**Patent Practitioners' Response to USPTO Request for Comments
on Patenting Artificial Intelligence Inventions**

10 January 2020

Andrei Iancu
Director
United States Patent and Trademark Office
P.O. Box 1450
Alexandria VA 22313-1450

Via email: AIPartnership@uspto.gov

Re: USPTO Request for Comments on Patenting Artificial Intelligence Inventions
(Docket Number: PTO-C-2019-0029)

The authors[1] identified herein are pleased to submit the following comments in response to the USPTO's request for comments, published in 84 FR 44889 (27 Aug 2019) related to patenting Artificial Intelligence inventions (Docket Number: PTO-C-2019-0029).

****

<u>Question 1:</u>
Inventions that utilize AI, as well as inventions that are developed by AI, have commonly been referred to as "AI inventions." What are elements of an AI invention? For example: The problem to be addressed (e.g., application of AI); the structure of the database on which the AI will be trained and will act; the training of the algorithm on the data; the algorithm itself; the results of the AI invention through an automated process; the policies/weights to be applied to the data that affects the outcome of the results; and/or other elements.

<u>Comment:</u>

"Artificial Intelligence" (AI) is broadly used to describe computer software or algorithms that make meaningful observations or predictions based on unique sets of data. That is, AI is fundamentally a data-driven technology that takes unique datasets as input to train AI computer models. Once trained, an AI computer model may take new data as input to predict, classify, or otherwise output results for use in a variety of applications.

While the specific elements of given AI inventions may differ, the elements typically comprise one or more of the following aspects:
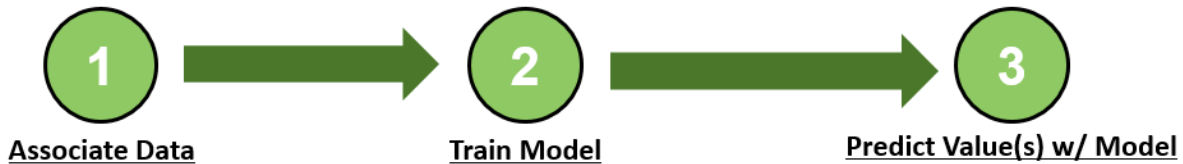
1. Associating or preprocessing a dataset or defining rules
2. Training or generating a model with AI algorithms/techniques using the dataset or rules
3. Using the trained model to classify, predict, or otherwise make meaningful observations based on new, but similar data or input

---

[1] Ryan N. Phelan, Partner, Marshall, Gerstein & Borun LLP; James (Jim) Lai, Manager, KPMG, LLP; the comments and opinions expressed herein belong to those of the author(s), and do not necessarily reflect the opinions of their respective firms and/or companies.

4. Using the trained model in a given environment and/or for a specific purpose (e.g., using the trained model to operate an autonomous vehicle)

For example machine learning, arguably the most widely used AI technique, may be described as a process that uses data and algorithms to train (or teach) computer models. The trained model allows the computer to make decisions without the need for explicit or rule-based programming. In particular, machine learning algorithms build a model on training data to identify and extract patterns from the data, and therefore acquire (or learn) unique knowledge that can be applied to new data sets.

Because of the reliance on data to train AI models, information and data sources are now an even more important and valuable resource. Companies that collect or store data (e.g., "big data"), incorporate information arising from the Internet-of-Things, or otherwise have large, unique datasets are typically well-positioned to develop or take advantage of AI technologies.

There are multiple AI learning techniques, including supervised learning, unsupervised learning, and reinforcement learning.

Additional information may be found at: https://www.marshallip.com/publications/artificial-intelligence-the-intellectual-property-landscape/

Question 2:
What are the different ways that a natural person can contribute to conception of an AI invention and be eligible to be a named inventor? For example: Designing the algorithm and/or weighting adaptations; structuring the data on which the algorithm runs; running the AI algorithm on the data and obtaining the results.

Comment:

As provided by the MPEP § 2137.01, the definition for Inventorship can be simply stated: "The threshold question in determining Inventorship is who conceived the invention. Unless a person contributes to the conception of the invention, he is not an inventor. … Insofar as defining an inventor is concerned, reduction to practice, per se, is irrelevant [except for simultaneous conception and reduction to practice, *Fiers v. Revel*, 984 F.2d 1164, 1168, 25 USPQ2d 1601, 1604-05 (Fed. Cir. 1993)]. One must contribute to the conception to be an inventor." (citing *In re Hardee*, 223 USPQ 1122, 1123 (Comm'r Pat. 1984)).

With respect to AI inventions, a natural person can contribute to the conception of an AI invention through contribution of one or more of the elements as described for Question 1 above herein. For example, a first inventor may contribute to the conception of an invention by defining preprocessing steps or datasets, or by defining rules used to train an AI model. A second inventor may contribute to the conception of an invention by developing a new AI algorithm that uses the dataset or rules in order to train a model. Still further, a third inventor may contribute to the conception of an AI invention by configuring the trained model to operate in a particular environment (e.g., autonomous driving).

**Patent Practitioners' Response to USPTO Request for Comments
on Patenting Artificial Intelligence Inventions**

Question 3:
Do current patent laws and regulations regarding inventorship need to be revised to take into account inventions where an entity or entities other than a natural person contributed to the conception of an invention?

Comment:

No. Current patent laws and regulations provide a commensurate level of *quid pro quo* to natural persons for sharing their respective inventions. The authors of these comments do not believe that non-natural persons were contemplated with respect to receiving the benefit of, or being incentivized by, patents in the same manner as natural persons.

Article I, Section 8, Clause 8, of the United States Constitution grants Congress the enumerated 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."

With respect to Clause 8, our founding fathers wrote: "The utility of this power will scarcely be questioned. The copyright of authors has been solemnly adjudged, in Great Britain, to be a right of common law. The right to useful inventions seems with equal reason to belong to the inventors." *Federalist Paper No. 43* (James Madison).

The above recognizes the *quid pro quo* between the U.S. government, on the one hand, and inventors (natural persons), on the other hand, to incentivize inventors to share their inventions with the public. Assuming that a non-natural person (e.g., a machine) would not be similarly incentivized by the *quid pro quo* originally contemplated by Constitution, it follows that the current patent laws and regulations do not need to be revised to incentivize non-natural persons.

An exception to this could be for "joint inventorship" situations, were a natural person uses an AI device to assist in the contribution to the conception an invention. For example, a natural person may use a trained AI model to identify or classify unique sets of proteins or other components for development of a new pharmaceutical. While the indication or classification of the proteins or other components may be solely performed by the trained AI model (i.e., a non-natural person), a natural person, in the given hypothetical, may have developed or preprocessed the training dataset or rules used to train the model. Further, the natural person may also have idenitifed the pharmaceutical for use in a particular treatment. Consequently, an issue may arise as to joint inventorship between the natural person and the non-natural person. In such situations, a modification, or at least interpretation of, current patent laws may allow the natural person to be attributed the full contribution to the conception of an invention.

Such interpretation would be consistent with similar situations (involving new technologies) where machines (e.g., a camera) assisted an author in the creation of intellectual property. To wit, when asked whether photographs were copyrightable in 1884, the Supreme Court noted that while the "ordinary production of a photograph" was "merely mechanical, with no place for novelty, invention or originality," the "existence of those facts of originality, of intellectual production, of thought, and conception on the part of the author" endowed the photograph with copyright protection. *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 59 (1884). According to the Supreme Court, it was the photographer's "mental conception" in selecting and arranging the subject's costume, determining the lighting, and arranging the scene that conferred the creativity sufficient for authorship. *Id.* at 54–55, 60.

Here, over 100 years later, an analogy arises with respect to AI inventions and patent law. In particular, like the photographer who arranges a subject's costume, determines the lighting, and arranges the scene, an AI inventor similarly arranges the dataset, determines the rules for training an AI model, and arranges for the use of the AI model during operation (e.g., to drive an autonomous vehicle).

Question 4:
Should an entity or entities other than a natural person, or company to which a natural person assigns an invention, be able to own a patent on the AI invention? For example: Should a company who trains the artificial intelligence process that creates the invention be able to be an owner?

Comment:

The question of assignment or ownership of an invention should turn on questions of Inventorship. Accordingly, the authors of these comments submit that the Comment to Question 3 applies equally to Question 4.

For example, as provided for Question 3 herein, in certain situations, a company (e.g., via an employee thereof) who trains an artificial intelligence model that contributes to the conception of an invention should be allowed to be an owner/assignee so long as the company can identify at least one natural inventor (e.g., the employee) as at least a joint inventor of the invention in question.

Question 5:
Are there any patent eligibility considerations unique to AI inventions?

Comment:

With respect to 35 U.S.C. 101, one area where AI inventions do raise patent eligibility considerations is in determining whether the invention is "useful" as required by 35 U.S.C. 101. As described in the comment to Question 1, an AI invention relies on a computer's analysis of a set of "training data" in order to "learn" how to produce desired results. If the training data set is poor, the AI invention will not function properly and may be rejected for failing the utility requirement. Here are some examples.

- In some jurisdictions, judges use AI tools to help determine a particular defendant's risk of recidivism. These criminal risk assessment algorithms are intended to help allocate criminal justice resources according to the likelihood that a particular defendant will benefit from rehabilitation services, for example. However, these algorithms have been trained using historical crime data to detect factors that correlate to a lower or higher recidivism risk. While this seems objective at first glance, historical crime data sets that, for example, fail to control for disparate impacts on poor and minority communities risk generating risk scores that are higher for poor and minority defendants than for similarly situated white or affluent defendants because of systemic biases against poor and minority defendants. (https://www.technologyreview.com/s/612775/algorithms-criminal-justice-ai/).

- While the Human Genome Project completed the first full sequencing of human DNA in 2003, there remains significant work to be done before the benefits of gene sequencing are available to all of humankind. The GenomeAsia 100K Project seeks to improve the medical

utility of human gene sequences by correcting for underrepresentation of non-Europeans in the original Human Genome Project and resulting in reduced medical relevance for a large proportion of the world's population due to failure of existing sequences to account for genetic differences among human populations. (https://www.nature.com/articles/s41586-019-1793-z).

AI inventions based on training data that fails to represent the full range of human subjects they are designed to analyze will inevitably fail to generate accurate results when applied to substantial populations. The USPTO should consider whether AI inventions meet the utility requirement of 35 U.S.C. 101 if they fail to address these concerns.

As to whether AI inventions should or should not be considered to recite an "abstract idea," as that term is understood pursuant to 35 U.S.C. 101, because AI inventions involve the use and application computer software, the authors of these comments submit that no patent eligibility considerations uniquely apply to AI inventions. That is, current patent law and regulations recognize and encompass the purview of computer related inventions, whether such computer inventions involve software-only inventions (*see, e.g., Enfish, LLC v. Microsoft Corp.,* 822 F.3d 1327 (Fed. Cir. 2016) (self-referential databases)) or hardware/software inventions. *See, e.g. Core Wireless Licensing SARL v. LG Elec.,* 880 F.3d 1356 (Fed. Cir. 2018) (guided-user interface (GUI) software implemented on mobile devices). As noted herein, for example with request to Question 2, AI inventions may comprise software-only inventions (e.g., algorithms for training an AI model) and/or software/hardware aspects (e.g., using a trained model to operate an autonomous vehicle).[2]

Question 6:

Are there any disclosure-related considerations unique to AI inventions? For example, under current practice, written description support for computer-implemented inventions generally require sufficient disclosure of an algorithm to perform a claimed function, such that a person of ordinary skill in the art can reasonably conclude that the inventor had possession of the claimed invention. Does there need to be a change in the level of detail an applicant must provide in order to comply with the written description requirement, particularly for deep-learning systems that may have a large number of hidden layers with weights that evolve during the learning/training process without human intervention or knowledge?

Comment:

No. Disclosure-related considerations should not differ from those already established and required by 35 U.S.C § 112.

A given invention should provide a sufficient disclosure to satisfy the written description and enablement requirements of Section 112. For example, to the extent that a given invention regards an algorithm that improves the accuracy or predictive aspects of an AI model, then that algorithm should be sufficiently described to demonstrate that the inventor has possession of the algorithm and to allow a person of ordinary skill in the art to practice the invention (e.g., train a same AI model with the algorithm) without undue experimentation.

---

[2] It is to be noted that the author's beliefs as to the current state of the law as to patent eligibility, especially in view of computer software inventions and the typical treatment of such inventions as "abstract ideas," is beyond the scope of this Question and this comment.

Question 7:
How can patent applications for AI inventions best comply with the enablement requirement, particularly given the degree of unpredictability of certain AI systems?

Comment:

The current test for enablement requiring disclosure sufficient to enable one of skill in the art to practice an invention without "undue experimentation" applies well for AI inventions. *See United States v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) ("The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation.").

In particular, a person of ordinary skill in the art, reading the specification, should be able to practice the AI invention without undue experimentation. That may include sufficient disclosure allowing those of ordinary skill in the art to preprocess the data (or define any applicable rules) in order for a skilled person to train or implement a same or similar AI model that generates or outputs the same or similar results as described in embodiment(s) of the specification.

Question 8:
Does AI impact the level of a person of ordinary skill in the art? If so, how? For example: Should assessment of the level of ordinary skill in the art reflect the capability possessed by AI?

Comment:

No. The fact than an invention may implement or comprise AI should not alter the determination of the level of a person of ordinary skill in the art. Instead, conventional means should be employed to determine the level of a person of ordinary skill in the art, i.e., the person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art may include: (A) "type of problems encountered in the art;" (B) "prior art solutions to those problems;" (C) "rapidity with which innovations are made;" (D) "sophistication of the technology; and" (E) "educational level of active workers in the field. In a given case, every factor may not be present, and one or more factors may predominate." In re GPAC, 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995); Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc., 807 F.2d 955, 962, 1 USPQ2d 1196, 1201 (Fed. Cir. 1986); Environmental Designs, Ltd. V. Union Oil Co., 713 F.2d 693, 696, 218 USPQ 865, 868 (Fed. Cir. 1983).

With respect to these factors, for an AI related invention, the level of a person of ordinary skill in the art should turn on the inventive aspects of the AI invention (e.g., whether the AI invention is directed to preprocessing data, developing an algorithm for training an AI model, etc.).

Question 9:
Are there any prior art considerations unique to AI inventions?

Comment:

No. The authors of these comments believe that current laws and jurisprudence pursuant to 35 U.S.C. §§ 102 and 103 sufficiently apply to AI Inventions. For example, as described herein, AI inventions are fundamentally computer software related inventions for which there are numerous cases that illustrate prior art considerations.

Question 10:
Are there any new forms of intellectual property protections that are needed for AI inventions, such as data protection?

Comment:

No. The authors of these comments believe current intellectual property protections, including those provided by copyright and trade secret law, provide adequate protections for given aspects of AI inventions, including for data used for AI inventions (e.g., data used to train an AI model).

Question 11:
Are there any other issues pertinent to patenting AI inventions that we should examine?

Comment:

The authors of these comments refer the reader to the comments herein.

Question 12:
Are there any relevant policies or practices from other major patent agencies that may help inform USPTO's policies and practices regarding patenting of AI inventions?

Comment:

The authors of these comments refer the reader to the following:

- EPO refuses DABUS patent applications designating a machine inventor, https://www.epo.org/news-issues/news/2019/20191220.html (last visited Jan. 5, 2019).

- EPO – Artificial Intelligence, https://www.epo.org/news-issues/issues/ict/artificial-intelligence.html (last visited Jan. 5, 2019).

****

Respectfully submitted,

/Ryan N. Phelan/

Ryan N. Phelan