Response to Question #2

Submitted by

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Mehtab Khan

Cole Gingrich

The role of humans in the development of AI inventions depends on the role of the AI in the inventions. When AI is a component or step in an invention create by human inventors, people have many roles, as indicated by the example roles provided by the USPTO for question #2. Some authors have described the roles in four broad categories: Software Programmers, Data Suppliers, Feedback Suppliers, and Operators.[1] These roles are fairly well understood. On the other hand, when an AI system is an inventor, the human roles are not as clear.

For all types of AI inventions, humans can be inventors or co-inventors. Even when AI is an inventor, one or more humans may be identified as co-inventors. For example, one or more people may identify a problem to be solved, and may identify one or more general approaches to solving the problem. The people may then specify general parameters for a solution, and have an AI system resolve implementation details or evaluate the multiple options.

In the case of inventions that use AI, software programmers can write code for an AI system itself, or applications that use AI. This includes software to retrieve data and generate input to the AI system or to process the output, such as a graphical user interface. Humans can also write software to monitor operation of the system.

Natural people can also provide the data used by an AI system, either by literally providing the data about themselves, or collecting data from other sources. Data scientists sometimes need to spend huge amounts of time collecting and converting scattered data into a common format.

One way of combining human ingenuity and AI systems is to discover new drugs.[2] The data is partly derived from research on the characteristics of chemicals, and the characteristics

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[1] Shlomit Yanisky-Ravid, Xiaoqiong (Jackie) Liu, *When Artificial Intelligence Systems Produce Inventions: The 3A Era and an Alternative Model for Patent Law*, 39 Cardozo Law Review, 2215-2263 (2018).

[2] Taylor Kubota, Stanford researchers create deep learning algorithm that could boost drug development, Stanford News, (APRIL 3, 2017), https://news.stanford.edu/2017/04/03/deep-learning-algorithm-aid-drug-development/

desired for new drugs. In some cases, AI systems can identify a small set of potential drugs based on the desired characteristics, and human research (e.g., animal testing and human clinical trials) can further determine what drugs are useful.

Response to Question #3

Submitted by

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Marta Studnicka

Lyric Stephenson

As the applications of Artificial Intelligence ("AI") evolve, they become more ubiquitous in our society and push the boundaries of the legal systems as we know them. The growth of AI over the past few decades and its potential will continue to fundamentally challenge the existing patent system. Current laws enable the USPTO to handle inventions that use AI, but the current developments in this technology already demonstrate the potential for AI itself to be an inventor of new technologies.[1] In their Stanford Tech Law Review Article, Ben Hattenbacha and Joshua Glucoft identify some inventions created using AI.[2] The current patent laws do not accommodate AI inventors (e.g., an AI system cannot sign an assignment or a declaration). The Congress and the USPTO should address this by revising the current patent laws and regulation to specifically allow for AI inventors.

According to the U.S. Constitution, "The Congress shall have power 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."[3] Furthermore 35 U.S.C. § 200 states that the patent system is supposed "to promote the commercialization and public availability of inventions made in the United States by United States industry and labor." Traditionally the USPTO has limited the term inventor to human entities.[4] It is, however, in the interest of the "progress of science and the useful arts"[5] to extend the definition of "inventor" to include AI

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[1] *See* Dan Robitzski, *Scientists Are Trying to List AI as* the *Inventor on a New Patent: They say rules requiring that patents go to humans are outdated*, Futurism (Aug. 2, 2019), https://futurism.com/scientists-ai-inventor-patent (the inventors in the UK have already been demanding adding Dabus AI as an inventor on their patent).

[2] *See* Ben Hattenbach & Joshua Glucoft, *Patents in an Era of Infinite Monkeys and Artificial Intelligence*,19 Stan. Tech. L. Rev. 32, 35 (2015) ("Engineers at Hitachi, for example, programmed a computer that independently designed a new nose cone for the Japanese bullet train, improving the trains aerodynamic performance and reducing the noise level for passengers.")

[3] U.S. Const. Art. I § 8,cl. 8.

[4] 35 U.S.C. § 100(f) states "The term 'inventor' means the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention."; 35 U.S.C. § 101 continues to refer to a human individual: "Whoever invents or discovers any new and useful process [...] may obtain a patent therefor [...]."; Furthermore 35 U.S.C. § 115 requires an inventor to sign an oath or declaration:[E]ach individual who is the inventor or a joint inventor of a claimed invention in an application for patent shall execute an oath or declaration in connection with the application."

[5] U.S. Const. Art. I § 8,cl. 8.

when appropriate to increase the number of inventions that become available in the market. AI inventors will continue to invent at increasing rates, potentially exceeding those of human inventors.[6] In some cases, AI is able to create inventions that humans could not do, so it is important to incentivize these inventions. One way the USPTO can accomplish this is by granting inventor status to AI, with a human surrogate to execute any oath, declaration, or assignment.[7] This would create continuous incentives for the development of AI that can invent new technologies and at the same time address the challenges around the patent law signatory requirement.[8] A human surrogate can declare (e.g., under penalty of perjury) that the AI inventor truly invented, and did not acquire the invention from an external source.

The bigger concerns with granting inventor status to AI include: 1) how to define "a person having ordinary skill in the art ("PHOSITA") to which the claimed invention pertains;"[9] and 2) how to determine the prior art rules around AI inventions. Because of the rapid evolution of AI, if AI were to be included in the PHOSITA definition and/or were designated as prior art, then a larger number of inventions would be considered obvious. These changes could impair the process of human inventiveness. Alternatively, AI inventions could be disregarded for purposes of prior art and PHOSITA. That, however, would result in an absurd split that could make an invention obvious or non-obvious based on who is listed as an inventor. "Any proposed solution to these issues must address: (i) the fact that there will be both human inventors and non-human inventors; (ii) the continued evolution of AI inventors, as well as advanced AI tools used by human inventors; (iii) the Constitutional and legislative goal to promote the progress of science and useful arts;and (iv) the need for a workable solution for inventors, patent practitioners, and patent examiners." *See* Daily Journal, "Can the U.S. Patent Office Handle 'Artificial Inventors'?", September 30, 2019, David V. Sanker.

The future is already here and AI is capable of developing meaningful inventions. AI inventors are able to produce creative works that were previously only possible in the human brain. As this new wave of discovery quickly approaches, we need to adapt a system of patent law that rewards such methods, while at the same time addressing the challenges.

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[6] See Tim Cushing, New "Company" Claims It Uses Algorithms to Create Content Faster than Creators Can, Making All Future Creations "Infringing", TECHDIRT, Sept. 29, 2014, https://www.techdirt.com/articles/20140929/08500728662/new-company-claims-it-usesalgorithms-to-create-content-faster-than-creators-can-making-all-future-creationsinfringing.shtml.
[7] 35 U.S.C. § 115, *supra* note 5
[8] *Id.*
[9] 35 U.S.C. § 103

Response to Question #4

Submitted by

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As AI progresses, the USPTO will have to grapple with the issue of non-human owners and inventors in order to ensure compliance with the constitutional goals of patent law. AI systems have already demonstrated the ability to pursue smart and creative processes that demonstrate intelligence, creativity, and inventiveness. [1]. Current AI systems have created challenges to the existing legal framework by demonstrating the ability to generate inventions without human intervention while satisfying the legal requirements typically expected from a human inventor. [2].

The USPTO is currently facing new challenges in evaluating AI-related patents. One such example is the task of evaluating the first ever patent filed in the name of an AI inventor named Dabus. This patent application has satisfied all of the primary requirements for patent eligibility and stands to challenge the issue of whether AI can be named as an inventor. [3]. Scholars have recognized the urgent need for the USPTO to consider such inventions created by non-human inventors in order to incentivize the use and development of AI for the advancement of humanity. Policy as it stands today has left authors and inventors with no choice but to "merely side-step the question of AI ownership by selecting not to disclose the use of AI in their registrations and applications." [4].

Allowing AI to be named as an inventor raises many questions in regards to eligibility of non-human inventors and the inventions that they create. AI lacks discretion as to whether or not to create inventions. However, this presupposes that an AI system should be granted ownership rights only when it achieves similar capabilities to natural persons, completely ignoring analogous legal personhood as is found in corporations and government entities. Such corporate ownership grants legal personhood based on the nexus between natural persons (i.e., shareholders) and the corporation. [5]. Does the nexus between a creative AI system, its developers, its trainers, and its users provide an equally useful solution?

The current patent regime recognizes ownership by legal subjects who are capable of being incentivized to invest in further technological development. Assuming, however, that AI systems are recognized as inventors with creativity requisite for patentable inventions, the open question is whether another entity should retain ultimate ownership of patents on AI-generated inventions. [6] Because any AI system has a corporate or human owner, that owner should be the owner of inventions created by the AI

system. This is similar to having the owner of industrial machinery be the owner of any products created by that machinery.

Attribution of ownership to an AI system's owner is most consistent with current property law, as well as the Constitution. [7]. Ownership rights are best suited to the owner rather a user or a developer because the owner would concentrate the incentive to develop via consumer demand, while preserving the owner's ability to negotiate and promote user access. [8]. Consequently, ownership by the AI system owner is functionally hybrid, balancing the benefits of a public domain framework. This includes widespread and self-driven innovation and the investment capabilities of corporations.

Some critics have rejected AI inventors based on complex questions about disclosure, assignment, and non-obviousness. However, attempting to ignore AI inventors is not a solution. We recommend allowing a human surrogate to sign assignment and declaration documents on behalf of AI inventors. Contractual obligations, such as ownership or license of AI technology, determine ownership of inventions created by the AI technology.

In sum, non-natural entities such as corporations can and should own patents for inventions created by AI technology that they possess, and this does not represent a substantial deviation from current law.

[1] Russ Pearlman, Recognizing Artificial Intelligence (AI) as Authors and Inventors Under U.S. Intellectual Property Law, 24 Rich. J. L. & Tech. no. 2, 2018.
[2] https://www.lexology.com/library/detail.aspx?g=c8362459-4735-43af-b744-4495e239fd0e
[3] https://eandt.theiet.org/content/articles/2019/08/world-first-patent-application-filed-for-ai-inventor-s-ideas/
[4] https://jolt.richmond.edu/recognizing-artificial-intelligence-ai-as-authors-and-inventors-under-u-s-intellectual-property-law/
[5] *See* Russ Pearlman, *Recognizing Artificial Intelligence (AI) as Authors and Inventors Under U.S. Intellectual Property Law*, 24 Rich. J. L. & Tech. no. 2, 2018. https://jolt.richmond.edu/recognizing-artificial-intelligence-ai-as-authors-and-inventors-under-u-s-intellectual-property-law/
[6] *See* Ryan Abbot, *I Think, Therefore I Invent: Creative Computers and the Future of Patent Law*, 57 B.C. L. REV. 1079, 1082 (2016).
[7] *See id.*
[8] *See* Yanisky-Ravid, Shlomit and Liu, Xiaoqiong (Jackie), *When Artificial Intelligence Systems Produce Inventions: The 3A Era and an Alternative Model for Patent Law*, 39 Cardozo L. REV., 2215, 2254 (2018).

Response to Question #5

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Priya Adlahka

Daniel Kennedy

There are five requirements for patent eligibility under Title 35 of the United States Code: (1) subject matter eligibility under 35 U.S.C. § 101, (2) utility under 35 U.S.C. § 101, (3) novelty under 35 U.S.C. § 102, (4) non-obviousness under 35 U.S.C. § 103, and (5) sufficiency of disclosure under 35 U.S.C. § 112. Of these, utility is a low bar and AI inventions do not appear to present any difficulties. Also, the standard for novelty is well-established and is based upon the existence of published works. The existence or lack of published works regarding AI also does not appear to present any difficulties.

For inventions that use AI as a component or step, the current patent laws and regulations are already suitable, and provide no substantial patent eligibility requirements. In particular, because the techniques of AI are fairly well-known at this point, an invention that uses AI must generally establish patentability based on the components or steps *other than* the AI.

Patent eligibility for inventions *created by* AI algorithms do create some unique considerations. An invention created by AI can satisfy the revised Step 2A of the 2019 USPTO guidance if it provides a technical solution to an underlying technical problem in conjunction with hardware enabled elements. However, there is a slight twist to the subject matter eligibility analysis. Because cases like *Berkheimer* deem the level of skill in the art to be relevant to subject matter eligibility when an invention is abstract, it is important to consider the appropriate level of skill in the art for inventions created by AI. This is similar to the analysis under § 103, as discussed below.

Obviousness is judged with respect to what is known by a "*person* having ordinary skill in the art" (PHOSITA). Thus, what qualifies as a PHOSITA for AI inventions is critical. For inventions created by AI, the PHOSITA to which the AI inventor is compared may be another AI algorithm. However, it is not clear that such an algorithm qualifies as a "person" as referred to in the concept of a PHOSITA. It is also unclear how sophisticated such a PHOSITA will be, since

an AI inventor may be a laptop computer using a training set of thousands of examples, a massively distributed computing network with a training set of millions or billions of examples, or anything between. Even if the definition of an AI PHOSITA can be readily determined at a single point in time, this definition may change rapidly due to rapid technological advance, making it difficult for patent examiners and courts to keep up and render accurate judgments on obviousness. The definition of a PHOSITA must also be general enough to handle both human and AI inventors. Patentability should not depend on whether an invention was created by a human, an AI system, or a combination of human and AI inventors.

As technology has advanced over the centuries, the concept of a PHOSITA has been general enough to adapt to the advances in human skill, and it will continue to adapt. Now, because of the existence of AI inventors (whether recognized by law or not), the concept of a PHOSITA must be more adaptable, but without setting such a high standard that most inventions are deemed obvious. The challenge will be defining the appropriate balance.

The level of skill for a PHOSITA is also relevant to the disclosure requirements under § 112. If the designated level of skill for a PHOSITA were too high, very little disclosure would be required, which would be contrary to the historical disclosure requirement. Such a change would appear undesirable, so the level of skill for disclosure under § 112 may need to be different than the level of skill used under § 103. In particular, § 103 is directed to the inventors, whereas § 112 is focused on providing enough disclosure for others to understand the invention. The different purposes of § 103 and § 112 may justify differences in defining the level of skill in the art for these two sections.

For inventions that use AI, the current patent laws and regulations are sufficient. However, inventions that are created by AI raise an important policy concern regarding appropriate level of the skill in the art. We recommend using a flexible PHOSITA definition that encompasses both human and AI inventors.

Response to Question #12

Submitted by

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Mariana Acevedo Nuevo

Nivedita Soni

The focus of legislation across several jurisdictions has been centered around the concepts of ownership and inventorship pertaining to Artificial Intelligence. In particular, the legislation relates to whether it is possible to recognize AI as an inventor and the implications of such a measure. This includes the possibility of granting "legal person" status to computers, with the consequent ethical implications. None of the current legislation from these other jurisdictions provide helpful guidance for the USPTO on how to address AI Inventors. The discussion within these jurisdictions focuses on the inventive or creative step needed in order to consider a person as an inventor. However, the definitions set forth by the examined legislations shed no meaningful light on who can be creative or what the process of invention should actually entail.

We reviewed the existing patent landscape in multiple jurisdictions, and their respective take on patenting of Artificial Intelligence. China, Japan, and South Korea do now allow for an AI system to be considered an inventor. In the United Kingdom, the Patent Act of 1977 defines the inventor as "the actual deviser of the invention" and the existing patent law regime does not allow for an AI system to be considered as an inventor.

There are multiple practical questions still left unanswered that focus on the role of AI as an inventor, such as how the inventor's moral and substantive rights can be safeguarded in the patent granting process or at what stage of a given invention's process should the inventor be included. None of the other patent laws or policies of other patent offices provide helpful guidance on how to address AI inventors, so the USPTO is essentially on its own to navigate this new territory.