Introduction and Course Overview

Felipe Glicério Gomes Marcelino

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Reinforcement learning is an excellent method build intelligent machines.

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Some intelligent machines to imitate human behavior is challenging to develop. It is because humans are not just smart, but they are good at solving problems and they are highly adaptable.

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

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

Reinforcement learning has an essential role in tasks like playing games. The success of reinforcement learning is the capacity to defeat your opponent.

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Deep reinforcement learning removes the need to extract features manually. For example, using CNN as a 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 generated by action to update

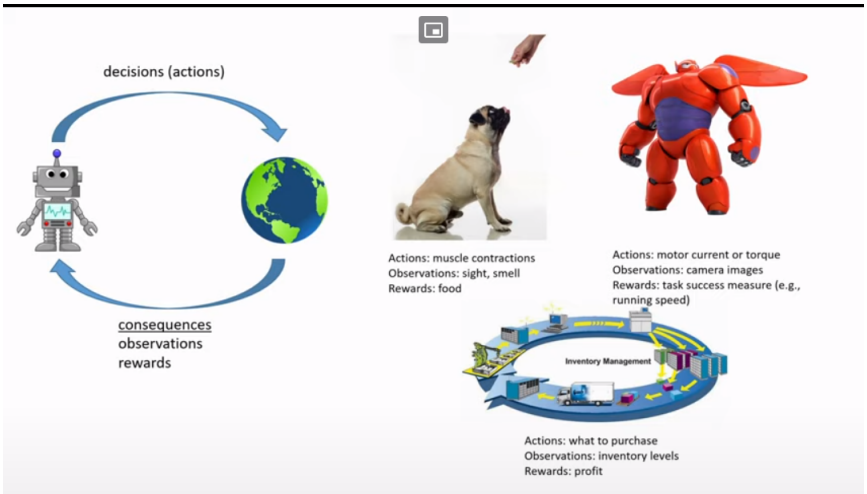

Figure 1: Framework of reinforcement learning

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

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

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Why should we study deep reinforcement learning this now?

1. Advances in deep learning - We can create complex architecture networks and training them using sophisticated 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 reasonable solutions.
3. Advances in computational capability - More power to process, more advanced tasks the model can realize.

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1. Basic reinforcement learning deals with maximizing rewards

2. Inverse reinforcement learning - Learning reward functions from examples
3. Transferring knowledge between domains (transfer learning, meta-learning)
4. Learning to predict and using prediction to act

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

With this in mind, the idea behind reinforcement learning is implementing learning algorithms and creating machines capable of executing simple and complex tasks.

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Algorithms used by deep reinforcement learning field must be capable of interpreting rich sensory inputs, as images, and choose complex actions. Consequently, it is necessary to use deep learning as base algorithms. Deep = can process complex.