Example of Reinforcement Learning: Robotaxi

Imagine a self-driving taxi, called a Robotaxi, that's learning how to drive around a busy city. The agent here is the Robotaxi itself, which uses lots of sensors—like cameras, LIDAR, and GPS—to understand its surroundings. It can see other cars, pedestrians, traffic lights, and road signs.

The Robotaxi can take actions such as ***accelerating, braking, turning left or right, and stopping***.

To learn the best way to drive, the Robotaxi gets rewards based on what it does:

- It gets ***+10 points*** every time it safely drops off a passenger at their destination. This encourages the Robotaxi to complete trips efficiently.
- It loses ***-20 points*** if it causes or is involved in an accident, so it learns to drive carefully and avoid crashes.
- Following traffic laws, like stopping at red lights or stopping for pedestrians, earns it ***+5 points***. This helps the Robotaxi be a responsible driver.
- Breaking traffic rules, such as running red lights or speeding, causes a penalty of ***-10 points***.
- Smooth driving, which helps save battery or fuel, gives a small reward of ***+2 points***, encouraging the Robotaxi to avoid sudden stops or fast acceleration.
- The Robotaxi also earns ***+3 points*** for picking up a new passenger quickly, promoting efficiency in finding rides.

Over time, the Robotaxi learns to make smart decisions by trying to maximize its total reward. It figures out that driving safely, obeying traffic rules, and efficiently picking up and dropping off passengers helps it get the highest score. If it makes mistakes, it loses points and tries to avoid those behaviors in the future.

This reward system helps the Robotaxi improve step by step, becoming safer and more efficient as it drives more miles in the city.