AN ANALYSIS OF THE DIFFERENT ASPECTS OF INTELLIGENCE IN MACHINES

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Abstract: The purpose of this research paper is to technically and philosophically analyze the behaviors of the current intelligent machines and try to think about an eventual artificial evolution. Will Artificial Intelligence (AI) bring us more advantages or more disadvantages? The paper analyzes the different types of intelligent technologies and sees how they are used in security controls, medical researches, military operations, house holding, and maintenance. It will take a look also at the cybernetic and robotic aspects of the topic, and see how they affect the military conflicts taking as points of reference the cyberterrorism and the design of new war-robots. The research will explain how everything started, how everything is quickly developing, and how the technological progress is affecting the human being. How will we react to this new intelligent machines in the future? Will they ever be able to overcome the human intelligence with an eventual artificial consciousness, more advanced learning skills and faster times of execution? Is it really coming up a new era? Are we really creating our successors or it is just science fiction?

Key words: Intelligent machines, artificial intelligence

Introduction: Artificial Intelligence (AI) is a topic that deals with various types of areas starting from medicine, aerospace, manufacturing, logistics, transportation, and manufacturing, passing by the everyday life comfort and facilities ending up to science fiction and philosophy. AI touches many different types of articulated subjects such as, Cybernetics, Neurophysiology, Mechatronics, and Robotics. Cybernetics is a term that derives from the Greek "kybernetes", which literally means "governor"[1]. The word was created by a group of American mathematicians, mainly guided by Norbert Wiener in the 1947 [2, 3]. Based on the Greek bases, they wanted to give to the word the meaning of "the science of the leadership" [4]. Essentially, they wanted to unify different emerging scientific movements of the time like digital electronic computing, neural networks, psychology, and social sciences. Lately, this subject has kept absorbing many other movements that differ between each other making the cybernetics the best unification between humanistic and scientific subjects. The cybernetics is an important aspect for the development of artificial intelligence, since it also describes the differences between a real brain and an artificial one (positronic brain vs human brain). The paper

will also include, as the cybernetics, both humanistic and scientific aspects, which, as always, get in conflict between each other due to the arising ethical and moral issues.

Different Components of Cybernetics in Intelligent Machines: Neurophysiology is the physiology of the nervous system [5]. Neurophysiology is incredibly useful for the study of the emotions and the understanding of the feelings that the human being has, in addition it is extremely essential to discover the real derivations of consciousness in humans and in intelligent machines [6].

Mechatronics is the branch of technology concerned with the integration of mechanics, electronics, and embedded computer control [7]. The term of mechatronics started existing in the late 50s, but just about in the 2010s started getting an important role in the industries and the technological progress. Mechatronics is an emerging subject in the engineering field, it is the union of mechanics and electronics, and it is an important matter in the AI technology development, since the robots are designed and built basing all the procedures on the principles of mechanical, electrical, computer, and industrial engineering [8]. The current mechatronic systems are defined as smart, since they all present sensors, actuators and computer control systems that put them on the highest level of technology also due to their incredibly fast and accurate performances.

Robotics is the technology or science of design, construction, operation, and use of robots and similar automatic devices [9]. Robotics is an advanced branch of mechatronics, the step from to the other is very short, in fact they both present similarities, but robotics is defined as a different subject, since it differs from mechatronics because it presents the design of information technology, interpretation of electric signals, interaction between user and machine, and most importantly artificial intelligence.

But what is really artificial intelligence? During everyday life, we face many issues that are not solvable with basic or conventional mathematical methods, therefore, the human being tended, as always, to adapt and to indirectly develop its mind's abilities, but this time through technological advancements making a machine to learn from and to solve problems. This is the exact moment of when the artefact became intelligent creating Artificial Intelligence. To better understand the AI concept, we could divide it in two main groups such as soft and hard AI. Soft AI gives solutions that are too complex for the hard AI, but it can only provide "heuristic solutions" not guaranteeing optimal or fully correct solutions, however it can give very good starting points and useful results. Hard AI on the other hand is the part that allows the human being to completely solve problems through things like professional systems, formal logic, or Bayesian networks, nevertheless it can't solve very complex problems like soft AI does, but it can provide exact solutions to many problems [10-12].

Applications of AI: AI robots are used in various areas like medicine, manufacturing, agriculture, civil, commercial, logistics and transportation, however the AI progress is mainly concentrated in healthcare, military, logistics, and commercial fields [11]. Therefore, it is easy to find it in the medical, military, aerospace and everyday comfort development areas AI [13]. They are ideal for the technological and scientific

developments, but at the same time they could also present negative aspects, that may lead to the infraction of some important ethical or moral principles. Most of the times, as already said, the engineering development focuses mostly in the medical and military improvement matters, and as always the aim of the engineers is the one of creating a machine that has to improve the human work, or even try to make it faster and easier. In the last decades, most of the times, a great part of the intelligent machines totally replaced the human intervention in entire processes. This led to the developments in the capabilities of the intelligent machines.

In numerous problems in the medical sciences it is essentially required the use of intelligent computational systems comparable to the human mind. In medical applications AI is also known as Bioinformatics, which is the point where medicine and technology meet and benefit the medical research developments [14, 15]. In fact, nowadays, the medical studies are done mostly with the help of machines, and thanks to them have been done several discoveries that saved and improved millions of human lives, favoring also the medical progress to grow every day faster.

A clear example of that is the use of AI in the computational prediction of toxicity in chemicals, an important aspect that is important for the control of the many emerging industries that produce thousands of new industrial substances every year [16]. The Office of Toxic Substances (OTS) of the United States Environmental Protection Agency (EPA) counted more hat 70,000 industrial chemicals in the 90s, and it has estimated that about 1000 compounds are added every single year, and most of them don't have a reliable toxicological information available. This is why EPA has started a project called ToxCast, which has the goal of finding reliable computational methods of toxicity prediction in chemicals to avoid poisoning circumstances in animals and humans or to decrease the environmental pollution [17]. AI has been a great help in this case, since many machine have been created to develop and to improve the quality of the researches basing all the experiments on computational kinds of Bayesian algorithms that really helped to simplify the predictions.

In the last decade, AI has been fundamental also for the prediction of cancer in various individuals [18, 19]. In fact, to monitor and to control the DNA micro-technologies are almost essential for the best efficiency in the medical analysis. Today, DNA microarrays are increasingly used to analyze the right organization and physiological functions of organs, since they provide highly precise diagnostics techniques allowing the discovery of genetic diseases or prevent cancers formations.

The logistic field is one of the areas that is achieving the best technological improvements building robots, that can travel miles and miles in all kinds of conditions without remote-controlled human interventions, or flying drones that can scan and control entire territories in seconds. The drones' development is one of the areas that is most subjected to the studies and inventions. The most famous and effective progresses in AI have been achieved by NASA, which uses robots for space station repairs, planetary explorations such as the ones on Mars or on the Moon.

"It is predicted that robotic technologies will become dominant in coming decades influencing every aspect at work or at home and in the process transforming lives and work practices, raise efficiency and safety levels and provide enhanced levels of service. It will create jobs and there would be lose interaction with people", said Y.H. Gharpure in his article called Metamorphic Robots[20]. In the same article he also said that the current robots market is 22 billion € and it is supposed to increase up to 56-62 billion by 2020, and the enormous progress will be that big that a whole robotic fast food restaurant will be a reality in 2030 bringing to an anguishing jobs halving in the U.S. by 2050.

AI Robots Description: Mainly the AI robots interact with the main user through programming, or tele-operation, but a self-sufficient robot should be autonomous, and require minimum supervision necessities. The AI Robots are composed by three main characteristics, which are mechanical construction, electrical aspects, and programming. They are all designed principally considering power sources, actuators, electric motors, piston and wiring muscles, electroactive polymers, elastic nano tubes, touch sensors, and vision sensors. In the AI Robots there are three main important skills that the robot should have in order to be an efficient machine, those are Manipulation, Locomotion, and Working abilities. (1) The manipulating skills are achieved by mechanical and vacuum grippers, or totally humanoid hands, in the robots the manipulation aspect primarily involves all the actions that affect picking up, modifying or destroying objects. (2) The locomotion are the second fundamental skills that have to characterize the AI Robots, and they are usually achieved by the use of one, two, four or even six wheels, actual mechanical legs, or tank tracks usually made out of metals or plastics. (3) The working skills are the most difficult to apply on robots, since they are skills that have to incorporate hopping, balancing, passive resistance, climbing, skating, swimming, or snaking. Moreover, robots are actually allocated in two categories, Industrial and Service Robotics based on what their purposes are. The Industrial Robots are the ones that are used in manufacturing fields, and their main purposes are to substitute the traditional manufacturing processes (handmade or artisanal ones) and do the same kind of works more precisely and efficiently. The Service Robots are also called the domestic ones, the ones that have the aim to make every daily difficulties easier and faster to do [20].

Consciousness and Philosophical Aspects: The Oxford English Dictionary, (OED), literal definition of consciousness is "Internal knowledge or conviction; the state or fact of being mentally conscious or aware of something". Instead, if we look for a scientific definition and we want to try to find where it comes from, why it makes an individual feel like an individual, and what it gives it the awareness of being a living creature, it would be hard to define because it is still today one of the greatest mysteries of science, and maybe it won't ever be defined scientifically, since it is something that can't be very explained. The two writers introduced in the previous paragraph are the most revolutionary ones, since their ideas are still the most brilliant ever seen. Spike Jonze analyzed a current situation, which sees the first real interaction between humans and machine, while on the other hand Asimov created from nothing a concept that gains substance every day more.

Spike Jonze in his movie “Her” wanted to highlight this new smartphone obsession creating a near probable future world, where everybody will be almost dependent on a machine. In an interview made by Nichole Holofcener, he said that he “was trying to write about was the way we long to connect with each other” admitting also that he is a sort of addicted to his phone like everybody else saying, “I definitely check my phone for texts a lot like, “Did anyone text me? Is anyone thinking about me? Does anyone love me?””. But not even he knows how to describe the actual relationship between the human and the machine, “I have a lot of contradictory feelings about it. It’s so complex...” Jonze said. But why it is so complex? Is it really hard to talk about a conscious machine talking to you? Yes, it is. Because consciousness itself is something that can’t be really recognized and studied, it is just something that the nature gave us. The application of this sense of existence to a machine would not be easy, it would be needed to know where it comes from, what it really does and how it does it. It will be required the creation of the Asimov’s positronic brain. But why create a machine with feelings, it will not even be convenient, as Gunn J. But would the positronic robot really make our life better? The answer is no. A robot with a positronic brain might lead to an insurgence or to ideological conflicts between the machine and the human, this is why it wouldn’t make sense to create a robot with feelings on purpose.

In fact, the real issue is that, what if we create a machine with consciousness without knowing that? Consciousness comes from perception of existence through the energy flux between physical space and mind space, like learning and reminding. Clear evidence of learning robots can be find easily today. Old Dominion University owns a NAO robot [21], a humanoid robot which is being taught from computer engineering students to know how to recognize their own body parts or individuals’ faces and talk with them. An even better humanoid machines are the Honda Asimo Robot [22]. These last ones have great learning, reminding and moving skills, they are getting used to do not make the same mistakes and to improve their performances. One of the most ambitious AI project in the world is the COG robot, the robot that has implanted in its single body sight, sound, and touch. Scientists provided it with these three senses because they are trying to give it the perfect conditions to feel things and to study where consciousness really comes from. Humans are practically teaching to machines to learn from and to remind the mistakes that they do giving them a certain senses and a perception of what is wrong and what is right. This will lead them to have personal abilities, and an own developing brains with memories, that could get even better than the human ones. This doesn’t mean that they will still have feelings, but they will still have a sort of awareness that would make them more intelligent and more powerful than us.

Conclusions: After a long analysis through the many aspects of artificial intelligence, we have seen that the opportunities that the human can give to a robot its own consciousness, its own thoughts, and its own ideas, are very low, and even taking in consideration the famous positronic brain that would be still hard to duplicate a humanlike brain capable of reasoning and have feelings. It would mean to put sensations into numbers. Science made huge steps, it has been able to solve very complex phenomena and to explain them mathematically. If we just think about the majestic theories of Einstein, Newton, or Hawking, we would truly realize that everything can be calculated or mathematically

demonstrated, but it is also true that the step from the calculation to the real life application is really huge. Although, as the sleep psychologist Dr. Bob Stickgold said, “Consciousness is an entirely internal experience. It’s why you say it’s the core of our existence because it’s absolutely private. If there’s one thing about consciousness, it’s that it’s private. And frankly, it’s so private that I as a scientist can’t see in you. And I have no way to measure it, and where to look for it.” Hence, consciousness would be hard to be applied on a machine, since it would require calculations, demonstrations and further applications.

Artificial Intelligence is an encouraging aspect of our era, it can give to humanity important tools for better futures and better lives, as long as we don’t forget the moral and human values that have always been part of the human being. AI made us to discover cures for diseases that seemed impossible to be treated, it permitted better security systems that allow more peaceful times, it facilitated the calculation of complex engineering problems allowing engineers to build better structures, it brought the mankind on the moon and to study closely other planets, it made us to improve our performances and to fix big mistakes, it even makes our daily life easier than ever allowing us to interact with each other in very simple ways. But at the same time in many years AI might lead to a drastic jobs halving in the U.S., completely substituting the human work and maybe deleting the ability for us to further evolve. AI is a serious matter that if is not treated with the right attention, it might not lead to the creation of machines with sensations, but more probably, it will bring a worldwide crisis and a severe human collapse.

If we think about AI as a living machine that has feelings, we could probably confuse the great engineering evolution process with science fiction, but excluding a thinking machine with a growing brain, with better human, and a possible naturally spontaneous creation of consciousness in an artificial individual’s skills would be still a big mistake.

NOTE: Artificial Intelligence already exists, it already presents self-developing brains, advanced processing skills, and very low physical limitations, but it is essentially impossible and mainly inconvenient the replica of consciousness behaviors in a machine by the human being, we would only be able to give the machine an intelligence that would lead to consciousness by itself.

“Consciousness and emotion, those things are hard to work on directly because they seem to emerge from intelligence somehow.” – Prof. Patrick Winston Director, Artificial Intelligence Lab

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