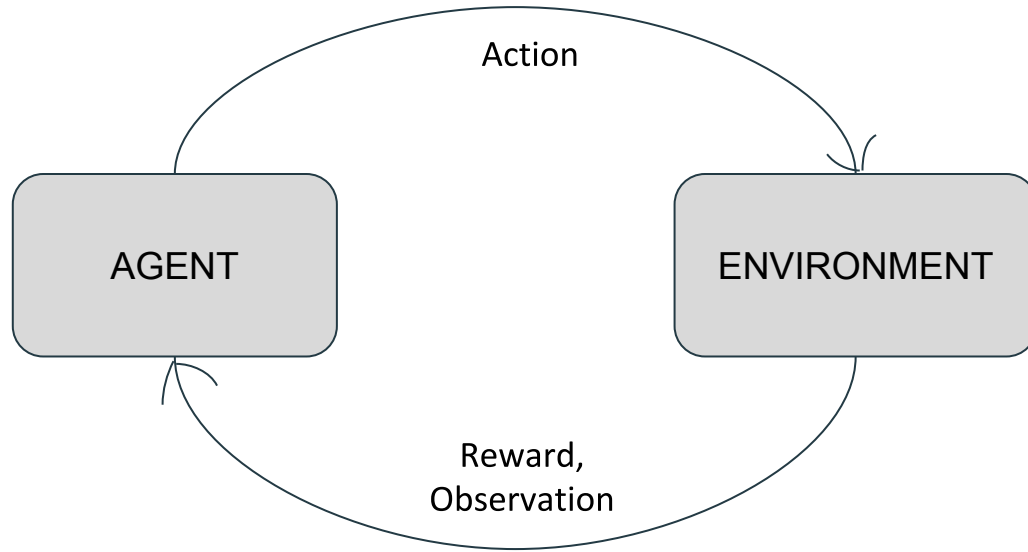
APPLICATIONS OF REINFORCEMENT LEARNING

- ❏ AI plays Computer Games
- ❏ Self-Driving Vehicles
- ❏ Motion-Planning in Robotics
- ❏ Strategy based Decision Making
- ❏ And many more ...

COMMON TERMS IN REINFORCEMENT LEARNING

- ❏ Agent
- ❏ Environment
- ❏ State
- ❏ Action
- ❏ Reward
- ❏ Policy

REINFORCEMENT LEARNING IN ACTION





REINFORCEMENT LEARNING is
the Science of making OPTIMAL
DECISIONS from EXPERIENCE.



STEPS IN REINFORCEMENT LEARNING

- ❑ Observe the Environment
- ❑ Decide how to act using some Strategy
- ❑ Act accordingly
- ❑ Receive Reward or Penalty
- ❑ Learn for Experience and re-define Strategy
- ❑ Iterate until the Optimal Policy (Strategy) is found



Q - LEARNING

STEPS IN Q-LEARNING

1. Create a Q-Table
2. Agent updates the Q-Table by interacting with the environment.

$$Q_{t+1}(s_t, a_t) = \underbrace{Q_t(s_t, a_t)}_{\text{old value}} + \underbrace{\alpha_t(s_t, a_t)}_{\text{learning rate}} \times \left[\underbrace{\underbrace{R_{t+1}}_{\text{reward}} + \underbrace{\gamma}_{\text{discount factor}} \underbrace{\max_a Q_t(s_{t+1}, a_t)}_{\text{estimate of optimal future value}}}_{\text{learned value}} - \underbrace{Q_t(s_t, a_t)}_{\text{old value}} \right]$$

LET'S GET CODING THE Q-LEARNING
ALGORITHM

CONCLUSION

- ❑ One of the easiest RL Algorithms
- ❑ Difficult to implement when the Q-Table size is very high
- ❑ When coupled with Deep Learning we get DQN (Deep Q-Learning Networks)