

# Assignment 1 – AI Fundamentals and intelligent agents

Claudio Di Salvo

September 4, 2023

## 1 What is Artificial Intelligence (AI)?

- Artificial intelligence (AI) is a set of technologies that enable computers to perform a variety of advanced functions, including the ability to see, understand, and translate spoken and written language, analyze data, make recommendations, and more. [1]
- Artificial intelligence (AI) is a common description of systems that perform actions in the physical or digital dimension by perceiving their environment and processing and interpreting huge amounts of information and data. AI systems have the ability to adapt their behavior by analyzing how the environment and conclusions are affected by previous actions. [2]
- AI is the ability of a machine to display human-like capabilities such as reasoning, learning, planning, and creativity.

AI enables technical systems to perceive their environment, deal with what they perceive, solve problems, and act to achieve a specific goal. The computer receives data - already prepared or gathered through its own sensors such as a camera - processes it and responds.

AI systems can adapt their behavior to a certain degree by analyzing the effects of previous actions and working autonomously.[3]

## **2 What is the Turing test? What is its purpose, and how is it conducted? Are there any new proposals for the Turing Test?**

The Turing test performs an experiment to determine if a human can not distinguish between talking with a human or a computer. His purpose is to determine if a computer is intelligent enough to be considered a human. As said before, the test is made by an end user who chats with an unknown person or computer. There are new proposals to improve the Turing test because the new chatbot seems outdated.

## **3 What is rationality and what is the difference between thinking rationally and acting rationally? Is rational thinking an absolute condition for acting rationally?**

With rationality, we are speaking of "*doing the right thing*". Thinking rationality is the "laws of thought" approach. It's thinking with logic and not worrying about uncertainty. Rationally acting is the study and construction of an agent that does the right thing and maximizes the expected value of their performance. Rational thinking is not an absolute condition in certain situations.

## **4 What is the connection between knowledge and action according to Aristotle? How can his argument be used to implement his idea in AI?**

The connection is about why we perform action because just by understanding how actions are justified, we can build an agent whose actions are justifiable. In fact, Aristotle said that actions are justified by a logical connection between knowledge and goals. These arguments created an algorithm that Newell and Simons implemented. This is called greedy regression planning. It's a method based on logical planning to achieve defined goals.

**5 Consider a robot with the task of crossing the road and an action portfolio A**

- Under these circumstances, the agent is rational because he doesn't have enough information about his environment and can not know that the elk will pass.
- The robot is irrational because, as we do with children, we can teach the robot to keep watch. Also, if it is green.

**6 Consider the vacuum cleaner world described in Figure 2.2. Let us modify this vacuum environment such that the agent is penalised with 1 point for each movement:**

**Could a simple reflex agent be rational for this environment? Why?**

Depends because a simple reflex agent can be stuck trying to cross a wall or pass under a sofa, but if the environment is simple without any tricky furniture or particular change of room is rational.

**Could a reflex agent with a state be rational in this environment? Why?**

Yes, since the agent can track the previous state, it can track the partial environment that is possible to see.

**Assume now that the simple reflex agent (i.e., with no internal state) can perceive the clean status of both locations at the same time. Could this agent be rational? Why? In case it could be rational, write the agent function using mathematical notation or a table**

Yes, since the problem of point 1 can be avoided

[A, Dirty]	suck
[A, Clean]	right
[A, Wall]	left
[A, Clean], [A, Wall]	left
[A, Dirty], [A, Wall]	suck
....	...

Figure 1: Table, just made for A site, for B he will invert left with right

**7 Consider the original vacuum cleaner environment shown in Figure 2.2. Describe the environment using the properties from Chapter 2.3.2 (e.g. episodic/sequential, deterministic/stochastic, etc.) Explain why you chose such values and properties.**

It's a deterministic environment because, except for the failure of the action, the result will be known. It's also sequential because the decision to suck now will affect the suck at the next moment when we pass in the same position. It's discrete because we can only have 2 states: clean and not clean. Also, no other agent is part of the environment, so it's a single agent. Although the vacuum can have sensors, it can not observe the world and the environment since this and the fact that the agent may know how his action effect the world is a known environment.

**8 Write both advantages and limitations of the following types of agents**

- Simple reflex agents are simple to implement but can not be rational in every environment because they do not know the history.
- Model-based reflex agents are used in partially observable environments because the agent can make guesses and acts thereby by using a sort of internal state that depends on the history. His limitations are all about the knowledge of the current state.

- Goal-based agents In this agent, we use a sort of goal to reach the best result, but this can be tricky due to the fact we need to find a way to achieve those goals.
- Utility-based agents use the same idea of goal-based by introducing a rating for the different actions.

## References

- [1] G. Cloud, “What is artificial intelligence a i,” Google Cloud, 2023. [Online]. Available: <https://cloud.google.com/learn/what-is-artificial-intelligence>
- [2] U. of Bergen, “What is artificial intelligence?” UiB, 2023. [Online]. Available: <https://www.uib.no/en/ai/152317/what-artificial-intelligence>
- [3] E. Parliament, “What is artificial intelligence?” EU Parliament, 2023. [Online]. Available: <https://www.europarl.europa.eu/news/en/headlines/society/20200827STO85804/what-is-artificial-intelligence-and-how-is-it-used>