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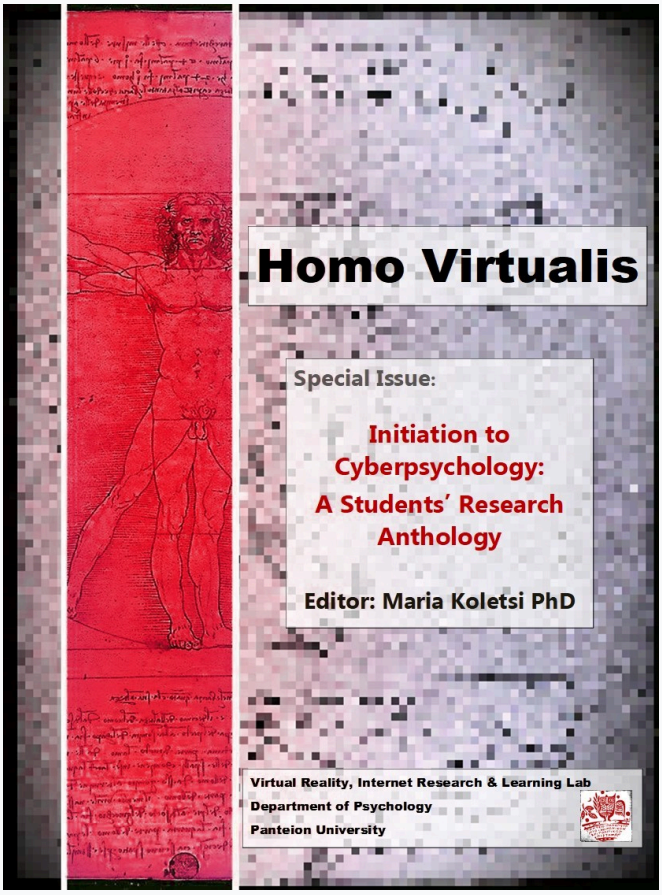

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Social Robots: The Case of Robot Sophia

Nikolaos Kouravanas[1] & Andreas Pavlopoulos[2]

Abstract: In recent years there has been an increasing use of robots in various areas of public and private life. This leads to a set of ethical, social and interpersonal dilemmas. The subject of this paper concerns attitudes towards social robots, starting with the issue of citizenship and moving on to the roles that can be attributed to a robot with Artificial Intelligence. A central example was the social robot Sophia, which has artificial intelligence, and it has been given to it a citizenship. In order to investigate the issue, a literature review of previous research articles related to social robots was initially conducted. An attitudes' questionnaire was then constructed, to which 137 participants answered. The results showed that, the majority of the sample did not want robots to acquire citizenship and equal rights as humans, nor did they want robots to be used for roles involved in interpersonal relationships, such as raising children, work, friendship, or love. In general, it has been observed that the research sample was not particularly prepared for the existence of social robots in society, while they have been associated with negative or malicious purposes. Gender and age also play an important role regarding attitudes towards social robots. However, this is an open issue that leaves much more unanswered questions and concerns.

Keywords: social robots; artificial intelligence; citizenship; cyber-psychology

Introduction

The interaction with the new Artificial Intelligence opens new horizons for the design. The technological advances in this field enable the user to have increased human influences with non-human constructions. This is a breakthrough in the emergence of companionship and help from the rise of chatbots (human computer software), as well as social robots. Hence many questions arise, such as how does Artificial Intelligence

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transform objects and spaces as well as ways of interacting? How can design give meaning and form to Artificial Intelligence when incorporated into products? How does the aesthetics and experience of objects change, through Artificial Intelligence at home, at work, in public places? How is the influence on individual and social evaluations explored, as well as in the copy of the design process and the user experience? (Colombo et al., 2019). In the context of this specific topic's investigation, we need to take into consideration the development of contemporary capitalism, which has led to the expropriation of various aspects of life and their transformation into commercial relations (Rifkin, 2001).

According to Tasis (2019), it is not possible to create an ethical Artificial Intelligence, as its algorithm will express the weaknesses of the ethical theory that will be used. It also refers to various issues that will arise such as ecological, since the widespread use of social robots will cause heat emissions, increased electricity consumption and therefore further pollution to the environment. What if the operation of the robots was considered from ecologically and economically aspect as unprofitable? What if artificial intelligence escaped the control of its creators or if it was impossible to correct a mistake in the original code that would have disastrous consequences for humanity?

So, an issue that is still in the form of negotiation, reflection and discussion is being studied. For Greece, this issue is interesting as most people has not met and has not yet interacted with a social robot or has not even thought about the usefulness of social robots in everyday life. Taking into consideration the first steps on this topic and given that technology is constantly evolving, and robots are now part of our society, we can say that the aim of this paper is to examine whether Greek society is ready for accepting and welcoming such controversial issues, starting with that of citizenship and moving on to the roles that could be assigned to a social robot. The research focuses on the study of the attitudes of adults in Greece towards social robots.

The work consists of two parts: the theoretical part presents a historical background of the evolution of robots and examines the relevant literature on citizenship and the role of social robots in modern society. The empirical part examines the attitudes of adults in Greece towards social robots.

Conceptual definitions

Robotics: "Robotics is the branch of science and technology where it deals with the design and the construction of robots. A robot is a machine capable of performing tasks that are normally performed by humans or animals. A robot may look like a human or an animal, but this is not necessary. It can be a mechanical hand or a wheeled vehicle. It can be of any size or shape" (Graham, 2004, p. 6).

Artificial intelligence: Intelligent robots differ from the rest because they decide for their own movements. This kind of their ability is based on a form of mechanical intelligence, called Artificial Intelligence (AI). The Artificial Intelligence is defined as the theory and development of computer systems that mimic the way the human brain

works (Graham, 2004; Oxford Dictionary, 2021). "Artificial Intelligence" (AI) was first formulated as a term at Dartmouth College in 1956, at a conference of researchers in Mathematics, Electronics and Psychology to study the possibilities of using computers to simulate human intelligence (McCarthy, Allen Newell, Herbert Simon and Marvin Minsky), in fact as a concept it had already appeared in 1950, in a study by Alan Turing (1912-1954), in which the famous English mathematician asked the question: 'Can machines think?' (Georgouli, 2015).

Algorithm: The term algorithm is attributed to the Persian-Arab mathematician Abu Ja'far Mohammed ibn Musa al Khowarizmi, who lived from 773 to 850 AD and wrote a study that is considered to be the first complete treatise on Algebra (Roth, 2006). "The Artificial intelligence (AI) is adapted through progressive learning algorithms to let data do the programming. The (AI) finds structure and regularity in the data so the algorithm acquires a skill: The algorithm sorts or categorizes" (SAS Global Forum, 2021, para. 14).

Cyberpsychology: "...cybernetics science studies the interconnections, manipulations and control of information in technical systems and living organisms (...) cyberpsychology considers that modern human beings, their relationships and the societies they create, have been mutated by the penetration of technology in everyday life and now they require different methodological tools to study (...) anything 'cyber-' characterizing the expansion (or even the shrinkage) of every physical object through its integration with electronic technology, thus suggesting a new dimension of human experience " (Davou, 2008, p. 21-23).

The robots' history

In this section it will be attempted a historical overview of the construction of robots, in order to be better understandable, by the reader, how the evolution of technology led to the social robot by the name Sophia. Thus, the first robot released on the market was a mechanical hand called "Unimate" and it was constructed by the "Unimation" company, whose founder was Dr. Joseph F. Engelberger in the USA, in the 1950s. The first 'Unimate' mechanical hands were used by the 'General Motors' automobile industry in New Jersey to extract hot casts from molds, a job that was perceived to be quite dangerous. Therefore, it was realized from a very early age that a key advantage of robots is that they can perform dangerous, dirty, or even boring tasks, such as moving things around a factory, even in human-dangerous environments, such as a nuclear reactor or great sea depths, etc. (Graham, 2004).

So, robots invaded the world of the automotive industry, and this field has since grown considerably, and thanks to the use of such robots as 'Unimate', it has become even more critical, especially from the early 1980s onwards. For example, the Japanese car industry has managed to become strategically competitive through the widespread use of this robotic technology in its factories, substantially reducing production costs and increasing the overall quality of the cars produced. This trend continued until the early 2000s, when some considered robotics to be heavily dependent on the

automotive industry. In fact, at the 2005 World Robotics Report of the Economic Commission for Europe and the International Robotics Federation, Åke Madesäter posed this risk: that the Spanish car industry in 1997-2003 received 70% of all new robot installations. In France, the United Kingdom and Germany, the rates were 68%, 64% and 57% respectively. The UN report states that at the same time the field of robotics expanded and transformed into a "revolution" according to many theoretical scholars (Pagallo, 2018).

The understanding of the importance of the 'Unimate' robot had such an impact that in 1988 the Danbury Hospital in Connecticut was the first to use a robot called the "HelpMate", which had the ability to move in corridors and booths or offices of the hospital, even using elevators, to carry up to 100 kg of medicine, food, or documents inside the hospital. In addition to activating the elevators, 'HelpMate' had a navigation software to avoid obstacles and not getting lost, as well as detectors and sensors, with which it could detect people and ask them to step aside so as not to obstruct its passage (Gasparetto & Scalera, 2019; Graham, 2004).

From the artificial help hand, the "Unimate" and "HelpMate", the robots will pass easily and quickly in the field of so-called robotic medicine, where in Germany the Fraunhofer Institute constructed a robot called "Care-O-Bot" to help the elderly individuals or individuals with a weakness or inability to self-care (Gasparetto & Scalera, 2019; Graham, 2004).

Since then, 'robotic – surgeons' have been involved in medical operations such as the so-called 'Robodoc', which has been involved in more than 8,000 hip replacement surgeries, provided it had the ability to drill holes in the bones much more accurately than humans, ensuring better fit for artificial joint that would be placed with a greater functionality, as well. A similar robot was the "Pathfinder" which was designed for tumor sampling and implantation of electrodes with great precision in the patient's brain. A notable case of a medical robot was that made in France, and it was so small that after being swallowed by the patient, it had the ability to move inside the body, with a tiny wheel to measure the length of the abdomen. Along the way it could take a sample of fluid or tissue using a scalpel or other tool to perform surgery at the appropriate site where the problem exists or even release a dose of medication (Deacon et al., 2010; Graham, 2004; Spencer, 1996; Wei & Fei, 2020).

A similar robot was created by German scientists in 1999, where an even smaller robot, as thin as a matchstick, with its three parts, pushing and pulling one part after another, could move and work in blood vessels (Graham, 2004). Alex Zivanovic, along with other scientists from the Imperial College of London, designed a robot that was able to examine the human's hand and receive blood sampling more reliably and efficiently compared to humans (Graham, 2004).

In addition, besides the field of medicine, robots were used to explore space, such as 'Skyworker', which was designed to help build and repair space stations and carry loads

of 1,000 times heavier than itself. Also, respectively, 'Hyperion', which had the ability to orient itself to the surface of a distant planet and monitoring the position of the Sun (Graham, 2004; Staritz et al., 2001).

From space, the robots will move into the urban environment, such as the 'urban robot' or 'Urbie', which is a small military robot that performs espionage missions in the cities. Apparently, robots had to be tested in all environments, even on the ocean floor, such as submarine vehicles (AUV), in order to collect lava flow information for long periods of time (up to one year), the physical characteristics of the seabed and record them (Cook et al., 2014· Graham, 2004; Vysin & Knoflicek, 2003).

The use of unmanned vehicles (UUVs) for work and exploration of remote areas on the sea surface became widespread, as well as underwater robots for the repair of pipelines, oil rig and so forth. Such robots developed even more from the mid - 1990s onwards. Unmanned aerial vehicles of type (UAV) or systems (UAS) changed the military landscape in the mid - 2000s. The road to the advent and use of motor cars was slowly paved, with the Nevada governor signing a relevant bill in 2011 for the circulation of cars without the need of a driver on public roads. The example of Nevada was followed by other states of USA (Chen, 2010; Pagallo, 2018).

Speaking above about robots that move on the surface of the sea or its bottom, it is worth mentioning that robots have been designed occasionally to mimic living organisms, such as insects, snakes, worms, fish, etc. The first robot fish was designed in 1994 at the Massachusetts Institute of Technology in the United States. Some robots modify their shape depending on the terrain, so that they move everywhere, while some are even more sophisticated, since they imitate living organisms by consuming sugar which they convert into electricity. Thus, the first "gastro robot" was created at the University of South Florida, in Tampa, USA (Graham, 2004).

Progress continues with the design of various robots, such as micro-robots and nano-robots used primarily in medicine, as we saw earlier. Medicine is generally offered as a branch for the development of robotics with the research in artificial limbs and prosthetics, muscle-electronics and robotic muscles. From the artificial limbs, it was so natural, for the next step to come, and move forward to make the so-called android or humanoid robots, i.e., robots that in their external form look like humans, since they have legs, arms, torso, head, eyes and so on. Androids use Artificial Intelligence and some of the human senses such as sight, hearing, etc., just like the 'Cog' robot which was designed at the US Institute of Technology in 1993 and it was equipped with the senses of touch, hearing, sight and speech. Additionally, the 'Cog' robot, is the first social robot that has Artificial Intelligence and could think, having the mental ability of a two-year-old child, to imitate the man and perform tasks learning from its mistakes (Brooks et al., 1998; Freedman, 1994; Graham, 2004). From then on, various robots are designed around the world for various purposes and Artificial Intelligence in androids is a challenge, but also from what it seems, a one-way street. Let us now present you

the robot Sophia, which, as we shall see, is a milestone in the history of robots, as it is the first one to have been granted citizenship by a state.

The social robot Sophia

The humanoid robot named Sophia is the first robot in history to receive full citizenship of a country, Saudi Arabia. The robot Sophia was constructed by Hanson Robotics, headed by AI (Artificial Intelligence) programmer David Hanson. The robot Sophia had once said that "she" would destroy humans, but since then "she" has reconstructed by stating that "she" wants to live peacefully among humans. David Hanson, who is a former Disney Imagineer (a person who invents and implements a new or extremely imaginative idea or technology, especially that person who invents attractions in Walt Disney theme parks) designed the robot Sophia with the intention of offering services as a personal assistant for the elderly, but also to serve the general public at important events or parks. Hanson told Business Insider (Weller, 2017) that the robot Sophia was designed to be able to understand people and really care about them. He wants people to communicate with the robot Sophia just as they would talk and interact with a friend. He hopes that the robot can perceive the social world as it perceives the physical world. A complex set of engines and gears allow Sophia a range of facial expressions, while "her" speech, although it has made significant progress, is still a bit harsh in casual conversations (Rocha, 2018; Saplacan & Herstad, 2019).

Certainly, the robot Sophia, has a machine learning software storing parts of the conversation, thus trying to understand the flow of the conversation and generate answers in real time. What Hanson attempted was the robot Sophia to mimic "the human capacity for love, empathy, anger, jealousy and a sense of life". It aimed to provide answers to questions such as: "What is life?", "What is intelligence?", "What is consciousness?" (Weller, 2017, para. 17). However, the robot Sophia currently exhibits limited emotions, such as happiness or about happiness. "She" can also raise "her" eyebrows and look frowned to show sadness or "she" can even grit "her" teeth to show anger. "She" has become the favorite robot of the media and has given countless interviews, sung in concert, and has been the cover of one of the leading fashion magazines. Hanson intends to add other similar robots that will be the family of the robot Sophia, and maybe eventually they become a society. However, the robot Sophia, as the only one of its kind, is not for sale. Jeanne Lim, the head of marketing for Hanson Robotics, told Business Insider that the company believes that robots which look alive are the future and that the era of living androids has come (Weller, 2017).

It is also worth noting that in October of 2017 the social robot Sophia was the first to receive citizenship from Saudi Arabia and a month later this act was designated as the first "innovation champion" of the United Nations Development Program. The great thing is that this title was first given to a non-human. Also in February of 2017, the European Parliament approved a proposal, where the EU institution calls on the European Commission to consider the legal implications of the use of such robots as Sophia and to propose solutions. However, it is not clear whether the European

Parliament's proposal on the "status of electronic persons" refers to the full legal personality of robots as suitable legal "persons" or whether it concerns their legal liability in relation to contracts and business law or both. Nevertheless, we would say that certainly the actions of the E.U. show the certainty that social robots will preoccupy, in the future, the form and organization that our societies will have (Pagallo, 2018).

The Overview of Research on Social Robots

The emergence of the Artificial Intelligence and that of social robots is a challenge for young engineers, as there is a connection to the urban spaces, objects and people with whom robots will interact. Emerging technology requires engineers to equip themselves with new ethical dilemmas, as the key question is how algorithmic decision making will affect user experience and behavior. We should therefore be concerned with how these increasingly intelligent and self-governing systems, which are increasingly being integrated into society, will have long-term effects (Colombo et al., 2019). In addition, Lupetti and Cila (2019) point out that besides the social, political and ethical consequences, there are also some technical and legal challenges to the design of urban centers.

Through an experiential workshop conducted by Lupetti and Cila (2019), were explored scenarios of coexistence between humans and autonomous robots moving in the city, which robots were considered as members of the community with rights and responsibilities. Some of the services that the robots would provide were related to delivery or surveillance. The potential practical benefits of robot services were, on the one hand, more personal distribution services or a reduction in the risk of violence, crime rate and police budget. On the other hand, there has been growing concern about privacy, that is, whether robots should be aware of the contents of the packages they would carry. Some people thought that they should know, especially if the package contains alcohol, so that it is not picked up by a minor. There have also been many ethical concerns about the surveillance scenario, such as the possibility of misjudgment and misrepresentation due to incorrect data analysis algorithms or people abusing the robots and deliberately blaming someone for personal differences or even in cases a robot is hacked.

Another very important issue that arose was the possible unpredictable malfunction, as the presence of robots on the sidewalks and roads could cause collisions with pedestrians or vehicles. Therefore, the city will have to change the layout of the buildings and its natural urban environment in general, for their more efficient and safer mobility. Other issues relate to human-robot relationships, such as robbery or vandalism. Finally, a serious issue was also that of who would decide which data would be collected, the purposes for which this data would be processed, and which security measures would be taken as the necessary ones (Lupetti & Cila, 2019).

In this research the robot citizenship is proposed as a perspective for planning and monitoring the sociability of human-robot interactions in the near future. An attempt

is made to understand the citizenship that underlines the social implications of the concept and the possibilities it gives us in order to reconsider how to approach the design of robots in practice. Humanoid robots, just like Sophia, have been the subject of controversy over citizenship and are therefore considered in the light of civil law rules on robotics, such as the European Parliament resolution. But also, in other cases, such as the extensive and uncontrolled presence of robots - distributors in San Francisco, where eventually the mobility of these robots in the city was restricted by strict regulations, while in the state of Arizona, the same rules and the same rights were decided for both pedestrians and robots. These concerns and decisions lead to the obligation to re-examine future urban environments in terms of the involvement of humans and robots. Therefore, the main issue to be considered is whether some robots will acquire Artificial Intelligence and evolve to such an extent that they will be practically indistinguishable from humans in terms of cognitive abilities, emotions, self-knowledge and they will be able to acquire the right to citizenship (Lupetti et al., 2019).

It is worth noting that there are some legal precedents where the same rights as those of humans were granted to non-human beings, such as the Whanganui River in New Zealand, the Ganges and Yamuna River in India and Lake Erie in the USA. Forlano explains that "by granting legal rights to the river, crimes against the tribe can be avoided, as long as the river is a member and as an ancestor can contribute to the well-being of the community" (Forlano, 2017, as cited in Lupetti et al., 2019, p. 88). If we go back in history, we will see that even some groups of people were not legal entities, such as the slaves who were not considered by the state as normal people according to ancient Roman Law which is still partially valid in business Law (Pagallo, 2018).

The issue should probably be approached in the light of a socio-relational perspective where ethics should not be perceived as an inherent, but rather as an external quality. In other words, the robot should not be treated as an ethical factor, but as an object of ethical examination considering the ethics of its relationships within a social context. The attribution of citizenship to robots should not be based on the question of whether robots are like us, humans, or if they help us, but if they are part of us. This is a question posed by Marx and Tiefensee (2015), in their research on the citizenship of sophisticated robots as well as by Kymlicka and Donaldson (2014), in their research on the citizenship of pets. Besides the rights and obligations, to qualify as a citizen, one must be engaged in interdependent relationships aimed at collective well-being (Lupetti et al., 2019). Kymlicka and Donaldson (2014) argue on the need for pets to have citizenship in order to be treated as fellow citizens, while Marx and Tiefensee (2015) disagree with animals' citizenship and point out that this should be our concern when it comes to robots, as they acquire more and more abilities and especially cognitive abilities that resemble those of humans and surpass those of animals.

So, we can see that interest has shifted from technical concerns and challenges to social and ethical ones. The issue of robot citizenship lends itself to a constructive and

ongoing debate about how there will be remarkable future collaborations between humans and computing artifacts. At this point, it is worth underling the view of Coeckelberg (2010, 2012), who argues that the so-called "apparent features" should not be taken for granted as ethically appropriate, as the concept of appropriateness is socially constructed and the interaction with other entities should also be considered, and this does not necessarily mean that the characteristics of the robots do not matter. Designers simply need to consider how these features are perceived by humans. More specifically, designers face the following challenges: 1) the need to adapt social robots to urban infrastructure and social norms, 2) to maintain safe distances, to properly navigate and to deal with the unpredictable behaviors of other entities, 3) the possible difficulty of robots being understood by humans and the possible wrong judgment or provoking negative emotions, 4) dealing with malicious actions towards robots such as hacking and bullying (Lupetti et al., 2019).

The approach towards robots is proximal to take them as members of the society rather than as machines - tools. Similar questions to the ones above are the following: What if a robot needs help to cross a road? Would anyone care to provide help? What if, despite the "apparent features", some people still perceive robots as obstacles, as a burden, or even as competitive? The latter question is not as simple as it seems, as it will have to be discussed and decided which utilities and which roles are desired by robots. Still, should there be a public debate or a referendum on such decisions to be made? And if so, what will happen if this debate provokes more conflict than consensus? (Lupetti & Cila, 2019).

We understand that the robot Sophia is a pioneer of general reflection, as except the sixty-two facial expressions, "she" also has blue eyes and Artificial Intelligence. Researchers have developed an advanced humanoid robot that humans may want to marry in the future. Such an event admittedly poses some serious challenges to lawmakers on matters relating to family law, such as whether child custody could be granted to these social robots or whether they could access the family bank accounts. This kind of future challenges is currently a very interesting thought experiment (Ryznar, 2019).

According to David Levy (2009, 2016), who is a computer expert, as technology continues to grow rapidly, it is estimated that by 2050 it will be more likely that humans will fall in love with robots, marry them, have sex with them and consider them as more attractive potential partners than people with whom they will have difficulty marrying or staying in marriage. In other words, it is believed that if future robots are designed with even more potential, such as being able to cook, do the vacuum cleaning and keep company, then they will embody exactly what humans want their future spouses to have. A future like this will give us the opportunity to reconsider the concept of family law and its application in a rapidly changing world. Of course, today the marriage between a human and a robot seems like a science fiction scenario, just as in

the past one would never think that contacts would be made through social media such as Facebook, Instagram, Tweeter etc.

Additionally, some years ago it was hard to believe that robots would have such a presence in society as for example in the sections of health care for the elderly, in home hospitalization, in service areas or in work environments. After all, sex dolls are already in use and robots have already begun to feed the market for sexual gratification. This facilitates the marriage of robots, and according to Levy (2009) who is the leading artificial intelligence expert, robots will soon meet the human need for companionship, especially when the robots are not so mechanical, but they will look like humans. However, at this point the question that could be asked is this: is emotional involvement with social robots feasible and real on the part of humans, but on the part of robots it is misleading and not true? Since social robots are constructed in such a way that their Artificial Intelligence currently recognizes patterns and responds to them, there is no authentic emotional response (Levy, 2009, 2016; Ryznar, 2019).

Since the decade of 1950, the Turing Test measures the ability of a machine to exhibit intelligent behavior that is indistinguishable from that of humans. The robot passes the test when it cannot be perceived whether the one responding to a written communication is a robot or a human. The first robot to pass the test was in 2014, where the robot pretended to be a Ukrainian teenager. So, the question is whether and to what extent it will come the day when a robot in the Turing Test reaches a certain level of age, could acquire the appropriateness to marry a human. Perhaps, the question is not whether the marriage between a robot and a human being concerns the rights of solely the robot or solely the human or both, but eventually if the robot one day demands to be treated as an individual and not as a property (Ryznar, 2019).

A number of serious legal issues and questions arise such as what will happen in the case of a divorce? Whether there will be an alimony, whether after the divorce the children will be able to visit the robot (parent) or vice versa and if they are emotionally attached and want to continue the relationship, who will finally take care of the children? Also, will the robot be able to adopt a child? To make matters worse, if the children are replaced by a "child-robot", then a copy of the child-robot will be given to the other parent? (Ryznar, 2019).

Social robots have been used in education with a teaching mission promoting metacognitive skills such as curiosity and a developmental mindset. Compared to tablets and screens, they have been shown to offer more learning benefits, evoking more emotional expressions. They have also been used to teach mathematics, languages and even the field of nutrition. In addition, social robots have been used as lecturers, for “one-on-one” interaction or even for a “two-person” dialogue, as they facilitate the learning process by introducing tests, managing time and encouraging discussion. The possible interaction roles of robots such as small groups of children or the elderly were also examined. All these developments gradually introduced social robots in the educational system, but also in homes. Overall, students perceived robots

as positive, friendly, and communicative, while compared to a human-trainer, they considered them more objective, efficient and accurate in terms of time management (Rosenberg-Kima et al., 2020).

Other studies focused on preschool children, adolescents, and children with autism. In school children through a systematic literature review, it was found that robots can be used to teach young students language skills, because of their ability to interact socially. Therefore, robots can help children develop oral language skills as they interact effectively (Hein & Nathan-Roberts, 2018). Social robots have particularly extensive capabilities, so they can increase their attention as well as engage children in activities by telling stories with emotion, visual perception, and sequencing. Children also showed an improvement in positive social skills by a long-term usage of a social robot at home (Scassellati et al., 2018).

Pfeifer and Lugrin (2018) highlighted the role of robots in education. They showed that a "female" robot can lead schoolgirls to learn better, thus dissolving stereotypes. Groups of four students conducted a group activity, followed the instructions of a robot facilitator, discussed the material, and then answered questionnaires about the interaction. The "Godspeed" questionnaire was used to measure attitudes towards the robot. It has been found that social robots can be used to shape social beliefs and minimize stereotypes, ensuring a motivating and interactive learning environment.

A study conducted in Italy examined the perceptions towards robots in society due to the growing use of robotics in all European countries and it has found that Italians' attitudes and expectations towards robots were complex, multidimensional, and opposite. There were those who have a positive attitude towards robots and positively evaluate the growing presence of robots in society, while on the other hand there were those who are afraid of the speed with which robots grow in the society.

Robots are designed to interact with humans, and this is considered as a part of a wider system influenced by social, cultural, and environmental factors, where the acting persons have different expectations and needs. Furthermore, the issue of robots has been found to be associated with a set of myths and distortions that do not correspond to reality (Operto, 2019).

In addition, women generally showed higher levels of confidence in the possibility that robots could save them time through repetitive activities. Time was an important variable as it was associated with the psychological well-being and the women who covered most of the household routines needed to reserve time. However, young women compared to men expressed fear that robots could restrict human freedom and were concerned about the impact of robots on education and assistance providing. The young men also expressed concern about losing their jobs and their possible replacement by computers. Opponents of robots have expressed more intensive concerns about ethical and regulatory issues, such as the possibility that robots could be used to harm humans depending on their designers. Gender and age

were found to be two important variables associated with the emergence of social roles. The research concludes that the perception of robots depends on the broader context of human relationships, cultural and social factors and those who have different expectations and needs (Operto, 2019).

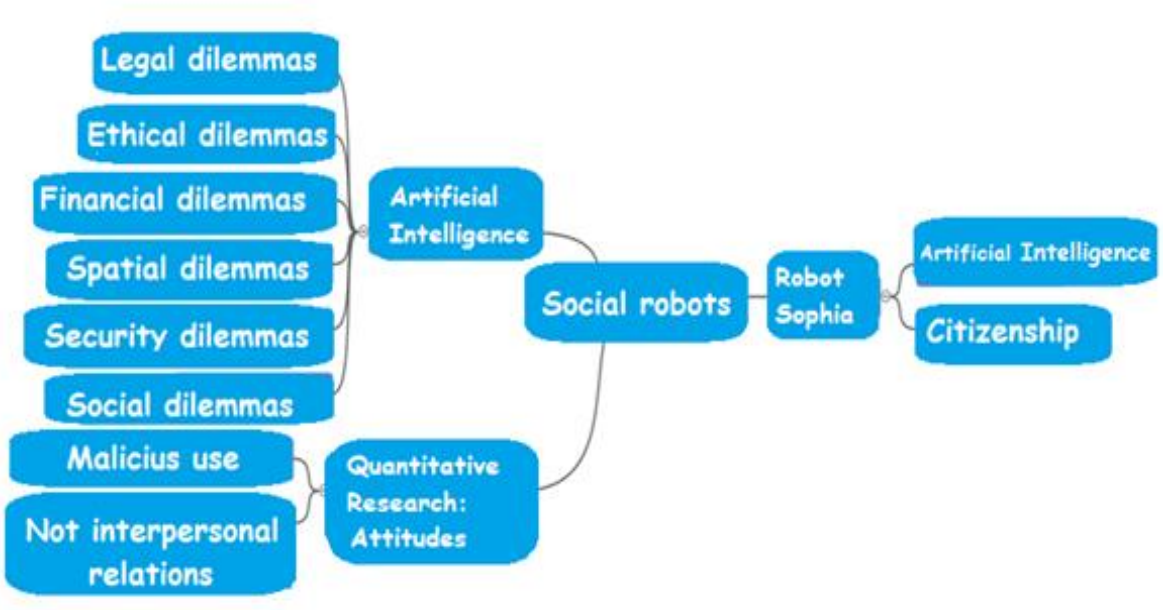
Differentiation is observed between evaluating robots by people who have already interacted with robots and evaluating and accepting robots by people who have not previously interacted with robots. There is also confusion about the results because of the different types of robots and because of their basic purpose of their construction. There is a set of questionnaires about the evaluation of social robots, which examine both their specific applications and the general attitudes of humans towards them (Krageloh et al., 2019). The issue is still in the first steps of its study and social attitudes are being shaped.

Research Questions

Whether individuals have a positive attitude towards robots in acquiring citizenship (equal rights and obligations to the state).

Whether the choice for the robots to acquire citizenship is corelated to the presence of robots in various roles and relationships (work, social, interpersonal).

Map 1. Mind maps for basic concepts



Methodology

Participants

The sample that answered the questionnaire consisted of 137 people, of which 74% were women and 26% were men. The age of the sample ranged from 18- 65 years, with the majority of the sample covering the ages of 18-30 years (37%), followed by the ages 41-50 years (30%) and the ages 31-40 years (23 %). The educational level of the sample covers all levels of education, from primary to tertiary. The majority of the sample (58%) had graduated from a University or a Postgraduate program (31%). In terms of occupation, 26% were private employees, 25.5% were civil servants, 18% were self-employed, 17.5% were students and 12% were unemployed. Finally, 79% lived in Athens and 21% in the province. In detail, the demographics of the sample are shown in the graphs that follow.

Demographics

Figure 1. Frequencies (%) for the gender of the sample

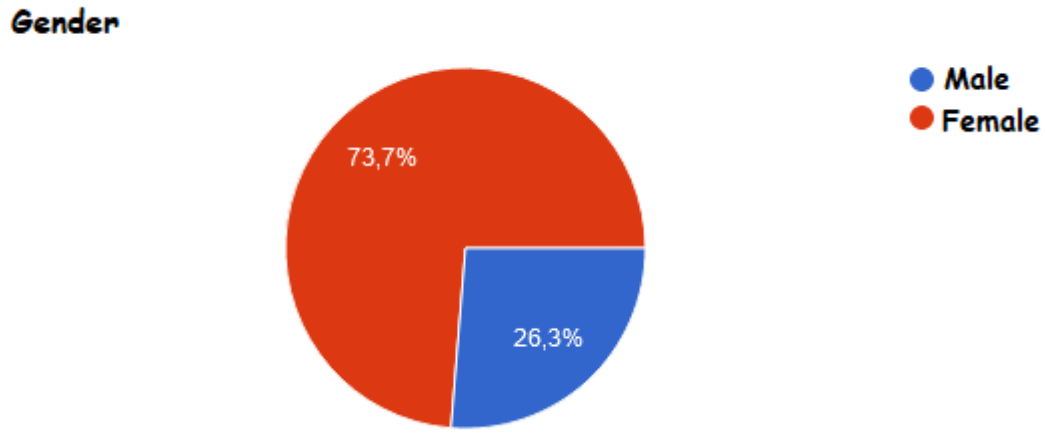


Figure 2. Frequencies (%) for the age of the sample

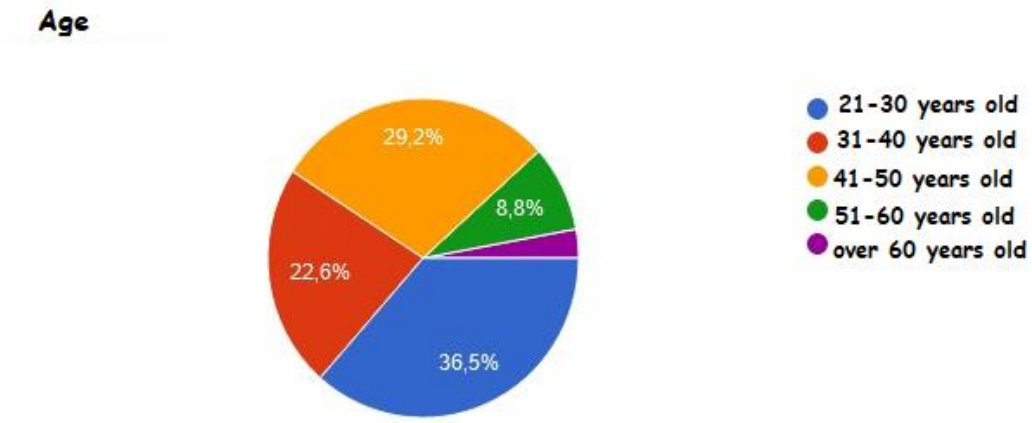


Figure 3. Frequencies (%) for the education of the sample

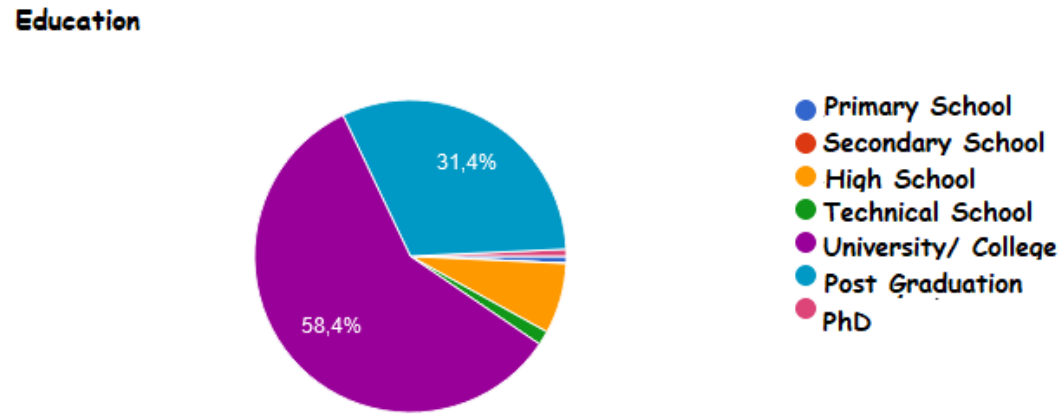


Figure 4. Frequencies (%) for the profession of the sample

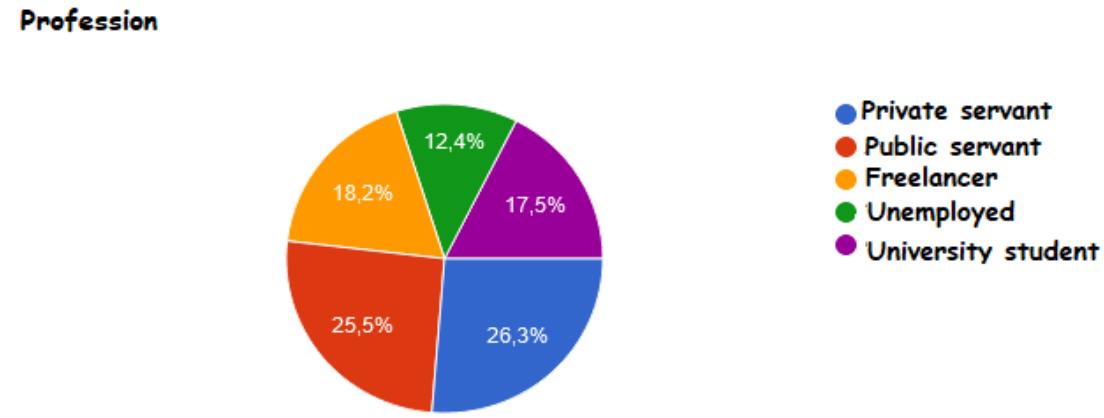
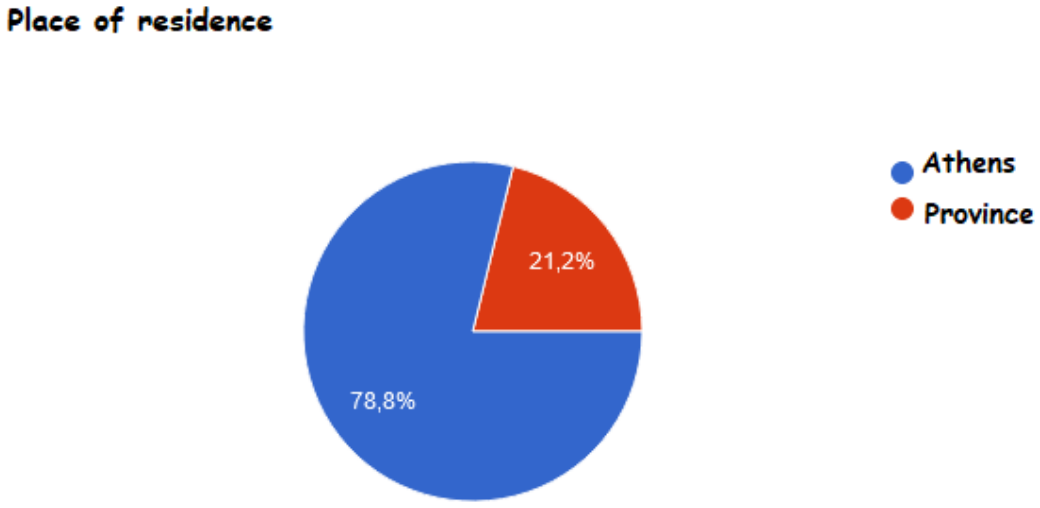


Figure 5. Frequencies (%) for the place of residence of the sample



Questionnaire

The questionnaire was designed to examine the attitudes of men and women, aged 18-65, about social robots (robots with Artificial Intelligence). For the selection of the sentences - statements, the literature review carried out on the specific topic and mainly questions that arose regarding the existence of social robots in the society were used.

The questionnaire was created electronically, using the Google Forms program, and initially it included instructions for completing it. On the first page, reference was made to the research department, the names of the researchers and the research supervisor, as well as to whom it is addressed. Participants were also informed that the research was voluntary and anonymous, also that it had a very short duration. This was followed by 14 sentences - statements and the answers were given through a seven-point Likert scale, where 1 corresponded to "strongly disagree" and 7 to "strongly agree". The middle answer covered the option "neither agree nor disagree".

The statements were based on the section of robots' history but also on the section of the research's overview on social robots. Thus, the first declaration (citizenship and equal rights) was considered of paramount importance, as the citizenship given to the robot Sophia paves the way for other countries to follow suit. Statements about whether stealing people's jobs and do dangerous jobs are directly related to the first robots we saw that were used to replace humans in dangerous work environments. For statements about raising children, working as teachers, as principals, or as domestic helpers, robots were used to investigate attitudes about robot roles in the workplace and at home, as some surveys have investigated this. A statement by the robot Sophia that "she" will destroy humans, has led to a further investigation into whether it is linked to a fear that robots will dominate the humans, that robots will surpass them in intelligence or that they will be used for criminal or delinquent purposes. Finally, four statements concerned the role of the robot in interpersonal relationships and human trust in them. Specifically, to what extent humans could interact with a robot as partners, as friends or as companions, since in many countries social robots are used in this way. The statement that they would trust a driverless robot car was used to investigate human confidence in the possibility of error, decision making, and critical ability, that is, some of the basic characteristics of Artificial Intelligence.

Procedure

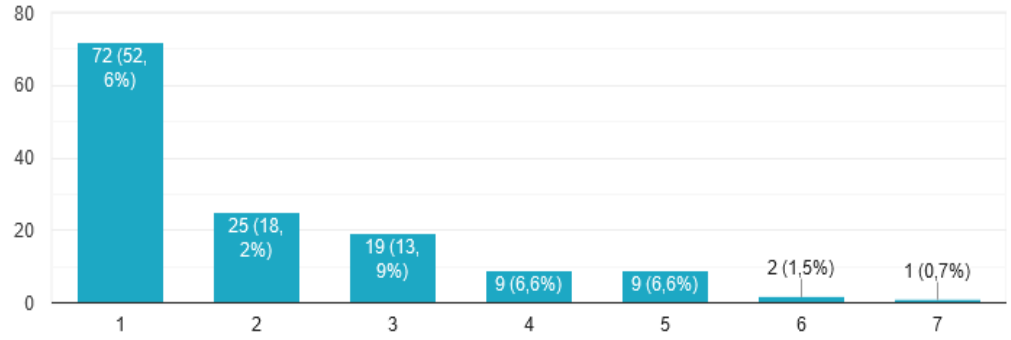
The internet and mainly e-mail and social media (Facebook and Instagram) were used to conduct the survey, in order to publish the questionnaire and find the sample needed. The data collection lasted two months, from April to May of 2021 and a total of 137 valid questionnaires were completed.

Results

In the statements that follow, based on the questionnaire that was distributed, 1 corresponds to "strongly disagree" and 7 to 'strongly agree'.

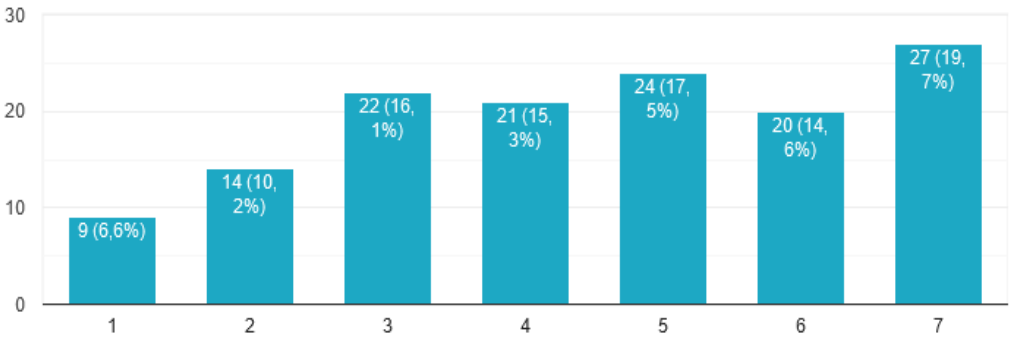
Frequencies and means of the sample's answers

Figure 6. Frequencies (%) for Statement 1 ("Robots can acquire citizenship and have equal rights as all citizens")



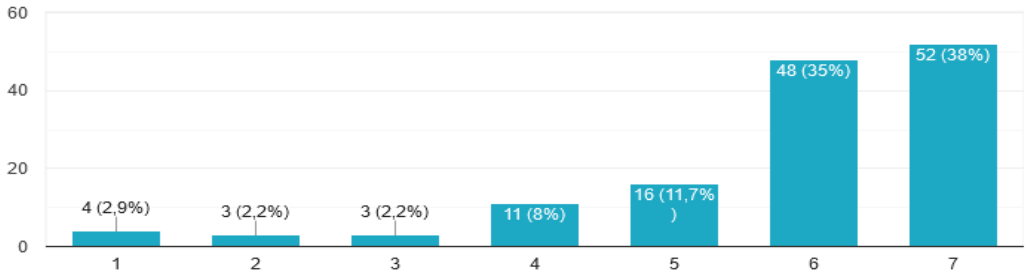
The majority of the sample disagrees with the acquisition of robot citizenship and equal rights between citizens and robots.

Figure 7. Frequencies (%) for Statement 2 ("Robots will steal peoples' jobs")



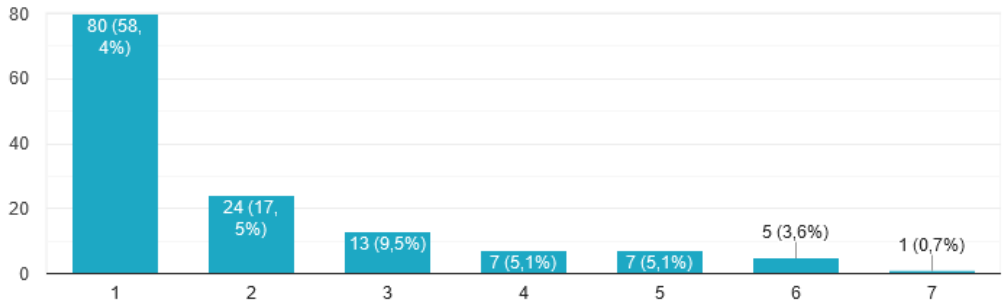
The answers of the participants to the statement "whether robots will steal people's jobs" are more scattered. The majority of the sample tends to share the statements, agreeing to a greater or lesser extent with this position. However, about 30% disagree with this statement.

Figure 8. Frequencies (%) for Statement 3 ("Robots can do dangerous or difficult work replacing humans")



By greater agreement with one another, the majority of the sample fully or completely agree with the statement that robots can do dangerous or difficult work by replacing humans.

Figure 9. Frequencies (%) for Statement 4 ("Robots can be used for the upbringing of the children")



Controversy is high regarding the statement whether robots can be used to raise children.

Figure 10. Frequencies (%) for Statement 5 ("Robots can work as teachers in the classroom")

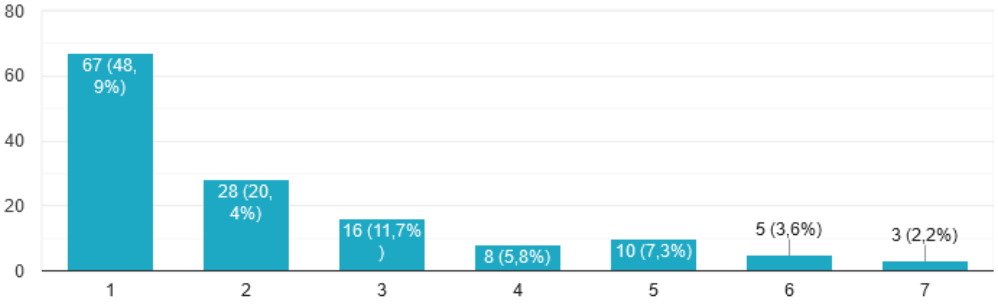
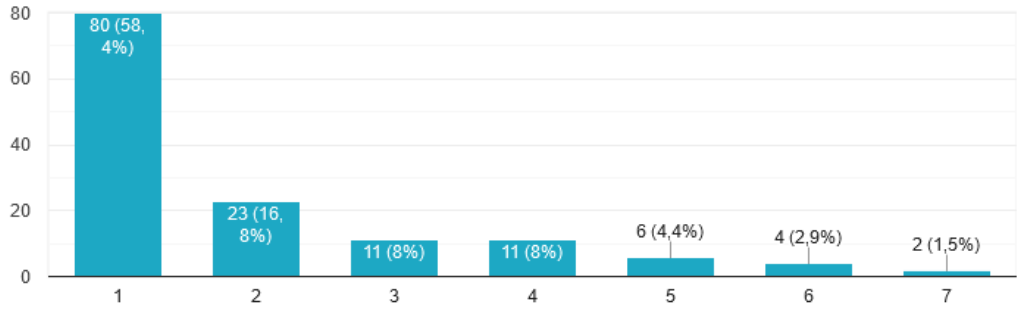
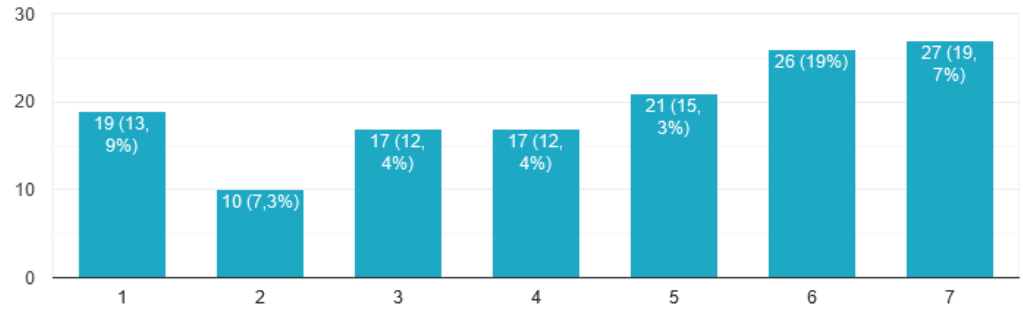


Figure 11. Frequencies (%) for Statement 6 ("Robots can become principals in work environments")



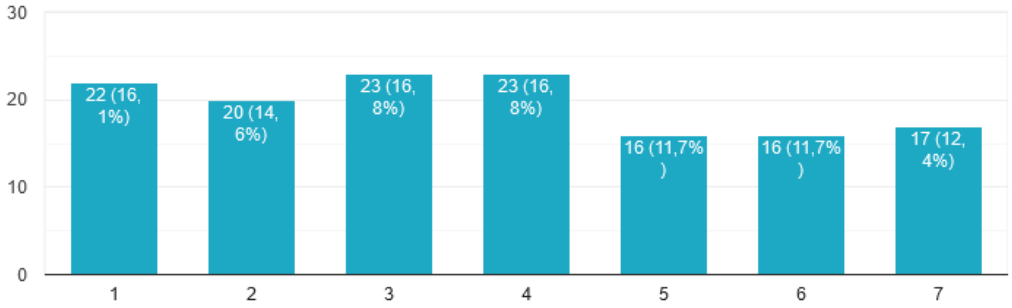
The majority of the sample answers negatively to the statements that "robots can work as teachers in the classroom" and that "robots can become principals in work environments".

Figure 12. Frequencies (%) for Statement 7 ("Robots can be hired as household assistants")



Participants' answers to the statement of whether robots can be hired as household assistants are more scattered. There are those who completely disagree or quite disagree, while the percentages of those who agree are a little higher.

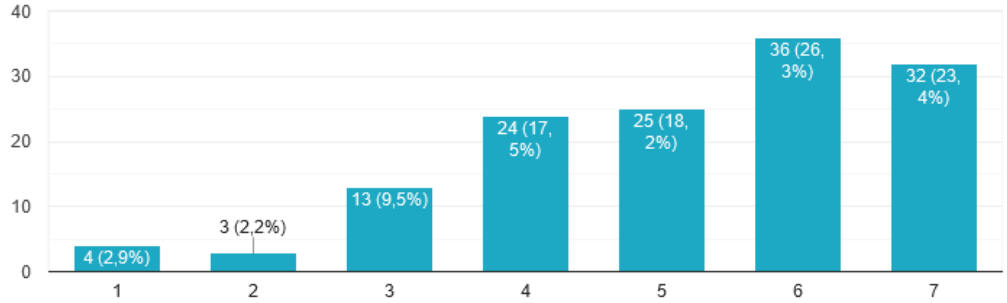
Figure 13. Frequencies (%) for Statement 8 ("Robots will dominate to the detriment of humans")



Opinions were divided among the persons of the sample on whether robots would

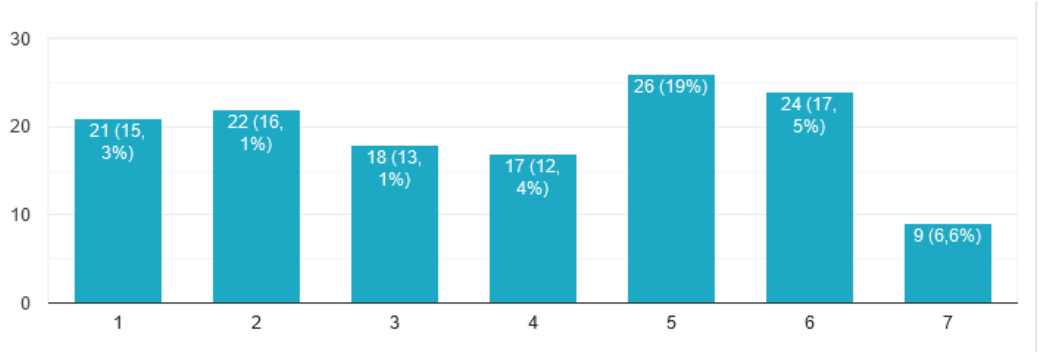
dominate to the detriment of humans. The majority seems to tend to disagree, but without much difference from those who agree.

Figure 14. Frequencies (%) for Statement 9 ("Robots can be used for delinquent and / or criminal purposes")



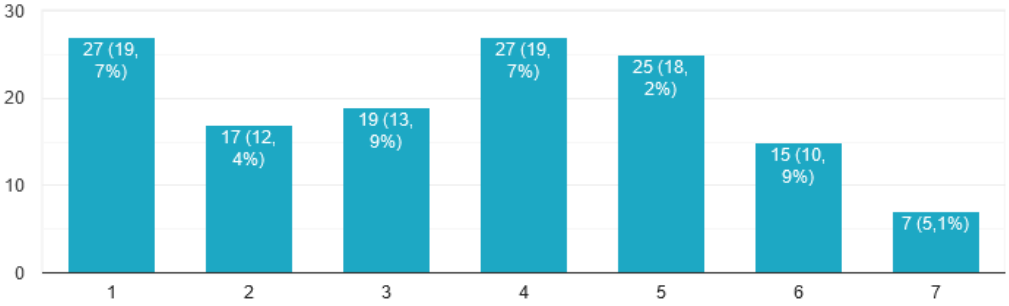
In the graph above, the majority of the sample agrees that robots can be used for delinquent or even criminal purposes.

Figure 15. Frequencies (%) for Statement 10 ("The artificial intelligence of robots will surpass the intelligence of humans")



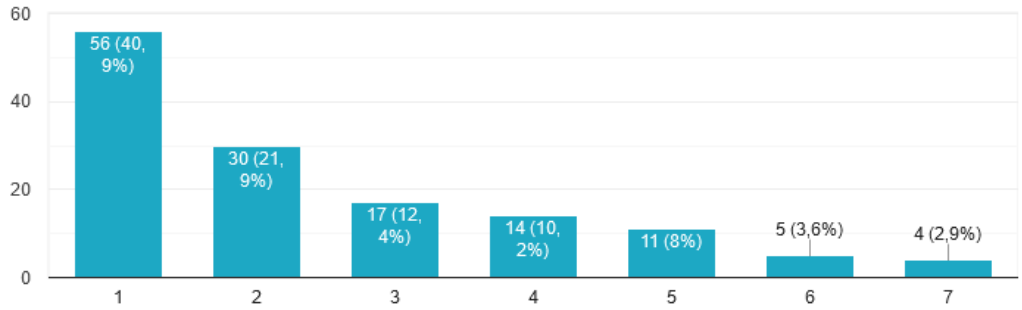
The percentages of agreement and disagreement regarding the statement that "the artificial intelligence of robots will surpass the intelligence of humans" are divided. More than 40% disagree with this statement and a corresponding percentage agree with this statement.

Figure 16. Frequencies (%) for Statement 11 ("I would feel comfortable collaborating with a robot")



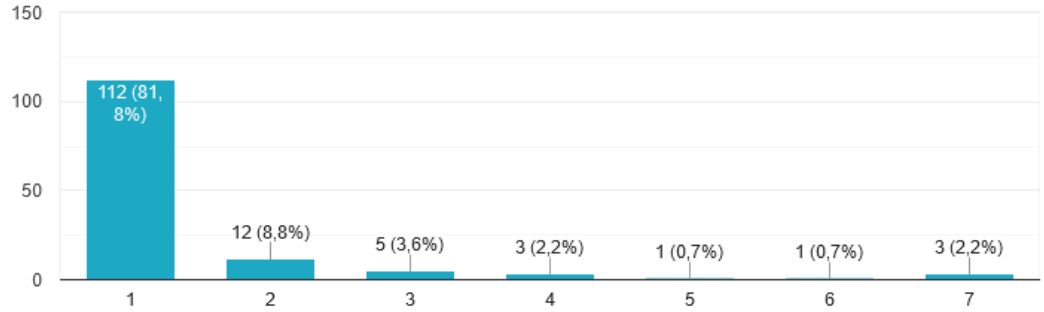
The majority of the sample disagreed with the statement that they would feel comfortable working with a robot, however, just over 30% agreed with this statement. 20% of the sample does not want to take a position, noting the middle answer (neither agree nor disagree).

Figure 17. Frequencies (%) for Statement 12 ("I would feel intimate having a robot as a friend")



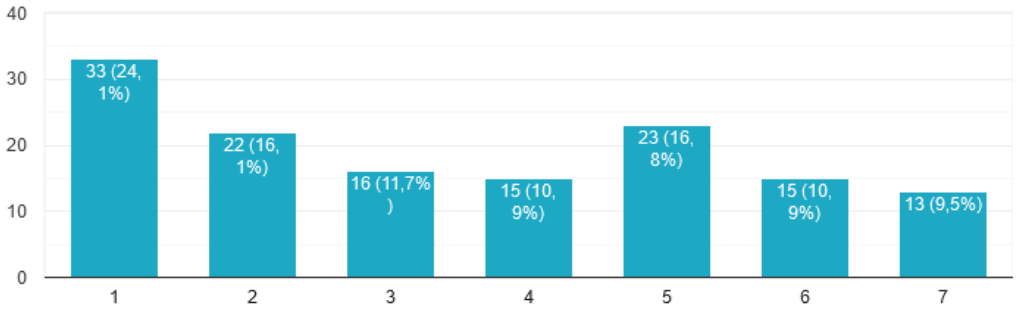
The tendency of the sample is clearer as to whether they would feel familiar with having a robot friend. 41% of the sample completely disagree with this statement, while few are in the options of the agreement.

Figure 18. Frequencies (%) for Statement 13 ("I would rather have a robot as a partner")



Here, as well, the tendency of the sample is clearer, where 82% would not prefer to have a robot as a partner.

Figure 19. Frequencies (%) for Statement 14 ("I would trust a driverless car-robot")



Finally, regarding the statement whether they would trust a driverless robot car, the answers tended to be more towards the disagreement.

In order to form a more concise picture for the whole questionnaire, another analysis was carried out with the means and standard deviations for all the statements which are shown in the table below.

Table 1. Means and standard deviations for the answers of questionnaire for the total sample

Statements	Means	Standard deviations
1. Robots can acquire citizenship and have equal rights as all citizens.	2,04	1,40
2. Robots will steal people's jobs.	4,50	1,86
3. Robots can do dangerous or difficult work replacing humans.	5,80	1,43
4. Robots can be used for the upbringing of the children.	1,95	1,45
5. Robots can work as teachers in the classroom.	2,22	1,60
6. Robots can become principals in work environments.	1,98	1,50
7. Robots can be hired as household assistants.	4,44	2,04
8. Robots will dominate to the detriment of humans.	3,78	1,96
9. Robots can be used for delinquent and / or criminal purposes.	5,18	1,50
10. The artificial intelligence of robots will surpass the intelligence of humans.	3,82	1,90
11. I would feel comfortable collaborating with a robot.	3,58	1,82
12. I would feel intimate having a robot as a friend.	2,45	1,67
13. I would rather have a robot as a partner.	1,42	1,61
14. I would trust a driverless car-robot.	3,51	2,04

Based on the means of the responses for the whole sample, it is observed that the participants mainly agreed with the following statements: "Robots can do dangerous or difficult jobs replacing humans", "Robots can be used for delinquent and / or

criminal purposes, whilst, to a lesser degree they agreed with the following statements: "Robots will steal peoples' jobs" and "Robots can be hired as household assistants".
Higher disagreement's percentages of the population are observed towards the following statements: "I would prefer to have a robot as a partner", "Robots can be used for the upbringing of the children", "Robots can become principals in work environments", "Robots can acquire citizenship and have equal rights as all citizens", "Robots can work as teachers in the classroom" and "I would feel intimate having a robot as a friend ". In general, they disagree with the statements that highlight a supporting role in robots and agree with the statements that give a negative image to robots and place them in bad or difficult positions.
The effects of demographics on the questionnaire statements were then examined. The effects of gender and age on the statements that appeared statistically significant are presented in detail. The place of residence, the educational level and the occupation were not found to have a statistically significant effect on the statements regarding the total sample.

The Effect of gender on the questionnaire responses

The following table examines the effect of gender on questionnaire responses. Statistically significant differences were observed in questions 1, 3, 4, 5, 6, 10, 11, 12 and 13. More specifically, women disagree more than men that robots can gain equal rights and citizenship, they can be used for the upbringing of the children, to work as teachers in the classroom, to become principals in work environments, to have a robot friend and to have a robot as a partner. Men agree more than women that robots can do dangerous or difficult works replacing humans, that artificial robot intelligence will surpass human intelligence, and that they would feel comfortable working with a robot.

Table 2. Gender effect on questionnaire responses

Statements	Men Means (S. D.)	Women Means (S. D.)	t	df	p
1. Robots can acquire citizenship and have equal rights as all citizens.	2,53 (1,64)	1,86 (1,25)	2,20	50,28	,032
3. Robots can do dangerous or difficult work replacing humans.	6,19 (1,21)	5,66 (1,49)	1,92	135	,057
4. Robots can be used for the upbringing of the children.	2,72 (1,90)	1,67 (1,15)	3,10	44,40	,003
5. Robots can work as teachers in the classroom.	3,19 (2,10)	1,87 (1,23)	3,55	43,78	,001

6. Robots can become principals in work environments.	2,64 (1,93)	1,74 (1,23)	2,60	45,54	,012
10. The artificial intelligence of robots will surpass the intelligence of humans.	4,81 (1,65)	3,48 (1,87)	3,99	69,32	,000
11. I would feel comfortable collaborating with a robot.	4,14 (1,93)	3,38 (1,75)	2,18	135	,031
12. I would feel intimate having a robot as a friend.	3,17 (2,00)	2,20 (1,46)	2,65	48,89	,011
13. I would rather have a robot as a partner.	2,14 (1,91)	1,17 (0,54)	2,99	37,07	,005

*p<0.05, **p<0.01, ***p<0.001

The Effect of age on questionnaire responses

Initially, a test of homogeneity of variances was held, where p> 0.05. The questions in which there was homogeneity of variance were the following: 1, 4, 5, 6, 8 and 11, in which through the analysis of variance a statistically significant difference was found with respect to the age groups.

Table 3. Effect of age on the questionnaire responses

Statements	18-30 years old Means (S. D.)	31-50 years old Means (S. D.)	51years old and over Means (S. D.)	F	df	p
1. Robots can acquire citizenship and have equal rights as all citizens.	2,34 (1,42)	1,99 (1,46)	1,42 (0,76)	3,17	2,134	,045
4. Robots can be used for the upbringing of the children.	2,32 (1,69)	1,63 (1,15)	2,11 (1,79)	3,45	2,134	,034
5. Robots can work as teachers in the classroom.	2,66 (1,78)	1,93 (1,41)	2,11 (1,62)	3,13	2,134	,047
6. Robots can become principals in work environments.	2,48 (1,81)	1,75 (1,25)	1,47 (0,96)	4,98	2,134	,008
8. Robots will dominate to the detriment of humans.	3,28 (1,66)	3,90 (1,95)	4,68 (2,42)	3,89	2,134	,023

11. I would feel comfortable collaborating with a robot.	4,26 (1,88)	3,26 (1,60)	2,89 (1,94)	6,27	2,134	,002

*p<0.05, **p<0.01, ***p<0.001

As it can be seen in the table above, the older the age, the more they disagree that robots can acquire citizenship and equal rights, as well as robots can become principals in work environments. The age group of 31-50 years also disagrees more with the statement that robots cannot be used for the upbringing of the children and to work as teachers in the classroom. This is an age group in which the majority are parents, and the issue of upbringing and education of their children is directly related, as they have school-age children. In addition, the older they get, the more they agree that robots will dominate to the detriment of humans, and the older they get, the more comfortable they will feel collaborating with a robot.

Correlations of the questionnaire responses

Table 4. Correlations among the questions of the questionnaire

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1		-0,17*	0,14	0,54**	0,49**	0,67**	0,31**	0,00	-0,02	0,23**	0,35**	0,37**	0,27**	0,14
2			-0,14	-0,14	-0,04	-0,20*	-0,12	0,67**	0,14	0,13	-0,35**	-0,07	0,02	-0,37**
3				0,12	0,17*	0,13	0,48**	-0,22**	0,26**	0,03	0,27**	0,19*	0,12	0,17*
4					0,72**	0,66**	0,37**	0,01	0,02	0,29**	0,45**	0,48**	0,43**	0,34**
5						0,66**	0,41**	0,07	0,09	0,36**	0,51**	0,52**	0,51**	0,27**
6							0,38**	0,05	0,02	0,29**	0,43**	0,57**	0,37**	0,29**
7								-0,11	0,23**	0,10	0,44**	0,38**	0,21*	0,40**
8									0,27**	0,36**	-0,24**	0,05	0,04	-0,22**
9										0,24**	0,05	0,03	-0,08	0,04
10											0,14	0,24**	0,24**	0,11
11												0,56**	0,22**	0,40**
12													0,34**	0,24**
13														0,12
14														

*p<0.05, **p<0.01, ***p<0.001

The statement that "robots can acquire citizenship and have equal rights as all citizens" is negatively related to the statement that robots will steal peoples' jobs ($r = -0.17$, $p < 0.05$), to a statistically significant degree, but without a strong correlation. The first statement relates to a statistically significant degree, positively but also relatively strongly with the following statements: "robots can be used for the upbringing of children" ($r = -0.54$, $p < 0.01$), "robots can work as teachers "($r = -0.49$, $p < 0.01$) and that robots can become principals in work environments ($r = -0.67$, $p < 0.01$).

The statement that "robots will steal peoples' jobs" is positively related, to a statistically significant degree, to the statement that "robots will dominate to the detriment of humans" ($r = -0.67$, $p < 0.01$). The statement that "robots will be used for the upbringing of the children" was found to be positively related, to a statistically significant extent, to the statement that "robots can work as teachers in the classroom" ($r = -0.72$, $p < 0.01$) and that "robots can become principals in work environments" ($r = -0.66$, $p < 0.01$). The statement that "robots can work as teachers in the classroom" seems to be positively related to the statement that "robots can become principals in work environments" ($r = -0.66$, $p < 0.01$), as well as the statement that "I would feel comfortable collaborating with a robot" ($r = -0.51$, $p < 0.01$), the statement that "I would feel intimate having a robot as a friend" ($r = -0.52$, $p < 0.01$) and the statement that " I would rather have a robot as a partner "($r = -0.51$, $p < 0.01$).

Additionally, a relatively strong, positive and statistically significant correlation was found between the statement "robots can become principals in work environments" and the statement "I would feel intimate having a robot as a friend" ($r = -0.57$, $p < 0.01$). Also, a statistically significant relatively strong positive correlation was found between the statements: "I would feel comfortable collaborating with a robot" and "I would feel intimate having a robot as a friend" ($r = -0.56$, $p < 0.01$).

Conclusions

The majority of the sample agrees that robots can be used in a negative way, connecting their use to dangerous or difficult jobs and/or delinquent and criminal purposes. The sample does not seem to be very ready for the social robots and has mainly associated them with negative or malicious purposes. As found in the literature, Lupetti and Cila (2019) identified a growing concern about the privacy and the potential hacking of robots. Also, on the roads, robots could cause traffic problems and/or incidents of theft or vandalism could be occurred. In the current research, the majority of the sample does not want robots to become citizens and as a consequence to have equal rights as human citizens, nor does want robots to be used for roles involved in interpersonal relationships, such as raising children, work, friendship or love. This is an element of controversy in the international literature, examining whether social robots with cognitive abilities, emotions and self-knowledge can acquire the right to citizenship, observing a transition from technical considerations to social and ethical ones (Lupetti & Cila, 2019· Marx & Tiefensee, 2015· Pagallo, 2018).

The views do not seem to be clear in the same direction, and this is a finding that agrees with the literature. There are those who have a positive attitude towards robots and those who are afraid of their rapid growth (Operto, 2019).

In terms of gender impact, some statistically significant differences were found between men and women regarding their attitudes towards social robots. Women seem to have a more conservative tendency and were stricter and more negative on issues related to the upbringing of children and their education by social robots and more generally on issues of relationships and emotional interaction with robots. On the contrary, men seem to agree with social robots taking on dangerous or difficult tasks, while they would have no problem working with a robot. They seem to agree on work issues that could be facilitated or replaced by a robot. The attitudes of men and women are related to the roles of both sexes, where women are mainly concerned with emotion and men with work. Gender and age, two key variables of the present study, were found to be indeed two important variables associated with the emergence of social roles and just like in the Operto's (2019) study in Italy, where women were found to be willing to use robots to save time in domestic activities (chores), while at the same time expressing fears for the freedom of humans and the allowance of robots in education and assistance. Young men also expressed concerns about losing their jobs and being replaced by robots (Operto, 2019).

The effect of age on attitudes towards social robots has also been found to be statistically significant in some statements. The increase in age seems to lead to more conservative views towards social robots and especially the issue of citizenship and equal rights and their place as well in the work environments, while there are fears that robots will dominate to the detriment of humans. As the age decreases, the participants agree that they would feel comfortable working with a robot. It is worth noting that the 31-50 group of age disagrees more with the statement that robots can be used for the upbringing of the children or to work as teachers in the classroom. This is an age group in which the majority are parents, and the issue of upbringing and education of their children is directly related, as they have school-age children, so they are more sensitive to this issue. In the current study, the attitudes of the sample towards the use of robots in the education and upbringing of children were negative, in contrast to the international literature which expresses a more positive attitude (Hein & Nathan- Roberts, 2018· Pfeifer & Lugrin, 2018· Rosenberg- Kima et al., 2020· Scassellati et al., 2018).

From all the set of the correlations, it is clear, that those participants who disagree with the statements referring to the work of robots (raising children, classroom teachers, principals in work environments), also disagree with the statements that describe the interpersonal relationships with robots, arguing that they would not feel comfortable working with a robot, befriending a robot and having a robot as a partner. Also, those who agree with the proposal that robots will steal people's jobs, also claim that robots will dominate to the detriment of humans. Some suggestions, such as that robots can

be hired as domestic helpers (assistants), that they can be used for delinquent or even criminal purposes, that Artificial Intelligence of robots would surpass human intelligence and that they would trust a driverless robot car, were not related to strong degree with any other statement.

The central question of whether robots can acquire citizenship and have equal rights as all citizens was found to be positively related to a relatively strong and statistically significant correlation with the statements that the robots used for the upbringing of the children, as classroom teachers and as principals in work environments. That is, those who agree that social robots should acquire citizenship and equal rights with citizens, give these robots a more active role in society, recognizing them as equal members who can "coexist" harmoniously with humans by adopting the same roles as humans. In Greece, however, the steps towards the recognition and acceptance of social robots are gradual and often hesitant. As Krageloh et al. (2019), point out it is completely different to evaluate robots while you have interacted and lived with them and the evaluation of them is completely different without any interaction.

Future research

It would be interesting for the present study to be repeated but to be conducted over a longer period of time, in order to gather a larger sample so that the results can be generalized to the entire Greek population. In addition, it would be equally interesting to conduct a survey over the attitudes of parents who have children with mental disorders or disabled regarding whether they would use social robots as sex assistants or caregivers or friends of their adult children.

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