



Review Article

The impact of artificial intelligence on human society and bioethics

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ABSTRACT

Artificial intelligence (AI), known by some as the industrial revolution (IR) 4.0, is going to change not only the way we do things, how we relate to others, but also what we know about ourselves. This article will first examine what AI is, discuss its impact on industrial, social, and economic changes on humankind in the 21st century, and then propose a set of principles for AI bioethics. The IR1.0, the IR of the 18th century, impelled a huge social change without directly complicating human relationships. Modern AI, however, has a tremendous impact on how we do things and also the ways we relate to one another. Facing this challenge, new principles of AI bioethics must be considered and developed to provide guidelines for the AI technology to observe so that the world will be benefited by the progress of this new intelligence.

KEYWORDS: *Artificial intelligence, Bioethics, Principles of artificial intelligence bioethics*

WHAT IS ARTIFICIAL INTELLIGENCE?

Artificial intelligence (AI) has many different definitions; some see it as the created technology that allows computers and machines to function intelligently. Some see it as the machine that replaces human labor to work for men a more effective and speedier result. Others see it as “a system” with the ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation [1].

Despite the different definitions, the common understanding of AI is that it is associated with machines and computers to help humankind solve problems and facilitate working processes. In short, it is an intelligence designed by humans and demonstrated by machines. The term AI is used to describe these functions of human-made tool that emulates the “cognitive” abilities of the natural intelligence of human minds [2].

Along with the rapid development of cybernetic technology in recent years, AI has been seen almost in all our life circles, and some of that may no longer be regarded as AI because it is so common in daily life that we are much used to it such as optical character recognition or the Siri (speech interpretation and recognition interface) of information searching equipment on computer [3].

DIFFERENT TYPES OF ARTIFICIAL INTELLIGENCE

From the functions and abilities provided by AI, we can distinguish two different types. The first is weak AI, also known as narrow AI that is designed to perform a narrow task, such as facial recognition or Internet Siri search or self-driving

car. Many currently existing systems that claim to use “AI” are likely operating as a weak AI focusing on a narrowly defined specific function. Although this weak AI seems to be helpful to human living, there are still some think weak AI could be dangerous because weak AI could cause disruptions in the electric grid or may damage nuclear power plants when malfunctioned.

The new development of the long-term goal of many researchers is to create strong AI or artificial general intelligence (AGI) which is the speculative intelligence of a machine that has the capacity to understand or learn any intelligent task human being can, thus assisting human to unravel the confronted problem. While narrow AI may outperform humans such as playing chess or solving equations, but its effect is still weak. AGI, however, could outperform humans at nearly every cognitive task.

Strong AI is a different perception of AI that it can be programmed to actually be a human mind, to be intelligent in whatever it is commanded to attempt, even to have perception, beliefs and other cognitive capacities that are normally only ascribed to humans [4].

In summary, we can see these different functions of AI [5,6]:

1. Automation: What makes a system or process to function automatically

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2. Machine learning and vision: The science of getting a computer to act through deep learning to predict and analyze, and to see through a camera, analog-to-digital conversion and digital signal processing
3. Natural language processing: The processing of human language by a computer program, such as spam detection and converting instantly a language to another to help humans communicate
4. Robotics: A field of engineering focusing on the design and manufacturing of cyborgs, the so-called machine man. They are used to perform tasks for human's convenience or something too difficult or dangerous for human to perform and can operate without stopping such as in assembly lines
5. Self-driving car: Use a combination of computer vision, image recognition amid deep learning to build automated control in a vehicle.

DO HUMAN-BEINGS REALLY NEED ARTIFICIAL INTELLIGENCE?

Is AI really needed in human society? It depends. If human opts for a faster and effective way to complete their work and to work constantly without taking a break, yes, it is. However if humankind is satisfied with a natural way of living without excessive desires to conquer the order of nature, it is not. History tells us that human is always looking for something faster, easier, more effective, and convenient to finish the task they work on; therefore, the pressure for further development motivates humankind to look for a new and better way of doing things. Humankind as the homo-sapiens discovered that tools could facilitate many hardships for daily livings and through tools they invented, human could complete the work better, faster, smarter and more effectively. The invention to create new things becomes the incentive of human progress. We enjoy a much easier and more leisurely life today all because of the contribution of technology. The human society has been using the tools since the beginning of civilization, and human progress depends on it. The human kind living in the 21st century did not have to work as hard as their forefathers in previous times because they have new machines to work for them. It is all good and should be all right for these AI but a warning came in early 20th century as the human-technology kept developing that Aldous Huxley warned in his book *Brave New World* that human might step into a world in which we are creating a monster or a super human with the development of genetic technology.

Besides, up-to-dated AI is breaking into healthcare industry too by assisting doctors to diagnose, finding the sources of diseases, suggesting various ways of treatment performing surgery and also predicting if the illness is life-threatening [7]. A recent study by surgeons at the Children's National Medical Center in Washington successfully demonstrated surgery with an autonomous robot. The team supervised the robot to perform soft-tissue surgery, stitch together a pig's bowel, and the robot finished the job better than a human surgeon, and the team claimed [8,9]. It demonstrates robotically-assisted surgery can overcome the limitations of pre-existing minimally-invasive surgical procedures and to enhance the capacities of surgeons performing open surgery.

Above all, we see the high-profile examples of AI including autonomous vehicles (such as drones and self-driving cars), medical diagnosis, creating art, playing games (such as Chess or Go), search engines (such as Google search), online assistants (such as Siri), image recognition in photographs, spam filtering, predicting flight delays...etc. All these have made human life much easier and convenient that we are so used to them and take them for granted. AI has become indispensable, although it is not absolutely needed without it our world will be in chaos in many ways today.

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON HUMAN SOCIETY

Negative impact

Questions have been asked: With the progressive development of AI, human labor will no longer be needed as everything can be done mechanically. Will humans become lazier and eventually degrade to the stage that we return to our primitive form of being? The process of evolution takes eons to develop, so we will not notice the backsliding of humankind. However how about if the AI becomes so powerful that it can program itself to be in charge and disobey the order given by its master, the humankind?

Let us see the negative impact the AI will have on human society [10,11]:

1. A huge social change that disrupts the way we live in the human community will occur. Humankind has to be industrious to make their living, but with the service of AI, we can just program the machine to do a thing for us without even lifting a tool. Human closeness will be gradually diminishing as AI will replace the need for people to meet face to face for idea exchange. AI will stand in between people as the personal gathering will no longer be needed for communication
2. Unemployment is the next because many works will be replaced by machinery. Today, many automobile assembly lines have been filled with machineries and robots, forcing traditional workers to lose their jobs. Even in supermarket, the store clerks will not be needed anymore as the digital device can take over human labor
3. Wealth inequality will be created as the investors of AI will take up the major share of the earnings. The gap between the rich and the poor will be widened. The so-called "M" shape wealth distribution will be more obvious
4. New issues surface not only in a social sense but also in AI itself as the AI being trained and learned how to operate the given task can eventually take off to the stage that human has no control, thus creating un-anticipated problems and consequences. It refers to AI's capacity after being loaded with all needed algorithm may automatically function on its own course ignoring the command given by the human controller
5. The human masters who create AI may invent something that is racial bias or egocentrically oriented to harm certain people or things. For instance, the United Nations has voted to limit the spread of nucleus power in fear of its indiscriminative use to destroying humankind or targeting on certain races or region to achieve the goal

of domination. AI is possible to target certain race or some programmed objects to accomplish the command of destruction by the programmers, thus creating world disaster.

POSITIVE IMPACT

There are, however, many positive impacts on humans as well, especially in the field of healthcare. AI gives computers the capacity to learn, reason, and apply logic. Scientists, medical researchers, clinicians, mathematicians, and engineers, when working together, can design an AI that is aimed at medical diagnosis and treatments, thus offering reliable and safe systems of health-care delivery. As health professors and medical researchers endeavor to find new and efficient ways of treating diseases, not only the digital computer can assist in analyzing, robotic systems can also be created to do some delicate medical procedures with precision. Here, we see the contribution of AI to health care [7,11]:

Fast and accurate diagnostics

IBM's Watson computer has been used to diagnose with the fascinating result. Loading the data to the computer will instantly get AI's diagnosis. AI can also provide various ways of treatment for physicians to consider. The procedure is something like this: To load the digital results of physical examination to the computer that will consider all possibilities and automatically diagnose whether or not the patient suffers from some deficiencies and illness and even suggest various kinds of available treatment.

Socially therapeutic robots

Pets are recommended to senior citizens to ease their tension and reduce blood pressure, anxiety, loneliness, and increase social interaction. Now cyborgs have been suggested to accompany those lonely old folks, even to help do some house chores. Therapeutic robots and the socially assistive robot technology help improve the quality of life for seniors and physically challenged [12].

Reduce errors related to human fatigue

Human error at workforce is inevitable and often costly, the greater the level of fatigue, the higher the risk of errors occurring. AI technology, however, does not suffer from fatigue or emotional distraction. It saves errors and can accomplish the duty faster and more accurately.

Artificial intelligence-based surgical contribution

AI-based surgical procedures have been available for people to choose. Although this AI still needs to be operated by the health professionals, it can complete the work with less damage to the body. The da Vinci surgical system, a robotic technology allowing surgeons to perform minimally invasive procedures, is available in most of the hospitals now. These systems enable a degree of precision and accuracy far greater than the procedures done manually. The less invasive the surgery, the less trauma it will occur and less blood loss, less anxiety of the patients.

Improved radiology

The first computed tomography scanners were introduced in 1971. The first magnetic resonance imaging (MRI) scan

of the human body took place in 1977. By the early 2000s, cardiac MRI, body MRI, and fetal imaging, became routine. The search continues for new algorithms to detect specific diseases as well as to analyze the results of scans [9]. All those are the contribution of the technology of AI.

Virtual presence

The virtual presence technology can enable a distant diagnosis of the diseases. The patient does not have to leave his/her bed but using a remote presence robot, doctors can check the patients without actually being there. Health professionals can move around and interact almost as effectively as if they were present. This allows specialists to assist patients who are unable to travel.

SOME CAUTIONS TO BE REMINDED

Despite all the positive promises that AI provides, human experts, however, are still essential and necessary to design, program, and operate the AI from any unpredictable error from occurring. Beth Kindig, a San Francisco-based technology analyst with more than a decade of experience in analyzing private and public technology companies, published a free newsletter indicating that although AI has a potential promise for better medical diagnosis, human experts are still needed to avoid the misclassification of unknown diseases because AI is not omnipotent to solve all problems for human kinds. There are times when AI meets an impasse, and to carry on its mission, it may just proceed indiscriminately, ending in creating more problems. Thus vigilant watch of AI's function cannot be neglected. This reminder is known as physician-in-the-loop [13].

The question of an ethical AI consequently was brought up by Elizabeth Gibney in her article published in *Nature* to caution any bias and possible societal harm [14]. The Neural Information processing Systems (NeurIPS) conference in Vancouver Canada in 2020 brought up the ethical controversies of the application of AI technology, such as in predictive policing or facial recognition, that due to bias algorithms can result in hurting the vulnerable population [14]. For instance, the NeurIPS can be programmed to target certain race or decree as the probable suspect of crime or trouble makers.

THE CHALLENGE OF ARTIFICIAL INTELLIGENCE TO BIOETHICS

Artificial intelligence ethics must be developed

Bioethics is a discipline that focuses on the relationship among living beings. Bioethics accentuates the good and the right in biospheres and can be categorized into at least three areas, the bioethics in health settings that is the relationship between physicians and patients, the bioethics in social settings that is the relationship among humankind and the bioethics in environmental settings that is the relationship between man and nature including animal ethics, land ethics, ecological ethics...etc. All these are concerned about relationships within and among natural existences.

As AI arises, human has a new challenge in terms of establishing a relationship toward something that is not natural in

its own right. Bioethics normally discusses the relationship within natural existences, either humankind or his environment, that are parts of natural phenomena. But now men have to deal with something that is human-made, artificial and unnatural, namely AI. Human has created many things yet never has human had to think of how to ethically relate to his own creation. AI by itself is without feeling or personality. AI engineers have realized the importance of giving the AI ability to discern so that it will avoid any deviated activities causing unintended harm. From this perspective, we understand that AI can have a negative impact on humans and society; thus, a bioethics of AI becomes important to make sure that AI will not take off on its own by deviating from its originally designated purpose.

Stephen Hawking warned early in 2014 that the development of full AI could spell the end of the human race. He said that once humans develop AI, it may take off on its own and redesign itself at an ever-increasing rate [15]. Humans, who are limited by slow biological evolution, could not compete and would be superseded. In his book *Superintelligence*, Nick Bostrom gives an argument that AI will pose a threat to humankind. He argues that sufficiently intelligent AI can exhibit convergent behavior such as acquiring resources or protecting itself from being shut down, and it might harm humanity [16].

The question is—do we have to think of bioethics for the human’s own created product that bears no bio-vitality? Can a machine have a mind, consciousness, and mental state in exactly the same sense that human beings do? Can a machine be sentient and thus deserve certain rights? Can a machine intentionally cause harm? Regulations must be contemplated as a bioethical mandate for AI production.

Studies have shown that AI can reflect the very prejudices humans have tried to overcome. As AI becomes “truly ubiquitous,” it has a tremendous potential to positively impact all manner of life, from industry to employment to health care and even security. Addressing the risks associated with the technology, Janosch Delcker, Politico Europe’s AI correspondent, said: “I don’t think AI will ever be free of bias, at least not as long as we stick to machine learning as we know it today,”.... “What’s crucially important, I believe, is to recognize that those biases exist and that policymakers try to mitigate them” [17]. The High-Level Expert Group on AI of the European Union presented *Ethics Guidelines for Trustworthy AI* in 2019 that suggested AI systems must be accountable, explainable, and unbiased. Three emphases are given:

1. Lawful-respecting all applicable laws and regulations
2. Ethical-respecting ethical principles and values
3. Robust-being adaptive, reliable, fair, and trustworthy from a technical perspective while taking into account its social environment [18].

Seven requirements are recommended [18]:

- AI should not trample on human autonomy. People should not be manipulated or coerced by AI systems, and humans should be able to intervene or oversee every decision that the software makes

- AI should be secure and accurate. It should not be easily compromised by external attacks, and it should be reasonably reliable
- Personal data collected by AI systems should be secure and private. It should not be accessible to just anyone, and it should not be easily stolen
- Data and algorithms used to create an AI system should be accessible, and the decisions made by the software should be “understood and traced by human beings.” In other words, operators should be able to explain the decisions their AI systems make
- Services provided by AI should be available to all, regardless of age, gender, race, or other characteristics. Similarly, systems should not be biased along these lines
- AI systems should be sustainable (i.e., they should be ecologically responsible) and “enhance positive social change”
- AI systems should be auditable and covered by existing protections for corporate whistleblowers. The negative impacts of systems should be acknowledged and reported in advance.

From these guidelines, we can suggest that future AI must be equipped with human sensibility or “AI humanities.” To accomplish this, AI researchers, manufacturers, and all industries must bear in mind that technology is to serve not to manipulate humans and his society. Bostrom and Yudkowsky listed responsibility, transparency, auditability, incorruptibility, and predictability [19] as criteria for the computerized society to think about.

SUGGESTED PRINCIPLES FOR ARTIFICIAL INTELLIGENCE BIOETHICS

Nathan Strout, a reporter at Space and Intelligence System at Easter University, USA, reported just recently that the intelligence community is developing its own AI ethics. The Pentagon made announced in February 2020 that it is in the process of adopting principles for using AI as the guidelines for the department to follow while developing new AI tools and AI-enabled technologies. Ben Huebner, chief of the Office of Director of National Intelligence’s Civil Liberties, Privacy, and Transparency Office, said that “We’re going to need to ensure that we have transparency and accountability in these structures as we use them. They have to be secure and resilient” [20]. Two themes have been suggested for the AI community to think more about: Explainability and interpretability. Explainability is the concept of understanding how the analytic works, while interpretability is being able to understand a particular result produced by an analytic [20].

All the principles suggested by scholars for AI bioethics are well-brought-up. I gather from different bioethical principles in all the related fields of bioethics to suggest four principles here for consideration to guide the future development of the AI technology. We however must bear in mind that the main attention should still be placed on human because AI after all has been designed and manufactured by human. AI proceeds to its work according to its algorithm. AI itself cannot empathize nor have the ability to discern good from evil and may

commit mistakes in processes. All the ethical quality of AI depends on the human designers; therefore, it is an AI bioethics and at the same time, a trans-bioethics that abridge human and material worlds. Here are the principles:

1. **Beneficence:** Beneficence means doing good, and here it refers to the purpose and functions of AI should benefit the whole human life, society and universe. Any AI that will perform any destructive work on bio-universe, including all life forms, must be avoided and forbidden. The AI scientists must understand that reason of developing this technology has no other purpose but to benefit human society as a whole not for any individual personal gain. It should be altruistic, not egocentric in nature
2. **Value-upholding:** This refers to AI's congruence to social values, in other words, universal values that govern the order of the natural world must be observed. AI cannot elevate to the height above social and moral norms and must be bias-free. The scientific and technological developments must be for the enhancement of human well-being that is the chief value AI must hold dearly as it progresses further
3. **Lucidity:** AI must be transparent without hiding any secret agenda. It has to be easily comprehensible, detectable, incorruptible, and perceivable. AI technology should be made available for public auditing, testing and review, and subject to accountability standards ... In high-stakes settings like diagnosing cancer from radiologic images, an algorithm that can't "explain its work" may pose an unacceptable risk. Thus, explainability and interpretability are absolutely required
4. **Accountability:** AI designers and developers must bear in mind they carry a heavy responsibility on their shoulders of the outcome and impact of AI on whole human society and the universe. They must be accountable for whatever they manufacture and create.

CONCLUSION

AI is here to stay in our world and we must try to enforce the AI bioethics of beneficence, value upholding, lucidity and accountability. Since AI is without a soul as it is, its bioethics must be transcendental to bridge the shortcoming of AI's inability to empathize. AI is a reality of the world. We must take note of what Joseph Weizenbaum, a pioneer of AI, said that we must not let computers make important decisions for us because AI as a machine will never possess human qualities such as compassion and wisdom to morally discern and judge [10]. Bioethics is not a matter of calculation but a process of conscientization. Although AI designers can upload all information, data, and programmed to AI to function as a human being, it is still a machine and a tool. AI will always remain as AI without having authentic human feelings and the capacity to commiserate. Therefore, AI technology must be progressed with extreme caution. As Von der Leyen said in *White Paper on AI – A European approach to excellence and trust*: "AI must serve people, and therefore, AI must always comply with people's rights.... High-risk AI. That potentially interferes with people's rights has to be tested and certified before it reaches our single market" [21].

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