

Reinforcement Learning

Introduction

HIIIIIII!!!!



Who am I?

- Professionally:
 - Worked in the world of Data Science and Machine Learning Engineer for over ten years
 - Currently a Lecturer at Leuphana University but also manage a Data Analytics Bootcamp for women, and *trying* to start my own company
- Personally:
 - Moved to Berlin in 2017 and Hamburg last year, and originally a mix between English and Pakistani
 - Techtivist
 - Interested in art, travel, plants, food and philosophy

Overview of the Course

- Experimental Course with different application of RL
- If students would like more theory, please let me know but this is designed to be a hand-on course
- Next weekend I will share the Exam Project and you will also have time to work on it
- We can plan breaks and the next two weekends according to how things are going.

Who are you?

- What inspired you to sign up for this course?
- What are you hoping to learn from this course?
- Have you programmed in Python or any other programming languages before?
- What would **you** like to learn?

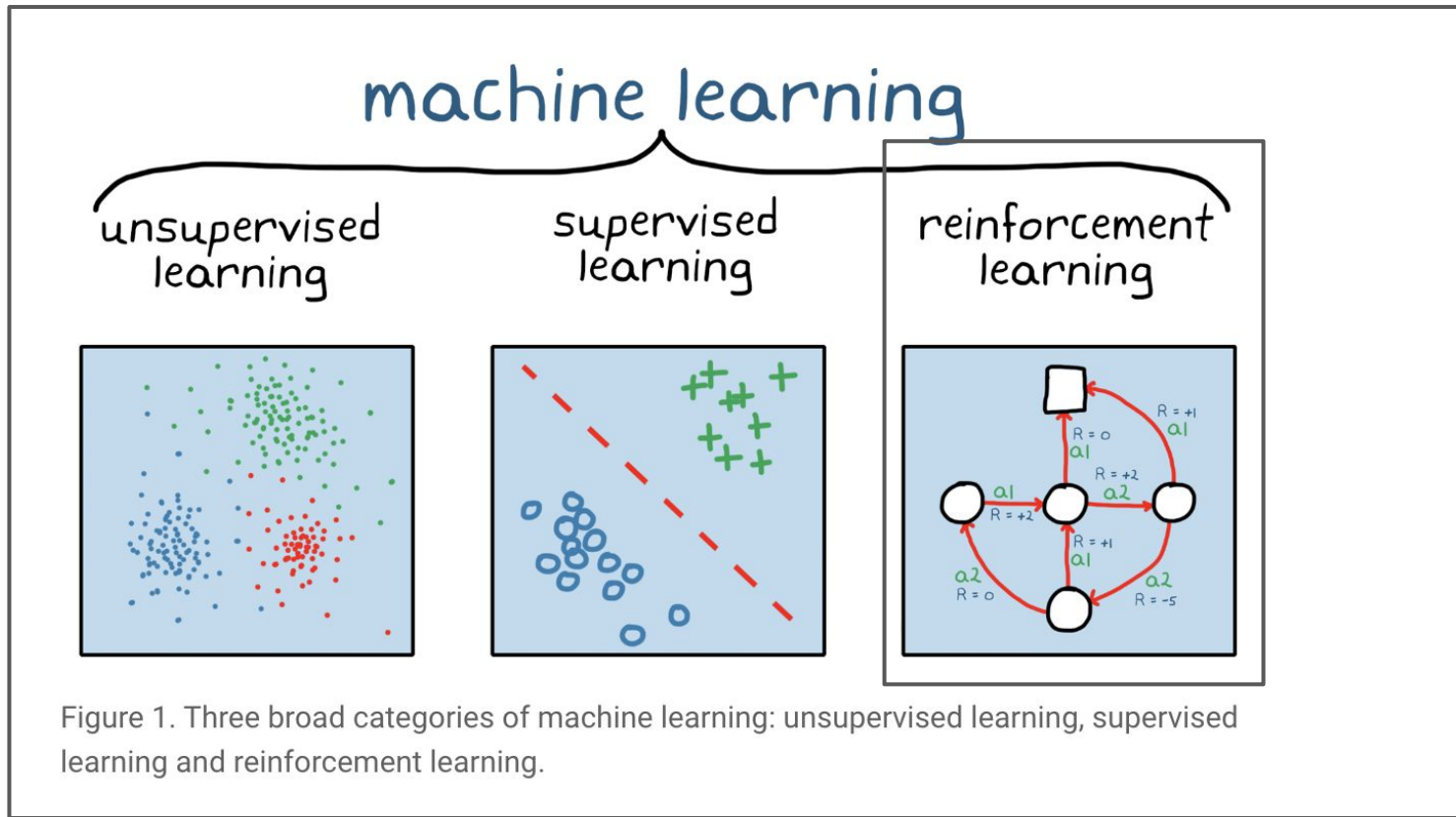
Goals for today

- Introduction to Machine Learning and Reinforcement Learning
- Setting up for the course
- Diving in to our first application of RL - Balancing a Cartpole
- Depending on how it goes today, second application of RL -

Today is all about getting everyone set up....



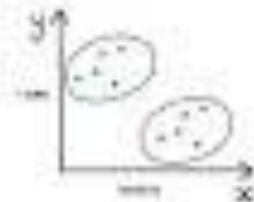
What is Machine Learning?!



**3 MILLION+
VIEWS**



simplilearn



BASICS OF MACHINE LEARNING



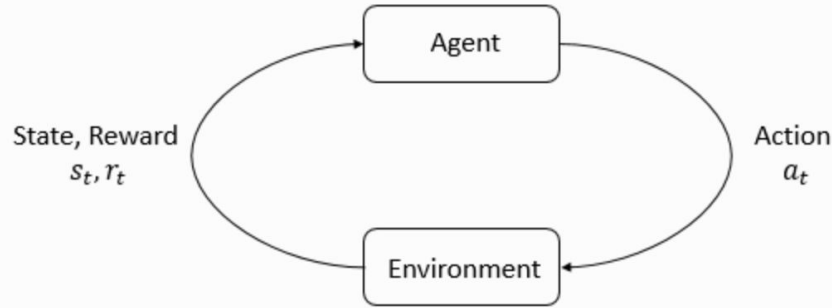
WEIGHT - FEATURE
CURRENCY - LABEL



Reinforcement Learning

- Reinforcement Learning (RL) is the science of decision making. **It is about learning the optimal behavior in an environment to obtain maximum reward.** This optimal behavior is **learned through interactions with the environment** and observations of how it responds, similar to children exploring the world around them and learning the actions that help them achieve a goal.
- In the absence of a supervisor, **the learner must independently discover the sequence of actions that maximize the reward.** This discovery process is akin to a trial-and-error search. The quality of actions is measured by not just the immediate reward they return, but also the delayed reward they might fetch. As it can learn the actions that result in eventual success in an unseen environment without the help of a supervisor, reinforcement learning is a very powerful algorithm.

Key Concepts and Terminology

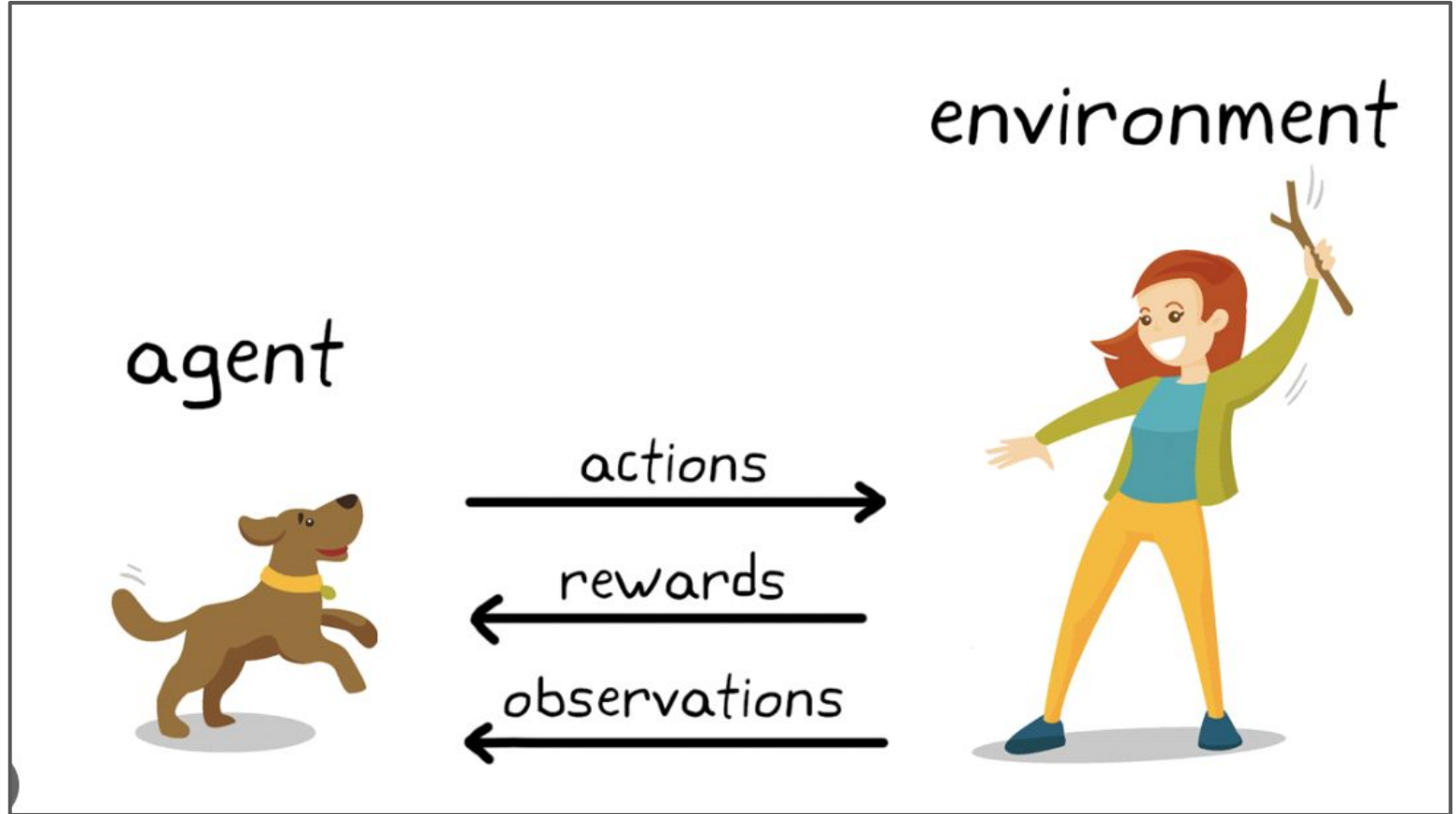


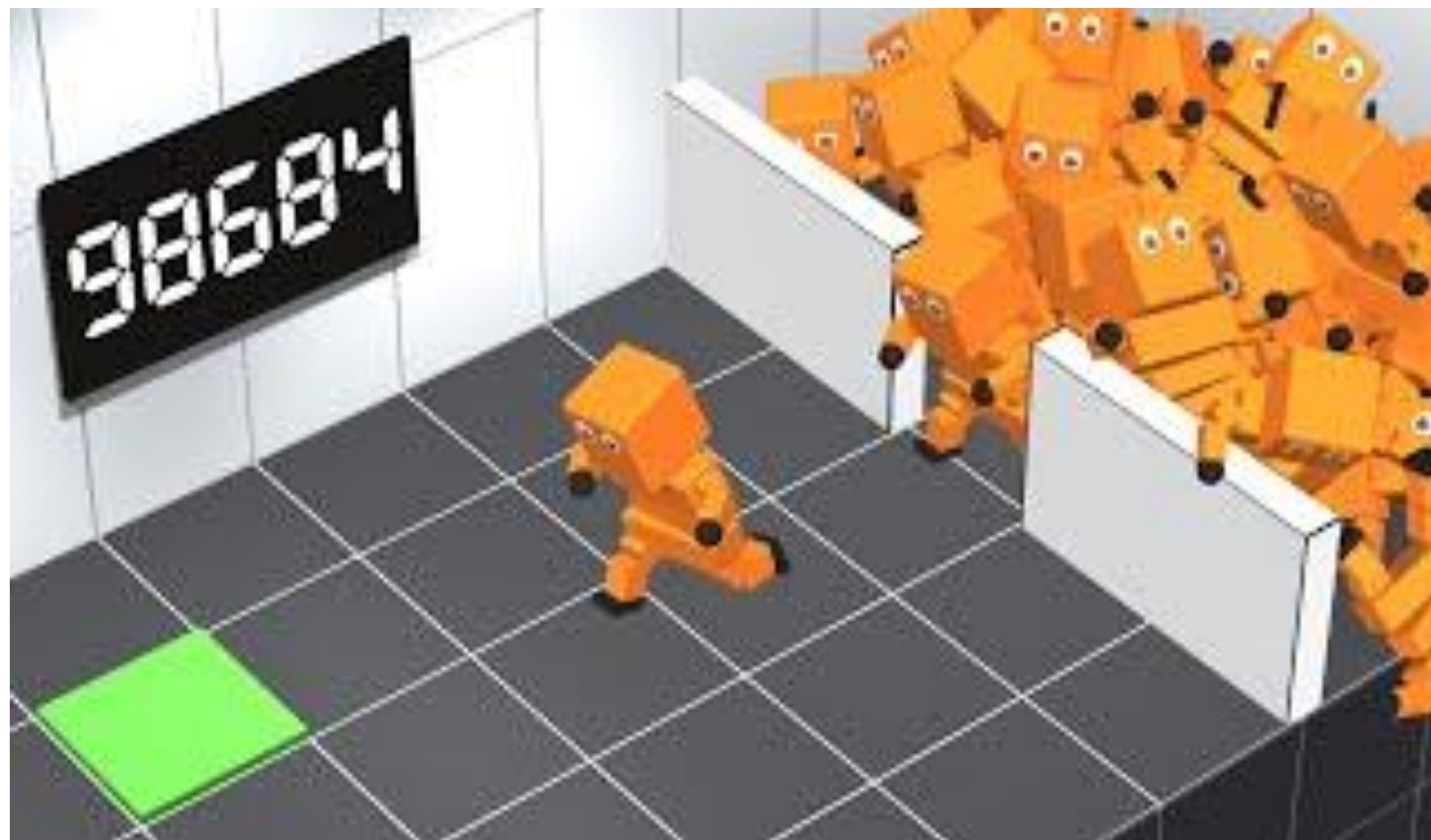
Agent-environment interaction loop.

The main characters of RL are the **agent** and the **environment**. The environment is the world that the agent lives in and interacts with. At every step of interaction, the agent sees a (possibly partial) observation of the state of the world, and then decides on an action to take. The environment changes when the agent acts on it, but may also change on its own.

The agent also perceives a **reward** signal from the environment, a number that tells it how good or bad the current world state is. The goal of the agent is to maximize its cumulative reward, called **return**. Reinforcement learning methods are ways that the agent can learn behaviors to achieve its goal.

Key Concepts





The Workflow

Reinforcement Learning Workflow

The general workflow for training an agent using reinforcement learning includes the following steps :

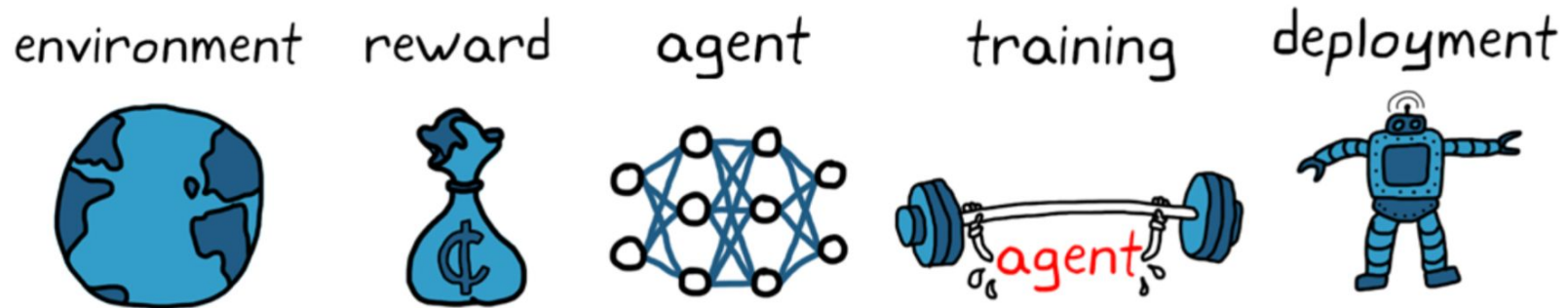


Figure 4. Reinforcement learning workflow.