Bull. Hiroshima Inst. Tech. Research Vol. 54 (2020) 19–28

Article

Harari and Kaku

Naoki ARAKI*

(Received Oct. 31, 2019)

Abstract

Historian Yuval Noah Harari predicts what will happen to human beings in the future in his book *Homo Deus*. According to him, everything comes to merge with the Internet-of-All-Things. Human beings are no exception. He says that human beings will become part of the flow of data. On the other hand, physicist Michio Kaku also considers the future of humankind in his writings. According to him, computers will become super-intelligent and surpass human beings. As a result of the evolution, humankind will be replaced by robots. These two scholars' views are similar in some respects but different in others. In this paper, we examine their views and clarify their similarities and differences.

Key Words: consciousness, algorithm, intelligence, Dataism, the Internet-of-All-things, superhumans

Introduction

As sciences are advancing, we are faced with the question: What will happen to human beings in the future? Harari and Kaku propose their answer to this question respectively based on their specialty, history or physics. In this paper, we examine their views on machines and consciousness, and also their predictions of what will happen to human beings in the future.

1. Machines and Consciousness

1. 1. Harari's Views

According to Harari, it is scientifically shown that we human beings have no soul like other animals (Harari 2015: 101). Harari insists that Charles Darwin's theory of evolution leads to the conclusion that human beings have no soul (Harari 2015: 103). According to the theory of evolution, all living things including human beings are composed of small particles constantly combining and splitting. There are no such things indivisible and unchangeable in natural selection (Harari 2015: 103–104). So, from evolution never emerges indivisible, unchangeable, and eternal soul. Soul has no parts (Harari 2015: 104). In short, evolution means change, so it cannot explain the existence of unchangeable eternity like soul (Harari 2015: 105).

On the other hand, according to Harari, the existence of mind can be confirmed whereas that of soul cannot:

> Mind is something very different from soul. The mind isn't some mystical eternal entity. Nor is it an organ such as the eye or the brain. Rather, the mind is a flow of subjective experience, such as pain, pleasure, anger and love. These mental experiences are made of interlinked sensations, emotions and thoughts, which flash for a brief moment, and immediately disappear. Then other experiences flicker and vanish, arising for an instant and passing away. (When reflecting on it, we often try to sort the experiences into distinct categories such as

* Department of Information Systems and Management, Faculty of Applied Information Science, Hiroshima Institute of Technology, Hiroshima 731–5193, Japan. E-mail: araki@ cc.it-hiroshima.ac.jp

sensations, emotions and thoughts, but in actuality they are all mingled together.) This frenzied collection of experiences constitutes the stream of consciousness. Unlike the everlasting soul, the mind has many parts, it constantly changes, and there is no reason to think it is eternal.

(Harari 2015: 105–106)

Therefore nobody cannot doubt the existence of mind as René Descartes insists that *Cogito ergo sum*:

The soul is a story that some people accept while others reject. The stream of consciousness, in contrast, is the concrete reality we directly witness every moment. It is the surest thing in the world. You cannot doubt its existence. Even when we are consumed by doubts and ask ourselves: 'Do subjective experiences really exist?' we can be certain that we are experiencing doubt.

(Harari 2015: 106)

Do, then, animals have mind? Descartes denies that animals have mind. But Harari says that they have mind because mind is a biochemical data-processing algorithm:

[…] the life sciences currently argue that all mammals and birds, and at least some reptiles and fish, have sensations and emotions. However, the most up-to-date theories also maintain that sensations and emotions are biochemical data-processing algorithms. (Harari 2015: 106)

If mind or consciousness is a biochemical data-processing algorithm, then how does science explain how mind or consciousness emerges?

To be frank, science knows surprisingly little about mind and consciousness. Current orthodoxy holds that consciousness is created by electrochemical reactions in the brain, and that mental experiences fulfil some essential data-processing function. However, nobody has any idea how a congeries of biochemical reactions and electrical currents in the brain creates the subjective experience of pain, anger or love. (Harari 2015: 107–108)

If subjective experiences are biochemical phenomena in the brain, we will have physicalism, which has been discussed in philosophy:

[…] scientists have certainly identified correlations and even causal links between electrical currents in the brain and various subjective experiences. […] When billions of neurons send billions of electric signals back and forth, subjective experiences emerge. Even though the sending and receiving of each electric signal is a simple biochemical phenomenon, the interaction among all these signals creates something far more complex—the stream of consciousness. (Harari 2015: 108)

But, on the other hand, Harari criticizes such an explanation above, pointing out that it does not clarify why electric signals cause subjective phenomena. The same criticism has already been proposed by Akira Sadakata, who makes it clear that from the outset there is an assumption that mind and body are separated from each other (Sadakata 1990: 118–119). For more details, see Araki 2020:

Yet this explanation explains nothing. It merely affirms that the problem is very complicated. It does not offer any insight into how one kind of phenomenon (billions of electric signals moving from here to there) creates a very different kind of phenomenon (subjective experiences of anger or love). (Harari 2015: 109)

But a data-processing system like computers does not always need any subjective experiences such as pain, pleasure, anger or love (Harari 2015: 113). For example, autonomous cars, which are one of data-processing systems, does not have any consciousness. Nor do they have any subjective experiences like fear (Harari 2015: 114). So, Harari asks, if machines function properly without any consciousness, then do they need any consciousness? In the history of science, ether was discarded, which was once presupposed to exist. In ancient times, God was responsible for natural phenomena, but not anymore. If so, do we not need soul or mind just as we did not ether or God? Soul or consciousness may be like Ockham's razor (Harari 2015: 114–115).

Also from another point of view Harari discusses consciousness. There are other reasons why

machines, which function better than human beings, do not need mind or consciousness. According to Harari, in science fiction intelligence and consciousness are confused and it is misunderstood that computers need to have consciousness in order for their intelligence to surpass that of human beings (Harari 2018: 68–69). But, Harari says, intelligence and consciousness are quite different things. Intelligence is the ability to solve problems while consciousness is the ability to feel pain, pleasure, love and anger. In animals including human beings, intelligence and consciousness go hand in hand. This means that animals solve problems with consciousness whereas computers solve problems without any consciousness. But algorithms do not need to have feelings such as pleasure, anger and fear when recognizing biochemical patterns of feelings (Harari 2018: 69). Then, are there never the possibilities that computers will have any consciousness? Harari gives us three possibilities concerning this question:

1. Consciousness is somehow linked to organic biochemistry in such a way that it will be never possible to create consciousness in non-organic systems.
2. Consciousness is not linked to organic biochemistry, but it is linked to intelligence in such a way that computers could develop consciousness, and computers will *have to* develop consciousness if they are to pass a certain threshold of intelligence.
3. There are no essential links between consciousness and either organic chemistry or high intelligence. Hence computers might develop consciousness—but not necessarily. They could become super-intelligent while still having zero consciousness. (Harari 2018: 69–70)

But Harari insists that both human beings and machines are algorithms and that human feelings are also algorithms. If he is right, we cannot deny the possibilities that machines will gain consciousness. In fact, Harari says that consciousness is the byproduct of algorithms, which means that machines are likely to have consciousness:

Rather, feelings are biochemical mechanisms that all mammals and birds use in order to quickly calculate probabilities of survival and reproduction. Feelings aren't based on intuition, inspiration or freedom—they are based on calculation.

When a monkey, mouse or human sees a snake, fear arise because millions of neurons in the brain swiftly calculate the relevant data and conclude that the probability of death is high. Feelings of sexual attraction arise when other biochemical algorithms calculate that a nearby individual offers a high probability of successful mating, social bonding, or some other coveted goal. Moral feelings such as outrage, guilt or forgiveness derive from neural mechanisms that evolved to enable group cooperation. (Harari 2018: 47)

According to Harari, the idea that consciousness is the byproduct of algorithms results from the fact that biotechnology merges with information technology (Harari 2018: 48). Next, we shall examine Kaku's views on consciousness.

1. 2. Kaku's Views

According to Kaku, human brains are different from digital computers (Kaku 2011: 80–81). This means that human beings have consciousness. Human brains are not only digital but also analogue at the same time. Also they transmit both discrete and non-discrete (continuous) signals (Kaku 2011: 82). It is linked to Descartes's mind/body dualism that human brains are different from digital computers. But if mind is distinct from body as Descartes insists, brains' injuries will not affect mind. But this is not the case:

This event [the case of Gage suffering from brain injuries] forever changed the prevailing opinions of the mind-body problem. Previously, it was believed even within scientific circles that the soul and the body were separate entities. People wrote knowingly about some "life force" that animated the body, independent of the brain. But widely circulated reports indicated that Gage's personality underwent marked changes after the accident. Some accounts claim that Gage was a well-liked, outgoing man who became abusive and hostile after the accident. The impact of these reports reinforced the idea that specific parts of the brain controlled different behaviors, and hence the body and soul were inseparable. (Kaku 2011: 100–101)

If mind and body cannot be separated, is it possible that machines have consciousness? If machines can have consciousness, then what is mind or consciousness? Kaku tries to redefine consciousness:

But if I were to venture a guess, I would theorize that consciousness consists of at least three basic components:

1. sensing and recognizing the environment
2. self-awareness
3. planning for the future by setting goals and plans, that is, simulating the future and plotting strategy

(Kaku 2011: 111)

According to Kaku, even simple machines have some form of consciousness in that they sense and recognize the environment. For example, a thermostat detects the temperature of the environment and acts on it (reacts to it) by transforming itself. Therefore, machines with a feed-back loop have a primitive form of consciousness. But robots lack pattern recognition (Kaku 2011: 111–112).

Then, is it possible to build a robot that satisfies the three conditions above?

AI researchers, therefore, should aim to create a robot with all three characteristics. The first is hard to achieve, since robots can sense their environment but cannot make sense of it. Self-awareness is easier to achieve. But planning for the future requires common sense, an intuitive understanding of what is possible, and concrete strategies for reaching specific goals.

So we see that common sense is a prerequisite for the highest level of consciousness. In order for a robot to simulate reality and predict the future, it must first master millions of commonsense rules about the world around it. But common sense is not enough. Common sense is just the "rules of the game," rather than the rules of strategy and planning. (Kaku 2011: 114)

So, unfortunately, it is very difficult to build a robot with consciousness because common sense is a prerequisite for consciousness. According to Kaku, a computer used in the field of medicine, Watson does not have self-awareness and common sense although it processes data faster than human beings (Kaku 2014: 215). Steven Pinker also says that it is impossible to create a robot that recognizes objects and reasons about the world and controls hands and feet (Kaku 2014: 217–218). In other words, robots (AI) lack pattern recognition and common sense. Robots cannot understand what they see even though they can detect more details of objects than human beings:

There are at least two basic problems confronting AI: pattern recognition and common sense.

Our best robots can barely recognize simple objects like a cup or a ball. The robot's eye may see details better than a natural eye, but the robot brain cannot recognize what it is seeing. [...]

Robots also have a problem with common sense. They do not understand simple facts about the physical and biological world. There isn't an equation that can confirm something as self-evident (to us humans) as "muggy weather is uncomfortable" or "mothers are older than their daughters." There has been some progress made in translating this sort of information into mathematical logic, but to catalogue the common sense of a four-year-old child would require hundreds of millions of lines of computer code. (Kaku 2014: 218–219)

So robots need to have consciousness in order to be like human beings. On the other hand, some think that robots cannot experience the essence of feeling, or "qualia" even though they can process feelings of color or sound better than human beings. But Kaku insists that the question, "Can robots feel color?" is not relevant here because the word "feel" is not well defined:

These arguments [e.g. John Searle's Chinese room (Searle: 1980)] have to be taken seriously, but there is also another way of looking at the question of qualia and subjective experience. In the future, a machine most likely will be able to process a sensation, such as the color red, much better than any human. It will be able to describe the physical properties of red and even use it poetically in a sentence better than a human. Does the robot "feel" the color red? The point becomes irrelevant, since the word "feel" is not well defined. At some point,

a robot's description of the color red may exceed a human's, and the robot may rightly ask: Do humans really understand the color red? Perhaps humans cannot really understand the color red with all the nuances and subtly that a robot can.

(Kaku 2014: 239)

Similarly, Kaku says that if robots can use Chinese better than human beings, the question, "Can robots understand Chinese?" will be irrelevant:

Similarly, it is only a matter of time before a robot will be able to define Chinese words and use them in context much better than any human. At that point, it becomes irrelevant whether the robot "understands" the Chinese language. For all practical purposes, the computer will know the Chinese language better than any human. In other words, the word "understand" is not well defined.

(Kaku 2014: 239–240)

After all, Kaku insists, the following question is no longer important: "Do robots feel sensations?" or "Do robots understand words?":

One day, as robots surpass our ability to manipulate these words and sensations, it will become irrelevant whether the robot "understands" or "feels" them. The question will cease to have any importance. [...] So the problem lies not in the hardware but in the nature of human language, in which words that are not well defined mean different things to different people. (Kaku 2014: 240)

Kaku's views above are the same as those of Alan Turing and Francis Crick:

But as time goes by, robots will eventually be able to describe sensations better than us on any level. Then it will be obvious that robots understand.

This was the philosophy behind Alan Turing's famous Turing's test. He predicted that one day a machine would be built that could answer any question, so that it would be indistinguishable from a human. He said, "A computer would deserve to be called intelligent if it could deceive a human into believing that it was human."

Physicist and Nobel laureate Francis Crick said it best. In the last century, he noted, biologists had heated debates over the question "What is life?" Now, with our understanding of DNA, scientists realize that the question is not well defined. There are many variations, layers, and complexities to that simple question. The question "What is life?" simply faded away. The same may eventually apply to feeling and understanding. (Kaku 2014: 240)

Thus, Harari and Kaku slightly disagree on whether computers will be likely to have consciousness. Harari is skeptical that machines might gain consciousness but Kaku does not deny that robots will have consciousness.

By the way, Harari insists in his book *Sapiens* (2011) that money, states, companies and so on are just fictions. Then, is the same true of intelligence and consciousness? If intelligence and consciousness are fictions, the relationship between intelligence and consciousness will vanish. Sadakata (1990) also points out that words make us think that something signified by them really exists by itself. For more details about this matter, see Araki 2019; 2020. But if computers advance in the future, what will happen to human beings? Next, we shall consider what Harari thinks of this question.

2. The Future of Human Beings

2. 1. Harari's Views

According to Harari, biologists have reached the conclusion that human beings are algorithms (Harari 2015: 84–85). On the other hand, machines are advancing and surpassing human beings but there is little, if any, possibility that machines will have consciousness:

In the past, there were many things only humans could do. But now robots and computers are catching up, and may soon outperform humans in most tasks. True, computers function very differently from humans, and it seems unlikely that computers will become humanlike any time soon. In particular, it doesn't seem that computers are about to gain consciousness, and to start experiencing emotions and sensations. Over the last decades there has been an immense advance in computer intelligence, but there has been exactly zero advance in computer consciousness. As far as we know, computers in 2016 are no more conscious than their prototypes in the 1950s. (Harari 2015: 311)

Harari says that it was once thought that intelligence and consciousness were inseparable but that advances of computers show that we have intelligence without consciousness (super-computers):

Until today, high intelligence always went hand in hand with a developed consciousness. Only conscious beings could perform tasks that required a lot of intelligence, such as playing chess, driving cars, diagnosing diseases or identifying terrorists. However, we are now developing new types of non-conscious intelligence that can perform such tasks far better than humans. For all these tasks are based on pattern recognition, and non-conscious algorithms may soon excel human consciousness in recognising patterns. (Harari 2015: 311)

What is the meaning of the fact that computers, which gain intelligence without consciousness, emerge? If human beings are algorithms, this means that sooner or later computers will surpass human beings:

The idea that humans will always have a unique ability beyond the reach of non-conscious algorithms is just wishful thinking. The current scientific answer to this pipe dream can be summarized in three simple principles:

1. Organisms are algorithms. Every animal—including *Homo sapiens* is an assemblage of organic algorithms shaped by natural selection over millions of years of evolution.
2. Algorithmic calculations are not affected by the materials from which you build the calculator. Whether you build an abacus from wood, iron or plastic, two beads plus two beads equals four beads.
3. Hence there is no reason to think that organic algorithms can do things that non-organic algorithms will never be able to replicate or surpass. As long as the calculations remain valid, what does it matter whether the algorithms are manifested in carbon or silicon? (Harari 2015: 319)

As Harari insists, if human beings are algorithms, computers may surpass human beings someday because they are also algorithms even though they do not have consciousness. In other words, as far as intelligence is concerned, the wall between organisms (human beings) and non-organisms (computers) will be removed. In fact, computers have already surpassed human beings in some fields. Sooner or later computers may take over human beings' jobs. The fields of medicine and arts such as music are no exception. According to Harari, if this reasoning is right, computers will rule the earth and go out to the universe:

[…] the AI takes over the planet, eliminates the human race, launches a conquest campaign to the ends of the galaxy, and transforms the entire known universe into a giant super-computer […] (Harari 2015: 327)

This scenario of Harari's is very similar to Kaku's prediction, which we shall deal with later. Furthermore, if all things are connected with the Internet, even human bodies will be linked through wearable devices. If so, everything will be controlled by a network of algorithms. This is also a conclusion brought about by life sciences that insist that human beings are algorithms:

It is the life sciences that have concluded that organisms are algorithms. If this is not the case—if organisms function in an inherently different way to algorithms—then computers may work wonders in other fields, but they will not be able to understand us and direct our life, and they will certainly be incapable of merging with us. Yet once biologists concluded that organisms are algorithms, they dismantled the wall between the organic and inorganic, turned the computer revolution from a purely mechanical affair into a biological cataclysm, and shifted authority from individual humans to networked algorithms. (Harari 2015: 345)

Here emerges, Harari insists, a new religion, Dataism, which worships data. But what is Dataism?

Dataism says that the universe consists of data flows, and the value of any phenomenon or entity is determined by its contribution to data processing. (Harari 2015: 367)

According to Harari, two factors have given rise

to the birth of Dataism: one is that life sciences have come to think of organisms (including human beings) as biochemical algorithms one and a half centuries after Charles Darwin published his book, *The Origin of Species* (1859), and the other is that computer scientists have come to develop electronic algorithms eighty years after Alan Turing formulated his Turing's test (1950). This removes the wall between organisms and machines. So electronic algorithms have come to be thought to surpass biochemical algorithms because the same mathematical laws can apply to both electronic and biochemical algorithms (Harari 2015: 367). If Harari is right, we will be able to get the theory that unifies all scientific disciplines:

> For scholars and intellectuals it [Dataism] also promises to provide the scientific holy grail that has eluded us for centuries: a single overarching theory that unifies all the scientific disciplines from literature and musicology to economics and biology. According to Dataism, *King Lear* and the flu virus are just patterns of data flow that can be analysed using the same basic concepts and tools. (Harari 2015: 367–368)

Furthermore, the history of human beings can also be analysed as the history of data-processing:

> From a Dataist perspective, we may interpret the entire human species as a single data-processing system, with individual humans serving as its chips. If so, we can also understand the whole of history as a process of improving the efficiency of this system, […] (Harari 2015: 377)

If the history of human beings has proceeded as Harari insists, what is their destination like?

> If humankind is indeed a single data-processing system, what is its output? Dataist would say that its output will be the creation of a new and even more efficient data-processing system, called the Internet-of-All-Things. Once this mission is accomplished, *Homo sapiens* will vanish. (Harari 2015: 380)

Dataism, then, would extend from the earth to the universe sooner or later:

> The supreme value of this new religion [Dataism] is 'information flow'. If life is the movement of information, and if we think that life is good, it follows that we should extend, deepen and spread the flow of information in the universe. […] Humans are merely tools for creating the Internet-of-All-Things, which may eventually spread out from planet Earth to cover the whole galaxy and even the whole universe. This cosmic data-processing system would be like God. It will be everywhere and will control everything, and humans are destined to merge into it. (Harari 2015: 380–381)

If organisms are biochemical algorithms, as Harari insists, the whole universe will be the flow of data and human beings will be chips of the flow:

> As authority shifts from humans to algorithms, we may no longer see the world as the playground of autonomous individuals struggling to make the right choices. Instead, we might perceive the entire universe as a flow of data, see organisms as little more than biochemical algorithms, and believe that humanity's cosmic vocation is to create an all-encompassing data-processing system—and then merge into it. Already today we are becoming tiny chips inside a giant data-processing system that nobody really understands. (Harari 2018: 56)

Harari's idea that human beings become chips of a gigantic network may be based on AI's connectivity and updateability, which are lacking in human beings:

> Two particular important non-human abilities that AI processes are connectivity and updateability.
> Since humans are individuals, it is difficult to connect them to one another and to make sure that they are all up date. In contrast, computers aren't individuals, and it is easy to integrate them into a single flexible network. (Harari 2018: 22)

Thus humankind merges with the information flow as chips in the Internet-of-All-Things. As the data-processing system gets larger, it is the source of meaning to merge into the system. Human beings spontaneously come to wish to merge into the system (Harari 2015: 386). Why is that? The reason is that according to Dataism, algorithms are

watching what you are doing as part of the data flow. So it follows that disconnecting to the data flow may be the loss of life's meaning. It is meaningless not to contribute anything to the exchange of information (Harari 2015: 386). But eventually human beings might vanish in this data flow:

> We might try to upgrade the human data-processing system, but this may not be enough. The Internet-of-All-Things may soon create such huge and rapid data flows that even upgraded human algorithms cannot handle it. When the car replaced the horse-drawn carriage, we didn't upgrade the horses—we retired them. Perhaps it is time to do the same with *Homo sapiens*. (Harari 2015: 388)

Then, will *Homo sapiens* be retired someday like horses that once drew a carriage? Even so, it is doubtful whether life can be reduced to the data flow. At present, it is unknown how the data flow produces consciousness of human beings. After all, organisms (including human beings) may not be algorithms (Harari 2015: 393). But, Harari says, even if Dataism is wrong and organisms (including human beings) are not algorithms, it will rule the world instead of human beings:

> Of course, even if Dataism is wrong and organisms aren't just algorithms, it won't necessarily prevent Dataism from taking over the world. [...] Dataism has especially good prospects, because it is currently spreading across all scientific disciplines. A unified scientific paradigm may easily become an unassailable dogma. It is very difficult to contest a scientific paradigm, but up till now, no single paradigm was adopted by the entire scientific establishment. Hence scholars in one field could always import heretical views from outside. But if everyone from musicologists to biologists uses the same Dataist paradigm, interdisciplinary excursions will serve only to strengthen the paradigm further. Consequently even if the paradigm is flawed, it would be extremely difficult to resist it.
> (Harari 2015: 394)

Then, if Dataism succeeds in ruling the world, what will happen to human beings? First, Harari predicts that health, happiness, and power will be pursued, but when the homo-centric world view shifts to the data-centric world view, human beings will become chips or data and eventually clumps of earth in the flow of data (Harari 2015: 394–395). After all, according to Harari, human beings may undergo the same thing that they did to other animals and humanity may become ripples of the flow of data in the universe. But, as Harari says, we cannot predict the future, so this should be understood as possibilities not prophecies (Harari 2015: 395). Next, we shall examine what Kaku thinks of the human beings' future.

2. 2. Kaku's Views

If robots advance, what will happen to human beings? According to Kaku, one scenario is that robots will retire human beings and rule the earth and eventually the universe:

> In one scenario, we puny humans are simply pushed aside as a relic of evolution. It is a law of evolution that fitter species arise to displace unfit species; and perhaps humans will be lost in the shuffle, eventually winding up in zoos where our robotic creations come to stare at us. Perhaps that is our destiny: to give birth to superrobots that treat us as an embarrassingly primitive footnote in their evolution. Perhaps that is our role in history, to give birth to our evolutionary successors. In this view, our role is to get out of their way. (Kaku 2011: 115)

Furthermore, Kaku predicts that robots, which are more intelligent than human beings, will produce robots even more intelligent than themselves and sooner or later they will use up the resources of the earth:

> When we finally hit the fateful day when robots are smarter than us, not only will we no longer be the most intelligent being on earth, but our creations may make copies of themselves that are even smarter than they are. This army of self-replicating robots will then create endless future generations of robots, each one smarter than the previous one. Since robots can theoretically produce ever-smarter generations of robots in a very short period of time, eventually this process will explode exponentially, until they begin to devour the resources of the planet in their insatiable quest to become ever more intelligent. (Kaku 2011: 116)

When computers have run out of the earth's resources, Kaku expects, the whole earth will become computers. Next, computers will go out to the universe and may make other planets or galaxies computers. So, eventually the whole universe may become computers:

In one scenario, this ravenous appetite for ever-increasing intelligence will eventually ravage the resources of the entire planet, so the entire earth becomes a computer. Some envision these superintelligent robots then shooting out into space to continue their quest for more intelligence, until they reach other planets, stars, and galaxies in order to convert them into computers. [...] Some even believe it might consume the entire universe, so that the universe becomes intelligent. (Kaku 2011: 116)

Furthermore, from another point of view Kaku says that AI will merge with human beings as it advances:

If you ask Dr. Brooks how we can coexist with these super-smart robots, his reply is straightforward: we will merge with them. With advances in robotics and neuroprosthetics, it becomes possible to incorporate AI into our own bodies. [...]

Some scientists even dream of the day when exoskeletons will have super-powers like those found in comic books, with super strength, super senses, and super abilities. We'd become a cyborg like Iron Man, a normal human with superhuman abilities and powers. (Kaku 2014: 248–249)

Furthermore, Kurzweil (2005) refers to the possibility that computers and human beings are unified, that is, computers are embedded in a human body (Kaku 2011: 119). Like Kurzweil, Kaku also refers to the possibility that computers and human beings are unified (Kaku 2011: 122). This is similar to Harari's idea that networks and human beings are unified. Furthermore, the following passage is similar to Harari's idea that medicine for treatments can be used to improve the ability of human beings' body and it leads to the emergence of superhumans (Harari 2015: 348):

In the next stage, he [Rodney Brooks] sees merging silicon and living cells not just to cure the ailments of the body but to slowly enhance our capabilities. For example, if today's cochlear and retina implants can restore hearing and vision, tomorrow's may also give us superhuman abilities. We would be able to hear sounds that only dogs can hear, or see UV, infrared, and X-rays. (Kaku 2011: 127)

Furthermore, Kaku thinks, if it is possible for human beings to control robots only by directions from their brains, then human beings will be cyborgs with robots' body:

Although this [an example of robots controlled by the mind] is a crude demonstration of mind over matter, in the coming decades it should be possible to increase the set of motions we can control in a robot, and also to get feedback, so we can "feel" with our new robotic hands. Goggles or contact lenses would allow us to see what the robots see, so we might eventually have full control over the body's motions. (Kaku 2011: 129)

According to Kaku, if we move this forward, it will lead to that human beings abandon their body and become software of a program encoding their personalities. This means that we will download our personalities into a computer. Eventually, human beings' body will be replaced by movement of electrons of a computer. This idea of Kaku's is similar to Harari's that human beings will merge with the Internet-of-All-Things (Harari 2015: 380–381):

In the ultimate scenario, we discard our clumsy bodies entirely and eventually evolve into pure software programs that encode our personalities. We "download" our entire personalities into a computer. If someone presses a button with your name on it, then the computer behaves as if you are inside its memory, since it has encoded all your personality quirks inside its circuits. We become immortal, but spend our time trapped inside a computer, interacting with other "people" (that is, other software programs) in some gigantic cyberspace/virtual reality. Our bodily existence will be discarded, replaced by the motion of electrons in this gigantic computer. In this picture, our ultimate

destiny is to wind up as lines of code in this vast computer program, with all the apparent sensations of physical bodies dancing in a virtual paradise. We will share deep thoughts with other lines of computer code, living out this grand illusion. We have great, heroic exploits conquering new worlds, oblivious to the fact that we are just electrons dancing inside some computer. Until, of course, someone hits the off button. (Kaku 2011: 131)

Will Kaku's predictions above be really realized in the future?

Conclusion

Harari insists that organisms including human beings are algorithms and that machines can surpass in intelligence without consciousness. On the other hand, Kaku claims that even machines can have consciousness and robots can outperform human beings. So both Harari's and Kaku's views are similar but they are different in some respects. Harari denies the existence of soul but accepts human consciousness as reality. He is not sure of the existence of consciousness in machines. In contrast, Kaku accepts the possibility that machines have consciousness by his own definition of consciousness. But Kaku does not mention whether organisms are algorithms and there is soul.

Furthermore, Harari predicts that as technologies are advancing, everything is merging with the Internet-of-All-Things. This means that even human beings are no exception. They come to be part of the flow of information or data. On the other hand, Kaku foresees that as a result of the evolution human beings will be replaced by robots. Robots reproduce more intelligent robots and come to rule the earth and eventually conquer the whole universe. Also in this point Harari's and Kaku's views are similar. But they are different in that Harari thinks that everything can be reduced to data flow but Kaku believes that robots rule the universe.

As we have seen, Harari and Kaku agree on the same pessimistic prediction that human beings will lose their present position as part of the flow of data or as a result of the evolution. It will turn out in the future what will actually happen to human beings. But at present we cannot judge whether their predictions are right or wrong. Time will show us what will happen to us in the future.

References

Araki, Naoki. "*Sapiens* and Language." *Bulletin of Hiroshima Institute of Technology*. 53. pp. 1–10. (2019)

Araki, Naoki. "Descartes's Problem." *Bulletin of Hiroshima Institute of Technology*. 54. pp. 9–18. (2020)

Brooks, Rodney A. *Flesh and Machines: How Robots Will Change Us*. Vintage. 2003.

Darwin, Charles. *The Origin of Species*. 1859. (A reprint of the 6th edition. Oxford University Press. 1951)

Harari, Yuval Noah. *Sapiens: A Brief History of Humankind*. Vintage Books. 2011.

Harari, Yuval Noah. *Homo Deus: A Brief History of Tomorrow*. Harvill Secker. 2015.

Harari, Yuval Noah. *21 Lessons for the 21th Century*. Jonathan Cape. 2018.

Kaku, Michio. *Physics of the Future: How Science Will Shape Human Destiny and Our Daily Lives by the Year 2100*. Anchor Books. 2011.

Kaku, Michio. *The Future of the Mind: The Scientific Quest To Understand, Enhance and Empower the Mind*. Penguin Books. 2014.

Kurzweil, Ray. *The Singularity Is Near: When Humans Transcend Biology*. Viking. 2005.

Pinker, Steven. *The Stuff of Thought: Language as a Window into Human Nature*. Viking. 2007.

Pinker, Steven. *How the Mind Works*. W. W. Norton. 2009.

Pinker, Stevens. "The Riddle of Knowing You're Here." In *Your Brain: A User's Guide*. Time Inc. Specials. (2011)

Sadakata, Akira. *Emptiness and Non-Ego: Buddhism's View of Language*. Kodansya. 1990. (in Japanese)

Searle, John. "Mind, Brains, and Programs." *The Behavioral and Brain Sciences* 3: pp. 417–457. (1980)

Turing, Alan. "Computing Machinery and Intelligence." *Mind* 59 (236): pp. 433–460. (1950)