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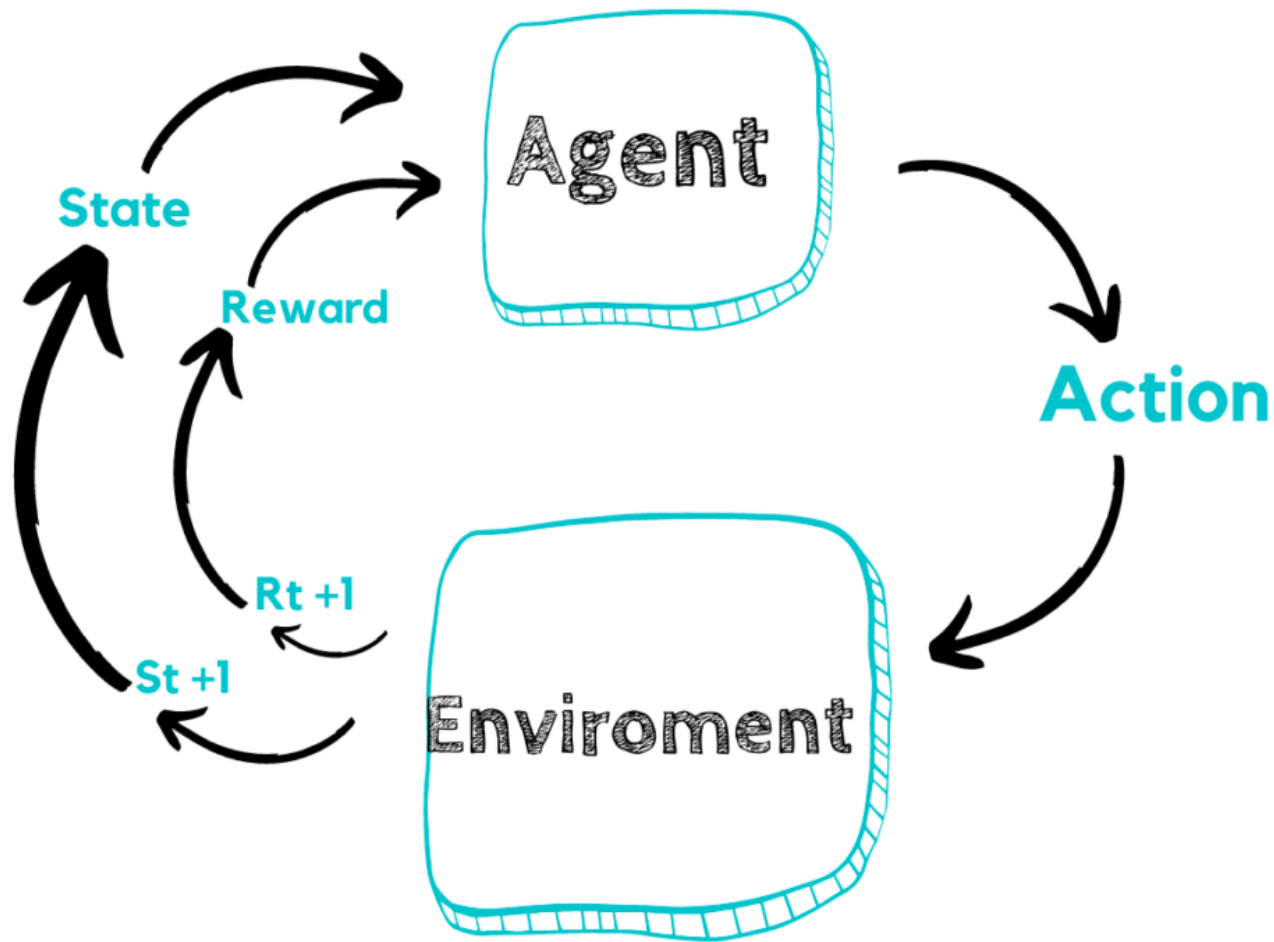
# **SESSION 03**

# **REINFORCEMENT LEARNING**

# Reinforcement Learning (RL)

- ❖ How can an agent learn behaviors when it doesn't have a teacher to tell it how to perform?
  - The agent has a task to perform
  - It takes some actions in the world/environment
  - At some later point, it gets feedback telling it how well it did on performing the task
    - The agent gets *positive reinforcement* for tasks done well
    - The agent gets *negative reinforcement* for tasks done poorly
  - The agent performs the same task over and over again

# Reinforcement learning cycle.

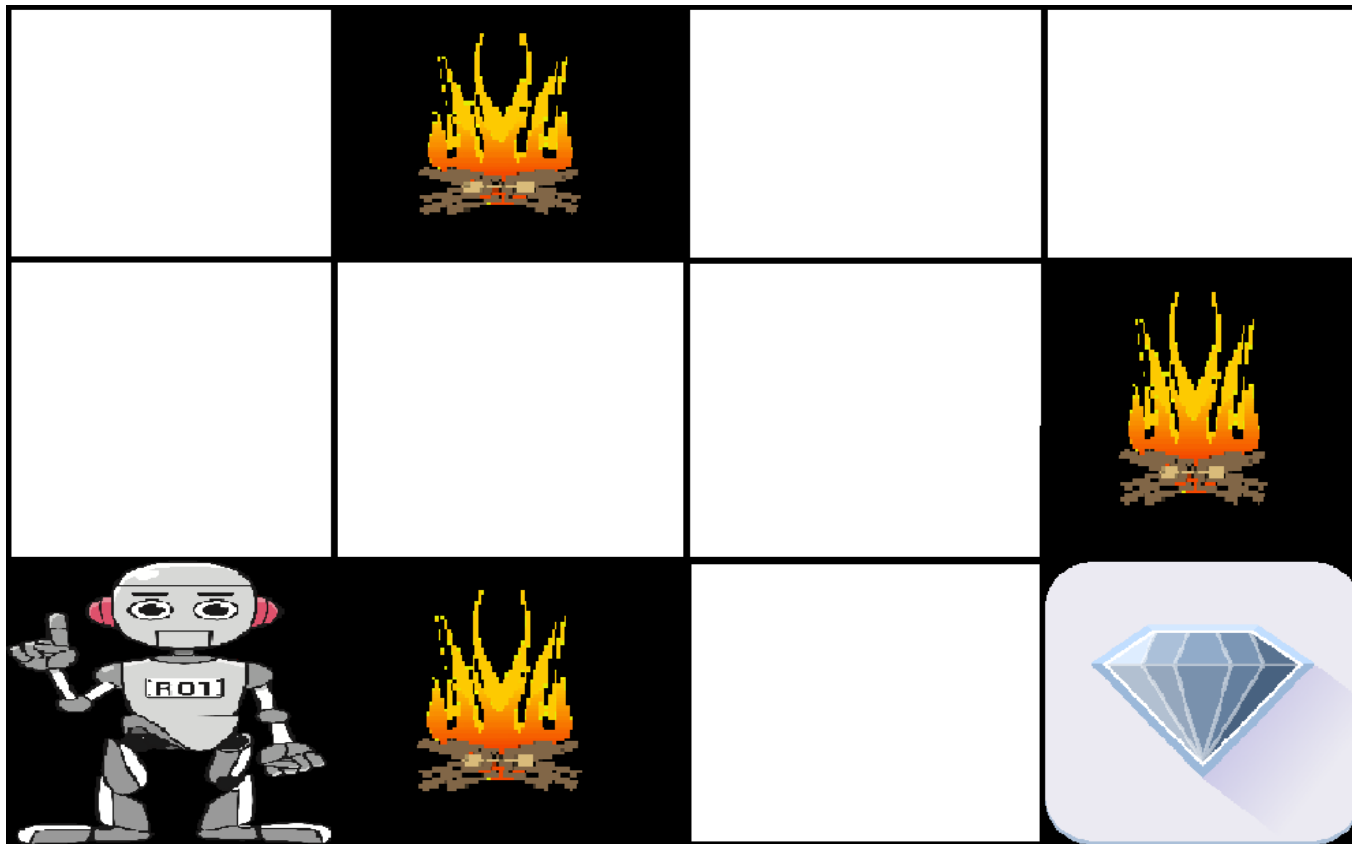


## Reinforcement Learning (cont.)

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- ❖ The goal is to get the agent to act in the world so as to **maximize its rewards**
- ❖ The agent is not told of which action is the correct one to achieve its goal
- ❖ The agent has to figure out (learn) what it did that made it get the **reward/punishment**

# Consider the following example



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- ❖ The robot learns by trying all the possible paths and then choosing the path which gives the reward with the least hurdles
  - ❖ Each right step will give the robot a reward and each wrong step will subtract the reward of the robot.
  - ❖ The total reward will be calculated when it reaches the final reward that is the diamond.

# Reinforcement Learning

- ❖ Reinforcement Learning (RL) is the type of ML method that enables an *agent* to learn in an interactive environment by *trial and error* using *feedback* from its own *actions*. OR
- ❖ A Machine learning based on rewarding desired behaviors and/or punishing undesired ones.
- ❖ There is no labeled data, so the agent Learns from **actions** not from data

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- ❖ Reinforcement learning, while high in potential, can be difficult to deploy and remains limited in its application.
  - ❖ Reinforcement learning approaches can be used to train computers to do many tasks such as Controlling robot limbs, Helicopter



## Review questions:

1. What is a labeled training set?

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2. What type of algorithm would you use to segment students into multiple groups?
3. Would you frame the problem of **spam detection** as a supervised learning problem or an unsupervised learning problem?
4. What type of Machine Learning algorithm would you use to allow a robot to walk in various unknown terrains?

# Sample Datasets for machine learning problems

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- ❖ Data and algorithms are core in Machine Learning problems
- ❖ It is best to actually experiment with real-world data, not just artificial datasets.
- ❖ Popular open data repositories:
  - ✓ UC Irvine Machine Learning Repository
  - ✓ Kaggle datasets
  - ✓ Amazon's AWS datasets etc