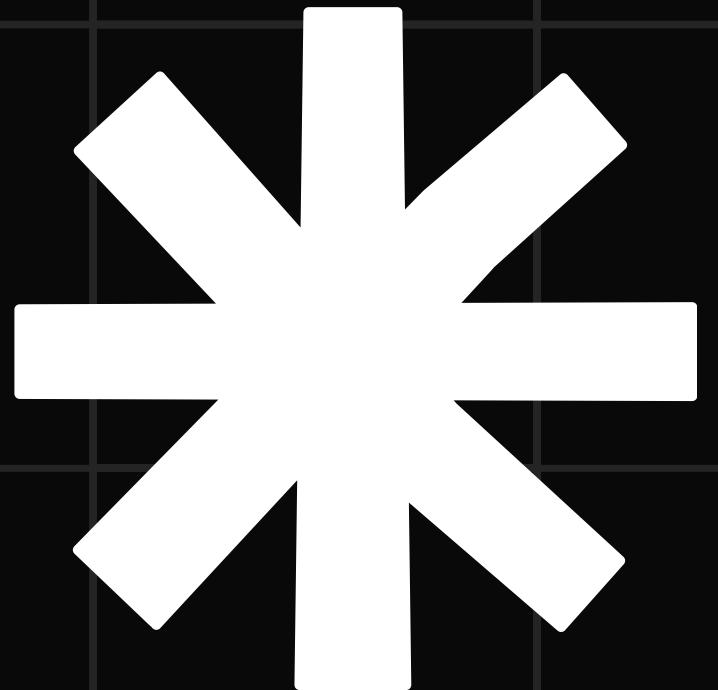
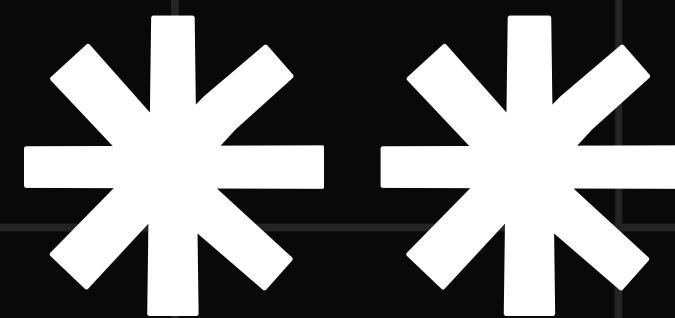


What is...

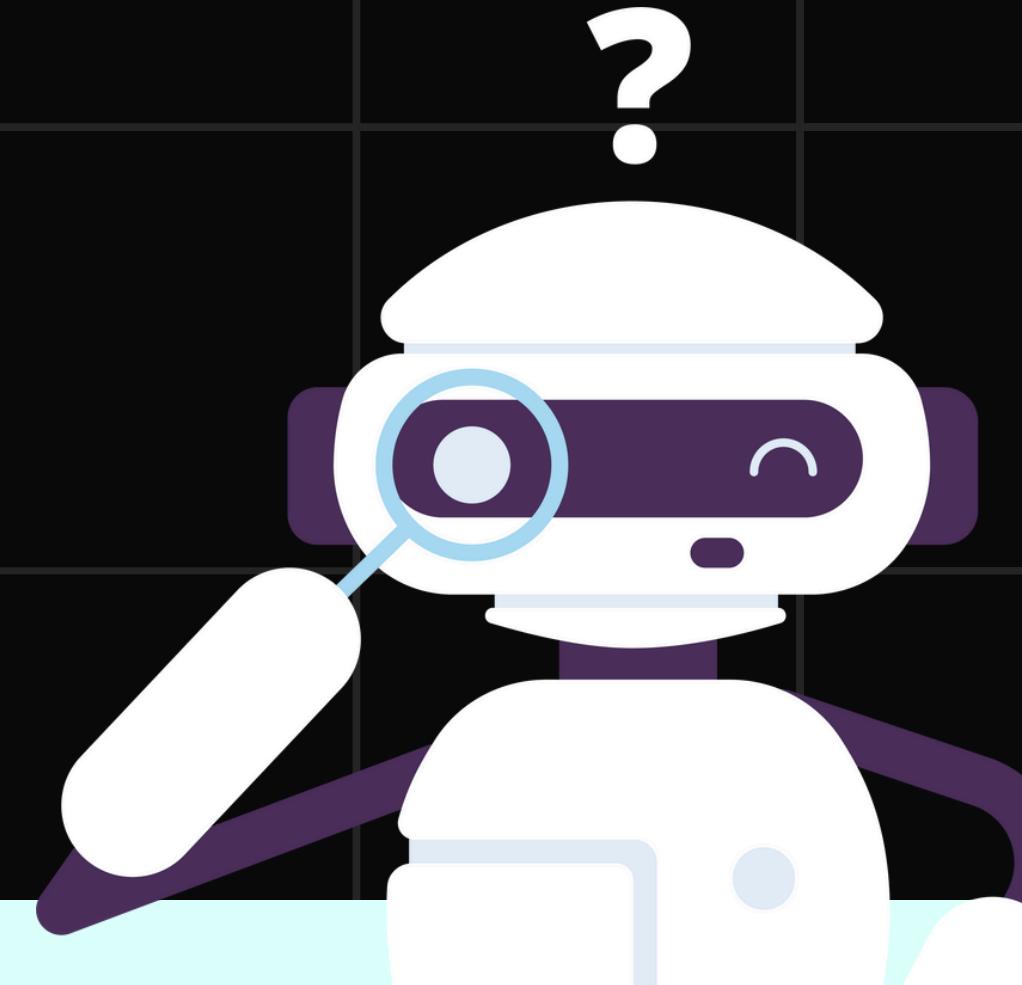
# Reinforcement Learning?

Presented by **Souleymane DIALLO**





# PLAN



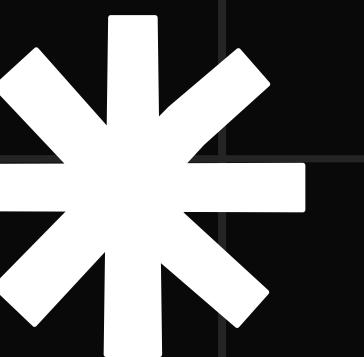
- 1. Core Concepts of Reinforcement Learning
- 2. Types of Reinforcement Learning

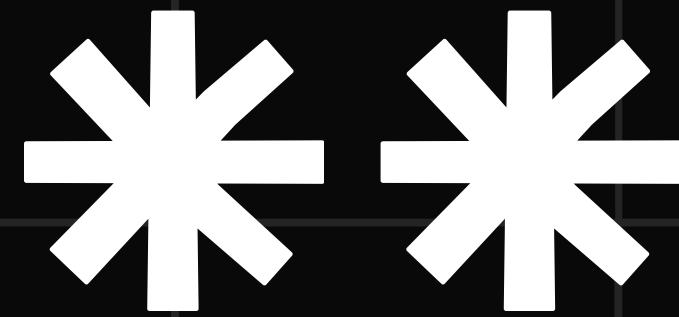
- 1. Applications
- 2. Challenges in Reinforcement Learning

Reinforcement learning is a computational approach to learning whereby an agent tries to maximize the total amount of reward it receives while interacting with a complex, uncertain environment.

**area of machine learning that focuses on training agents to make a sequence of decisions**

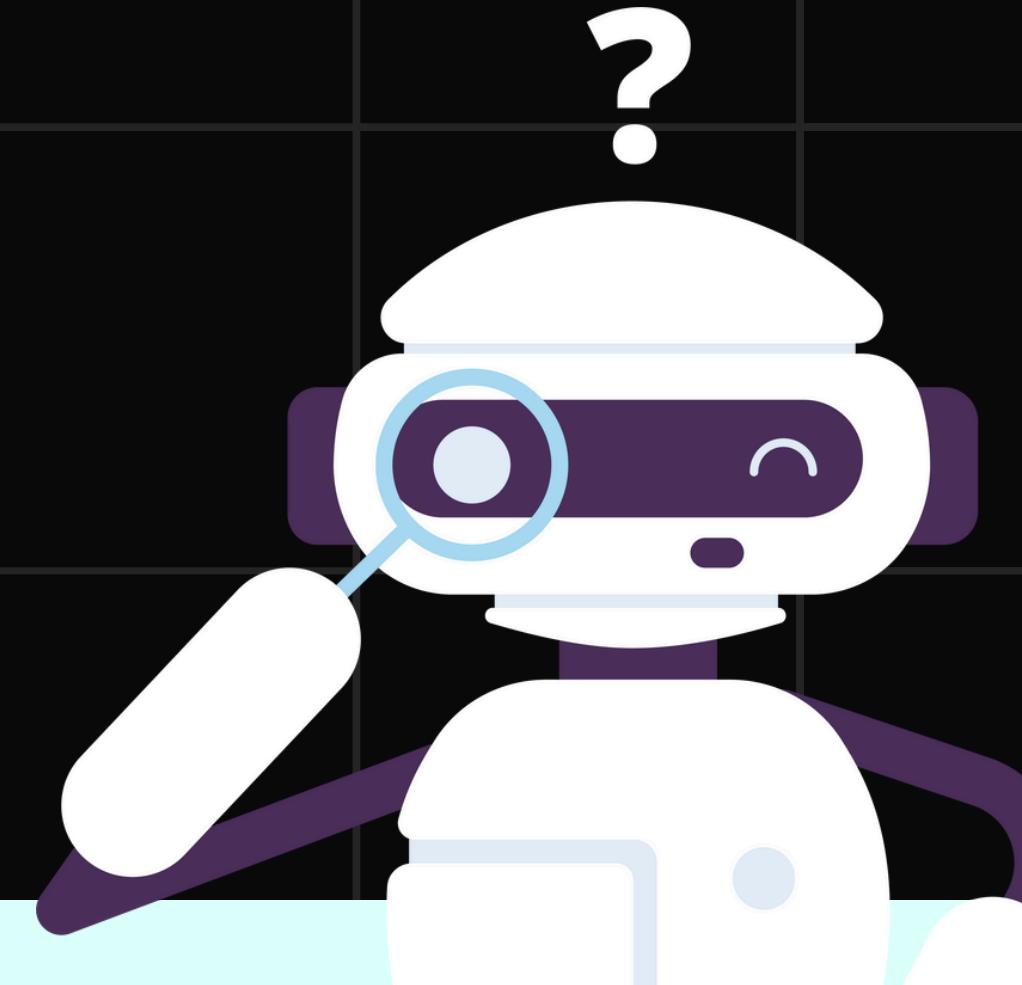
Unlike supervised learning, where models learn from labeled datasets, RL involves learning optimal behaviors through trial and error in an interactive environment.

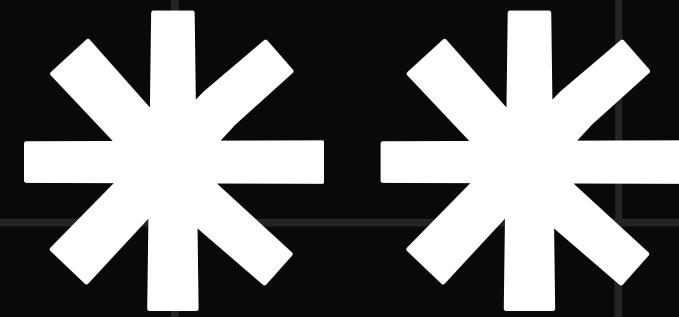




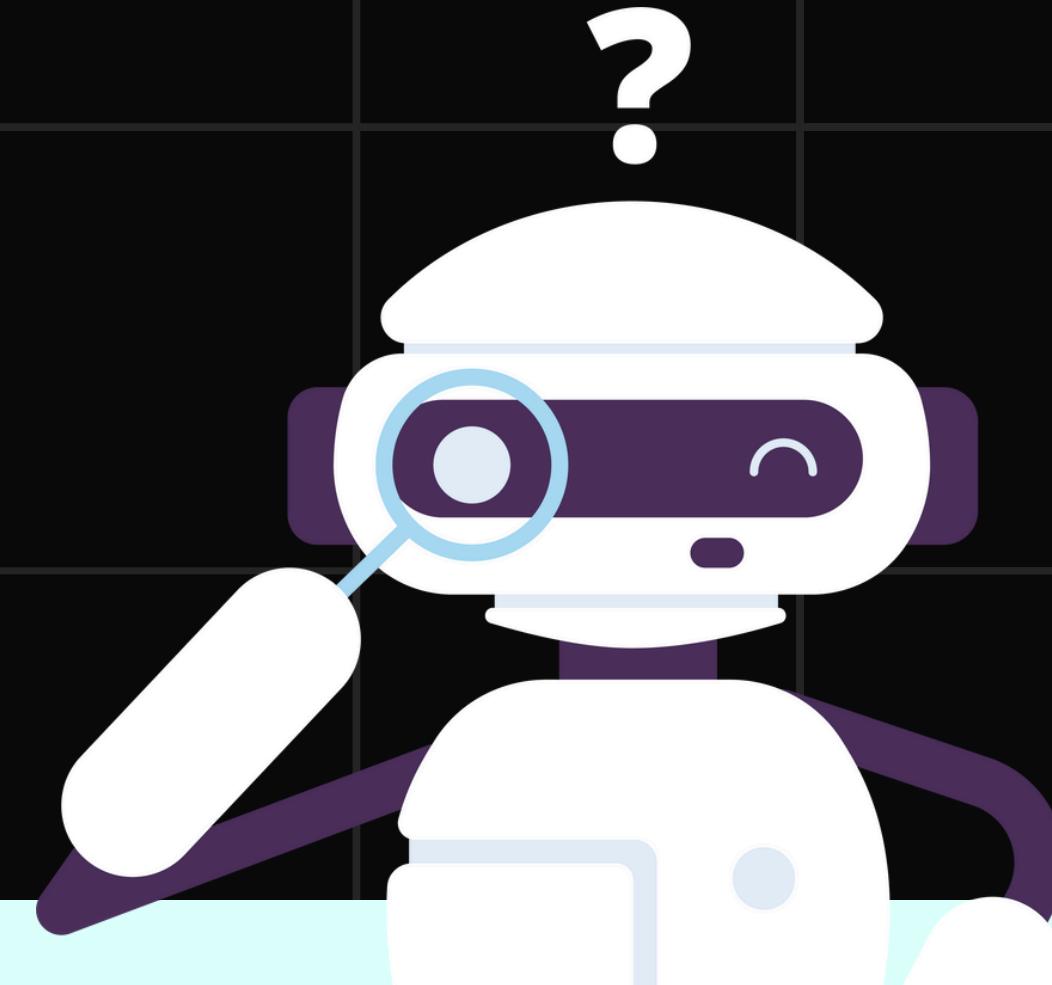
# Core Concepts of Reinforcement Learning

Agents, Environment,  
Actions, and Rewards





# Core Concepts of Reinforcement Learning

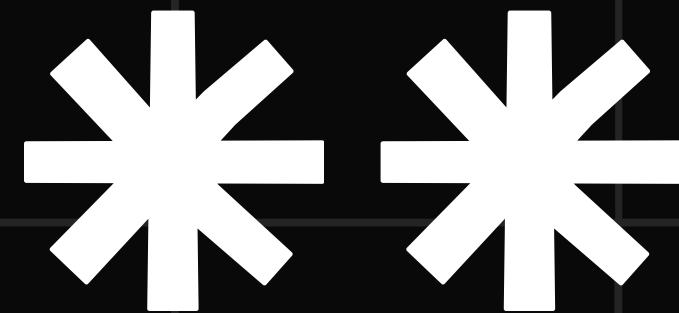


## Agents

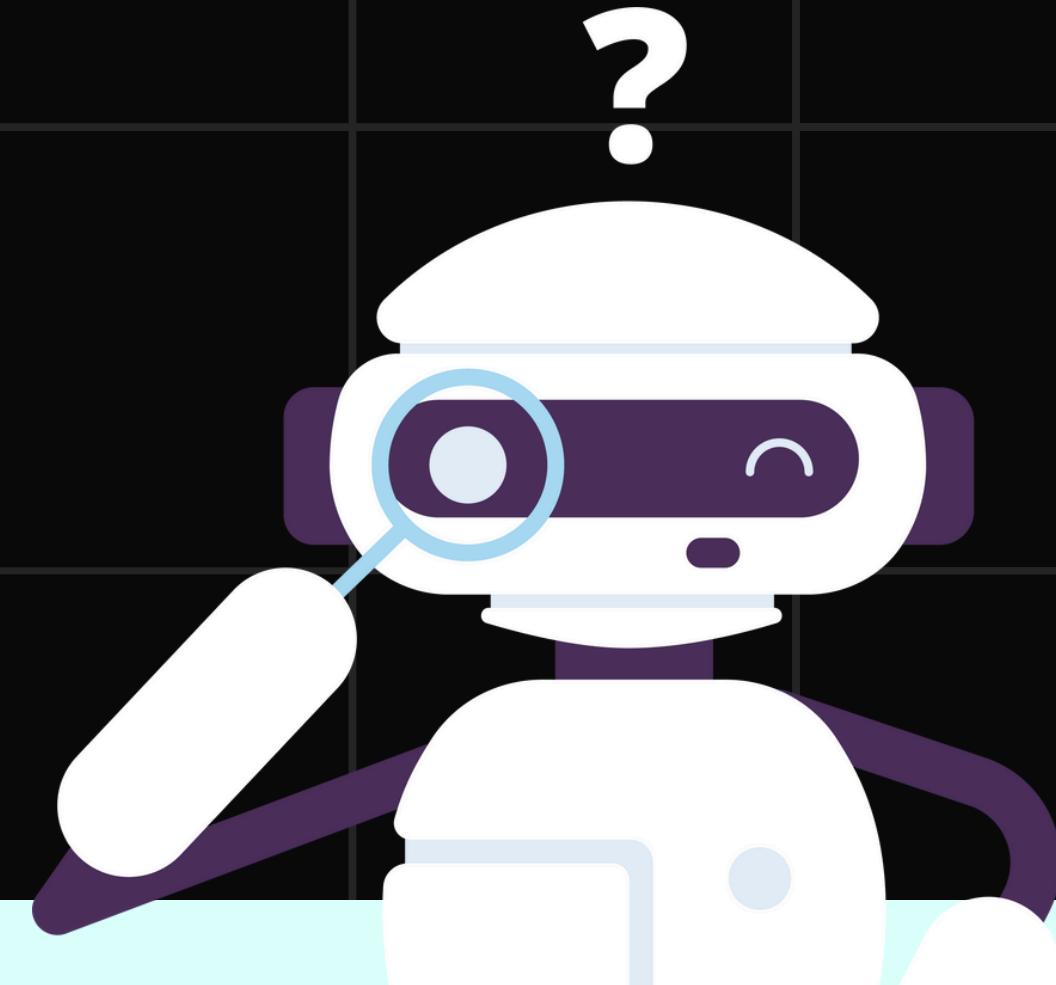
Entities that make decisions.

## Environment

The setting or context where the agent operates.



# Core Concepts of Reinforcement Learning

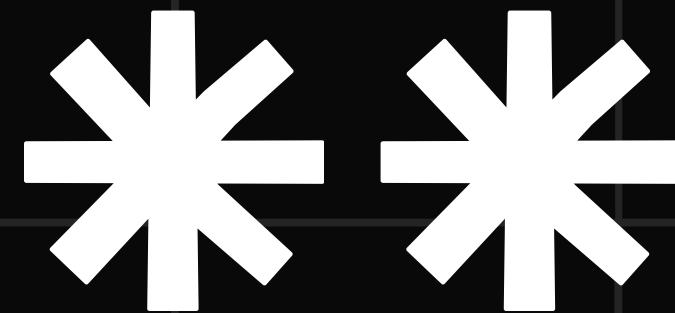


## Actions

Decisions or moves made by the agent.

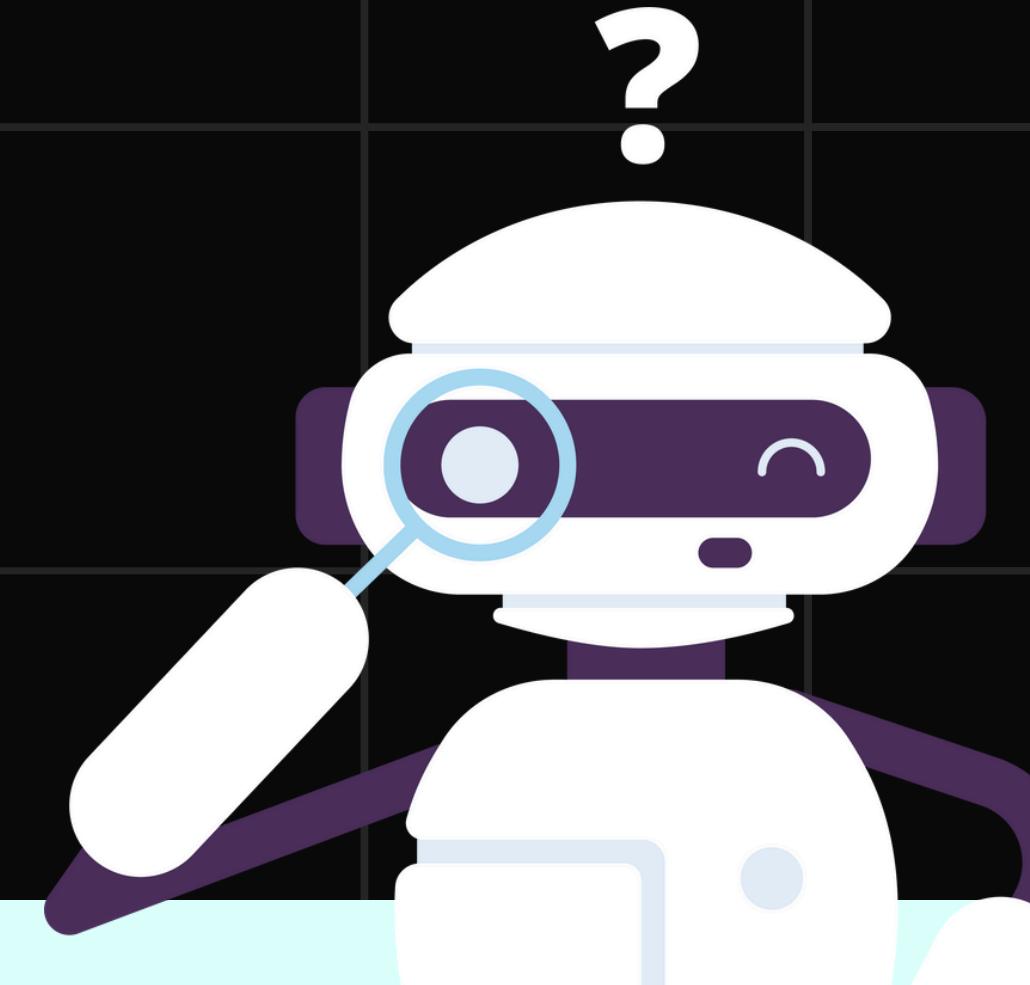
## Rewards

Feedback received from the environment following an action, guiding the agent's learning process



# The Learning Process

In RL, an agent learns to map states of the environment to actions that maximize cumulative rewards over time. The agent explores the environment, makes decisions, and adjusts its strategy based on the rewards received.



# Types of Reinforcement Learning

## Model-Based RL

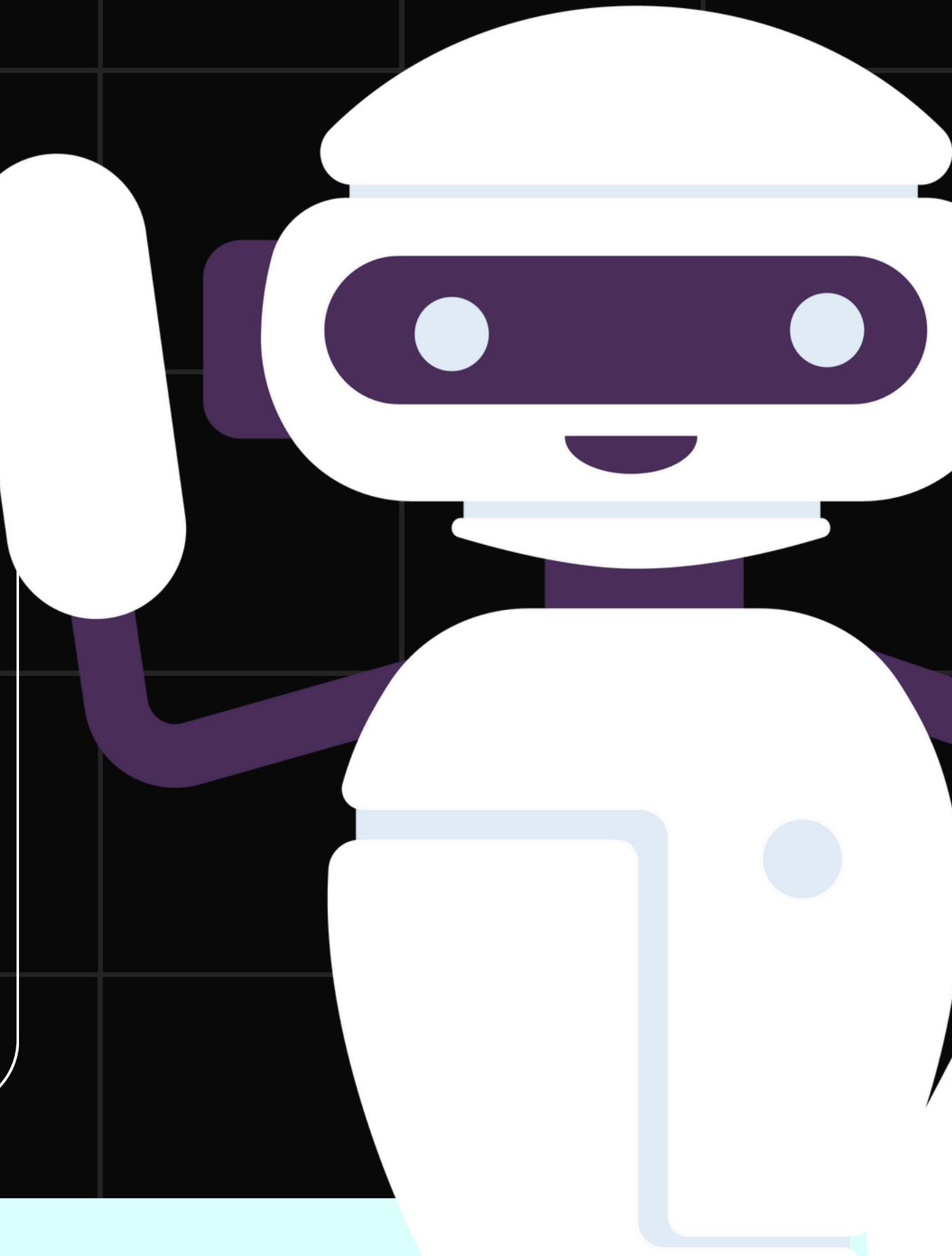
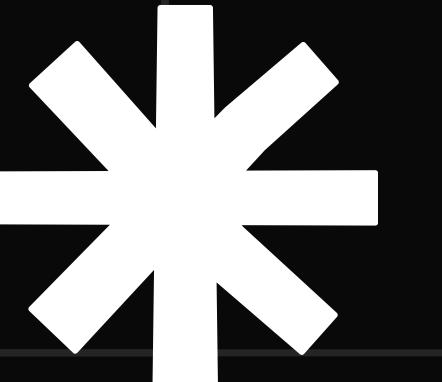
The agent develops an internal model of the environment and uses it for decision-making.

## Value-Based Methods

Focus on learning the value function, which estimates future rewards.

## Model-Free RL

The agent learns directly from interactions with the environment without modeling it.



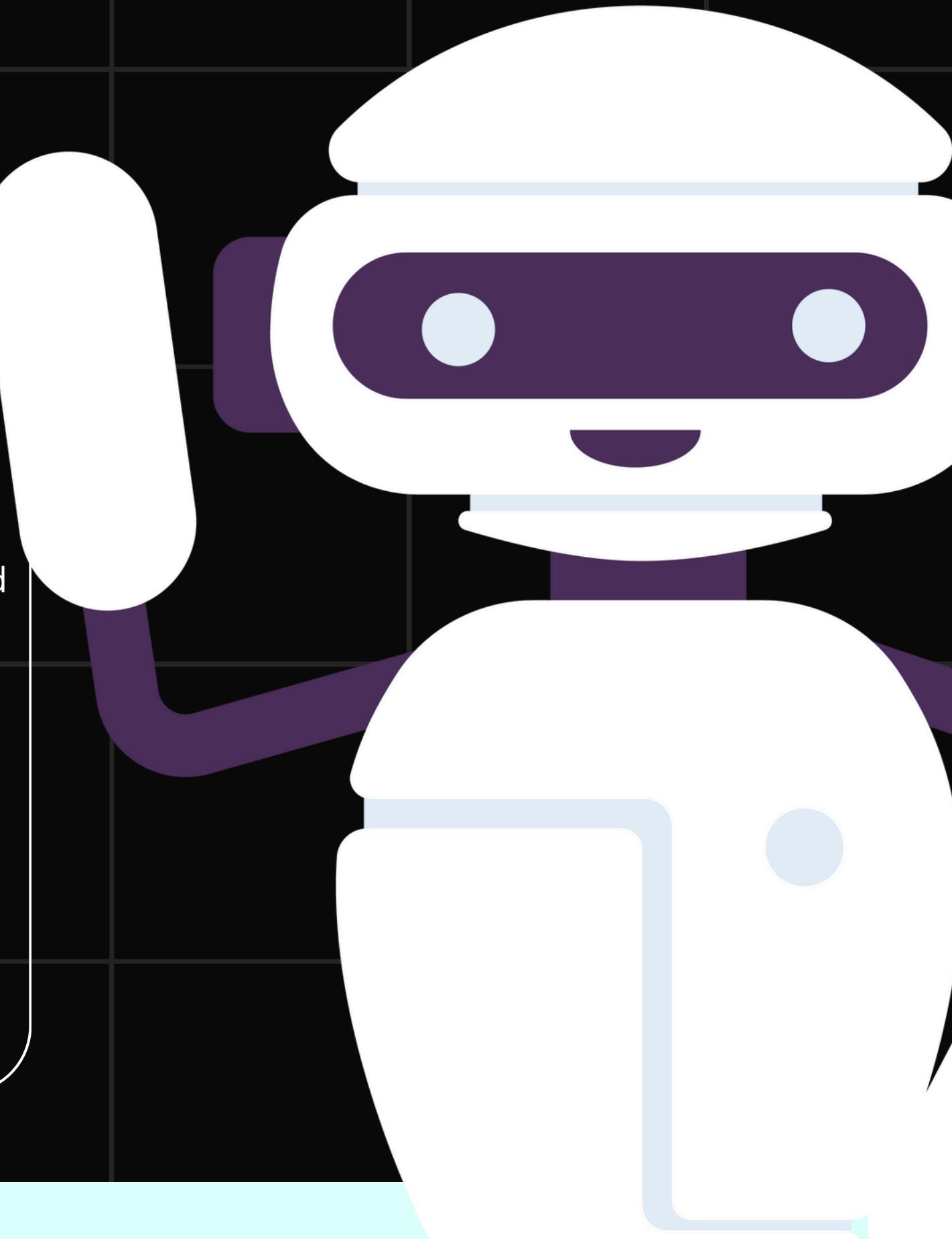
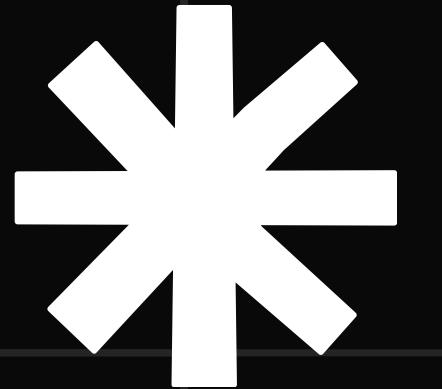
# Types of Reinforcement Learning

## Policy-Based Methods

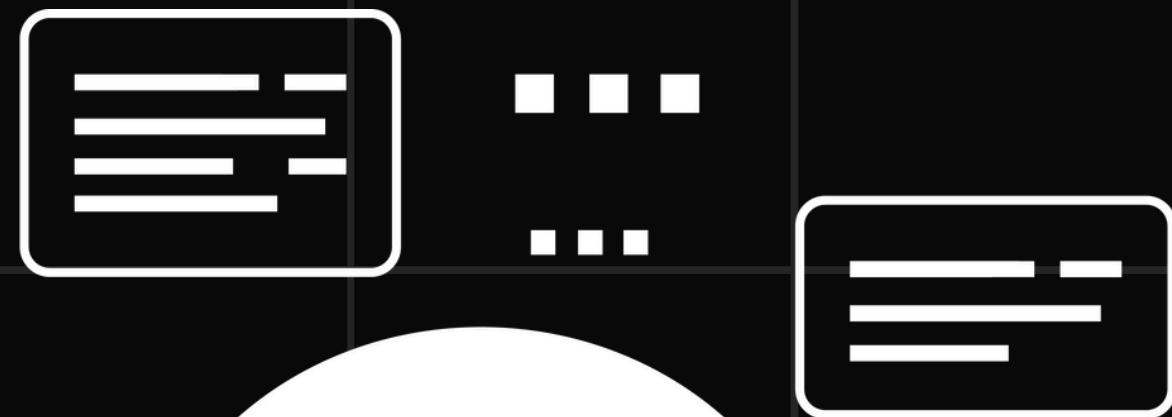
Directly optimize the policy function that determines the agent's actions.

## Actor-Critic Methods

Combine policy-based and value-based approaches for more balanced learning.



# RL Applications

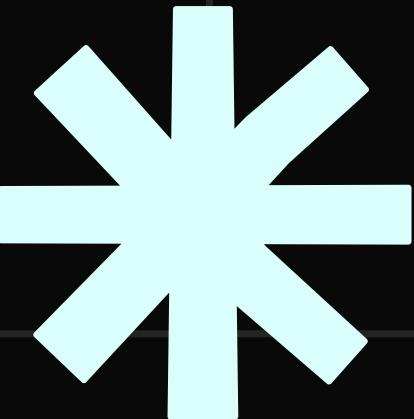


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Reinforcement Learning (RL) has been successfully applied in a variety of fields, including robotics, gaming, healthcare, and finance.

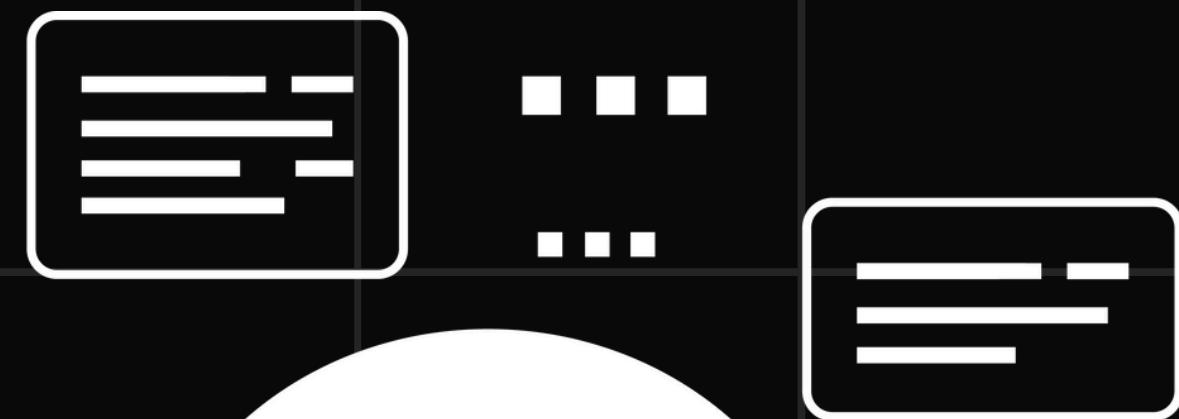
It is particularly effective in scenarios requiring decision-making and strategy optimization.

One emerging application area is in Large Language Models (LLMs).



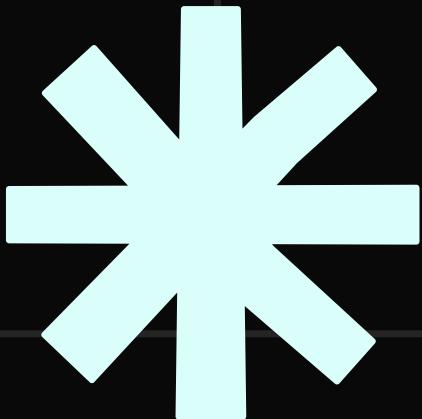
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# RL Applications

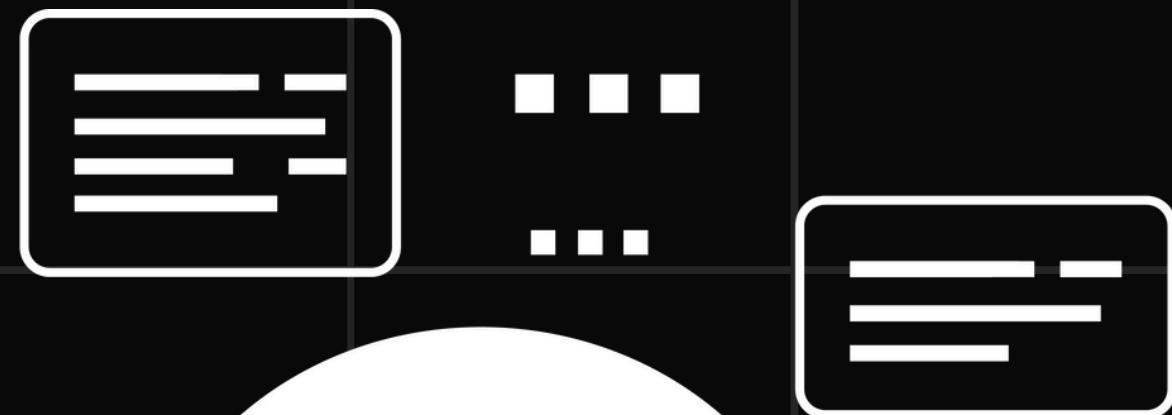


## RL in Large Language Models (LLMs)

RL is being utilized to improve the training and performance of LLMs. For example, in the development of language models like GPT-3, RL can be used to fine-tune responses based on user feedback. This feedback is treated as a reward signal, allowing the model to adjust its responses to be more helpful, accurate, or contextually appropriate. The process involves training the model initially with a standard supervised learning approach and then further refining it with RL, where the model learns from interactions with users.



# RL Applications



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## Another Example is AlphaGo

AlphaGo, developed by DeepMind, is a prime example of RL application. It's an AI program designed to play the board game Go. AlphaGo used a combination of deep neural networks and tree search algorithms, trained through both supervised learning from human-played games and reinforcement learning from games it played against itself.

**Self-Play and Reinforcement Learning:** AlphaGo played numerous games against itself, learning and adapting its strategies. The reinforcement learning process enabled it to improve beyond human level, discovering new strategies and tactics.

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# Challenges in Reinforcement Learning

## Exploration vs. Exploitation Dilemma

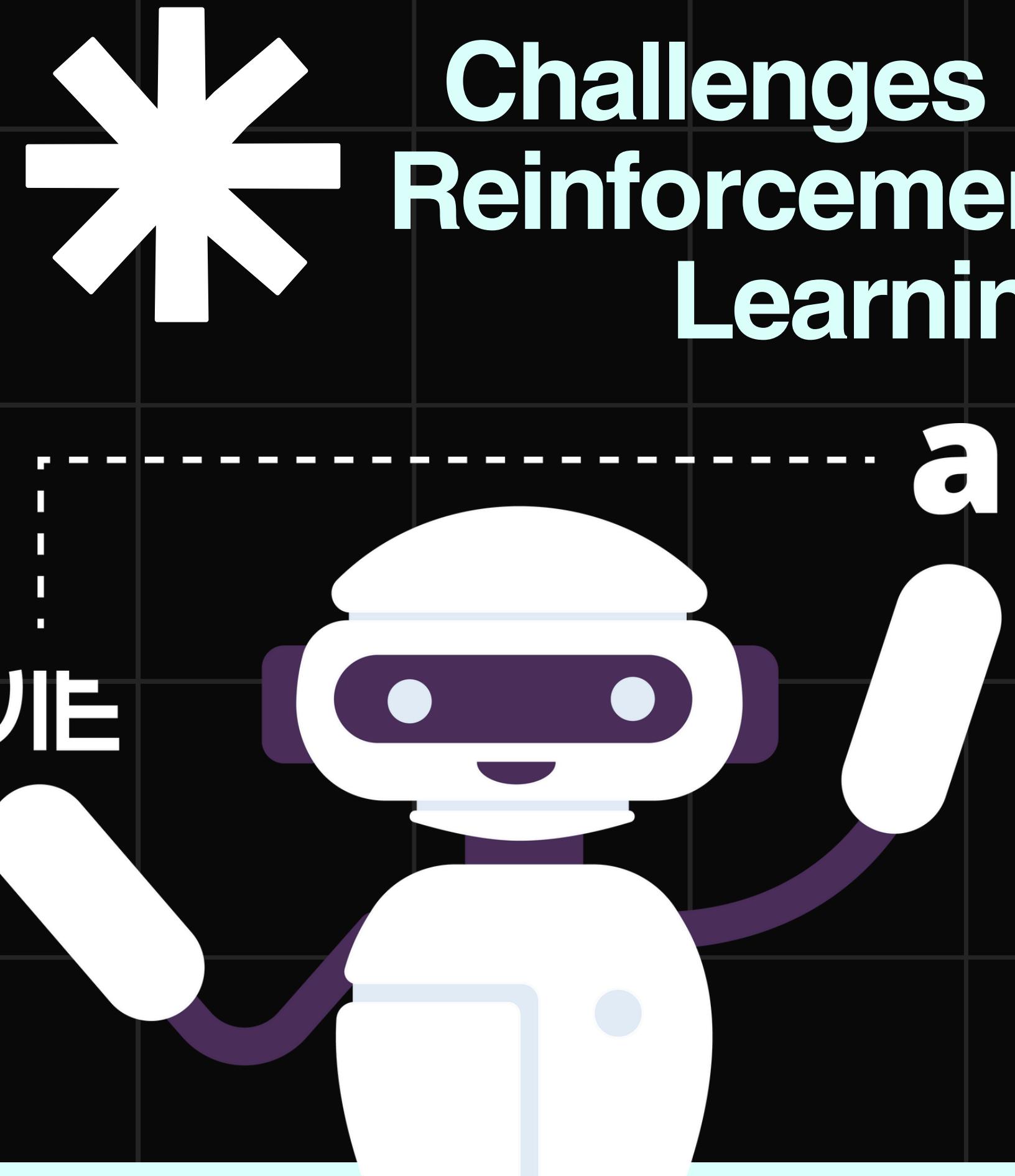
Balancing the need to explore new actions and exploit known strategies is a key challenge in RL.

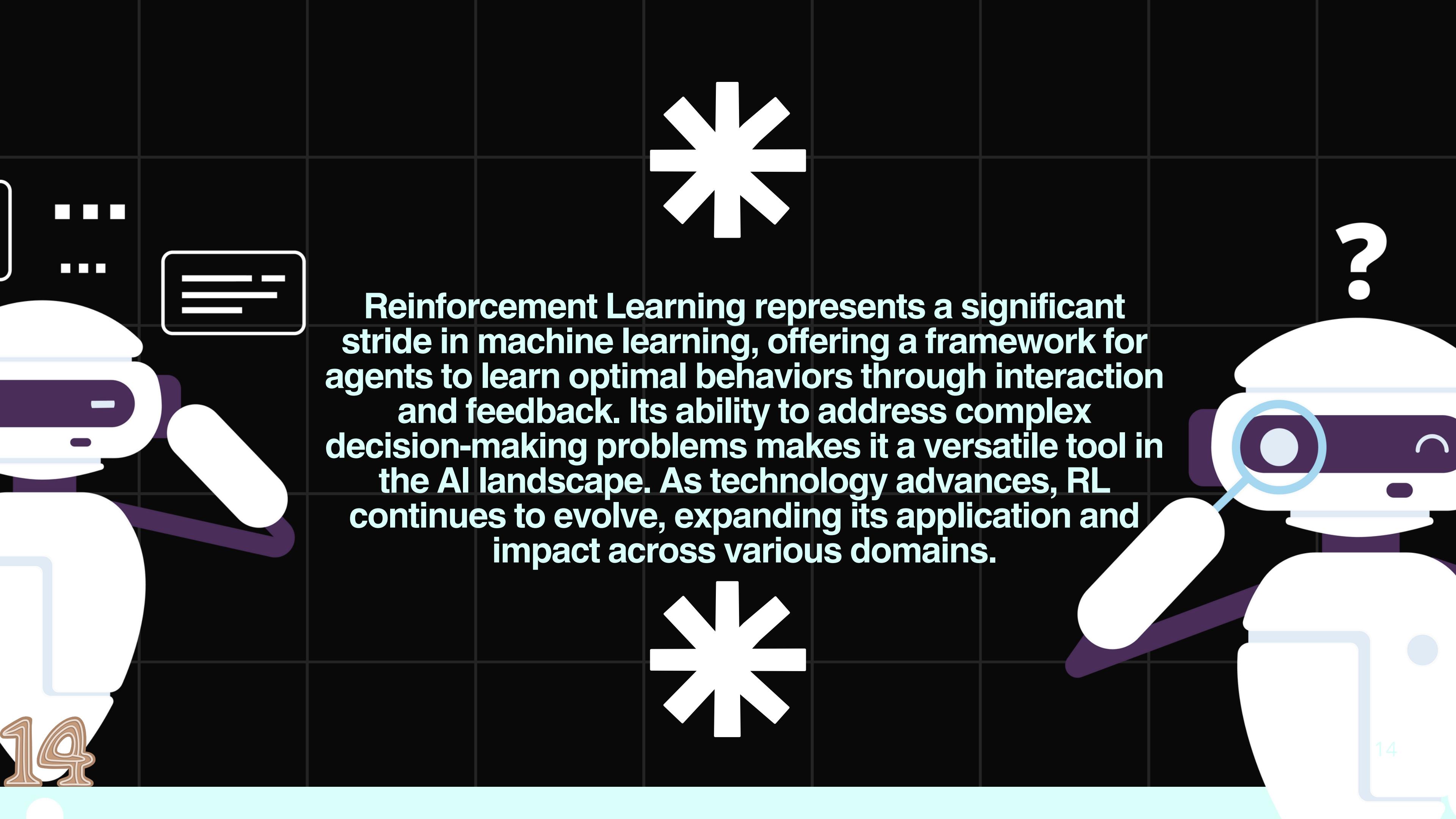
## Sample Efficiency

Many RL algorithms require extensive interaction with the environment, which can be resource-intensive and time-consuming.

## Stability and Convergence

Ensuring that learning converges to a stable and optimal policy is a significant challenge, particularly in complex environments.





**Reinforcement Learning represents a significant stride in machine learning, offering a framework for agents to learn optimal behaviors through interaction and feedback. Its ability to address complex decision-making problems makes it a versatile tool in the AI landscape. As technology advances, RL continues to evolve, expanding its application and impact across various domains.**

\*\*

# Thankyou

@sdley.github.io

References:

- [codefinity: What-is-Reinforcement-Learning?](#), consulted on February 6, 2025
- <https://www.geeksforgeeks.org/what-is-reinforcement-learning/>, consulted on February 6, 2025