

Book Report

RL, DRL

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Definitions & Examples:

1. RL(Reinforcement Learning):

Reinforcement Learning (RL) is a type of machine learning where an agent learns by interacting with an environment, taking actions, and getting rewards or penalties based on the results.

The agent's goal is to maximize total rewards over time by learning the best strategy.

Example:

- A robot learning to walk:
 - If it moves correctly → **Reward**.
 - If it falls → **Penalty**.
- Over time, the robot learns **how to walk properly** by trying many times.

2. DRL(Deep Reinforcement Learning):

Deep Reinforcement Learning (DRL) is Reinforcement Learning + Deep Learning.

It uses a deep neural network to help the agent understand very complex environments with high-dimensional inputs (like images or large sensor data).

Example:

A self-driving car:

- It sees a full **camera image** (complex input) and decides whether to **steer, brake, or accelerate**.
- A deep neural network helps the car **learn the best actions** from experience.

How can RL (Reinforcement Learning) be applied for a Routing Problem? (Explain with Example)

- In a routing problem, the goal is to find the best path from a start point to a destination.
- Reinforcement Learning (RL) can solve routing by making the agent learn the best paths through trial and error.
- The agent tries different routes and gets rewards for shorter or faster paths and penalties for longer or blocked paths.

Example:

- In a network (like the internet), RL can help a packet find the fastest path to reach the destination by learning from delays or network congestion.

Simple Example:

Imagine a delivery robot in a city.

- If it reaches quickly → **Reward**.
 - If it gets stuck in traffic → **Penalty**.
- Over time, the robot learns the best and fastest routes.

How do RL and DRL Work? (With Diagram)

Type	How It Works
RL (Reinforcement Learning)	The agent interacts with an environment, takes actions, receives rewards, and learns the best strategy to maximize the rewards.
DRL (Deep Reinforcement Learning)	It is RL + Deep Learning. A deep neural network helps the agent understand very complex environments and states.

Simple Diagram:

Environment



Reward



Agent → Action → Environment (next state)

- **RL:** Agent decides based on simple rules or small data.
- **DRL:** Agent uses a deep neural network to decide better in complex situations.

Difference between RL, DRL, and Supervised Learning:

Aspect	RL	DRL	Supervised Learning
Learning Type	Learn by trial and error	Learn by trial and error + deep neural network	Learn from labeled data (input-output pairs)
Example	Robot learns to walk by trying	Self-driving car learns to drive in a city	Classifying emails into spam or not spam
Feedback	Reward or penalty	Reward or penalty	Direct correct answer is given
Complexity Handling	Moderate	High (complex environments)	Works well if labeled data is available

In short:

- **RL** = Learn from rewards and penalties.
- **DRL** = RL + Deep Learning (for bigger problems).
- **Supervised Learning** = Learn from examples with correct answers.



Conclusion

To know more visit:

- https://github.com/rifah07/Introduction_of_Machine_Learning

