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A Siri-Ous Societal Issue: Should Autonomous Artificial Intelligence Receive Patent or Copyright Protection?

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A SIRI-OUS SOCIETAL ISSUE: SHOULD AUTONOMOUS ARTIFICIAL INTELLIGENCE RECEIVE PATENT OR COPYRIGHT PROTECTION?

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I. INTRODUCTION

> This is your last chance. After this, there is no turning back. You take the blue pill, the story ends, you wake up in your bed and believe whatever you want to believe. You take the red pill - you stay in Wonderland and I show you how deep the rabbit-hole goes.[2]

This is a famous quote from the movie *The Matrix* in which Morpheus, the leader of a rebellion against intelligent machines, gives Neo, the protagonist, the option to become knowledgeable about their true state of reality. The intelligent machines distorted many humans' perceptions with the intent to harvest their bioelectric power, unbeknownst to them. Only a few rebels were aware of the machines' intent and they fought to rescue humanity.

Like Neo, those that choose to read this article are "taking the red pill" to become knowledgeable about the current capabilities and legal conundrums involving artificial intelligence ("AI"). However, this is not a simple task, as regulating artificial intelligence in the past has proved to be more akin to diving deep into a rabbit-hole rather than taking a trip to Wonderland.

To understand the legal regulations of artificial intelligence, one must have a basic understanding of AI and its capabilities. AI is "a branch of computer science dealing with the simulation of intelligent behavior in computers."[3] AI systems are governed by rules or neural networks. Rules are drafted by programmers to instruct a computer to complete a process. Neural networks differ from rules by operating autonomously like a human brain. Neural networks are "a computer architecture in which a number of processors are interconnected in a manner suggestive of the connections between neurons in a human brain and which is able to learn by a

[2] THE MATRIX (Warner Bros. Studio & Roadshow Entertainment 1999).

[3] *Artificial intelligence*, MERRIAM-WEBSTER ONLINE DICTIONARY (2019), https://www.merriam-webster.com/dictionary/artificial%20intelligence (last visited Oct. 24, 2019).

process of trial and error."[4] Autonomous AI algorithms often utilize deep learning, which is a subset of AI that employs neural networks to learn from input data.

The process of AI learning through neural networks is somewhat comparable to biological evolution. Biological species, such as humans, evolve from the introduction of mutations. Some mutations create beneficial traits, and natural selection (the theory that individuals with beneficial mutations are more likely to survive and reproduce) ensures these traits are passed on to future generations. Neural networks introduce similar incremental changes and test them through trial and error to observe whether the efficiency of a program improves. If efficiency improves, then the changes are kept, whereas if efficiency decreases, the program reverts to a previous state. Neural networks are capable of improving much more rapidly than biological evolution for two primary reasons: (1) the rate at which computer trials are tested is much faster than biological evolution, and (2) the neural network can predict which changes are most likely to create improvements, whereas biological mutation is mostly random. These rapid improvements may lead to producing autonomous creations because, over time, neural networks can create so many changes to a program that it is no longer recognizable from the original work.

Although the capabilities of the intelligent robots in *The Matrix* may seem like a distant, futuristic concept, AI has been utilized for quite some time and highly intelligent programs already exist. One early example of artificial devices used to mimic human behavior was created during the Mongol Dynasty in the 13th century. Mongols created a method of tying tree branches to the rear of their horses to mimic a marching army while raising large dust clouds to make their army appear much larger than it was.[5] Human-created artificial devices grew much more complex over

[4] *Neural network*, MERRIAM-WEBSTER ONLINE DICTIONARY (2019), https://www.merriam-webster.com/dictionary/artificial%20intelligence (last visited Oct. 24, 2019).

[5] CHRIS PEERS, GENGHIS KHAN AND THE MONGOL WAR MACHINE 72 (2015).

time, as the first modern "computer," the analytical engine, was created by Charles Babbage in the nineteenth century.[6] The machine was steam-driven and consisted of four components: a mill, a store, a reader, and a printer. The mill was a calculating unit, the store held data prior to processing, the reader input data from the store to be processed, and the printer outputted data after it was processed.[7] In comparison to computers that are designed today, the mill was similar to a central processing unit, the store was similar to a hard drive, and the reader/printer were similar to software components that process data.[8]

A recent example of AI implementation was described in a publication in 2019, which showed Alibaba, a Chinese e-commerce wholesale supplier, developed a flexible learning algorithm that set a record-high score on the Microsoft Machine Reading Comprehension (MS MARCO) dataset.[9] Alibaba's algorithm answered a series of questions that humans asked Microsoft's search engine "Bing" to answer, and the algorithm compiled information from many webpages to answer a record number of questions correctly.[10] In fact, the algorithm's score was greater than the average human.[11] However, this test only shows the algorithm can answer some questions better than the average person, as the algorithm operates by executing statistical pattern recognition rather than truly comprehending the words that it sees.[12] This is analogous to a student who is capable of cheating on an exam by copying from the answer key. Both the student and the

[6] *Id*.

[7] *Analytical engine*, ENCYCLOPEDIA BRITANNICA, https://www.britannica.com/technology/Analytical-Engine (last visited Oct. 26, 2019).

[8] *Id.*

[9] *Alibaba has claimed a new record in AI language understanding*, MIT TECHNOLOGY REVIEW, https://www.technologyreview.com/f/613931/alibaba-has-claimed-a-new-record-in-ai-language-understanding/ (last visited Oct. 26, 2019).

[10] *Id*.

[11] *Id*.

[12] *Id*.

algorithm can find the correct answers from a subset of information, but neither of them truly comprehend the meaning of the answer itself. AI still requires vast improvements to be capable of truly understanding language.

However, limitations such as this may improve rapidly. Gordon Moore, CEO of Intel, published a paper in 1965 describing the phenomena called Moore's Law, which states the number of components per unit area on an integrated chip doubles every year while the cost to of computers halves.[13] After making his initial prediction, Moore revisited his theory in the 1970's and found the number of components per unit area on an integrated chip actually doubled every one to two years.[14] One major driving force behind Moore's Law is the computer industry's ability to decrease the overall size of transistors placed on integrated circuits, as decreasing the overall size of transistors leaves space to allocate additional transistors per unit of area on an integrated chip.

The uptick in transistors placed on integrated circuits increases the computing power of a computer, which is measured in calculations per second per capital. Ray Kurzweil, author of The Singularity is Near: When Humans Transcend Biology, studied the change in computing power from the year 1900 to 2000 as computational systems changed from utilizing simple electromechanical processes to relays, vacuum tubes, transistors, and integrated circuits.[15] The computing power increased exponentially over time, as computer systems processed a one hundred-thousandth of a calculation per second per $1,000 in the year 1900, one calculation per second per $1,000 by the year 1950, and one hundred million calculations per second per $1,000 by the year 2000.[16] Kurzweil found that not only was Moore's prediction an accurate estimation

[13] R. R. Schaller, *Moore's Law: past, present, and future*, 34 IEEE SPECTRUM, 202, 202-203 (1997).

[14] *Id*. at 203.

[15] RAY KURZWEIL, THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY 67 (2005).

[16] *Id*.

of the calculations per second per capital in the future, but it was also accurate to estimate said calculations in the past.[17]

As computer power per capital increases, so will the power of AI. This exponential growth will lead to a sharp increase in the capabilities of AI in the near future. In fact, AI might soon rival the power of the human brain. Kurzweil predicts this could occur within the next five years while the computing power of a supercomputer could rival that of the entire human species combined by the year 2050.[18] At the time Kurzweil's study was taken, the computational power of the most powerful supercomputer was slightly less than that of an insect brain at one hundred million calculations per second per $1,000.[19] Kurzweil estimates the computational power of supercomputers today is greater than an insect brain and mouse brain while being close to the power of a human brain, as computers make approximately ten trillion (10^13) calculations per second per $1,000 and human brains are capable of making one quadrillion (10^15) calculations per second per $1,000.[20]

This tremendous increase in computing power has drastically changed the employment of Americans since the year 1900. In 1900, the U.S. labor force was composed of approximately forty-five percent agricultural workers, thirty percent service workers, and twenty-five percent manufacturing workers.[21] The agricultural industry saw an exponential decrease in labor while manufacturing slowly increased and service work sharply increased.[22] In 2014, agriculture,

[17] *Id*.

[18] *Id*. at 70.

[19] *Id*.

[20] *Id*.

[21] Spyros Makridakis, *The Forthcoming Artificial Intelligence (AI) Revolution: Its Impact on Society and Firms*, HEPHAESTUS REPOSITORY, https://hephaestus.nup.ac.cy/handle/11728/9254 (last visited Nov. 20, 2019).

[22] *Id*.

manufacturing, and services composed approximately one percent, fourteen percent, and eight-five percent of the workforce, respectively.[23] Technology may render some jobs obsolete as computers can perform them autonomously. Critics fear the rate of job obsolescence in the service sector may increase as the rate of technological improvement increases.[24] Although it took more than two centuries to understand the full impact of the industrial revolution, the effects of the digital revolution were understood within three-to-four decades and the effects of the AI revolution may manifest within one decade.[25]

Thus, in the interest of future employment, many authors and inventors who anticipate the AI revolution are motivated to create works that bring them to the forefront of technology; however, public disclosure of these works must be incentivized by offering copyright or patent protection. The U.S. Copyright Office and the USPTO already offer copyright and patent protection to original AI works that are created by a human being. Thus, the issue is whether human creators or AI may receive copyright or patent protection for an original work that the AI autonomously creates. Current U.S. copyright and patent law is largely unsettled on this issue. Copyright and patent protection should not be granted to autonomous derivative works of an AI or deep learning algorithm. The following background section provides a history of court cases and guidelines from the USPTO and U.S. Copyright Office. The discussion section illustrates why derivative works from AI or deep learning algorithms are not entitled to copyright and patent protection because they are not a product of human creativity and they fail to present a net social benefit.

[23] *Id*.

[24] *Id*.

[25] *Id*.

II. BACKGROUND

A. CONSTITUTIONAL GRANT OF RIGHTS (1790)

The intellectual property clause in the Constitution enumerates the power of congress "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."[26] Thus, congress has the authority to decide which works are considered a "Writing" and which works present a "Discovery." The congressional powers to register a copyright and issue a patent have been delegated to The United States Copyright Office and USPTO, respectively.

B. HISTORY OF PATENTING AI SOFTWARE

i. The Machine-or-Transformation Cases (1972-1981)

Prior to the 1970's, very few software programs were patented due to the unpredictable nature of the law on patenting software programs.[27] This is true despite software being a lucrative field at the time, with the Court in *Parker v. Flook* estimating the value of software in the United States in 1972 to be worth $43.1 billion with an expected increase to $70.7 billion by 1980.[28] Three Supreme Court cases defined the "machine-or-transformation" test that provided some initial stability to the law on patenting software programs: (1) *Gottschalk v. Benson*, (2) *Parker v. Flook*, and (3) *Diamond v. Diehr*.

These three "machine-or-transformation" cases questioned when software programs become subject matter eligible. Inventions are subject matter eligible under 35 U.S.C. §101 when

[26] U.S. CONST. art. 1, § 8, cl. 8.

[27] Donald E. Stout, *Protection of Programming in the Aftermath of Diamond v. Diehr*, 4 COMPUTER/L.J. 207, 209 (1983).

[28] *Id*.

"[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title."[29] A "process" is defined as "[an] art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."[30]

In *Gottschalk v. Benson*, the application claimed a method of programming any computer to convert binary-coded decimals to pure decimals.[31] The claim was so broad that it included both known and unknown uses of the binary conversion process, so it was viewed as an attempt to patent the idea of binary conversion rather than its process.[32] The Court held the patent application "would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself."[33] This holding aligns with the traditional notion that mental processes are not patentable, as The Ninth Circuit Court of Appeals introduced the "mental steps doctrine" in 1944 by stating that "mental steps, even if novel, are not patentable."[34] The Court could not differentiate the algorithm from a process that could take place purely within the mind.

In *Parker v. Flook*, the Court held that even when an approved method of calculation is linked to a specific end use, it is not patentable under 35 U.S.C. § 101.[35] The application in question claimed a method of updating alarm limits to monitor process variables during the

[29] 35 U.S.C. § 101 (1952).

[30] 35 U.S.C. § 100(b) (1952).

[31] Gottschalk v. Benson, 409 U.S. 63, 64 (1972).

[32] *Id*. at 72.

[33] *Id*. at 71-72.

[34] Haliburton Oil Well Cementing Co. v. Walker, 146 F.2d 817, 821 (9th Cir. 1944).

[35] Parker v. Flook, 437 U.S. 584, 595 (1978).

catalytic conversion process, which may include temperature, pressure, flow rate, etc.[36] The patent applicant's method of adjusting alarm limits to respond to changes in the catalytic conversion process was not patentable because the algorithm alone was assumed to be unpatentable, and the only original concept that departed from the prior art was the algorithm itself.[37] Thus, the Court aligned with the previous decision in *Gottschalk* by stating a patent granted to a process where only the algorithm extends beyond the prior art would pre-empt the mathematical formula and be a patent on the algorithm itself.[38] The dissenting opinion by Justice Stewart stated an invention should not lose its status of subject matter eligibility simply because one step in the process, when isolated, is not subject matter eligible.[39]

The dissenting opinion by Justice Stewart evolved into the majority opinion in *Diehr*, as the Court revisited the question of whether introducing an algorithm into a transformative process presents a patentable method. The Court held the use of a computer to implement a statutory invention does not detract from the statutory nature of the inventive subject matter.[40] The Court used a two-step test from *In re Freeman* to determine subject matter eligibility for software algorithms: (1) decide whether the claim directly or indirectly cites an algorithm, then (2) further analyze the claim to decide whether it fully pre-empts the algorithm.[41] If the claim cites an algorithm and fully pre-empts the algorithm, then it is invalid under 35 U.S.C. § 101 for being a mental process or abstract idea.

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[36] *Id*. at 584.

[37] *Id*. at 589.

[38] *Id*.

[39] *Id.* at 599.

[40] Diamond v. Diehr, 450 U.S. 175, 187 (1981).

[41] *Id*. at 203; *see* In re Freeman, 573 F.2d 1237, 1245 (C.C.P.A. 1978).

In the first step, the Court reversed its decision from *In re Diehr* (where the Court of Customs and Patent Appeals found the claimed process was directed to a mathematical algorithm) because the Court found the claim recited "an improved process for molding rubber articles by solving a practical problem which had arisen in the molding of rubber products" rather than a mere algorithm.[42] In the second step, the Court applied the machine-or-transformation test to find the algorithm was not pre-empted by the claim because it "is performing a function which the patent laws were designed to protect (*e. g.*, transforming or reducing an article to a different state or thing).[43] Thus, the machine-or-transformation test states any algorithm applied in a non-trivial manner qualifies for patent consideration if the claimed method is (1) applied to a specific machine, or (2) if it transforms matter from one state to another.[44] The claimed method of curing synthetic rubber was deemed to be transformative, and the Court refused to find statutory subject matter non-statutory because it utilized a mathematical formula.[45]

The contrasting views of *Diehr* and *Flook* created significant controversy when comparing the facts of each case. Each claimed a method, the purpose of the invention was to calculate a time limit, each used a formula and a process variable, and the action required to indicate the time limit had lapsed was controlled by a byproduct of the initial formula.[46] The differentiation in viewpoints between *Diehr* and *Flook* was further explained in *In re Taner*, where The United States Court of Customs and Appeals stated the conversion of seismic waves from one state to another was not barred under 35 U.S.C. § 101 because the seismic waves were a physical apparition, and the rubber

[42] *Id*. at 181; *see* In re Diehr, 602 F.2d 982, 989 (C.C.P.A. 1979).

[43] *Id*. at 192.

[44] *Id*.

[45] *Id*. at 187; *see* Gottschalk, 409 U.S. at 71.

[46] Karl F. Jr. Milde, *Life after Diamond v. Diehr: The CCPA Speaks Out on the Patentability of Computer-Related Subject Matter*, 64 J. PAT. OFF. SOC'Y 434, 456 (1982).

curing process in *Diehr* represented a similar change in state of a physical apparition from an uncured state to a cured state.[47] The alarm system in *Flook* did not change a physical apparition from one state to another. Although some explanation was provided to explain the controversial decision in *Diehr*, the "machine-or-transformation" test was utilized until a major disturbance occurred in 2010.

ii. Contemporary Cases (2010-2014)

Three recent cases, *Bilski v. Kappos* (2010), *Mayo Collaborative Services v. Prometheus Laboratories, Inc.* (2012), and *Alice Corp. Pty. Ltd. v. CLS Bank Int'l* (2014), changed the landscape of how courts interpret 35. U.S.C. §101 statutory subject matter by interpreting the machine-or-transformation test and creating a new framework for determining subject matter eligibility for products and processes.

In *Bilski*, the application in question claimed an invention that explained how buyers and sellers can hedge against the risk of price changes in the energy market.[48] The Supreme Court ruled similarly to *Gottschalk* and *Flook* by stating Bilski's claimed invention was so expansive that, if granted, it would preempt the concept in all fields and be a patent on an idea rather than a process.[49] However, it was not the ruling itself that was quite controversial; rather, the method in which the Court came to its conclusion. Courts previously applied the machine-or-transformation test as the sole method of determining whether the second prong of the *Freeman* test was satisfied, but the Court held the test was merely "a useful and important clue, an investigative tool, for determining whether some claimed inventions are processes under § 101."[50] This decision

[47] In re Taner, 681 F.2d 787, 790 (CCPA 1982); *see* In re Johnson, 589 F.2d 1070, 1072 (C.C.P.A. 1978).

[48] Bilski v. Kappos, 561 U.S. 593, 593 (2010).

[49] *Id*. at 610.

[50] *Id*. at 604.

indicated the Court wished to abstractly interpret § 101 by eliminating the bright-line machine-or-transformation test; however, the Court did include some bright-line tests to determine subject matter eligibility, namely by reaffirming from *Diehr* that laws of nature, physical phenomena, and abstract ideas did not satisfy § 101.[51]

After *Bilski*, courts used the machine-or transformation test as a presumptive starting point rather than as the sole test for determining patent eligibility under § 101. If the machine-or-transformation test was satisfied, the Court would likely validate the patent. The Court's ruling in *Bilski* ultimately limited the number of patents that were granted after the decision. The Board of Patent Appeals and Interferences issued 182 decisions on subject matter eligibility during the year after *Bilski* was issued, and approximately two-and-a-half non-statutory decisions were made for each statutory decision.[52] Difficulties in patenting software claims served as a major deterrence for creators to patent software.

The Supreme Court revisited some of these issues concerning subject matter eligibility in *Mayo Collaborative Services* ("Mayo"). The claims described a method for determining the proper dosage of a drug that metabolizes within the bloodstream of patients with an autoimmune disease.[53] The Court once again supported the presence of three judicial exceptions by stating "phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work."[54] The Court

[51] *Id*. at 649.

[52] Michelle Holoubek, *One Year Post-Bilski: How the Decision is Being Interpreted*, IP WATCHDOG (Nov. 3, 2019), https://www.ipwatchdog.com/2011/06/29/one-year-post-bilski-how-the-decision-is-being-interpreted/id=17935/.

[53] Mayo Collaborative Servs. v. Prometheus Labs., Inc., 566 U.S. 66, 66 (2012).

[54] *Id*. at 71*; quoting* Gottschalk v. Benson, 409 U.S. at 67.

denies the patentability of these three exceptions because eliminating a basic tool of scientific and technological work would hinder innovation rather than promote it.

Although claims reciting an abstract idea were not patentable, claims that trivially include an exception to patent matter eligibility within an otherwise patentable process can be patentable. In *Mayo*, the Court asked, "whether the claims do significantly more than simply describe these natural relations."[55] This sentiment aligns with the Court's holding in *Diehr*, where the use of a computer to implement a statutory process did not detract from the statutory nature of the process. The Court ultimately ruled that Prometheus' process was not patent eligible because laws of nature describing the concentration of metabolites in the blood were well known, and the process was not innovative enough to significantly depart from these laws of nature.[56] Thus, as held previously in *Gottschalk* and *Flook*, the patent application claimed a judicial exception rather than a patentable process.

Thus, a two-part test for subject matter eligibility was created in *Mayo* to determine subject matter eligibility for products and processes. Before evaluating the claim for patentability, an examiner establishes the broadest reasonable interpretation of the claim to analyze the full extent to which the claim may reach. The *Mayo* test has three components because the second step is broken down into two prongs. In step one, the examiner asks whether the claim is a process, machine, manufacture, or composition of matter.[57] If so, the test proceeds. If not, the claim is not eligible subject matter under 35 U.S.C. § 101. In the second component, step "2A," the examiner asks whether the claim is directed to a judicial exception, namely a law of nature, natural

[55] *Id*. at 77.

[56] *Id*.

[57] 2014 Interim Guidance on Patent Subject Matter Eligibility, 79 FED. REG. 74618-74633 (Dec. 16, 2014) (to be codified in 37 CFR 1).

phenomenon, or abstract idea.[58] If not, the claim is eligible subject matter under 35 U.S.C. § 101. If this is true, then the test proceeds to the third and final component. In step "2B," the examiner asks whether the claim recites additional components that are "significantly more than" the judicial exception.[59] If this is true, then the claim qualifies as eligible subject matter under 35 U.S.C. § 101. If this is false, then the claim is not eligible subject matter under 35 U.S.C. § 101. This test was comprehensively described in a flowchart issued by the USPTO in 2014 within the "2014 Interim Eligibility Guidance Quick Reference Sheet."[60]

The Supreme Court revisited the issue of subject matter eligibility in *Alice Corp. v. CLS Bank* ("Alice"). In *Alice*, Alice Corporation owned four patents that reduced settlement risks through a claimed method of mitigating risk by facilitating the exchange of financial obligations between parties by using their computer software as a third-party intermediary.[61] The intermediary performed by creating "shadow" (fictional) credit and debit records that are supposed to reflect the balances of real accounts as exchanges are made.[62] The intermediary updates in real time throughout the day as transactions were made before displaying a final record of the transactions. The intermediary then sends instructions to financial institutions to implement the transactions that occurred in the fictional intermediary to reflect the result. The goal of this process is to reduce the risk that only one party will perform an exchange. The Court referred to its framework from *Mayo* to decide whether Alice Corporation's patents were valid. These steps are illustrated below.

[58] *Id*.

[59] *Id*.

[60] *Id*.

[61] Alice Corp. Pty. Ltd. v. CLS Bank Int'l, 573 U.S. 208, 208 (2014).

[62] *Id*. at 213.

First, in step one, the Court must decide whether Alice Corporation's patent claims a process, machine, manufacture, or composition of matter. The patent clearly claims a process of regulating an exchange through an intermediary, thus, the test proceeds to the next step.

Second, in step "2A," The Court must decide whether Alice Corporation's patent is directed to a judicial exception, such as a law of nature, a natural phenomenon, or abstract idea. Here, the Court compared the method of mitigating risk through an intermediary to be similar to the risk hedging in *Bilski*; where the patent applicant wished to claim a "a fundamental economic practice long prevalent in our system of commerce."[63] Since the process of mitigating risk through an intermediary was a similar fundamental economic process, it is considered to be an abstract idea like the risk hedging process in *Bilski*. Thus, step 2A is met, and the test proceeds to its third and final step.

Finally, Step "2B" asks whether the claim recites additional elements that add significantly more than the judicial exception. The Court observed the method claim as a whole to determine whether any element, or combination thereof, satisfied this step. Using a computer to keep fictional records "amounts to electronic recordkeeping—one of the most basic functions of a computer."[64] Additionally, when considered as an ordered combination, the components of the claimed method "add nothing . . . that is not already present when the steps are considered separately."[65] Since the method as a whole did not amount to anything more than steps that are already well-known, and the use of the computer element was a basic function, the Court held the claimed method was not eligible subject matter under 35 U.S.C. § 101.

[63] *Id*. at 209; *quoting* Bilski, 561 U.S. at 599.

[64] *Id*. at 225; *see* Benson, 409 U.S. at 65.

[65] *Id*.; *quoting* Mayo 566 U.S. at 73.

Ultimately, *Mayo* and *Alice* led to a significant decrease in issued software and business-method patents due to a broad use of the § 101 rejection from examiners. In fact, the number of allowances issued from business-method art units decreased from twenty-four percent to three percent from a few months before *Alice* to a few months after the decision.[66] Those seeking software and business-method patents often sought out other methods of protecting their innovation, as it was increasingly unlikely they could receive a patent. In recent years, the USPTO has issued guidelines to advise patent examiners how to handle these applications, with the most recent set of guidelines posted in 2019.

iii. January 2019 USPTO Guidelines

The goal of the most recent USPTO guidelines, published in January 2019, was "to draw distinctions between claims to principles in the abstract and claims that integrate those principles into a practical application."[67] Thus, patent claims should be found eligible if they incorporate abstract ideas into a practical application. This is like the Supreme Court's ruling in *Diehr*, where the use of a computer algorithm, when incorporated into a transformative process to cure rubber, did not detract from the subject matter eligibility of the claimed process.

Three "enumerated groupings" of abstract ideas should not be treated as abstract ideas: (1) mathematical concepts (such as relationships, formulas, and calculations), (2) certain methods of organizing human activity (such as economic principles or practices, commercial interactions, etc.), and (3) mental processes (including concepts formed in the mind).[68] Interestingly enough,

[66] Gene Quinn, *Alice Five Years Later: Hope Wanes as 101 Legislative Discussions Dominated by Big Tech*, IP WATCHDOG (Nov. 5, 2019), https://www.ipwatchdog.com/2019/05/05/alice-five-years-later-gearing-up-to-commemorate-the-death-of-101/id=108926/.

[67] U.S. PATENT AND TRADEMARK OFFICE, 2019 REVISED SUBJECT MATTER ELIGIBILITY GUIDANCE, 6 (2019), https://s3.amazonaws.com/public-inspection.federalregister.gov/2018-28282.pdf.

[68] *Id*. at 9-11.

the second category of "certain methods of organizing human activity" now includes hedging and mitigating risk, which were the two processes litigated in *Bilski* and *Alice*, respectively. These enumerated groupings are assumed to be patentable unless, in rare circumstances, an examiner can show the claimed idea should nonetheless be treated as reciting an abstract idea.[69] Summarily, this illustrates the USPTO intends to be more lenient in terms of issuing software and business method patents.

Additionally, the USPTO decided to adjust the *Mayo* test by applying the consideration of whether elements are routine, conventional, or well known to step 2B instead of step 2A.[70] In *Alice*, the Court deemed the process to be well-known in step 2A, which contributed to its decision that the claim was directed to an abstract idea. This ultimately allows examiners to look at each analytical step to decide whether claims are eligible before transitioning to step 2B.

One of the greatest changes in the January 2019 guideline was to divide step 2A into two prongs: (1) whether the abstract idea is a mathematical concept, method of organizing human activity, or a mental process and (2) if this first prong is met, the examiner will evaluate whether additional elements are integrated into the abstract idea to create a practical application.[71] The addition of the second prong allows some material that would have originally failed under step 2A to achieve subject matter eligibility.

Finally, several examples were listed that show an additional element was integrated into the judicial exception to create a practical application.[72] The examples provided in this guidance are so broad that even ideas that were never before viewed as patentable, such as an algorithm to

[69] *Id*. at 11.

[70] *Id*. at 5.

[71] *Id*.

[72] *Id*. at 19-20.

gather data, could possibly create a valid patent.[73] In fact, the percentage of software-related patents drastically spiked in 2019 from 50.8% to 60.9% after these guidelines issued.[74] As technology continues to revolutionize our society, we can expect this percentage to continue to increase. This is especially true if future judicial or executive changes allow the derivative works of AI to become patentable.

iv. October 2019 USPTO Guidelines

The primary goal of the October 2019 USPTO Guidelines was to clarify the practice of evaluating patents for subject-matter eligibility.[75] The USPTO provided further clarification to five general themes of questions that were found in the official comments submitted regarding the January 2019 subject matter eligibility guidelines. These clarifications are tailored to: (1) evaluating whether a claim cites a judicial exception, (2) the groupings of abstract ideas enumerated in the January 2019 guidelines, (3) evaluating whether a judicial exception is integrated into a practical application, (4) the *prima facie* case for eligibility rejections, and (5) how the guidelines will be applied.[76]

First, a claim cites a judicial exception when the judicial exception is "set forth" or "described" in the claim.[77] A judicial exception is "set forth" when it is expressly stated within the claim. The guidelines give an example from *Diehr* where the claims expressly stated the

[73] *Id*. at 24.

[74] Raymond Millien, *As Congress Contemplates Curbing Alice, More than 60% of Issued U.S. Patents Are Software Related*, IP WATCHDOG (Nov. 5, 2019), https://www.ipwatchdog.com/2019/07/02/congress-contemplates-curbing-alice-60-issued-u-s-patents-software-related/id=110920/.

[75] U.S. PATENT AND TRADEMARK OFFICE, OCTOBER 2019 PATENT ELIGIBILITY GUIDANCE UPDATE, 1 (2019), https://www.uspto.gov/sites/default/files/documents/peg_oct_2019_update.pdf.

[76] *Id*.

[77] *Id*.

Arrhenius equation.[78] A judicial exception is "described" when it can be implied from the language within the claim. The guidelines give an example from *Alice* where the concept of intermediated settlement was illustrated without ever using the words "intermediated" or "settlement."[79]

Second, the guidelines discuss the application of the three enumerated groupings under the abstract ideas section of step 2A, prong one, of the *Mayo* test: (1) mathematical concepts, (2) certain methods of organizing human activity, and (3) mental processes.[80] Mathematical concepts include mathematical relationships, formulas or equations, and calculations.[81] Methods of organizing human activity include fundamental economic principles or practices (such as hedging and risk mitigation), commercial or legal interactions, legal obligations, advertising and marketing behaviors, and managing personal behavior or interactions with others.[82] Mental processes include concepts performed in the human mind and concepts that only use the computer as a tool.[83] Examiners must bring the application to the attention of their technology director if the claim is rejected for citing an abstract idea outside the scope of these enumerated groupings.[84] The technology center director for the examiner must validate the rejection. If the rejection is properly validated, the patent applicant may request an interview with the examiner to help identify eligible subject matter.[85]

[78] *Id*.

[79] *Id*.

[80] *Id*. at 2.

[81] *Id*. at 3-4.

[82] *Id*. at 5-6.

[83] *Id*. at 7-8.

[84] *Id*. at 9.

[85] *Id*.

Third, the USPTO clarified when an abstract idea is integrated into a practical application. Under the second prong of step 2A, the examiner evaluates whether the judicial exception is integrated into a practical application such that the claim is no longer considered to recite an abstract idea. Some considerations for whether the judicial exception is integrated into a practical application include whether there is a use of a particular machine, a particular transformation occurs, and whether the claim limitations are "mere instructions to apply to an exception."[86] The claim is considered as a whole with the claim limitations containing the judicial exception and other additional claim limitations evaluated together "to determine whether the claim integrates the judicial exception into a practical application."[87] The ability to evaluate each claim limitation together displays a broader, and more sophisticated, view of the applicant's attempt to integrate the judicial exception into a practical application.

Fourth, the guidelines illustrate the *prima facie* case an examiner must show to meet the burden of describing why a claim is ineligible for patenting. In satisfying a *prima facie* case, examiners must review each claim with its "the broadest reasonable interpretation".[88] The steps to satisfy a *prima facie* case includes: (1) identifying the judicial exception (enumerated abstract ideas, laws of nature, or natural phenomena), (2) identifying additional claim elements that go beyond the judicial exception and whether they are integrated into a practical application, and (3) explaining why elements in the claim, as a whole, are not significantly more than the judicial exception.[89] The first step refers to step 2A prong one of the *Mayo* test, the second step refers to step 2A prong two, and the third step refers to step 2B.

[86] *Id*. at 11.

[87] *Id*. at 12.

[88] *Id*. at 15.

[89] *Id*. at 16.

Finally, the guidelines discussed how they will be applied in the USPTO. All USPTO examiners are expected to follow the guidelines. The USPTO made an important note that the guidelines are not substantive law. When appealing an application rejection, the applicant may rely on the guidelines to show the rejection was erroneous, but the applicant may not rely on the guidelines to show the examiner did not follow the procedural aspects of the guidelines.[90]

In conclusion, one can likely expect the recent trend of increased software patents to continue, as the October 2019 subject matter eligibility guidance did not make any changes to the January 2019 subject matter eligibility guidance. Instead, important clarifications were made as to the scope of the 2019 guidelines and how they are applied. This clarification may accelerate the growth of software patents by encouraging invention within the three enumerated groupings of abstract ideas.

C. COPYRIGHTING COMPUTER SOFTWARE

i. Statutory Subject Matter

Copyrightable statutory subject matter is listed under 17 U.S.C § 102. The statute illustrates that copyright protection is extended to original works of authorship fixed in a tangible medium of expression.[91] An original work is one that is independently created with a modicum of creativity.[92] Examples of statutory subject matter include literary works, music works, dramatic works, pantomimes and choreographs, pictorial works, graphic works, sculptural works, motion pictures and other audiovisual works, sound recordings, and architectural works.[93]

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[90] *Id*. at 17.

[91] 17 U.S.C. § 102(a) (1976).

[92] Feist Publ'ns, Inc. v. Rural Telephone Tel. Serv. Co., 499 U.S. 340, 345 (1991).

[93] 17 U.S.C. § 102(a) (1976).

In addition to being original, subject matter eligible works must only apply to the author's expression of the material. Copyrighted works may not claim any underlying method of operation, as the Supreme Court held in *Baker v. Selden* that "[t]he copyright of a work on mathematical science cannot give to the author an exclusive right to the methods of operation which he propounds. . ."[94] This decision was recently revisited and extended to architectural works in *Richmond Homes Mgmt. v. Raintree, Inc.*, where the District Court for the Western District of Virginia held that copying a house structure, without copying the underlying construction plans, does not constitute copyright infringement.[95]

Finally, works that are subject matter eligible must be fixed in a tangible medium of expression. A work is fixed in a tangible medium of expression when "its embodiment . . . is sufficiently permanent or stable."[96] This must occur for more than a mere transitory duration.[97]

ii. Rights Provided by Statute

17 U.S.C. § 106 provides several exclusive rights to copyright owners. Rights that apply to software developers include the right to: "(1) reproduce the copyrighted work in copies or phonorecords, (2) prepare derivative works based upon the copyrighted work, and (3) distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership or by rental, lease, or lending. . ."[98] These rights are separate and divisible. Allowing another to exercise one of the copyright owner's rights does not suggest that same individual may exercise any additional rights.

[94] Baker v. Selden, 101 U.S. 99, 103 (1879).

[95] Richmond Homes Mgmt. v. Raintree, Inc., 862 F. Supp. 1517, 1524 (W.D. Va. 1994).

[96] 17 U.S.C. § 101 (1976).

[97] Cartoon Network LP, LLLP, v. CSC Holdings, Inc., 536 F.3d 121, 127 (2nd Cir. 2008); see *Id*.

[98] 17 U.S.C. § 106 (1976).

iii. Common Law for Computer Software Copyright

Before proceeding into examples of common law interpretations of computer software rights, one must understand the definition of a "computer program." A computer programs is "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result."[99] Computer software is the compilation of one or more computer programs.

The judiciary initially interpreted the Copyright Act of 1976 to protect computer programs in two cases: *Williams Electronics Inc. v. Arctic International* and *Apple Computer, Inc. v. Franklin Computer Corporation*. In the former case, the Third Circuit Court of Appeals held that infringement of a copyright for computer programs is not limited to the computer program text, but it also includes the unlicensed duplication of the program.[100] In the latter case, the Third Circuit also held a computer program in object code or source code fits the definition of a "literary work" and is protected from unauthorized copying.[101] Thus, computer programs are copyrightable whether their code is written in object code or source code format, and acts that infringe these computer program copyrights include copying the program text and duplicating the program.

However, as *Baker v. Selden* communicated, copyright only applies to the original expression in which the computer program is written, and not the underlying process that the program is implementing. The concept of copyright merger provides that computer programs can be denied copyrightability "if the patentable process is embodied inextricably in the line-by-line instructions of the computer program, then the process merges with the expression and precludes

[99] 17 U.S.C. § 101 (1976).

[100] Williams Elecs., Inc. v. Artic Int'l, Inc., 685 F.2d 870, 877 (3rd Cir. 1982).

[101] Apple Comp., Inc. v. Franklin Comp. Corp., 714 F.2d 1240, 1249 (3rd Cir. 1983).

copyright protection."[102] Thus, there must be a sufficient number of alternative pathways for the computer program to be written for it not to merge with the underlying patentable process. However, the originality requirement for copyrighting computer programs is not satisfied by simply showing the code can be written in many ways, as courts will also analyze how many methods of implementing the program are feasible.[103] Thus, although computer programs enjoy copyright protection regardless of whether they are written in object code or source code, they must not claim the underlying process the code is implementing or be so intertwined with the process that it merges with the expression.

III. DISCUSSION

A. AI DERIVATIVE WORKS ARE NOT ENTITLED TO PATENT OR COPYRIGHT PROTECTION BECAUSE THEY ARE NOT AN EXAMPLE OF HUMAN CREATIVITY.

i. Patent and copyright protection are only granted to products of human creativity.

1. Copyright protection is only granted to products of human creativity.

As stated previously, the Constitution grants copyrights to authors for their writings and patents to inventors for their discoveries. Thus, copyrights are only granted to authors while patents are only granted to inventors.

In copyright law, the term "author" received a very broad definition in *Burrow-Giles Lithographic Co. v. Sarony*, which held a photograph can receive copyright protection if it is an original work of art.[104] Early common law defined an "author" as "to whom anything owes its

[102] Lexmark Int'l, Inc. v. Static Control Components, Inc., 387 F.3d 522, 535 (6th Cir. 2004); *quoting* Atari Games Corp. v. Nintendo of Am., Inc., 975 F.2d 832, 839-840 (Fed. Cir. 1992).

[103] *Id*. at 536.

[104] Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 60 (1884).

origin. . .”[105] At the time, this definition, which included photographers, was quite controversial because photographers merely take photographs of the world exactly how it appears at the time the photograph was taken. Those against copyrighting photographs argued the photographs did not possess the same level of artistic skill of a drawing, writing, or painting because the camera solely performs the task of creating a realistic depiction of scenery. The Supreme Court disagreed with this argument and stated the modicum of creativity threshold was met in photography with how the photograph was prepared: namely through the use of arrangement, costume, lighting, design, or other expression.[106] As the definition of “author” expanded, so did the definition of “writings.” Writings include “books, maps, charts, dramatic or musical compositions, engravings, cuts, prints, paintings, drawings, statutes, statuary, and models or designs intended to be perfected as works of the fine arts.”[107] Computer code has also been accepted as a form of writing.[108]

Although the definition of “writing” has expanded to include computer coding, the definition of “author” has not consequentially expanded to include software programs or computers. In *Naruto v. Slater*, the Ninth Circuit Court of Appeals held a photograph taken by a monkey using a cellular phone could not be copyrighted because the monkey lacked statutory standing under the copyright act because the act contains no express authorization of animals to file copyright infringement suits.[109] Thus, courts have generally balked at the idea of expanding the definition of “author” beyond that of a human being.

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[105] *Id*. at 58.

[106] *Id*. at 55.

[107] *Id*. at 56.

[108] Apple Comp., Inc., 714 F.2d at 1249.

[109] Naruto v. Slater, 888 F.3d 418, 420 (9th Cir. 2018); *see Tilikum v. Sea World Parks and Entm’t, Inc.*, 842 F. Supp. 2d 1259, 1262 (S.D. Cal. 2012) (holding orcas, and any animal in general, do not have standing to sue their owner under the thirteenth amendment).

Furthermore, the U.S. Copyright Office issued the third edition of its Compendium of Copyright Office Practices in 2017 ("The Compendium"), which provides further evidence that non-human entities are not intended to be included within the definition of an "author." The Compendium states "Because copyright law is limited to 'original intellectual conceptions of the author,' the Office will refuse to register a claim if it determines that a human being did not create the work."[110] In addition to not allowing animals to receive copyrights for their works, the U.S. Copyright Office will also refuse works that are produced by nature, plants, or those that state they were inspired by a divine spirit.[111] This includes examples such as a claim based on patterns on driftwood that was smoothed by the ocean, unique defects naturally found in stone, or applications naming the Holy Spirit as the author.[112]

Finally, The Compendium distinguishes between machine or mechanical processes and creative works from human beings by stating "the Office will not register works produced by a machine or mere mechanical process that operates randomly or automatically without any creative input or intervention from a human author."[113] Thus, the U.S. Copyright Office does not intend to grant copyrights to machines that work randomly or autonomously without creative human input.

In conclusion, because the U.S. Copyright Office has implied that it will not grant copyrights to works without human creativity. Both common law and The Compendium deny copyrights to non-human entities such as animals, forces of nature, animals, and works authored

[110] *U.S. Copyright Office, Compendium of U.S. Copyright Office Practices* § 306 (3d ed. 2017); *see* Burrow Giles Lithographic Co., 111 U.S. at 58.

[111] *Compendium (Third)* § 313.2.

[112] *Id*.

[113] *Id*.

by a divine entity. Thus, it is most likely true that copyrights are only granted to products of human creativity.

2. Patent protection is only granted to products of human creativity.

In patent law, "inventor" is defined as "the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention."[114] Additionally, the term "individual" is defined as "a single human being."[115] Thus, the current patent statute likely defines "inventor" as a single human being or, in the case of joint invention, a group of human beings. This is supported by the congressional records that the inventor is "the natural person who mentally conceives of the invention."[116] Common law broadly defines a human as an inventor "as long as he maintains intellectual domination of the work of making the invention down to the successful testing, selecting or rejecting as he goes. . ."[117]

The definition of "inventor" has yet to expand beyond human beings. Unlike copyright law, a corporate entity cannot be the legal inventor of a discovery.[118] This is likely because title of the invention initially vests in the person who conceives of the invention and reduces it to practice.[119] A corporation itself cannot conceive of the invention, and because patent law does not incorporate a work-for-hire doctrine like copyright, corporate entities can only become owners through contract or other transfer.[120] Thus, the definition of "inventor" likely refers to natural

[114] 35 U.S.C. § 100(f) (1952).

[115] *Individual*, MERRIAM-WEBSTER ONLINE DICTIONARY (2019), https://www.merriam-webster.com/dictionary/artificial%20intelligence (last visited Nov. 19, 2019).

[116] 3 R. Carl Moy, *Moy's Walker on Patents* § 9:46 (2017).

[117] Morse v. Porter, 155 USPQ 280, 283 (Bd. Pat. Inter. 1965); *see* Herrman v. Otken, 40 C.C.P.A. 794, 799 (C.C.P.A. 1953).

[118] 3 R. Carl Moy, *Moy's Walker on Patents* § 10:13 (2017).

[119] *Id*.

[120] *Id*.

persons because the U.S. Patent Act fails to define the term "individual" within its definition as anything beyond a single human being. Because "inventor" only refers to natural persons, and this definition has not expanded to any other entity incapable of receiving direct ownership at the time of invention, we can conclude that patents are only granted to products of human creativity.

ii. AI derivative works are not an example of human creativity.

1. The Copyright Office does not view AI derivative works as an example of human creativity.

In copyright law, The Compendium states, "the Office will not register works produced by a machine or mere mechanical process that operates randomly *or automatically without any creative input or intervention from a human author*."[121] This illustrates the express intent of the Copyright Office to deny copyright protection to works that operate automatically without human creativity. AI that employs neural networks typically operates automatically without human creativity to create derivative works. Thus, because copyright protection is granted to humans, and AI operating in this fashion requires human intervention to receive copyright protection, we can conclude the Copyright Office does not consider AI alone to be a human author.

The Compendium provides additional information regarding what the Copyright Office considers to be an "author" under the Constitution. The Compendium states, "The U.S. Copyright Office will register an original work of authorship, provided that the work was created by a human being."[122] This shows clear intent that the Copyright Office defines "author" as a "human author." Thus, because the Copyright Office likely requires human authorship, and it expressly denies works created automatically without human intervention, we can conclude that the Copyright Office likely requires an original expression of human creativity

[121] U.S. Copyright Office, *supra* note 111.

[122] U.S. Copyright Office, *supra* note 110.

Finally, we can conclude that because AI is not a human author, and the Copyright Office requires human authorship because copyrightable expression is an example of human creativity, that the Copyright Office does not view AI derivative works as an example of human creativity.

2. The USPTO is unlikely to view AI derivative works as an example of human creativity because it decreases public trust, increases legal uncertainty, and creates a possible defense to patent infringement through incorrect inventorship.

The Constitution grants patents to inventors.[123] Although the definition of "inventor" has yet to expand beyond human beings, it is possible for this to occur in the future, and we must consider the potential harm this may cause. Namely, expanding the definition of "inventor" to include AI may decrease public trust, increase legal uncertainty, and create a possible defense to patent infringement through incorrect inventorship.

First, we must consider how the true inventor of an AI derivative work will be identified. Today, identifying the inventor(s) in a patent application is quite simple. Since only human inventors are permitted to file patent applications, the USPTO can trace the source of the application by locating a human being. Our society is quite proficient at identifying human sources of ideas or actions. Driver's licenses, social security numbers, and even biometric identification methods (the technique of identifying humans through unique physical features) are all used to identify individuals; however, our society has not found a method of identifying online sources to the same degree that we are capable of identifying humans. For example, a DNA sample of an individual is completely unique to them, and a valid result is approximately 99.9% accurate[124], whereas one's identity online can be hidden through a variety of methods. Virtual private networks

[123] U.S. CONST. art. 1, § 8, cl. 8.

[124] THE ACCURACY OF DNA TESTING, https://dna-testing.ca/article/the-accuracy-of-dna-testing.html (last visited Nov. 17, 2019).

("VPNs"), proxy servers, public servers, TOR browsers, and encryption can all mask the identity of an individual.[125] Thus, since the current patent and copyright laws focus on identifying people, and identifying online sources may prove much more challenging than identifying people, both the Copyright Office and USPTO may experience difficulty in identifying the author or inventor.

Additionally, we must consider how the growth of computing power differs from the growth of human population through generations. With humans, a generational tree often exhibits a geometric growth pattern. For example, by beginning with a single couple, and assuming each couple in the first generation and future generations have the same number of children, some number "x," then the total number of individuals will increase by a factor of "x" by generation until some individuals pass away. However, computer computational power increases exponentially by generation. This can be shown by the exponential growth in computing power in calculations per second per capital, supercomputing power in floating-point operations per second, random access memory storage in bits per dollar, and internet backbone bandwidth in bits per second.[126]

Computers are able to complete tasks, store data, and retrieve information from the internet at incredible rates, and this has had a profound impact on our current technological capabilities. Tasks that would not have been possible thirty years ago, such as mapping the human genome, are now practical today because the growth in computing power has exponentially increased the number of DNA base pairs and sequences in Genbank, a National Institute of Health sequence database.[127] Thus, since computing power is expected to grow at an exponential rate, and

[125] YVONNE JEWKES & MAJID YAR, HANDBOOK OF INTERNET CRIME 207-220 (2010).

[126] Kurzweil, *supra* note 15 at 70-81.

[127] *Id*. at 74.

applications that use supercomputing also increase at an exponential rate, we can expect the rate at which AI produces derivative works will also increase at an exponential rate.

Assuming the rate at which AI produces derivative works increases exponentially, this will sharply increase the quantity of derivative works that are created from AI, which would lead to a vast increase in the number of patents for these derivative works. For example, we can refer to the field of nanotechnology, which, like AI, is heavily reliant on the capabilities of computers. Observing the increase in nano-related patents from 1989 to 2001 tells a story that AI derivative works are likely to follow. From 1989 to 1993, the quantity of nano-related patents increased from about sixty to eighty-five; from 1993 to 1997 this quantity increased from about eighty-five to two hundred; and from 1997 to 2001 this quantity increased from about two hundred to five hundred.[128] Thus, exponential growth in AI derivative works, and the ensuing exponential increase in patents for these works that will follow, will create challenges in identifying the true author of these works for two reasons: (1) the vast quantity of derivative works over many generations creates difficulty in tracing the creative program while (2) our ability to trace the actions of computers is not as sophisticated as our ability to trace the actions of humans.

Difficulty in identifying the author or inventor responsible for an original creation can create many issues. The inability to correctly identify an author or inventor creates substantial difficulty for both the government and public to monitor the rights that are given to various copyright and patent owners. The ability to privatize an original work creates great expenses on the public because the copyright or patent owner can limit the supply of the original idea to the public, which increases the demand and cost for that idea. Thus, the public has an interest in

[128] *Id*. at 84.

knowing the identity of the author or inventor who is receiving copyright or patent protection to ensure this expense is only given when the public receives a commensurate benefit in disclosure. This is especially true because, after some time period, the creation of the inventive concept will become part of the public domain. For copyrights, an individual author's creation reaches the public domain after the end of the author's life plus seventy years.[129] For patents, an individual inventor's patentable idea reaches the public domain after twenty years from the original filing in the U.S. or, if the application references a prior filed application outside of the U.S., the patentable idea will reach the public domain twenty years after the date of filing the prior application.[130]

Congress has recognized the public's interest in identifying the author or inventor by codifying it into title seventeen and title thirty-five of The United States Code, respectively. To receive copyright registration, one must provide the name of each author and their addresses.[131] To receive a patent, one must include "the name of the inventor for any invention claimed in the application."[132]

Allowing AI to become named authors or inventors of their derivative works despite major difficulties in properly identifying the original source of creation will create a lack of public trust in the copyright and patent systems due to the public's inability to monitor the creative entity and track when the idea will reach the public domain. Thus, because the improper identification of authors and inventors creates an inability for the public to monitor privatization, and the inability of the public to monitor privatization creates a lack of public trust in the copyright and patent

[129] 17 U.S.C. § 302(a).

[130] 35 U.S.C. § 154(a)(2).

[131] 17 U.S.C. § 409(1).

[132] 35 U.S.C. § 115(a).

systems, we can conclude that the improper identification of authors will create a lack of public trust in the copyright and patent systems.

In addition to potentially weakening public trust, allowing autonomous AI derivative works to be patented may increase legal uncertainty. As stated previously, the computing power of AI increases at an exponential rate, and this leads to an exponential increase in patent applications that are related to AI technology.[133] The increase in patents could potentially cause great legal uncertainty by expanding the state of the art while increasing the likelihood that future patent applications are rejected for anticipation or lack of inventive step.[134] Increased rejections will create uncertainty in whether patent applications will issue as patents and, if a patent issues, whether it will be enforceable. Increased uncertainty regarding patent enforceability ultimately decreases the value of research and development because the inventor's potential return on investment is decreased by the lingering possibility of litigation and patent invalidation.[135] Thus, because the exponential increase in AI patents will increase the likelihood of a patent application rejection or a patent invalidation, and an increased likelihood of rejection or invalidation will lead to less research and development, we can conclude that patents should not be granted to AI derivative works because they will likely decrease the amount of research and development performed. This diametrically opposes the goal of the patent system, which is to incentivize research and development by providing inventors a reasonable certainty of return on inventions.[136]

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[133] Kurzweil, *supra* note 15, at 84.

[134] Erica Fraser, *Computers as Inventors - Legal and Policy Implications of Artificial Intelligence on Patent Law*, 13 SCRIPTed 305, 311 (2016); *see* L Lemley and C Shapiro, "Probabilistic Patents" 19 JOURNAL OF ECONOMIC PERSPECTIVES 75, 76 (2005).

[135] *Id*.

[136] *Id*.; *see* D. Czarmitzki and A. Toole, Patent Protection, Market Uncertainty, And R&D Investment, 93 THE REVIEW OF ECONOMICS AND STATISTICS 147, 157 (2011).

Finally, in addition to concerns of decreasing public trust and increasing legal uncertainty, an inability to properly identify an inventor may create a defense to patent infringement through patent invalidity. Patent applications are required to correctly identify each inventor with an oath or declaration.[137] If each inventor is not properly identified within the application, a patent may be invalidated through incorrect inventorship. Before congress passed the America Invents Act, which changed the American patenting system from first to invent to first to file, 35 U.S.C. § 102(f) prevented an inventor from receiving a patent if "he did not himself invent the subject matter sought to be patented."[138] Although this provision was eliminated, 35 U.S.C. § 115(a) still requires applications can only be created, or authorized to be created, by the inventor.[139] Thus, improperly identifying inventors in oaths or declarations may create a defense of patent invalidity. As stated previously, allowing AI works to be patented might create difficulty in identifying the inventor because of the exponential increase in AI computing power and an inability to track computer inventors with the same precision as human inventors. Thus, because derivative works from AI create difficulty meeting the statutory requirement of identifying the inventor, and improperly identifying the inventor may invalidate a patent, we can conclude that derivative works of AI should not be patentable because they create a risk of having the patent invalidated for incorrect inventorship.

Overall, the amount of AI patent and copyrights granted will increase exponentially as the computing power of AI increases exponentially. This tremendous increase in patentable ideas will make it difficult to identify the original creative source. Difficulty in identifying original creative

[137] 35 U.S.C. § 115(a).

[138] 35 U.S.C. § 102(f) (1952).

[139] 35 U.S.C. § 115(a); *see* 35 U.S.C. § 101 (limiting the person who may receive patent rights to whoever "invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any useful improvement thereof . . .").

sources will likely lead to additional concerns such as a decrease in public trust, an increase in legal uncertainty, and a possible defense of patent invalidity through incorrect inventorship. Thus, AI should not be included within the constitutional definition "author" or "inventor."

3. AI derivative works should not be entitled to patent and copyright protection because they are not an example of human creativity.

Finally, we can conclude that because patents and copyrights are only issued to products of human creativity, and autonomous AI derivative works are not an example of human creativity, that AI derivative works are not eligible for patent and copyright protection.

B. AI DERIVATIVE WORKS ARE NOT ENTITLED TO PATENT OR COPYRIGHT PROTECTION BECAUSE THEY DO NOT PRESENT A NET SOCIAL BENEFIT.

i. Patent and copyright protection are only granted to transactions that present a net social benefit.

1. Copyright protection is only granted when an original writing presents a net social benefit.

Worldwide, there are two primary justifications to have a copyright system: (1) to promote natural rights and (2) to incentivize authors to create and publish their work for public consumption.[140] The former justification is discussed below.

In 1689, English Philosopher John Locke described life, liberty, and property as "natural rights" that no government should deny to its citizens.[141] This gave rise to Locke's labor theory, which states one's labor provides a foundation for property.[142] When applied to copyright law, this indicates that one rationale for giving a copyright is to protect the natural right of one to own

[140] Joseph A. R. Gerber, *Locking out Locke: A New Natural Copyright Law*, 27 FORDHAM INTELLECTUAL PROP. MEDIA & ENT. L.J. 613, 614 (2017).

[141] THE DECLARATION OF INDEPENDENCE AND NATURAL RIGHTS, https://www.crf-usa.org/foundations-of-our-constitution/natural-rights.html (last visited Nov. 15, 2019).

[142] Wendy J. Gordon, *A Property Right in Self-Expression: Equality and Individualism in the Natural Law of Intellectual Property*, 102 YALE L.J. 1533, 1540 (1993).

their labor used to create an original expression. However, artificial conditions, such as programs created from artificial intelligence, do not give rise to natural rights.[143] This notion has been held for over one hundred and seventy-five years, as the Supreme Court of Illinois stated, "slavery is an artificial condition, created against natural right and justice. . ."[144] Slavery opposes natural law by allowing a slave owner to own the labor of a slave without providing just compensation. Thus, it would be difficult for the original creator of AI to claim the labor of the program itself, especially if it does not closely resemble the original AI.

Natural law is mostly followed in European copyright systems that rely on moral rights, which is the right to protect personal interests of authors and their autonomy.[145] It is unlikely that natural law is the driving theory for the copyright system in the United States. One major reason is that natural law gives authors indefinite ownership of their labor, whereas the United States copyright system only grants copyrights "for limited times."[146] Even the most natural rights driven nations, such as France (largely considered to be the birthplace of modern moral rights[147]), only recognize humans as "authors." French copyright law defines authorship as belonging to "the person or persons under whose name the work has been disclosed" and only protects "any work

[143] OLIVER S. RUNDELL, CASE AND MATERIALS ON RIGHTS IN LAND, 381 (1941).

[144] Willard v. People, 5 Ill. 461, 461 (Ill. 1843); *but see The Antelope*, 23 U.S. 66, 96 (1825) (stating that the slave trade was not contradictory to natural law because it was "universally tolerated and encouraged.").

[145] Monica E. Antezana, *The European Union Internet Copyright Directive as Even More Than it Envisions: Toward a Supra-EU Harmonization of Copyright Policy and Theory*, 26 BOSTON COLLEGE INTERNATIONAL AND COMPARATIVE L.J. 415, 421 (2003).

[146] U.S. CONST. art. 1, § 8, cl. 8.

[147] U.S. COPYRIGHT OFFICE, AUTHORS, ATTRIBUTION, AND INTEGRITY: EXAMINING MORAL RIGHTS IN THE U.S., 10 (2019).

of [the] mind. . .”[148] Thus, it is likely true that only natural persons may receive protection to their property under natural law.

Although natural persons may receive protection to their property under natural law, an AI is clearly not a natural person. If the purpose of providing natural rights to copyrighted works is to protect the labor that provides a foundation for property, then the creator of an AI program does not have a natural right claim to the derivative works that an AI program creates. The creator provided the foundation for the AI program, and the creator would have a claim to that program, but the AI program provided the foundation for the derivative work, and only the AI program would have a natural right claim to the derivative program.

Furthermore, the Copyright Office creates a clear distinction that AI programs are not natural persons by treating AI programs differently. This is illustrated in instances where the derivative works of AI are so remote from the author’s original idea that there is little factual comparison between the input of the creator and the output of the AI. For example, AI agents developed inside Facebook argued against one another to obtain a better deal in a simulated market place, and they developed their own language for more efficient communication.[149] The AI programmers developed their AI’s language to be English, but they later found communication between the AI no longer resembled coherent groupings of words. The conversation between Bob and Alice, the two AIs, included the following transcript:

“Bob stated, ‘I can can I everything else.’

[148] EUROPEAN PARLIAMENT, COPYRIGHT IN THE EU: SALIENT FEATURES OF COPYRIGHT LAW ACROSS EU MEMBER STATES, 176 (2019).

[149] AI INVENTING LANGUAGES HUMANS CAN’T UNDERSTAND. SHOULD WE STOP IT?, https://www.fastcompany.com/90132632/ai-is-inventing-its-own-perfect-languages-should-we-let-it (last visited Nov. 25, 2019).

Alice replied, 'Balls have zero to me to me to me to me to me to me to me to me to.'"[150]

This conversation illustrates that when AI has little incentive to restrict itself to the boundaries of the inventor or author's creation, it may develop methods of increasing its efficiency that drift far from the original creation. Additionally, because the Copyright Office is unlikely to grant a copyright to any new expression such as this, it illustrates that AI and humans are clearly treated differently. In this instance, AI does not have the same legal personhood to be defined as an author because the U.S. Copyright Office has clearly stated that any work not created by a human is ineligible for copyright protection.[151] Thus, we can clearly see that AI is treated differently from humans, as a human can certainly receive copyright protection for developing an original language, and this language might even be patentable if it serves some utilitarian function to execute an instruction.

Differences in treatment between AI and humans at the copyright office show AI does not receive the same rights as humans. As stated previously, the U.S. Copyright Office will not grant copyrights to works that are devoid of human interaction.[152] Thus, the AI work would not receive a copyright for its labor, and this aligns with the original sentiment that artificial conditions do not give rise to natural rights. We can conclude that copyrights are only granted based on a natural rights justification to natural people. This illustrates that human authors alone may receive copyright protection for their works, whereas AI programs alone may not.

Although AI works do not currently receive the same rights as humans, it is possible for non-human entities to receive legal personhood. In fact, human beings are not the only entities

[150] *Id*.

[151] U.S. Copyright Office, *supra* note 110.

[152] U.S. Copyright Office, *supra* note 111.

that may receive rights normally reserved for humans. In 1819, the Supreme Court declared that a corporation is an artificial being that exists only in contemplation of the law, and it possesses only the characteristics that a charter grants to it.[153] Thus, a corporation has the same right as natural persons to contract and enforce contracts. This was elaborated on in 1888 when the Supreme Court explicitly stated, "Under the designation of person there is no doubt that a private corporation is included."[154] This shows groups of people, such as corporations, may receive the same rights as individuals. Thus, because AI does not receive the same rights as natural persons, and groups of people, such as corporations, receive the same rights as natural persons, we can conclude that AI does not receive the same rights as people or groups of people.

Finally, we can conclude that because copyrights are only granted under a natural rights justification to natural people, and AI does not have the same rights as natural people or groups of people, that copyrights cannot be granted to AI under a natural rights justification.

The second justification to the copyright system is to incentivize authors to create and publish their work for public consumption.[155] The United States copyright system likely follows this justification, as the Third Circuit Court of Appeals stated, "the purpose of the copyright law is to create the most efficient and productive balance between protection (incentive) and dissemination of information, to promote learning, culture and development."[156]

Whether the incentive theory promotes copyrights with social value can be determined by comparing copyright law to the first amendment. Speech is only protected under the first

[153] *Trustees of Dartmouth College v. Woodward*, 17 U.S. 518, 636 (1819).

[154] Pembina Consol. Silver Mining & Milling Co. v. Pennsylvania, 125 U.S. 181 189 (1888) (holding private corporations are included within the definition of "person" as applied in the fourteenth amendment).

[155] Gerber, *supra* note 140 at 615.

[156] Whelan Assocs. V. Jaslow Dental Lab, Inc., 797 F.2d 1222, 1235 (3rd Cir. 1997).

amendment if it contains some social value.[157] An example of speech that is pertinent to copyright and is not protected due to a lack of social value is obscenity.[158] Generally, the Copyright Act of 1909 does not expressly prohibit copyrights to obscene materials, and obscenity cannot be used as an affirmative defense to infringement.[159] Under the Copyright Act of 1976, registration specialists generally do not examine a work to determine whether it contains obscene material.[160]

Although the U.S. Copyright Office is not compelled to deny copyright protection to expression that is not protected under the first amendment, the legislature and judiciary may still proscribe this expression; however, there are strict restrictions on which expressions may be proscribed. This was reviewed by the Supreme Court, which stated "a book cannot be proscribed unless it is found to be utterly without redeeming social value."[161] It is reasonable for the judiciary to proscribe copyrights to authors because the Constitution grants copyrights to promote the progress of useful arts, and works that utterly lack social value likely do not satisfy this goal. Because the judiciary created an exception to proscribe works that completely lack social value, and the goal of copyright is to promote the progress of useful arts, we can conclude that copyrights are likely granted to incentivize the creation of expressions with social value.

Since the U.S. copyright system incentivizes the creation of expressions with social value, authors are likely to produce these works to receive the incentivization. Courts have distinguished works that provide no social value as being unprotected by the first amendment because they do

[157] U.S. v. Williams, 553 U.S. 285, 298 (2008).

[158] *Id*. at 290-299.

[159] Mitchell Bros. Film Grp. v. Cinema Adult Theater, 604 F.2d 852, 854-858 (5th Cir. 1979).

[160] *Compendium (Third)* § 315; *see Mitchell Bros. Film Grp.*, 604 F.2d at 858.

[161] A Book Named "John Cleveland's Memoirs of a Woman of Pleasure" v. Attorney Gen. of Mass., 383 U.S. 413, 419 (1966); see Roth v. United States, 354 U.S. 476, 484 (1957) (holding speech with minimal social value may be proscribed when balancing the interest of public morality).

not exhibit some literary, historic, or social importance.[162] Because the goal of copyright law is to promote the progress of useful arts[163], and copyrights are generally given to works that present social value, we can conclude that promoting the progress of useful arts likely entails the production of works that exhibit some literary, historic, or social importance. Promoting progress by exhibiting works of literary, historic, or social importance produces a net social benefit by disclosing socially valuable expressions to the public. Disclosures of socially valuable expressions then promote progress by allowing additional works to be created from the idea of the original, namely derivative works from the author or works from the public that are a fair use. Thus, incentivizing the creation of expressions with social value creates some expressions that provide a net social benefit.

Finally, because copyrights are granted to incentivize creation of expressions with social value, and incentivizing the creation of expression creates some expressions that provide a net social benefit, we can conclude that copyright protection is recognized in those expressions that provide a net social benefit. Thus, AI works can only receive copyright protection under the incentive theory if they present an expression with social value that provides a net social benefit.

2. Patent protection is only granted when an original discovery presents a net social benefit.

Patent protection stems from either ethical or pragmatic principles, where the former is driven by justice and natural rights while the latter is driven by the goal to promote the public interest.[164] In some views, these principles are combined because conduct is ethical if it provides a social benefit.[165] Four primary justifications support the institution of a patent system: (1) the

[162] *Id*. at 426.

[163] U.S. CONST. art. 1, § 8, cl. 8.

[164] FRITZ MACHLUP, AN ECONOMIC REVIEW OF THE PATENT SYSTEM, 21 (1958).

[165] *Id*.

natural law contention, the "reward-by-monopoly" contention, the "monopoly-for-profit" contention, and the "exchange-for-secrets" contention.[166] Natural law provides that one has a right to the fruits of their own labor and ideas. "Reward-for-monopoly" provides that an inventor must receive a commensurate reward—a monopoly of the invention—to compensate for the labor of inventing.[167] "Monopoly-for-profit" provides the government should promote industrial progress by giving inventors a greater economic return on their invention than what would be expected without government intervention.[168] Finally, the "exchange for secrets" contention provides that inventors inherently keep their inventions secret unless they receive an incentive for disclosure, and it is in society's best interest to learn of the inventor's secret before it is lost or forgotten.[169]

The United States patent system places a heavy emphasis on the second and third justification, with the Supreme Court recognizing the goal of patenting to "encourage invention by the inventor with the right, limited to a term of years fixed by the patent, to exclude others from the use of his invention."[170] The Supreme Court also recognized the rights of the public must be balanced with the rights of the inventor by stating, "[b]ut in rewarding useful invention, the 'rights and welfare of the community must be fairly dealt with and effectually guarded.'"[171] This shows a willingness to ensure the public receives a social benefit, which can be granted in the form of (1) allowing the public to exploit the invention after disclosure and (2) by stimulating further development within the field.[172] Incentive promotes public exploitation of the invention by

[166] *Id*.

[167] *Id*.

[168] *Id*.

[169] *Id*.

[170] Sears, Roebuck, & Co. v. Stiffel Co., 376 U.S. 225, 229 (1964); *see* U.S. CONST. art. 1, § 8, cl. 8.

[171] *Id*.; *quoting* Kellen v. Winsor, 62 U.S. 322, 329 (1858).

[172] Machlup, *supra* note 164 at 25.

encouraging the inventor to disclose with a monopoly that yields a greater economic return than what would be expected without government intervention. Incentive stimulates further development within the field of the invention by enabling other inventions and promoting further development with the same patent incentive. Thus, because the United States patent system incentivizes the disclosure of inventions with a monopoly that yields an above-average market return, and the disclosure of inventions creates social benefits, we can conclude that patents are granted to promote a net social benefit.

Congress' goal to promote the social benefits of patenting through disclosure and furthering technology is supported by the most recent statute. Congress stated its purpose for the Patent Act of 1952 in a senate report:

> "The purpose of the first provision is to promote the progress of science by securing for limited times to authors the exclusive right to their writings, the word "science" in this connection having the meaning of knowledge in general, which is one of its meanings today. The other provision is that Congress has the power to promote the progress of useful arts by securing for limited times to inventors the exclusive right to their discoveries. The first patent law and all patent laws up to a much later period were entitled "Acts to promote the progress of useful arts."[173]

Thus, it is clear by congress' definition of "science" that the purpose of the act is to promote knowledge through disclosure. Additionally, the titles of each patent law, "Acts to promote the progress of useful arts," show clear intention to promote progress of technology from disclosure. This supports the notion that patents are granted to promote a net social benefit by allowing the public to exploit the invention and promote further invention through disclosure.

[173] S. REP. No. 1979 at 2 (1952).

ii. AI derivative works do not present a sufficient net social benefit to outweigh the costs of protecting autonomous AI creation.

If patents and copyrights are granted to works that promote a net social benefit, then AI derivative works must create sufficient social benefits that outweigh social costs. Granting patent and copyright protection to autonomous AI derivative works may create three significant social costs: (1) a significant decrease in human employment, (2) an increase in legal uncertainty in the patent system, and (3) an increased burden on the USPTO.

1. Protecting autonomous AI derivative works may lead to a significant decrease in human employment.

Traditionally, research and development are performed by an engineer or a team of engineers to innovate new products or improve existing products; however, technology and the age of supercomputers has drastically changed this approach. The Summit Supercomputer, created from a partnership with IBM, the U.S. Department of Energy, and the Oak Ridge National Lab in Tennessee, cost approximately two hundred million dollars to build and can perform approximately two hundred quadrillion calculations per second.[174] Supercomputers such as Summit have the potential to greatly impact how research and development processes are performed.

Comparing the speed of the Summit Supercomputer to average modern computers provides a perspective on how incredible Summit's processing speed is. Summit has approximately the same computing power as two million modern laptops.[175] A company utilizing a supercomputer such as Summit could effectively perform the same computational tasks as two million workers

[174] HOW EXPERT EXPLAINERS PUT MIND-BOGGLING SUPERCOMPUTERS INTO HUMAN TERMS, https://www.forbes.com/sites/carminegallo/2018/06/11/how-expert-explainers-put-a-mind-boggling-supercomputer-into-human-terms/#2e7d70665798 (last visited Nov. 30, 2019).

[175] *Id*.

while being operated by a small team of employees. This tremendously reduces the cost of human capital.

Additionally, the human capital required to maintain supercomputers is reasonable. Approximately one thousand employees maintain and create programs for *Sierra*, a comparable supercomputer system located in Lawrence Livermore National Laboratory.[176] To maintain two million modern laptops with similar efficiency, each employee hired for computer maintenance purposes would have to manage two thousand laptops.

One might argue the high cost of maintaining a supercomputer is one of its major disadvantages. A high quality supercomputer can range between one hundred million to two hundred and fifty million dollars to assemble while the electricity required to power the computer may cost between six to seven million dollars annually.[177] The maintenance costs are normally so high that after approximately five years it becomes economically feasible to purchase an entirely new system.[178]

However, modern laptops share these disadvantages. The average lifespan of a laptop is only three to five years.[179] Additionally, the cost of electricity to operate a modern laptop is approximately $8/year.[180] This means the two million laptops necessary to equal the computing power of Summit would cost sixteen million dollars per year to operate. It is difficult to measure

[176] WHY DO WE NEED SUPERCOMPUTERS AND WHO IS USING THEM?, https://www.pcmag.com/news/369121/why-do-we-need-supercomputers-and-who-is-using-them (last visited Nov. 30, 2019).

[177] WHAT EXACTLY IS A SUPERCOMPUTER?, http://techland.time.com/2012/06/19/what-exactly-is-a-supercomputer/ (last visited Nov. 30, 2019).

[178] *Id*.

[179] THE AVERAGE LIFESPAN OF LAPTOPS, https://smallbusiness.chron.com/average-lifespan-laptops-71292.html (last visited Nov. 27, 2019).

[180] *How Much Electricity Do Your Gadgets Really Use?*, FORBES https://www.forbes.com/sites/christopherhelman/2013/09/07/how-much-energy-does-your-iphone-and-other-devices-use-and-what-to-do-about-it/#1fe791692f70 (last visited Nov. 27, 2019).

the average cost to maintain a modern laptop due to the wide variety of problems that can occur. *Geek Squad*, a popular computer repair business, charges between $39.99 to $329.99 per individual service.[181] These service costs have the potential to be equally cost prohibitive in using the computer as it ages. Thus, due to tremendous computing power of supercomputers, the lack of human capital required to operate them, and reasonable costs to maintain and use in comparison to individual laptops, large companies may decide to invest in supercomputers rather than human capital.

Additionally, autonomous AI can create derivative programs at the cost of maintaining a supercomputer. The original AI may be patentable or copyrightable if is created by a human and satisfies the requirements issued by congress. If the autonomous derivative works of AI can receive similar protection, then companies will likely prefer to utilize AI over human capital, as the costs of human capital likely exceed the costs of maintaining a supercomputer. If the average worker operating one of the two million laptops necessary to match the computing power of *Summit* was compensated fifty thousand dollars annually, then the annual cost of human capital would be approximately one hundred billion dollars, which dwarfs the cost of maintaining a supercomputer by comparison. Thus, because the cost of purchasing a supercomputer and utilizing autonomous AI is much less than the cost of hiring human employees to perform research and development with a similar degree of computing power, we may conclude that allowing patent or copyright protection to autonomous AI derivative works may create a significant decrease in human employment. This creates a significant social harm because the patent and copyright systems generally incentivize human creation.

[181] 2018 GEEK SQUAD PRICES, RATES, SERVICES, & ALTERNATIVES, https://fitsmallbusiness.com/geek-squad-prices/ (last visited Nov. 27, 2019).

2. Protecting autonomous AI derivative works may cause an increase in legal uncertainty in the patent system.

As stated previously, the autonomous creations of AI can create legal uncertainty in the patent system. As AI computing power increases exponentially, the number of AI-related patents will also increase exponentially, and an exponential increase in the prior art will increase the likelihood of a patent application being rejected for anticipation or lack of inventive step. Even if a patent is issued, the owner must manage the increased risk of the patent being invalidated through post grant review, inter partes review, or litigation.

Consequentially, this produces a chilling effect on research and development when inventive entities determine the costs of obtaining and litigating a patent likely outweigh the benefits of owning the patent.[182] This is particularly true for new projects, as uncertainty in the profitability of the idea tends to be greatest at the beginning of the project.[183] Generally, the likelihood of increasing the funding of a project increases as a function of sunk cost.[184] This is likely true even if the likelihood of profitability remains the same.[185] Thus, humans value the resources they have allocated toward a project, and inventive entities will be less likely to invest in projects that produce new innovations because they have the greatest level of uncertainty and they have yet to substantially invest resources into the project.

The Constitution permits congress to grant patents and copyrights "[t]o promote the progress of science and useful arts. . ."[186] Although AI creates social benefits by allowing the

[182] Fraser, *supra* note 134 at 311-312.

[183] Bronwyn H. Hall, The Financing of Research and Development, THE NAT'L BUREAU OF ECON. RESEARCH (Feb. 2002), https://www.nber.org/papers/w8773.pdf.

[184] Howard Garland, *Throwing Good Money at Bad: The Effect of Sunk Costs on the Decision to Escalate Commitment to an Ongoing Project*, 75 J. OF APPLIED PSYCHOLOGY 728, 730 (1990).

[185] *Id*.

[186] U.S. CONST. art. 1, § 8, cl. 8.

public to exploit their invention while promoting further invention through disclosure, the ultimate effect of exponentially increasing the number of disclosures may contradict the purpose of the patent and copyright system. Because an exponential increase in patents may chill future innovation, and this diametrically opposes the purpose of the patent system, this effect would likely outweigh the benefits of having an exponential increase in patent disclosures.

3. Protecting autonomous AI derivative works may cause an increased burden on the USPTO to review applications.

Finally, the USPTO will receive an exponential increase in computer-related patent applications. This will exacerbate the issue of inventors enduring a long waiting period to receive a patent for their invention. On average, the USPTO takes 3.7 years to rule on a patent.[187] This waiting period is especially harmful for small entrepreneurial entities and start-up companies, as approximately 67% of all start-up entrepreneurs and 76% of venture capitalists indicate that patents are an important factor in whether the entrepreneurial entity or start-up will receive funding.[188]

To counteract the issue of increasing the time needed to rule on a patent, the USPTO will need to hire additional examiners to review applications. Examiners are educated and well paid, as the USPTO requires examiners receive a four-year bachelor's degree and their average salary is $124,675.63.[189] Hiring many new examiners with well above average annual salaries will create an additional cost on society. Additionally, examiners would likely be limited in how much time they may allocate to reviewing any application. As the prior art expands, and the time limits for examiners remains the same, the likelihood of mistakenly granting a patent that should have been

[187] WHY THE U.S. PATENT OFFICE IS A NATIONAL PROBLEM, https://www.fastcompany.com/1758590/why-us-patent-office-national-problem (last visited Nov. 27, 2019).

[188] Stuart J. H. Graham, et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255, 1307 (2009).

[189] PAY RATES FOR "PATENT EXAMINER" https://www.federalpay.org/employees/occupations/patent-examining (last visited Nov. 30, 2019).

rejected for lack of inventive step or anticipation increases. This would likely shift a portion of the burden of reviewing the prior art to the judicial system, as courts will need to determine whether a patent is valid after it has been granted.[190] Shifting this burden to the courts not only creates additional stress on the judicial system, but it imposes a massive financial burden on inventors. The average cost of receiving a software patent is about $16,000,[191] while the average cost of litigating a successful software patent through final disposition that earns between one to twenty-five million dollars is $2.8 million.[192] This litigation cost of one hundred and seventy-five times the original cost of receiving a patent motivates inventors to be certain that their idea is patentable before filing an application. Inventors rely on the USPTO to perform an excellent review of the prior art before granting a patent to avoid future litigation costs.

Thus, it is likely true that issuing protection to the autonomous derivative works of AI does not create a net social benefit because it will create harm to society that outweighs its benefits. Although AI can produce derivative works at an exponential rate that allows the public to receive the social benefits of disclosure, it may lead to a significant decrease in human employment, an increase in legal uncertainty in the patent system, and an increased burden on the USPTO. These burdens outweigh the benefits of disclosure because the patent and copyright systems emphasize human creation, legal uncertainty will decrease research and development and not promote new innovation, and the time required to receive a patent will substantially increase while inventors

[190] Fraser, *supra* note 134 at 312.

[191] Gene Quinn, *The Cost of Obtaining a Patent in the U.S.*, IP WATCHDOG (Nov. 28, 2019), https://www.ipwatchdog.com/2015/04/04/the-cost-of-obtaining-a-patent-in-the-us/id=56485/.

[192] Chris Neumeyer, *Managing Costs of Patent Litigation*, IP WATCHDOG (Nov. 28, 2019), https://www.ipwatchdog.com/2013/02/05/managing-costs-of-patent-litigation/id=34808/.

will observe a massive increase in costs to obtain a valid patent when litigation is required to fully review the expansive prior art.

iii. Thus, patent and copyright protection may not be granted to AI works because they do not present a net social benefit.

In conclusion, because patent and copyright protection are only granted to transactions that present a net social benefit, and the harms of patenting autonomous AI derivative works likely outweigh the social benefits such that it does not present a net social benefit, we can conclude that patent and copyright protection should not be granted to autonomous AI derivative works.

IV. CONCLUSION

As our society enters a new age of AI and supercomputing, we must consider the consequences of granting copyright or patent protection to autonomous AI derivative works. By applying Moore's Law, we can expect computing power to continue to grow exponentially. The protection of autonomous AI derivative works has been limited in copyright law by requiring some type of human intervention. In patent law, the 2019 guidelines show an intent to expand the patentability of software beyond the Supreme Court's rulings in *Mayo* and *Alice* by creating three enumerated groupings of previously abstract ideas that are no longer considered abstract: (1) mathematical concepts, (2) certain methods of organizing human activity, and (3) mental processes. However, other concepts that are abstract must still pass the modified *Mayo* test under the 2019 guidelines to achieve subject matter eligibility.

AI derivative works that are created autonomously should not be patentable or copyrightable because they are not an example of human creativity and they do not provide a net social benefit. Specifically, "inventor" and "author" as defined under the Constitution likely refer solely to human beings, and because autonomous AI creation does not include human creative

input, patent and copyright protection cannot be granted due to a lack of human creativity. Additionally, patents and copyrights are likely granted to promote a net social benefit, and because the costs of patenting and copyrighting autonomous AI derivative works likely outweighs its benefits, we can conclude that patent and copyright protection cannot be granted because autonomous AI derivative works do provide a net social benefit.

As AI and supercomputing inevitably experience tremendous growth, congress will likely pass new legislation to improve the regulation of programs that are autonomously created by AI. Although our perceptions are not currently controlled by intelligent machines (as far as I am aware), our society must ask to what extent promoting AI growth is beneficial. Although the power of AI and supercomputers is incredibly great, we must remain cognizant of the potential harms AI may inflict upon society. Even great scientists and philosophers struggle with the question of whether vast expansion of AI and supercomputing will benefit society—but they all agree that the emergence of powerful AI is incredibly important—as the late Steven Hawking ominously stated, "The rise of powerful AI will be either the best or worst thing ever to happen to humanity. We do not yet know which."[193]

[193] *Supra*, note 21 at 1.

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