Introduction and Course Overview

Felipe Glicério Gomes Marcelino

18 April 2020

1 Notes

Slide 11

Reinforcement learning is really important ingredient for question of how do we build intelligent machines.

Slide 12

Some intelligent machines to imitate human behavior are difficult to build. It is because humans are not just smart but they are good at soling problems and they are highly adaptable.

Slide 13

Deep learning are very good at handling on unstructured because they can learn from large amounts of data and discover patterns.

Slide 14

Reinforcement learning provides a formalism for behavior. It is a mathematical formalization of a decision-making problem. Reinforcement learning has a agent, an environment and the agent interacts with the environment creating a action for a specific state of the environment. Subsequently the environment return a response taking into account the action.

Reinforcement learning has been used for things like playing games. Actually the success of the reinforcement learning is the capacity to defeat your opponent in some games like Go(Alpha).

Slide 15

Deep reinforcement learning removes the need to extract features manually. For example, using a CNN as policy, it is only necessary to pre-process the image and pass this through the model. The model going to learn how to extract the features correctly using the outcome generate by action to update the parameters.

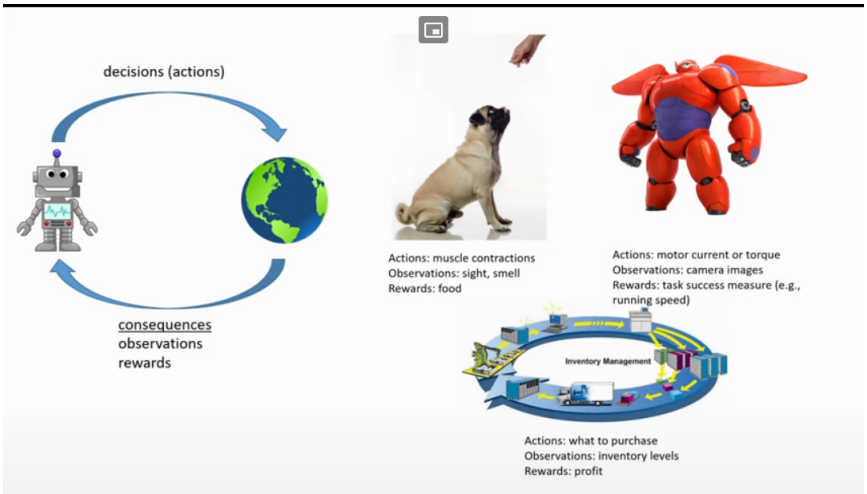

Figure 1: Framework of reinforcement learning

Slide 21

Figure 1 shows how the framework of reinforcement learning works. It has three elements:

- Agent: Responsible to make a action using a observation space
- Observation Space: Data used to assist the agent
- Reward: Consequence of the action made by the agent

Slide 27

Why should we study deep reinforcement learning this now?

1. Advances in deep learning - We can create complex architecture networks and training them using sophisticates techniques to understand high dimensional observation spaces, such as images.
2. Advances in reinforcement learning - We have algorithms with favorable numerical properties, they are stable to use and reliable. It can converge to good solutions.
3. Advances in computational capability - More power to process, more advanced tasks can be achieved

Slide 31

1. Basic reinforcement learning deals with maximizing rewards

2. This is not the only problem taht matters for sequential decision
3. Inverse reinforcement learning - Learning reward functions from example
4. Transferring knowledge between domains (transfer learning, meta learning)
5. Learning to predict and using prediction to act

Slide 42

How do we build intelligent machines? It is possible to program and execute in a computer a imitation of the brain. It is possible to emulates the behavior of the brain. However, each of these parts from brain are themselves quinte complicated to emulate.

So the idea behind reinforcement learning is implement learning algorithms that can acquire the functionality of those parts from brain.

Slide 46

Algorithms used by deep reinforcement learning field must be capable to interpret rich sensory inputs, as images and choose a complex actions. Consequently, it is necessary to use deep learning as base algorithms. Deep = can process complex sensory input, and anslo compute really complex functions.