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ARTIFICIAL INTELLIGENCE: AN ANALYSIS OF ALAN TURING'S ROLE IN THE CONCEPTION AND DEVELOPMENT OF INTELLIGENT MACHINERY

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ARTIFICIAL INTELLIGENCE: AN ANALYSIS OF ALAN TURING'S ROLE IN THE CONCEPTION AND DEVELOPMENT OF INTELLIGENT MACHINERY

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Abstract

The purpose of this thesis is to follow the thread of Alan Turing's ideas throughout his decades of research and analyze how his predictions have come to fruition over the years. Turing's *Computing Machinery and Intelligence* is the paper in which the Turing Test is described as an alternative way to answer the question "can machines think?" (Turing 433). Since the development of Turing's original paper, there has been a tremendous amount of advancement in the field of artificial intelligence. The field has made its way into art classification as well as the medical industry. The main concept researched in this analysis focuses on whether or not a machine exists that has passed the Turing Test. Should it be determined that a machine has indeed passed this test, it is important to discuss what the ethical implications of this accomplishment entail. Turing's paper, while raising great controversy regarding its ethical implications, proves to offer significant contribution to the field of artificial intelligence and technology.

KEY WORDS: Alan Turing, Turing Test, Imitation Game, intelligent machines, artificial intelligence

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Artificial Intelligence: An Analysis of Alan Turing's Role in the Conception and Development of Intelligent Machinery

Chapter One: Introduction

"We can only see a short distance ahead, but we can see plenty there that needs to be done." – Alan Turing (b. 1912- d. 1954)

These words encompass the scholar's work; his ideas were revolutionary but were not recognized until after his death. He was a main figure at Bletchley Park during World War II. Turing spearheaded the team that worked to break the ENIGMA code, which was used by the Germans to communicate with their forces regarding the plans for the U-boats. Poland had completed portions of the work on breaking the code, but once it was overtaken by the Germans, it was up to the United Kingdom to stop German forces. Here, Turing's mathematical and natural talent for cryptology came into play. When breaking the ENIGMA code, he created a machine, called "the bombe," that performed most of the trial and error calculations; in doing so, he essentially built the first computer. His interest in cryptology sparked ideas about the possibility of mechanical development as well as what characteristics and abilities machines may have in the future. Thus, Turing's brilliant—and now famous—ideas about machine intelligence were born ("The Enigma of Alan Turing").

Alan Turing's education speaks highly of his ideas; he attended Cambridge University for his undergraduate studies and received his Ph.D. from Princeton University, which boasts the best mathematics program in the world. When Hollywood began to shed some light on his discoveries, the public received a window into a mind that was gone too soon. Alan Turing was born in 1912 but tragically took his own life in

1954 ("Alan Turing Biography"). At the time of his paper's publication, there was development in the computer science realm but no advancements toward an intelligent machine such as the one that Turing proposed. Since *Computing Machinery and Intelligence* was published over sixty years ago, the field of computer science has experienced exponential growth. Throughout numerous decades, his ideas have grown and changed into a field we now call "artificial intelligence." Although the field has grown beyond belief, the finish line is still not in sight.

Before the 1950s, computer programming was limited to counting, copying, and simple computations (Anonymous, "Eight New IBM Machines"; Anonymous, "Electronic Calculator, Collator, Cardatype"; Anonymous, "Semi-Automatic Photo-Copying Machine"). As we entered the late 1950s, however, computer programming began evolving into a language of its own. As the growth of computers' functions became more ambitious, the language became more complex (Nofre et al.); This movement of pushing the boundaries of computers' basic functions resulted from Turing's research. His paper outlines a machine that is unique and unlike any other device present at that time; his propositions of machine intelligence potential in 1950 transformed and have grown into something much greater than Turing could have predicted. His revolutionary ideas have transcended generations and within the past 60 years, the field of artificial intelligence (AI) evolved and has grown exponentially thanks to his ideas.

Chapter Two: Methodology and Expanding Turing's Paper

The methodology of my thesis is solely a literature review; since I am focusing on Turing's ideas and the imitation game, I am unable to create an actual experiment. However, I am able to discuss ways in which his ideas play a major part in the artificial intelligence field today and the strides made in machine intelligence. Since the literature review is the backbone of my thesis, I will proceed to explain how I approached my sources.

Firstly, I picked primary source materials; my thesis revolves around Alan Turing's paper *Computing Machinery and Intelligence*. The additional sources utilized all align with the ideas Turing proposed in this paper or the paper itself. I have selected sources spanning the past 60 years to analyze the historical timeline of Turing's ideas. The articles used are all published by experts in their field and prove very accessible because this topic of conversation remains prevalent today.

Around the same time Alan Turing published his paper, IBM had recently released their revolutionary magnetic storage tape (Bradshaw and Schroeder). The decision to store data on magnetic tape was risky for the IBM corporation; at the time, the switch from a physical punch card system to a magnetic strip was uncertain and uncharted territory (Bradshaw and Schroeder). While IBM was considered to be thinking outside of the box, Turing offered an idea that was unprecedented.

In the first line of Turing's paper, he proposes the question, "Can machines think?" (Turing 433). Computers, at that point, were utilized mostly used for simple computations and storage; talk of developing a different kind of computing machine was fairly new.

In 1948, Norbert Wiener published a book entitled *Cybernetics,* in which he divulges into the science of communication: the unifying factor between many areas of study. Unlike Turing, Wiener warns the general public about the negative consequences associated with creating a machine that can act as a human brain. Wiener was attempting to determine how machines could be used to learn more about the cyclical nature of the human nervous system (Littauer). Warren S. McCulloch, neuropsychiatrist and cybernetician, worked as the middle-man between biomedicine and engineering during the 1940s. McCulloch was originally more involved in the neuropsychiatric field while studying at University of Illinois in the early 1940s. While there, he teamed up with Walter Pitts, a mathematician, to study the logic of the nervous system. After this, McCulloch became more interested in discovering how the brain works through the lens of information systems (Abraham). Unlike Wiener and McCulloch, Turing was interested in the possibility of a machine becoming just as complex as a human brain and harnessing the possibilities similar to those that humans possess.

Turing specifically discusses which kind of machines would satisfy the criteria to qualify for what is now commonly referred to as the Turing Test. At that time, the term “computers,” instead of naming a device, usually referred to the humans whose main job was to carry out computations. He specified that he is talking about a digital computer made up of a store, executive unit, and a control. He made an analogy between the jobs of each of these components and the tasks of a human computer. The “store” is the paper used to write out the calculations. The “executive unit” would be the desk machine that the human would use for arithmetic. The “control” would be the rulebook that the human computers would have to follow when carrying out a computation(Turing 437).

Turing clarified that the machine he described would be considered a discrete state machine, but in reality, that type of machine is not one that exists. Everything moves continuously, but most machines are considered discrete. For example, turning a light switch on and off may seem discrete because there are only two options: on and off. However, electricity is continuous; no operation on it can make it discrete (Turing). A lengthy amount of Turing's paper is dedicated to addressing the possible arguments against the probability that a machine will be able to answer his essential question. He introduced this section by clearly stating what he believes will happen; he predicted that within the next 50 years, there will be a machine that will be able to successfully perform in the imitation game.

According to Turing's assumptions, theologians will argue that God gave immortal souls only to humans, and in turn, machines and animals would never have the ability to think the way that humans are able to (Turing 443). With the rise of artificial intelligence in the 21^{st} century, there is a current conversation within Christianity surrounding God's creation of the soul. If God is indeed the creator of beings and their souls, is it possible for a man-made robot to possess a soul? It is reasonable to assume that most people, including Christians, would claim it is impossible for a machine to have a soul. Russell C. Bjork, professor of computer science at Gordon College, clarifies Turing's statement by acknowledging that he is talking about the origin of a soul: God can create things both material and immaterial, i.e. a soul (Bjork). Mike McHargue, Christian author of *Finding God in the Waves: How I Lost my Faith and Found it Again Through Science*, approaches the situation differently. McHargue argues that if we are able to learn how to translate the brain into a code that could then be programed in AI, that AI could potentially become a digital version of the human that the brain belonged to and therefore have a soul (Merritt).

Turing claims that if God is an almighty and omnipotent being, there is nothing restricting Him from giving an immortal soul to anything He pleases. Turing believes that if an animal brain proved advanced enough to handle an immortal soul, God would bestow one on that animal; he directly correlates this with the idea of an advanced form of machinery (Turing 443). "Head-in-the-sand" is an idiom that describes the mentality people develop when they see a potential issue and therefore choose not to acknowledge it (Merriam-Webster). Turing ties this objection with that of the theological statement; he links it to intellectuals' fear that their superiority will be taken from them (Turing 433).

Moving away from societal arguments, Turing continues onto the arguments that originate within the mathematical sphere. Gödel's theorem shows that there are limitations to logical systems because they cannot be proven or disproven lest they are inconsistent. There are said to be no limitations on human intellect and we as a society accept that as truth without any proof. Turing argues that if there is no proof of limitations on human intellect, it cannot be assumed that there are limitations on machines without any proof. Turing quotes Geoffrey Jefferson, noting,

> Not until a machine can write a sonnet or compose a concerto because of thoughts and emotions felt, and not by the chance fall of symbols, could we agree that machine equals brain – that is, not only write it but know that it had written it. No mechanism could feel (and not merely artificially signal, an easy contrivance) pleasure at its success, grief when its valves fuse, be warmed by flattery, be made

> miserable by its mistakes, be charmed by sex, be angry or depressed when it cannot get what it wants. (qtd. in Turing 445)

Turing used the aforementioned quote to set up the "Argument from Consciousness;" his counterargument is that this perspective does not take into account the effectiveness of the imitation game (Turing 445).

At this point, Turing turns to the criticism about the limitations of machines. Some may claim that despite progress in artificial intelligence, there will always be some human function that a machine will be unable to perform; he calls this the "Argument of Disability." He believes there is not much of a backbone to this argument since many people who advocate for it do not have any knowledge about the mechanics of a machine, so they are just inferring things based on what they have heard. A few of the arguments that follow this one are related to this general idea (Turing 447).

Augusta Ada King-Noel, Countess of Lovelace, known as Lady Lovelace, was a English mathematician in the mid-1800s. Lovelace's objection comes from a her memoir in which the main idea presented is that a machine will never be able to "take us by surprise" (Turing 450). A machine is only capable of the intelligence programmed into it—nothing more. Turing's counterargument is less effective than Steven Harnad's, of the University of Southampton, whose commentary gives evidence to the difficulty of arguing that any matter has originated since the Big Bang (Epstein et al. 53).

Turing's "Argument from the Continuity in the Nervous System" is similar to that of Lady Lovelace's objection in regard to the fact that a discrete machine would not be able to mimic a continuous system, i.e. the nervous system. Turing points out that the set-up of the imitation game allows for the difference between discrete and continuous machines to not affect the interrogation (Turing 451).

It could also be argued that when comparing machine and man, the elements truly being contrasted are the "laws of behavior" and "rules of conduct." The question essentially being asking is: are we able to calculate every man's reaction in every circumstance? Turing stated that some machines have "surprised" him, so the absence of the "laws of behavior" does not mean that the machine or human only acts based on "rules of conduct" and vice versa. Therefore, since there is no way to predict man's behavior, then we cannot state that the machine's reactions accurately or inaccurately mimic those of a human (Turing 452).

After Turing describes all of the counterarguments, he presents his idea that attempts to create a machine capable of disproving all of the objections: learning machines. The ideal learning machine would have the mind of a child with the ability to learn and store information to access at a future time. The machine would, in essence, program itself as time progresses. He suggests that a child's brain can be reduced down to an algorithm (Turing 454).

The Turing Test, also referred to as the Imitation Game, is the backbone of Turing's paper. This is the method he intended to use to prove whether or not a machine could take on the persona and mental capacity similar to that of a human. There are three beings involved in this game: a man, a woman, and an interrogator, labeled A, B, and C respectively. The interrogator, C, refers to the other beings in the game as X and Y, one being a woman and one being a man. It is the job of the interrogator to figure out which one is the man, and which one is the woman. A, the man, is trying to get C, the interrogator, to answer incorrectly; in other words, A wants C to guess that he is a woman. B, the woman, is trying to get C, the interrogator, to answer correctly; in other words, B wants C to guess that she is a woman. All communication between the three beings will go through a third party. The mediated communication removes variables, such as tone of voice, language, etc. Turing then asks the question, “What will happen when a machine takes the part of A in this game?” (Turing). He uses this game to replace his initial question “can machines think?”

Chapter Three: Present State of Machine Intelligence

Machine learning plays a large part in our culture today, whether in the form of ads on a user’s Facebook page or recommendations YouTube makes based on a viewer’s browsing history. Those examples of machine learning are generally known by the public, but also play a part in many other fields, such as art, that may not be as obvious.

The classification and organization of art started during the colonial period in Europe. The initial focus was on art that reflected traditional European culture, but by the 20^{th} century, art historians had expanded their description to include all types of cultures and peoples. They also expanded the mediums that are considered art, i.e. sculptures, mosaics, paintings, ceramics, etc. (“What Is Art History?”). These pieces of art say a lot about the culture and community of the places they come from, so it is important to be able to categorize and compare them. There are only a limited number of art historians to study the immense number of art pieces, so machines have the potential to aid historians.(“What Is Art History?”)

A group of colleagues at Rutgers University, headed by a gentleman named Babak Saleh, wanted to develop an algorithm that would enable computers to recognize similarities between paintings (Elgammal). A big component of an art historian's job is to recognize the influence that artists have on one another (Saleh et al. 3566). This group of researchers focused on paintings as the art medium in particular. Computers have been used in the artistic sorting process before on a basic level of identification, but influence can become subjective depending on which historian was examining the piece (Saleh et al. 3567). For their experiment, the researchers surveyed over 1700 paintings by 66 different artists, spanning over 500 years (The Physics arXiv). They used three different methodologies to analyze and compare the paintings as well as two types of discriminative models, using a Bag-of-Words approach and semantic-level feature, as well as a generative model. Within these methods, they used joint probability, Euclidean distance, and other mathematical concepts to create this algorithm for painting classification (Saleh et al.).

As predicted, the algorithm recognized the connection between the paintings below, as it is clear they contain similar properties and inspiration. Firstly, the algorithm detected the influence of Velázquez (left) on Bacon (right) (Figure 1), but it also recognized some influences – not previously established by historians – of Bazille (left) on Rockwell (right) (Figure 2) (Elgammal). Although this is an impressive discovery, Babak and his colleagues understand the limitation of the machine. Despite the fact that this algorithm could help art historians, it is not developed so extensively that it could replace them (The Physics arXiv).

Figure 1 (Saleh et al.)

Figure 2 (Saleh et al.)

Human intelligence is very complex; to boil it down to purely objective rules seems impossible. At a conference held by IBM in 2001, there were six technological proposals presented that would need to be accomplished to create this brain-like machine that Turing proposed. The machines are language-understanding, machine-reasoning, knowledge-representing, knowledge-acquiring, dialog-managing, and emotion-experiencing (Brackenbury and Ravin). This is a laundry list of technologies that are all extremely complex in themselves.

A current study attempting to eliminate all of the subcategories is the Human Connectome Project. The purpose of the Human Connectome Project, funded by the National Institutes of Health, is to create a map of the “anatomical and functional connectivity of the human brain" (Mapping the Human Connectome)("Mapping the Human Connectome"). Unlike the commonly known grid-like mappings, the connectomes consist of nodes, representing the brain regions, connecting with multiple other nodes. This creates a topological field rather than a grid (Brown and Hamarneh).

The partnership of machine learning and the connectome is fairly new and centers around the predictions of future outcomes. Connectomes are creating using both functional and diffusion MRI. This is a non-invasive way of learning what is going on in the brain. The connectome gives both structural and functional data that can be interpreted and used by machines (Brown and Hamarneh). Since each connectome is not created by a general template, it is very complex and differs from other connectomes in size and intricacy. Therefore, for most models, there is a focus either on the structural connectivity or functional connectivity (Brown and Hamarneh).

Although the connectome can help in the medical field, there are many other machine learning models that help humans keep up with the large amount of data processing necessary for specific jobs. Surveillance has grown over the years, particularly in the United States; from 2001 to 2011, there have been an estimated 30 million security cameras installed in the U.S. These security devices have been used for missing persons and terrorist attacks alike (Linn). When a tragedy such as this occurs, law enforcement is able to go back through the video footage to look for suspicious activity. However, what happens when time is sparse and there are hours upon hours of footage to watch? Or, what if there is not enough storage and the device stops recording before the approximate time of the attack?

This type of monitoring process is necessary for event prediction and the collection of data regarding unusual events (Margineantu et al.). Machine learning can play a role in monitoring and analyzing all of the information that is collected, both on surveillance and social platforms, which would be impossible for a human to accomplish. In a paper published by Radboud University in the Netherlands, scholars Kunneman and Bosch collected 65.02 million Twitter posts to analyze. The methods used to analyze the words that occur frequently or trends in tweets are detected using document-pivot and term-pivot clustering. Document-pivot clustering analyzes the level of tweets that share common terms while term-pivot clustering looks at the trend of specific terms over a span of time. In this paper, they used the term-pivot approach and found a correlation between the common terms and events (Kunneman and Van den Bosch). This machine learning model was complex to create, but humans, nearly effortlessly, have the inherent ability to read through their Twitter feed and comprehend the significant events while also identifying a common thread amongst posts. These experiments and papers are all pieces of the puzzle trying to understand the complexity of the brain and seeing if the replication of it is possible. Turing set a high bar for his expectations of a machine that would mimic a brain. Although humans have made progress in creating machines to help them with the mundane tasks that humans complete, will there ever truly be a machine that mimics a brain extensively enough to pass the Turing Test?

Chapter Four: Passing the Turing Test and the Ethical Implications

It is first important to recognize that there is disagreement regarding the definition of passing the test (Brackenbury and Ravin). Ergun Ekici, vice president of Emerging

Technologies at IPsoft, believes that Turing's original question need to be expanded. First, he addresses whether or not the computers believed to have "passed" the Turing Test are actually intelligent machines (Ekici). A Turing Test competition was held in 2014, where a Russian robot, Goostman, convinced one-third of the judges that it was human(Vardi). Some argued that although this machine had gotten at least 30% of the judges to guess incorrectly, there was not enough evidence that the it had passed the Turing Test (Vardi). Ekici agrees with the skeptics; he thinks that there is a different question that needs to be asked instead of the original one that Turing posed: Can machines understand, learn and solve problems? (Ekici).

To achieve comprehension, machines must interpret situations and not take every word at face value. They must be able to interpret conversations and gain information from social and vocal cues that might not be explicitly said. This coincides with the machine's necessity to learn; not only does the machine need to interpret what is said, but it needs to comprehend what it hears or read. Just as children are tested on their academic advancement through elementary school, machines should become smarter as time goes on from learning from the information they are taking in. As the machine matures, it now needs to apply its knowledge just as college students are expected to implement in their studies to solve problems that they encounter. It needs to be able to recall the information it has learned and apply the principles or concepts to potential solutions (Ekici).

The significance of the Turing Test is questioned in the artificial intelligence field; both the timeline it presented and the weight of it importance are elements called into debate. Turing predicted that a machine with the ability to pass the Turing Test would be created by the year 2000 (Korb). In 2017, Ray Kurzweil, Google's Director of

Engineering, predicted that artificial intelligence will pass the Turing Test by 2029. Kurzweil believes that, at that time, machines will possess the same level of intelligence as human brains. He believes that we will be able to expand the human mind by linking it with this kind of AI (Griffin). Kurweil is a futurist so he tends to be extreme in his thoughts, such as suggesting that when a machine does pass the Turing Test, he will accept the machine as a human (Kurzweil).

Some believe that the Turing Test is methodically flawed and causes us to pigeon-hole ourselves by trying to only pass the test and therefore missing other opportunities to advance intelligent machines that, while unable to mimic the human brain entirely, still prove valuable. His paper should be seen as a reference to understand attitudes towards artificial intelligence, but not to define an intelligent machine (Cohen). It is important to also recognize the generality that the Turing Test ensues; the quality of the test's results will depend on the questions asked. If you evaluate the test at base value, there are many complexities of humanity that it neglects. It is important to remember the intent behind the game that Turing created; it is not just whether a machine could pass for a human, but rather, if a machine could think (Ball).

Moshe Vardi, a professor of computer science at Rice University, wrote an article that challenges the idea that the Turing test is even a good indicator of machine intelligence (Moshe Y. Vardi)("Moshe Y. Vardi"). Vardi claims that Turing had a strong argument, but it was supported by a weak definition of intelligence. His incomplete diagnosis of intelligence leads Vardi to believe that the question Turing should have proposed was: can machines act intelligently? Some philosophers argue that thinking is a human act so attributing it to a machine proves an incorrect use of the word. There is a need for multiple intelligence tests, not just one; intelligence has so many branches that one test would not be able to accurately assess all of them (Vardi).

Prior to Goostman, ELIZA was a natural language processing program created by Joseph Weizenbaum, a professor at MIT, between the years of 1962 and 1970. ELIZA was programmed to answer its users as a psychiatrist would which prompted Weizenbaum to write his book, *Computer Power and Human Reason*. This text introduced the debate of the relationship between humans and machines (Lawrence).

The potential consequences of an intelligent machine are the biggest ethical debate in the artificial intelligence field. A question that seems to be asked indirectly is: Will an intelligent machine be helpful or harmful to humans and their livelihood if it is created?

The ethical element of artificial intelligence seems to be the only aspect of intelligent machinery that the public hears or reads about. Karamjit Gill, professor of Human Centered Systems as the University of Brighton, assesses, in his paper “Artificial Super Intelligence: Beyond Rherotic,” the possible complications that may occur with the growth of artificial intelligence. He assesses the commentary of experts and their thoughts about where artificial super intelligence is headed. Gill references Seth D. Baum who brings up the issue that although there is research regarding the academic and global effects, there is very little research on the existential risk to humanity itself. Baum argues that the way to lessen the catastrophe is to take the time to address the threats now (Gill). The relationship between humanity and intelligent machines is a complex issue because it is easy for the threats to be overlooked at the expense of possible benefits.

Dr. John Danaher strives to explore the effects that artificial intelligence has in the workplace as well as human's livelihood and the meaning of life. He states that the belief of unemployment due to technology is split between many authors; some believe it is overstated while others believe the opposite. Dr. Danaher first discusses the benefits to humanity that technology in the workplace could create. For those who believe in this optimistic view, they either side with the fact that work is bad, so non-work is the solution, or that even though work is not bad, non-work is the ultimate goal. He then fleshes out the argument that the non-work environment technology could create would lessen the quality of life catastrophically. There are four theories that support this argument: simple subjectivist theory, simple objective theory, aim-achievement theory, and fitting-fulfillment theory. Simple subjectivist theorists believe that the meaning of life is created by the experience of subjective states. Simple objective theorists claim that the meaning of life is created by the experience of objective states. Aim-achievement theories are an equal balance of the ideas presented in the simple objective theories and simple subjectivist theories. Fitting-fulfillment theory combines both the simple subjectivist and objective theories, but places more of an emphasis on the objectively good states experienced. Dr. Danaher's concluding argument was that the key to success in having technology in the workplace is integrating the human's work and the technology's. They need to work as a team rather than as two separate entities (Danaher).

Chapter Five: Conclusion

Turing's work has played a major part in the creation of the artificial intelligence field while the Turing Test specifically helped in the further development of the field.

Throughout my research, I have concluded that the Imitation Game plays a large role in motivating computer scientists to challenge themselves to create a machine with a human-like intelligence. However, the Imitation Game is not the test that determines whether they have accomplished this or not. Due to its history and reputation among computer science, the test can be used as a motivator; as time has progressed, humans in the medical field have developed a more thorough understanding of the complexity of the brain, proving that the Turing test does not address all of the aspects of intelligence encapsulated within a human brain.

Kevin Warwick and Huma Shah investigated how the passing of the Turing test might not be all it is cracked up to be. Passing the Turing test does not automatically indicate that a machine possesses human-level intelligence. While machines may be able pass the test, Turing never claimed that these machines would have a human-like intelligence; he simply stated that the machine could be considered intelligent. The misinterpretation of his paper is the reason why people believe it has not been passed yet. The paper is misinterpreted based on the people's agenda and knowledge of the human brain's complexity, which was not as clearly known to Turing (Warwick and Shah).

This interpretation of Turing's paper makes the ethical implications of the test less frightening. If a machine passes the Turing test, it has still not reached a human level of intelligence and therefore is not as controversial as one may expect. When considering a machine that has a human-level of intelligence, the ethical ramifications are catastrophic and cannot be overlooked.

According to biblical context, humans were made and given the rhythm of work and rest. In A. J. Swoboda's book *Subversive Sabbath: The Surprising Power of Rest in a Nonstop World,* the order of creation is compared with the rhythm of culture:

> God's rhythm of work and rest soon became the framework for human work and rest: "Six days you shall labor and do all your work, but the seventh day is a Sabbath to the LORD your God. On it you shall not do any work" (Exod. 20:9-10). From the beginning, God's own life becomes the model for human life. (Swoboda)

Intelligent machines can add to the necessary rest we were created to enjoy that sometimes gets neglected by our need for accomplishment. There is a fine, dangerous line that we would need to walk to find the right balance. Since all of society does not hold the Bible as truth and some people do not always have good intentions, I do not believe that this balance will be achieved.

If computer scientists do create this type of intelligent machine, we, as a society, need to discuss as a whole how we can incorporate the benefits in small quantities so that it does not take away our inherent nature that motivates to work. We need work to have purpose. I believe that at the time Turing wrote his infamous paper, he was unaware of the effect that it would have following his death. Although he was very detailed in his paper, there is still debate over whether the test itself is as important as it was first thought to be. What cannot be doubted is that whether you believe Turing's ideas to be idealistic or elementary, the significance of his contribution to the field of artificial intelligence is unmatched.

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