AI-Revolutionizing The Way We Do Things

As extensively studied and recorded by a myriad of anthropologists, archaeologists, paleontologist, and historians among many other scholars, human-beings are believed to have gone through a multitude of technological advancements over zillions of years arguably in an effort to improve their living conditions; many people might have differing opinions in terms of the motivations for the technological ideations and advancements, though. As to humans, you know, there is no accounting for taste; however, many of the arguments made in a number of lines vis-a-vis technological inventions and advancements have some grains of truth hard to completely ignore. Many people attribute it to addressing societal and communal problems. Put another way, they firmly believe that technological inventions are made with the benign motives of extricating the inventors and their fellow people from the quagmire of darkness and poverty, and protecting the human race from the wrath of nature by making the world a better place to live in. They, without an inch of doubt, believe that technological products can at least help people mitigate the effects of such dangers as endemics, epidemics, pandemics, malaria, volcanic eruptions, earth quakes, locust plagues, bug infestations, tornadoes, torrential rains/flooding, et cetera, in as many thousand little ways. Some people attribute it to human indolence because they believe that many inventions were made due to lazy mindsets. That is to say, a bunch of technological progresses come from the idea of evading arduous, tedious, and time-consuming tasks. Laziness might push the couch potatoes to try out new solutions that make everything more automated and efficient leaving them with plenty of time to sleep on their sofa around the clock. Eventually, the invention of the indolent gets adopted by more people and become a norm.

Yet, some other people ascribe it to power hunger, avarice and sinister intents of human-beings. Many believe that most, if not all, of the technological progresses are driven by the morbid obsession of people for power. They argue that a very community-based world where people are kind and understanding to one another and help out one another without expecting anything in return would never drive a technological advancement at the same rate we have witnessed because of wars. They rather believe that most of the scientific and technological advancements in recent years are driven by arms race for better weaponry that gives one better control over others. They go further to believing there are no better forces that would motivate human-beings to develop technology faster than the desire to kill each other, capture resources, or grab lands that belong to others. Furthermore, in a sense that might sound like a luxurious activity to some people, and in direct contradiction to the common English maxim “curiosity killed the cat”, sense of adventure to discover about the other side of the world has also played pronounced roles in technological advancements. Recasting it, curiosity to know about what is on the other side of the treacherous, ungovernable, and unfathomable oceans inspired people to invent boats, which gave way to the construction of the state-of-the-art gigantic ships way longer than a soccer court. Additionally, the burning desire to find out what is on the other side of many mountains and impenetrable jungles pushed people to invent countless useful gears. Likewise, many a scientist has been moving earth and heaven to understand how the human brain processes information and create artificial intelligence based on it. Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) models (with input, hidden, and output neurons) constructions are typically inspired by how the trillion neurons—electrically conducting cells in our brain that give us the incredible computing power, memory, and ability to think that we are known for—work. The neurons have such special components like dendrites that receive information to the cells body from another neuron more like a receiver (Rx), axons that take information away from the cell body more like a transmitter (Tx), and a synapse that helps information flow from one neuron to another more like a communication medium.

On the flip side, it is also common to see and meet reactionary people who are completely techno-phobic and live in a wishfully mythical or non-extant world and always wistfully say “gone are the days when stones were loaves of bread”. They view all kinds of technological ideation and invention as satanic and

ungodly acts as a result of which they spend most of their time eulogizing primitive life-style and vehemently objurgating the present and hurling curses after curses at technological creators, spreaders, enablers, helpers, and users to make them look like anathemas; to no avail, though. So, in the eyes of many people, technological advancement is both a blessing and a curse. However, I am of the opinion that technology gives us the sixth sense to better fathom the work of nature and our surrounding to create a world more friendly to human-beings in many senses. Its upsides usually outweigh its downsides. At the same time, if someone tells me to my face that the nuclear technology, one of the engineering marvels of the 20th century, was invented to purely make the world a better place to live in, that is something I would take with a huge sack of salt.

According to historians, humans have registered three major waves of changes to date, namely Agricultural Revolution (10000B.C.), Industrial Revolution (1750s to 1950s), and Information Revolution (1950s to present), and the roles of technological advancement in these waves was irreplaceable. Taking a bit deeper but brief look at the technological periodization, human-beings have seen a lot of technological advancements during the Prehistoric, Ancient, Middle, and Modern Ages; the vast majority of them were created in alarming speed and rate in Modern Ages, though. History tells us that it all began with the Homo Habilis who managed to invent choppers, sharpened stone tools, made by smashing one stone against another during the New Stone Age. The progress by then was believed to be extremely slow and it is said to have incredibly taken them about three stone ages (the Old, Middle, and New Stone Ages) or millions of years to create such tools. These inventions gave way to the Copper Age where humans started smelting and manipulating coppers to make tools. This, in turn, laid the foundational works to the next technological period known as the Ancient History dominated by the Bronze and Iron Ages, where humans began to use tools made from bronze and iron materials. However, the technological advancement registered during the Modern Age—marked by sub blocks of time like the Industrial Age, the Machine Age, the Atomic/Nuclear Age, the Space Age, and Information Age—is unfathomably astounding. Electricity, one of the most ingenious invention of the 19th century (initially conceived in the mid of the 18th century; a number of people think Benjamin Franklin was the one who invented electricity with his famous kite-flying experiments in 1752, though), gave way to the inventions and advancement of computers in the 1940s and 1950s, and then to the information age. Another ingenious invention brought into being by the US-DoD in the 1970s was the Internet. Now, thanks to it, the world is wired; metaphorically speaking, it has narrowed to a village. The various social networks and other services that run on the Internet have empowered people to build communities very easily irrespective of geographical locations and brought the world together closer. The Internet has become one of the basic human necessities in that it daily affects the way we communicate and do business.

Disciplines such as Engineering, Computer Science, Biology, Psychology, Linguistics, and Mathematics constitute the foundation of an AI, a science and technology. The development of computer functions associated with human intelligence was the main thrust of AI. That is, the advent of computers and various computing paradigms (edge, fog, or cloud computing) inspired by the Internet gave way to the advancement of Artificial Intelligence. In the eyes of computing, the human brain majorly offers three functionalities, namely computing power, memory, and ability to think. Then, AI was brought into being with notion of leveraging computers and machines to mimic the problem-solving and decision-making capabilities of the human mind; it still relies on data and specific instructions fed into the models, though. The earliest successful AI program was written in 1951 by Christopher Strachey, one of the computer pioneers who served as the director of the Programming Research Group at the University of Oxford. Then, John McCarthy coined the term *Artificial Intelligence and made the d*emonstration of the first running AI program at Carnegie Mellon University. But unlike other computing fields, the AI progress had been relatively quiet until the dawning of the 1980s. In the 1980s, Geoffrey Linton, dubbed as the Godfather of Artificial Neural Network (ANN), carried out a lot of promising researches and published many papers. A decade later, Yann Lecun – a student of Geoffrey and often nicknamed as the grandfather of Convolutional Neural Networks (CNN), took AI to another level in the 1990s. He made a great contribution to the

conception and advancement of CNN. Now both of them are members of the active drivers of the deep learning in their respective companies. CNN is a very intriguing area and at the same time very challenging to deal with. It is too involved, convolved, and mathy one that takes a great deal of computational powers. Hence, mainly due to the lack of sufficient computational powers, it again went through another quiet period until the advent of the Imagenet in 2012 that has revolutionized the development of CNN. Since then, a number of more accurate convoluted networks like VGG-Net, Res-Net, and many others were developed based on deeply involved network architectures. These types of networks are convenient for cloud computing or server-based deployment. Then, starting 2015, the trend changed to developing lightweight CNN models that can fit into mobile and other edge computing environments. The advancement of graphical processing unit (GPU) has played very paramount role in the development of AI in that GPUs have evolved from a single core, fixed function hardware which was exclusively employed for graphics purpose to a set of programmable parallel cores capable of handling the most complex deep learning calculations. Today, AI has become ubiquitous. It can give us recommendations about the future pathways we should pursue to navigate our companies in the right direction based on insights derived from huge historical data, it can enable us to make informed decisions, it can provide us with directions while driving, it can provide answers to our questions, it can automate tasks and communications in the workplaces through the use of chat-bots, et cetera. It was during the last decade that AI has evolved into technology like facial recognition and autonomous cars. But it has quickly become tangibly accessible far beyond theory and the academia. It is now applied in ways that it can help people a lot. Some of the most fascinating regenerative AI tools in use today are ChatGTP, Grammarly, Voice.ai, Repurpose.io, Synthesia, Jenni AI, Andi, Cowriter, Skim It, Prompt Hunt, and All Search AI. Putting it in a nutshell, as of 2022, we have embarked on a new era, the AI era. I am 100% in agreement with what Mark Cuban, an American entrepreneur, and television personality had to say in 2022 about the role AI would play in workplaces . "AI, deep learning, machine learning—whatever you're doing if you don't understand it—learn it. Because otherwise, you're going to be a dinosaur within 3 years."

Such buzzwords as AI, ML, and DL are confusing to the ordinary people at best and unfathomable at worst. Many people have difficulty differentiating between them. Then, I'd like to shed light on their similarities and differences concisely. Using some sort of mathematical set notation to elucidate their relationships, AI is the super set, ML is its subset and DL is the subset of ML. In a broader sense, AI can be defined as the ability of an electronic machine to mimic an intelligent human behavior. Intelligence, an intangible human trait, is composed of five elements, namely reasoning, learning, problem-solving, perception, and linguistic intelligence. Then, AI was intended to have all these attributes; it is not there yet, though. ML is a specific application of an AI that allows a system of hardware and software to automatically learn and improve from experience. Furthermore, as precisely defined by Tom Mitchell, ML is a computer program capable of learning from experience E with respect to some set/class of tasks T and performance measure P. Then, the performance P of an ML model at tasks T improves with experience E. Based on its purposes and the way its model is trained and created, it is commonly divided into such categories as Supervised learning, Unsupervised Learning, Semi-supervised Learning, and Reinforcement Learning. And DL is an application of ML that uses highly involved or convoluted algorithms and deep neural networks to train a model. Today, AI research is one of the most exciting fields in the tech world. The ongoing AI developments are put into four categories, namely reactive machines, limited memory, theory of mind, and self-aware AI. A Reactive Machine is the very basic type of AI capable of responding to external stimuli in real time; however, it lacks the ability to store information for future use. A Limited Memory AI is one that can store knowledge and use it to learn and train for future tasks. It uses recently garnered data to make immediate decisions, like in self-driving cars. Theory of Mind refers to the concept of an AI capable of sensing and responding to human emotions, and performing tasks of limited memory machines. Lastly, a Self-aware AI is the ultimate stage of AI where machines will have human-level-intelligence to be able to have a self-sense and recognize the emotions of others. To date, as far as I can tell, humans have managed to build Reactive Machines and Limited Memory AI based models; however, humans are "millions of years" away from building self-aware AI models. I don't' have an inch of doubt that AI models will play very pronounced roles in automating

workplaces and will be able to replaces the roles of many white-collar workers in the foreseeable future. It is 100% possible to build models and computers capable of performing a quintillion of operations per second in a structured way. In this department, the AI and computers are at least a quintillion times faster than human beings in the era of exaFLOPS/exascale computing. Additionally, AI can be very useful in helping doctors perform diagnosis easily and accurately, data analytics, data science, navigation systems, weather forecasting, military applications, smart mechanical surveillance systems, natural language processing, gaming, augmenting reality, creating virtual reality, in operating unmanned aerial and ground vehicles or robotics in general, vision systems, smart irrigation system, ...etc. However, as I see it, it is next to impossible to build AI models or machines capable of dealing with highly nuanced things like language and common sense. As stated earlier, AI can definitely beat humans in some departments, but AI certainly lacks common sense and stumbles in dealing with things that have shade of differences and unforeseen circumstances because the world we live in presents endless unforeseen challenges now and then. In short, the world is light-years away from creating a self-aware AI; there is some possibility to create a human-like AI with metamemory skills, though.

However, unless used under the control of responsible individuals and/or states, there are a hundred and one good reasons for one to believe that AI is a double-edged sword. It has the power to shape the future of humanity across nearly every industry positively; however, it could also have cataclysmic consequences in infinitely many ways if misused. To corroborate this line of argument, let us delve into its surveillance and military applications and the question of fairness. Beginning with the AI role in the practice of video surveillance systems (VSS), currently there are well over a billion closed-circuit television (CCTV) cameras in use around the globe. Wherever you go, big brother is watching you! The billions of CCTV cameras mounted on building walls, ceilings, and corners or perched on street poles, border checkpoints, and lamp posts enable governments to collect a great deal of information about individuals without their knowledge and consent with flagrant disregard to their privacy rights. Universally, privacy is a fundamental human right upon which other rights are built. It is defined as the sate of being free from any disturbance or observance without one's consent and knowledge. It is designed to help individuals establish boundaries to determine who can have access to their personal information. Furthermore, it is defined as the protection of personal information that says anything about who we are, what we do, what we think, and what we believe in. However, governments, in an effort to rationalize their blatant intrusive surveillance actions, often argue that only bad people have reasons to want to hide things and care about their privacy. Then, they often mention the famous quote "If you have got nothing to hide, you have got nothing to worry about" to substantiate their argument. On the other hand, many argue to debunk the previous argument that it is never all about hiding something, it is all about an individual's private things being no one else's business. The quote "I don't have anything to hide, but I don't have anything I feel like showing to you, either" is used in an effort to corroborate this position. To the utter dismay of political opponents and civilians, AI has added a lot of capabilities to CCTV cameras enabling governments to collect more specific information about targeted individuals and perform tracking around the clock. Today, so powerful CCTV cameras are out there equipped with powerful facial recognition AI models, tracking systems, and the ability to link individuals with their databases. The AI models help the cameras to effectively perform video frame inspection, identification, recognition, classification, observation, detection, and monitoring on the spot based on edge-computing paradigm or offline based on a remote cloud computing scheme. Despotic governments can make use of AI-powered cameras to flagrantly suppress and attack political opponents, dissents or even civilians. They are always watching you by being in the surveillance operation center (SoC)!

AI, as we know, can react significantly faster than systems that rely on human input/intervention and it can drastically augment the process of military target acquisition. The AI models can better help in the detection and identification of the location of a target in sufficient detail to allow the effective employment of lethal and/or non-lethal means/weapons. Deep-diving into the roles an AI can play militarily, well, it is currently playing instrumental role in enhancing the surveillance and target acquisition capability of both manned and

unmanned ground and aerial vehicles (MGV, UGV, MAV, and UAV). If such technologies fall on the hands of irresponsible governments or individuals, they can quickly unleash disasters. For instance, drones can pop up out of no where and unleash catastrophe. The world has witnessed how deadly a drone warfare can get in the Nagorno-Karabakh War where a great deal of military equipments and personnel were reduced to zeros very shortly, and in Tigria (Ethiopia) war where millions of people were massacred in the most macabre manner ever. Moreover, the world is now in a hypersonic missile race and the role of AI is really scary. At present, many a country possesses thousands of inter-continental ballistic missiles (ICBM) (that can carry both conventional and nuclear warheads) capable of traveling at a speed of mach 23 (28,200 kilometers per hour) or higher; however, they are vulnerable in that they travel via predictable trajectories. That is to say, they can be detected and tracked by missile defense systems ;then, they might be intercepted either in their boost phase, midcourse phase, or terminal phase. As a result, countries are in a race of owning a class of missiles called hypersonic glides which can travel through unpredictable trajectories to evade air-defense systems and successfully reach their targets. Here, AI can play roles both in perpetrating an attack using these missiles and countering these missiles. The AI can give these missiles the power to follow random or unpredictable paths rendering existing missile defense systems useless. It can be instrumental in making a hypersonic missile smarter to follow erratic paths and top up their invisibility by timely forming plasma waves that absorb radar signals to protect them from radar detection. On the other hand, it can also be employed to accelerate the complete kill chain from detection to destruction of hypersonic missiles. Probably, AI is gonna be the only feasible technology that will allow militaries to better and timely defend against hypersonic weapons which travel at a ridiculously high speed via erratic trajectories. Again, it never takes a genius to tell how devastating it would turn out when such a consequential AI-powered technology comes into the possession of irresponsible parties.

In relation to the fairness of AI, there is a pervasive misconception and misunderstanding in that many people fallaciously believe that AI works fair and square. This notion is absolutely wrong in that AI can only get as fair as you make it. In reality, AI can potentially suffer from three types of biases, namely algorithmic AI Bias, training data bias, and societal AI bias. AI algorithms might be designed to systematically manipulate the weights of some parameters differently depending on people's race, history, origin, belief, location, etc that creates unfair outcomes. Putting it another way, the algorithm can only be as fair as the builder wants it to be. Data bias is introduced when less diversified data is employed to train an AI model. In a scenario that produces desirable outcome, sufficiently large data for a certain group or situation and less data for another group or situation might be employed for creating an AI model. In this case, the group or situation with lion-share of the dataset might get unfairly favorable outcome compared to the underrepresented group or situation. Conversely, for instance, for a model that detects criminal behavioral pattern, more data on a certain group of people might be employed in building the AI model and it might unfairly target those group of people. At last, some societal or communal assumptions and norms have the potential to cause AI model creators to have some blind spots or expectations in their thinking, which they might potentially carry and build into the AI models.

In parallel to the AI age, a sub-block of the Information Age, other fascinating technologies are on the rise. The Experience Age has dawned thanks to the combination of technological advancements registered in mobile connectivity, the Internet of Things (IoT), artificial intelligence, chatbots, & social messaging. Now we are on the cusp of the next great technological period: the Augmented Age dominated by virtual reality (VR) and augmented reality (AR). The ARVR Community Vision is moving from gaming to everyday life in three major steps. At first, VR is mostly perceived as a gaming and entertainment tool during the period between 2015 and 2020. Secondly, from 2020-2025, VR & AR are expected to merge together, where VR will grow to become a more promising professional platform. Eventually, 2025-2030, advanced VR sets are expected to be created, touted to be capable of reading our minds and helping us get our works done on the go in any situation. It is projected that it would be hard to live without them. AR is not the same as VR in terms of the technology applied and devices employed. VR is designed to create an alternative reality that a

user can experience without input from the real world and the whole experience is digitally created and controlled. In contrast, AR is designed to incorporate digitally-created 3D objects and 2D imagery into real life, where the user remains present in the physical world. It just adds digital content into a physical world with no change in its overall aspects. AR Smart glasses are already in the market. They incorporate AR technologies into a wearable device that allows users hands-free access to their laptops, mobiles or the Internet. Users can amazingly keep themselves abreast of current information on the spot without interrupting their work by using voice control, eye movement or simple button-press on buttons built-into the frame of the smart glasses. It won't be long before prompters are fully superseded by the AR smart glasses; users can make presentations right from their smart eyeglasses where they can open apps through eye blinks and other controlled movements. Besides, it won't be far before we have augmented driving and safety features in cars that would enable us to have 360-degree view of the car (partly realized now). As a result, personally, I am so passionate about AI and AR; and I champion for responsible engagement in these areas of endeavors to positively and fairly impact the world.

To date, some tremendous successes have been achieved in the process of imparting data, information, and human intelligence to electronic machines that can at least narrowly mimic human behavior and perform tasks by learning and problem-solving. That is, AI still glaringly lacks common sense and the ability to understand nuanced things. Besides, I feel like humans might not be able to build self-aware AI systems/machines. However, the fact that we are at a point of time where AI models are capable of simulating natural intelligence to solve some complex and highly convoluted problems is a remarkable achievement. Now, the sad reality is that many in the third-world are not yet ready to embrace such most ingenious and mesmerizing technologies. In the eyes of technological periodization, many people around the world are still between the Stone and Iron Ages. Obviously, there has been an astronomical gap between the economic haves and have-nots, and it will certainly get far worse due to the alarmingly growing technological divides. What all the harbingers show at this point of time is that there is a good chance that countries with no data-savvy and tech-savvy population will find it so hard to survive in many ways because AI will surely further change the way we do things, the way we communicate, the way we do business, …, and the way countries will wage wars. What former US president Bill Clinton once said in relation to the technological divide is still absolutely true; "It is dangerously destabilizing to have half of the world on the cutting edge of technology while the other half struggles on the bare edge of survival". Hence, in lieu of engaging in frivolous acts and gossip-mongering and frittering away your time on preaching myths and anachronous things, it is far wise to recognize that AI is already underway, understand where AI flourishes, and devise an excellent strategy to survive in its huge presence.

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Disclaimer: This view is exclusively mine (personal).