# Autonomous and Intelligent Robots: Social, Legal and Ethical Issues

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**Abstract** The word "robot" was used for the first time in 1921 by the Czech writer Karel Čapek, who wrote a play called R.U.R. ("Rosumovi Univerzální Roboti"), featuring a scientist who develops a synthetic organic matter to make "humanoid autonomous machines", called "robots". These so called "robots" were supposed to act as slaves and obediently work for humans. Over the years, as real "robots" actually began to be built, their impact on our lives, our work and our society, has brought many benefits, but also raised some concerns. This paper discusses some of the areas of robotics, its advances, challenges and current limitations. We then discuss not only how robots and automation can contribute to our society, but also raise some of the social, legal and ethical concerns that robotics and automation can bring.

## 1 Introduction

Robots are complex (usually electromechanical) systems, equipped with processors, actuators, sensors and batteries. Actuators can range from wheels or legs, that make a robot locomote, to loudspeakers that allow the robot to communicate through speech or non-verbal acoustic signals, and include arms to grasp or manipulate objects. Video camera, microphone, or touch and tactile sensors enable robots to replicate some human senses, but also to perform other measurements, such as distance, orientation or speed. Robots need on-board processors, such as those in the computers we use in everyday life, to be autonomous regarding decision-making and action capabilities. Such processors run algorithms that, with greater

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or lesser sophistication, provide the robot with autonomy and machine intelligence, including the ability to learn. Energetic autonomy is provided by on-board batteries or renewable energy sources.

The word "robot" was used for the first time in 1921 by the Czech writer Karel Čapek, who wrote a play called R.U.R. ("Rosumovi Univerzální Roboti"), featuring a scientist who develops a synthetic organic matter to make "humanoid autonomous machines", called "robots". These so called "robots" were supposed to act as slaves and obediently work for humans. Over the years, real "robots" began to be built, and the introduction of robots in factories dates back to the 1950s. The first automatic guided vehicles (AGV), mobile robots that followed a path realized by cables buried in the ground, were invented in 1954, but the term AGV was only coined in the 1980s. Industrial manipulators were also conceived in the mid-1950s but only introduced in factories in the early 1960s. The first mobile robots using vision were developed in research laboratories in the USA, such as the Stanford Cart (1961) and Shakey (1966). From them on, progress in autonomy was swift towards robots deployed in environments less structured than factories, e.g., homes, offices, hospitals, roads, search and rescue scenarios, Moon or Mars, requiring advanced perception and decision-making. These robots, called service robots, have evolved to interact with humans in daily activities and even replacing the humans in household chores, and inaccessible/dangerous locations.

While industrial robots triggered social problems by replacing workers in factories, they undeniably led to a production growth and wealth increase that, together with other factors, increased well-being, wealth redistribution and new, less boring and less dangerous jobs. On the other hand, service robots may or may not replace human work and, even if they do, the amount of jobs lost is variable. For instance, a vacuum-cleaning robot helps with household chores, but it hardly replaces domestic workers; however, autonomous trucks may lead to a significant loss of jobs among truck drivers. Moreover, service robots that include a strong component of interaction with humans also raise ethical and legal issues: will they disclose any private information of their human companions? Can they harm humans?

These issues become more delicate when robots act autonomously. Although there is no universally accepted definition of "autonomy" for robots, we adopt the notion that *an autonomous robot is an "embodied" system, endowed with sensors to perceive and understand the surrounding world, actuators that allow it to act on that world (possibly including interaction with other robots, animals and/or humans), and decision-making capacity independent from complete external control, namely by humans*. We should note that autonomy is a loaded term in Artificial Intelligence (AI). C. Castelfranchi discusses autonomy as a relational notion (Castelfranchi 1994) that entails different dimensions, leading to distinct types of autonomy, in particular, "executive autonomy", that means to be able to move, act and make decisions in the world without the need to be explicitly helped to do so. Although this is subject to intense philosophical debate, we also consider that autonomy is a necessary, but not sufficient condition for a robot to be endowed with intelligence (in the sense of machine-intelligence). In this sense, machine-intelligence requires, in addition to autonomy, the ability of a robot to adapt its behaviour and actions to the surrounding world. Note however that this distinction is relevant. First there is a wide misunderstanding about what robots are, often confusing intelligent software systems, or "dis-embodied" agents, with autonomous robots. As argued, robots need to be able to physically perceive and act in the physical world. Secondly, not all robots are intelligent or autonomous, and many, for example many of the toy drones, are tele-operated and controlled by humans, where their intelligence and autonomy is non-existent. Often the public debate about the ethical and social issues raised by robots confuses the general software systems, endowed with artificial intelligence, with robots and considers all autonomous robots as intelligent.

We consider that autonomous robots, as defined, given their specific characteristics, bring new social, ethical and legal concerns, which we will discuss in this chapter.

This chapter is organized as follows: first we provide a brief view of industrial robots, followed by service robots. Then we discuss the potential for these robots to be placed in social settings, and how intelligence is needed for social interactions with humans. Given these types of robots, we then discuss the social, ethical and legal implications of their integration in our society.

## 2 Industrial Robots and Automation vs Service Robots

Robots were introduced in factories to automate repetitive tasks that were performed by humans up to then. Those included robot manipulators, mimicking human arms, in different operations: picking objects from pallets in transporting vehicles or from conveyor belts and placing them into manufacturing cells, and back from there to other conveyor belt or transportation vehicle; assembling parts into a more complex object; painting and welding. They also included mobile robots, in the form of AGVs or LGVs (laser-guided vehicles, that do not need buried cables or painted lines on the ground) to carry objects autonomously between different locations in the industrial plant.

A common feature of all these applications and scenarios is their *structured* nature. The locations of conveyor belts, pick and place posts, and manufacturing/assembly cells with machines, are well known, static and easily recognizable. In most cases, objects are channelled to very precise locations where they are picked by the manipulators, and loading/unloading stations have clamping and fixture mechanisms that force the objects to be tightly confined to their transporting platforms. Industrial robotics is also commonly designated by automation, because the involved robots perform automatic operations, but are not autonomous in a strict sense. In most cases, traditional industrial automation does not require sensors such as vision to locate objects to be picked, or the most adequate placing locations for them. It also does not handle deformable objects such as food or soft packages.

In the last century, documentaries of robots automating production in construction, assembly, painting, parts transport and welding factories dazzled the


**Fig. 1** Service robot for construction and brick transportation

general public. But the more modern and challenging robot research seeks to create machines capable of dealing with less structured and less predictable environments, such as our homes or even outdoor environments, populated by humans and other agents that do not behave as deterministically as in a factory environment. These are called service robots (see an example in Fig. 1).

Service robots range from the commercially successful vacuum-cleaning robots to a planetary rover exploring the surface of Mars. Vacuum cleaners wander around the home covering the largest possible area while avoiding unexpected objects (such as things left on the floor, table and chair legs, or a person feet) detected by onboard vision and laser scanning sensors. Martian rovers move across difficult terrains they need to observe before the next move, heading towards locations of scientific interest that were previously identified by their on-board cameras. Service robots also include autonomous driving cars, search and rescue teams of heterogeneous (land, air) unmanned vehicles, medical robots to assist human surgeons in performing surgeries, or robots assisting patients in hospitals and healthcare facilities, agriculture robots, surveillance drones and many others.

A common feature in service robots is that they operate in *unstructured*, often previously unknown environments, where sensors are essential to build a situational awareness by the robot, so as to support its reasoning and decision-making. Service robots cannot afford to act *automatically*. They need to be *autonomous* or, at least, have a high degree of independence from human remote operators. Because of that, they raise a new plethora of ethical and legal problems (e.g., which action should the robot pick when there are alternatives and they have different impacts in the human safety; what must an autonomous car do to ensure it abides by the driving rules) that were not raised before by industrial robots, whose main impact was social,

**Fig. 2** Baxter robot for small factories

namely concerning job losses. Indeed, most service robots tend to be pervasive in operations not commonly performed by humans, such as non-repetitive and/or dangerous scenarios, so the social impact is relatively small. Nevertheless, they start entering industrial scenarios (e.g., using force sensors to endow robots with the ability to avoid harming humans, thus reducing the space occupied by robotic cells and their safeguards—see Baxter in Fig. 2; to perform pick and place actions over less structured environments, soft packages and materials) and large operations such as autonomous taxis and trucks, which may lead to large replacement of human work force by autonomous machines.

Current research on service robots is very much focused on robots that collaborate with humans and not on robots that replace humans. Search and rescue robots are developed to collaborate with Civil Protection teams; medical robots help doctors and nurses in hospitals, and planetary rovers extend the reach of human curiosity to the exploration of Mars. This also raises other challenging and interesting social questions: how should the robots act so as to interact the more naturally possible with the humans? What does it mean to act socially?

## 3 Robots and Humans: The Rise of Intelligent and Social Robots

Would a rescue robot, as it interacts with humans in an emergency setting, be considered a social robot? Or a drone that flies in a formation with other drones to overcome some obstacle? The word "Social" arises from the Latin word "socii",

**Fig. 3** Examples of social robots—from left to right: Vizzy, Pepper, ASTRO and MBOT

meaning friends or allies. The concept of being “social” in general is associated with behaviors that take into account others, their interests, motivations and needs. An individual is considered social if she/he has the capability to interact and consider the others in his/her actions, and thus establish social relations. However, “sociality” in robots, may cover different perspectives or even degrees. Many service robots, can be classified as a being “socially evocative”. For example, a robot with big eyes, such as the Vizzy robot built by the ISR institute in Lisbon (see Fig. 3) or Roomba, a vacuum-cleaning robot that moves purposefully around in a home: both may evoke responses that are social and emotional in nature. Just their physical embodiment and their autonomous actions are enough to act as a natural interface to elicit human-like responses, even if the robots themselves are not actually capable of responding in a clever and social manner. Furthermore, just by being placed in a social setting, robots can be socially receptive, that is, benefiting from the interactions with others, learn from a human “teacher” and thus, improve their performance. However, as more robots are required to perform activities in human-centered settings, they will be given “social competencies” . Social robots are considered to be able to perceive each other and humans, engage in social interactions, possess histories (perceive and interpret the world in terms of their own experience), explicitly communicate with humans and learn from them.

But social robots are often designed to execute tasks that in essence may not be “social”. For example, consider a robot in a healthcare setting designed to transport materials from one place to another in a hospital. Most of its jobs, like carrying medicines, or linen, are not necessarily social. Yet, social competencies, when present, can enrich the interaction they establish with humans around them, and improve their performance. For example, the healthcare robot may be able to recognise nurses, respond and execute their orders given in natural language, interact with patients, and provide information when needed. Another example is our vacuum cleaning robot, that can be given some social competencies, such as avoiding or interacting with humans, or adapting its actions to habits of the members of a household, making its performance more efficient. So, there social competencies can be seen as the stepping stones for robots to become active members of our lives and society. From a technical point of view, this entails building social competencies (Fong et al. 2003), that include the capability to recognise humans, understand their actions, perceive their emotions, use natural language and non-verbal cues and in general recognize, “understand” and reason about the social situations they will be immersed.

But building these social capabilities requires advanced AI techniques and algorithms. To perceive humans, capture their actions and emotions, techniques from vision and social signal processing are needed. For action generation, automated planning algorithms are required. Natural language and speech processing methods are essential if we want robots to interact in a natural and human-like fashion with humans. Further, as we also need robots to be able to adapt and learn to execute tasks, we need to use machine learning algorithms. In fact, many of the major AI techniques that are being developed in AI nowadays are essential to build intelligent social robots that are able to act in dynamic and social domains. Furthermore, social robots constitute the ideal test-bed for the integration of such techniques.

Typical application domains for social robots are vast, and include healthcare, transport, logistics, cleaning, education, entertainment, agriculture, and others.

In the context of healthcare, there has been a considerable development in the past few years, with a clear increase since the COVID-19 pandemic. Robots are being introduced in healthcare facilities to transport materials and supplies, especially in situations where such transport may pose risk to the exposure to pathogens, such as a virus. Another important use of social robots has been for therapy and care, in particular for the elderly and for patients with dementia. A study analyzing the use of the robot PARO (a seal-like robot) in home care facilities in Japan, has shown the positive impact that the robot has in decreasing stress and calming down patients with dementia, also providing indirect benefits by increasing their activity in particular social interactions (Šabanović et al. 2013). Another study has shown that the use of a home robot for the elderly, in rural areas of New Zealand, lead to an increase in quality of life, more independence and autonomy by the elderly, and a decrease in primary care visits and phone calls to healthcare practitioners (Orejana et al. 2015) . These results are encouraging signs that the technology can have a positive social impact in our ageing society.

The area of transportation is perhaps one of the areas where service robots have shown the largest increase as autonomous vehicles began to be placed on our roads. Roads are, in essence, a social setting, meaning that autonomous decisions by vehicles must consider the presence of other drivers as well as pedestrians. Autonomous cars are therefore endowed with competencies (in prediction and action) associated with social interactions. Furthermore, the social impact from the potential increase of their use in the roads is undoubtedly quite large. Although this impact has been shadowed by the overstated predictions that autonomous cars would be dominating the roads by 2020, we cannot ignore the social, ethical and legal implications that autonomous vehicles will have in the future.

Other areas of application such as cleaning and logistics are also increasing, and once again, the pandemic gave rise to a series of applications where robots can be used to provide safe and efficient ways to do their jobs. These application areas of robotics, where robots become integrated in our social settings, raise concerns in the general population, in manufacturers and in law-makers. Still a widely unregulated market, robots may in the future be placed in settings where they interact with humans capturing private information, influencing their actions, and largely impacting the unstable job-market. Yet, as mentioned before, some of these fears are still unfounded, and the eco-system that is being built for the introduction of AI into our society and legislation being drawn as we write, is a safeguard for our robots.

in this paper we draw some of the social ethical and legal implications of this fascinating new technology.

## 4 Ethical, Social and Legal Impacts

For robots to be able to succeed as a technology that makes our world a better place, we must engage researchers, designers, developers, engineers, companies and law-makers, into building an ecosystem where robots are trusted, effective, secure and relevant to our society. The current perception of autonomous robots by the general public often imagines futuristic capabilities in the robots. Robots are portrayed as being capable of executing extraordinary jobs and deal with many different tasks and problems. And, in spite of the fact is that the technology is still quite limited, many non-justified fears and concerns have emerged in the general public.

Discussions on “killer robots”, or “robots for the elderly”, have invaded the space of public opinion. But, in many cases these concerns deserve deep debates and a serious approach. The (still) immature state of this discussion, which is understandable given its relative novelty of the field, means that matters of a different nature are often associated with ethical problems resulting from an exaggerated perception of robots. In this chapter we will try to raise and discuss some of these concerns, and distinguish between the ethical, social and legal debates that need to exist around this new technology.

### *4.1 Ethical Issues*

How should an autonomous robot react in situations where its decisions may harm humans? What about the protection of humans’ privacy when, e.g., a domestic assistant robot is wandering around the house with a camera and interacting with the human in ways that may reveal his/her intimate behaviour? should autonomous robots be involved in health care, from monitoring the elderly or children to surgical interventions? And what is the impact of the progressive introduction of bionic devices (prostheses, exoskeletons) in humans, which could 1 day lead to the difficulty of distinguishing between human and robot? These questions lead to ethical problems that need to be addressed as robots are created. These questions need to be addressed by robotic manufacturers, by researchers and law-makers in collaboration.

In fact, the discussion around the ethics of decision-making and behaviour by autonomous robots gained new strength and relevance with the awareness of the very likely massification of driverless (or autonomous) cars. As the Google/Waymo Car and other vehicles from car manufacturing companies started entering our daily lives, they have faced a growing number of situations, particularly in urban environments, in which they have to take decisions autonomously. Typical examples representative of these situations are abundant.

Consider the situation: an autonomous vehicle moves at a considerable speed and detects a group of pedestrians crossing the road unexpectedly; the potentially fatal run-over cannot be avoided without the vehicle deciding to leave the road, eventually running over a pedestrian who walks on the sidewalk. What should the vehicle's decision be:

- (1) go forward, running over pedestrians on the road, or to deviate, running over the pedestrian on the sidewalk?
- (2) leaving the road, eventually sacrificing the life of its occupant(s), or moving on, running over the pedestrians that got in its way?

These types of dilemmas have been explored in the moral machine project[1] that was created to explore moral dilemmas that are faced by autonomous vehicles. The online platform presents moral dilemmas to users that must choose between two potential bad outcomes, such as killing three passengers in the autonomous car or killing three pedestrians. This platform has been used to gather millions of decisions in ten different languages and 233 countries. The data shows that people prefer sparing humans to animals, and sparing more and young lives (Awad et al. 2018). This study is important as it gives data to policy-makers for how to deal with situations where machines may have to decide who should live or die.

The issue of the ethics of decision-making by robotic systems begun to be seriously addressed by some countries and organisations in the world, starting from the document produced by the British Standards Institute in 2016, with guidelines on ethical rules to be followed in the design of robot systems by managers and designers (BSI Standards Institution 2016). Similarly the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems ("The IEEE Global Initiative") produced the Ethically Aligned Design[2] document that provides guidance to developers, governments, businesses, and the public, to how to deal, design, use and establish rules for advancement of autonomous systems that contribute to the society.

In the last few years the High-Level Expert Group on AI (AI HLEG) from the European Commission has issued a set of ethics guidelines for achieving trustworthy AI. Obviously, as we deal with autonomous robots, which are endowed with different AI algorithms used for their functioning, these guidelines may also apply. We can therefore extrapolate such guidelines to intelligent robots: (1) **Human**

[1] See https://www.moralmachine.net/.

[2] See https://ethicsinaction.ieee.org/.

**Agency and Oversight-** robots and robot systems should respect human agency and support oversight of their execution; (2) **Technical Robustness and Safety-** robots should be robust and safe as they interact with humans and in our society; (3) **Privacy and Data Governance-** robots should follow the established privacy rules and data governance mechanisms; (4) **Transparency-** robots should be transparent when making decisions, and about their capabilities, making clear why certain decision is the appropriate; (5) **Diversity, Non-discrimination and Fairness-** Robots should respect not discriminate nor cause discrimination, and guarantee fairness in their decisions; (6) **Environmental and Societal well-being-** robots should foster societal well-being and contribute to a better society and environment; (7) **Accountability-** a clear accountability process and eco-system should be in place and followed by robot manufacturers, guaranteeing that when problems occur the process can be triggered.

Adopting theses guidelines, has lead to the field of Responsible Robotics that deals with ”the responsible design, development, use, implementation, and regulation of robotics in society” (van Wynsberghe and Sharkey 2020). In particular medical and healthcare robots raise particularly relevant ethical problems. Robots began to enter hospitals in very different ways. The best known and probably the most impactful to date are robots that support surgeons in performing surgeries, increasing accuracy and filtering out unavoidable tremors even in the best specialists. But for some years now, mobile robots have been transporting meals, medicines and various instruments between hospital areas, freeing up medical and nursing staff to carry out tasks that are closer to patients. There are more recent examples, still in an embryonic state, of robots that interact with the elderly and children, seeking to improve their clinical condition by encouraging exercise or performing interactive games, respectively.

There are also other measures taken to address some of these ethical issues, that question the role of the robots, and foster the development of “collaborative robots”. The main idea is that instead of replacing workers by machines in carrying out tasks that require deep professional knowledge and experience, focus on tasks where the robot can free the doctors and nurses to focus on their main activities. Examples of these are robots that transport meals and medicine to rooms of an hospital, robots that provide remote access to highly contagious patients, or robots that provide assistance to patients not requiring the more affectionate presence of humans.

## *4.2 Social Issues*

The massive introduction of robots into society may contribute to the society not only in positive terms, but also by its impact on employment, self-esteem and/or human behaviour. The controversy raised by the replacement of humans by machines in work activities are not new, and are not restricted to the loss of jobs, which, in fact, did not happen, in past situations. In 1821, at the peak of the industrial revolution, the economist David Ricardo claimed that the introduction of machines would being harmful to the interests of the working classes, namely because the wealth created benefited above all those who lived on capital income. Yet, past automation has improved the living conditions of the societies in which it has been installed, and has provided better paid, less inhumane and less dangerous jobs.

Thus, the question one should pose is whether the current revolution will be different. The international press has come forward with the most terrifying estimates about the consequences of the robotization of society. According to a 2013 study by Carl B. Frey and Michael Osborne of the University of Oxford, 47% of US jobs would be at risk of being replaced by "computer capital" (Frey and Osborne 2013). A more recent study by Merrill Lynch predicts that, by 2025, the annual impact of "creative disruption" resulting from Artificial Intelligence could reach 14–33 billion (billions of dollars), including a reduction of $9M in knowledge-based employment costs, replaced by machines; $8M in manufacturing and healthcare; $2M resulting from the use of autonomous vehicles and drones (Lynch 2015).

The key issue underlying all these numbers is that they essentially result from developments in intelligent autonomous agents that are not "embodied" and do not interact with the surrounding world except through a computer keyboard and monitor. This predictions can be appreciated given the current situation with increase use of smartphones, or Internet search agents (e.g., Google, travel agencies), or recommender systems, showing that Artificial Intelligence (AI) is rapidly putting many jobs at risk—a transformation that, according to McKinsey Global Institute, occurs ten times faster, and on a scale three hundred times the past. But the problem would be bigger if the same were to happen with Robotics, since retraining workers specialized in physical tasks, not intensive in knowledge, can be much more complicated, especially at the rate of change at which the changes take place. Yet, it turns out that the technological development of Robotics, despite many recent advances, is incomparably harder, smaller, and even autonomous vehicles, which are promising a dazzling appearance, will take many years to completely replace driver-driven vehicles—e.g., as evidenced by an infamous fatal accident in the US with a Tesla car on autopilot, resulting from the overconfidence of the driver and the manufacturing company. The situation is even more glaring when we talk about robots that help in household tasks, or in hospitals, in agriculture or even in modern factories, more flexible and with less repetitive work. Not only are these far from being autonomous, but many are built to collaborate with humans.

We are, therefore, considering two different realities, despite normally witnessing an association between Robotics (embodied AI) and AI (dis-embodied). However, in either case there are concerns and risks to be carefully considered. The benefits brought by automation cannot make us give up on finding other occupations and jobs for those who lose their current ones—such as creative occupations or the maintenance and production of robots. And they should not divert us from social concerns that deserve the attention of public policies, that can even pass through the creation of mandatory minimum income, and legislation that forces companies that become less dependent on human work to (1) retrain or relocate their workers and/or (2) pay taxes and social security contributions proportional to the creation of wealth resulting from the incorporation of robots and AI technologies in their production. Above all, and going back to the concerns of some economists during the industrial revolution, we as a society should not allow that the greater wealth generated by this technology remains in the hands of very few, namely those of the companies that own the technology. The risk of this happening if we do not act is disproportionately greater today than it was in the nineteenth century.

## *4.3 Legal Issues*

Reflection on the ethics of decision-making often leads to discussions on legal issues, namely on how (and to whom) to assign legal responsibility for such decisions. Questions such as who is legally liable by an autonomous robot actions? How far can a surveillance robot go without interfering with citizens security and/or privacy? How is intellectual property protected regarding inventions performed with the help of agents or robots? Furthermore, if 1 day robots are to be confused with humans, or animals, in the sense of having their own identity, should their rights also be protected?

The European Commission has been at the forefront of regulation, with the new proposal for an EU regulatory framework on artificial intelligence (AI) launched in April 2021.[3] The proposed legal framework focuses on the specific utilisation of AI systems and associated risks, focusing primarily on guaranteeing trustworthiness in the process of creating and delivering intelligent systems. In spite of being a first and admirable attempt to making sure that AI is used in a way that companies and users can trust, some aspects related with embodiment, and thus, intelligent robots, are left untouched. Furthermore, these new regulations may raise other problems, because it is not clear who would be responsible for implementing the laws and guaranteeing the compliance with them. Common sense may indicate that the laws and guidelines are aimed at robot designers, producers and operators, but given the robot's autonomy shouldn't it be endowed with the capacity for self-awareness so that, evaluating the situation, decides by itself to apply or not all the other rules that determine its operation? We should not forget that robots can be initially deployed with capabilities that improve over time. So, issues related with the ethics of robot systems that interact with humans, point towards attributing a level of legal responsibility for a potential accident, and for the damage caused by it, in proportion to the amount of instructions initially programmed in the robot versus the amount of autonomy acquired by learning, already without the direct intervention of its programmer. In this way, an intelligent autonomous robot with more years of experience and, during which it learned new behaviours and actions, would assume greater legal responsibilities. Yet, evaluating the autonomy ratio taught by

[3] See https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0206&from=EN.

the designer in relation to that learned by the robot is certainly difficult, and a more pragmatic alternative would be to introduce mandatory insurance, or as proposed by the EU, making sure that decisions taken are transparent and can be inspected by external entities. We agree that a legal framework such as what is proposed by the EU, embracing the current technology to guarantee its proper, sound and positive use in our society is very important. Yet, we should not exaggerate in the regulation, because autonomous robots are still in its infancy, and legalizing it creation and use too soon may dampen the innovation and compromise the potential social benefits that they can bring, not too mention leaving other regions of the globe in an unfair advantage in what concerns research and innovation.

## 5 Conclusions

In 1939, the visionary Russian/American writer Isaac Asimov, in his book *I, Robot*, established the so-called Three Laws of Robotics: Law 1- robot cannot harm a human being or, through inaction, allow a human being to come to harm; Law 2- robot must obey orders given to it by human beings except in cases where such orders conflict with 1; and Law 3- a robot must protect its own existence as long as such protection does not conflict with 1. or 2. In spite of the simplicity of these laws, Asimov was able to produce many entertaining and well thought dilemmas exploring the difficulty that we have in introducing autonomous machines into our society. Indeed, this is a difficult problem, and in here we briefly show just a tip of the iceberg. AI and robotics will certainly change the way we live and function in society. One day our descendants will wonder about how it was possible to have cars driven by humans with all the risks that that entailed; or why it was necessary for a worker to make a superhuman effort to carry excessive weights that were harmful to his/her health). We believe that AI and its use in Robotics for creating intelligent and autonomous robots will be a driver for a societal change that will contribute for better, more human, more sustainable and healthier societies.

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