

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Request for Comments on Patenting Artificial Intelligence Inventions

Docket No. PTO-C-2019-0029

**COMMENTS OF INTERNET ASSOCIATION,
HIGH TECH INVENTORS ALLIANCE,
THE SOFTWARE AND INFORMATION INDUSTRY ASSOCIATION, AND
ACT | THE APP ASSOCIATION**

November 8, 2019

Table of Contents

I. Commenters' Interest.....	3
II. Summary of Comments.....	4
III. The USPTO Should Place a Renewed Focus on Technical Training.....	4
A. <i>The Existing Technical Training Programs Are Insufficient</i>	4
B. <i>The USPTO Should Provide Robust AI Technical Training</i>	6
C. <i>The Failure To Adequately Train in Emerging Technologies Like AI Is Particularly Dangerous</i>	7
IV. Specific Answers to the RFC's "Issues for Comment"	8
1. <i>What are elements of an AI invention?</i>	9
2. <i>What are the different ways a natural person can contribute to conception of an AI invention and be eligible to be a named inventor?</i>	10
3. <i>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?</i>	10
4. <i>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?</i>	11
5. <i>Are there any patent eligibility considerations unique to AI inventions?</i>	11
6. <i>Are there any disclosure-related considerations unique to AI inventions?</i>	14
7. <i>How can patent applications for AI inventions best comply with the enablement requirement, particularly given the degree of unpredictability of certain AI systems?</i>	15
8. <i>Does AI impact the level of a person of ordinary skill in the art?</i>	16
9. <i>Are there any prior art considerations unique to AI inventions?</i>	17
10. <i>Are there any new forms of intellectual property protections that are needed for AI inventions, such as data protection?</i>	17
11. <i>Are there any other issues pertinent to patenting AI inventions that we should examine?</i>	17
12. <i>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?</i>	18

I. Commenters' Interest

The four associations (“the Associations”) joining these comments represent broad sectors of the technology community and depend on the success of the patent system to continue innovating.

Internet Association (IA) is the unified voice of the internet economy, representing the interests of America’s leading internet companies and their global community of users. IA is dedicated to advancing public policy solutions to strengthen and protect internet freedom, foster innovation and economic growth and empower users. IA members¹ have extensive experience in the field of artificial intelligence (AI). Many IA members sit at the crossroads of the leading edge of AI and the continued development of the internet-based economy. As a result, IA members have a deep interest in the development of AI as well as the protection of intellectual property that occurs alongside that development. At the same time, IA members believe that the scope of patent protection should match the contribution made by the inventor, which can be difficult to assess in an area like AI.

High Tech Inventors Alliance (HTIA) members are some of the most innovative technology companies in the world, creating the computer, software, semiconductor and communications products and services that support growth in every sector of the economy. HTIA members rely on a well-functioning patent system as they collectively invest about \$75 billion in R&D each year, generating technological advances protected by their more than 175,000 patents. HTIA companies also contribute significantly to employment and the economy, providing more than 1.3 million jobs and generating more than \$600 billion in annual revenues. HTIA’s mission is to promote balanced patent policies that preserve critical incentives to invest in innovation, R&D, and American jobs. HTIA members include Adobe, Amazon, Cisco, Dell, Google, Intel, Oracle, Microsoft, and Salesforce.

The Software and Information Industry Association (SIIA) is the principal U.S. trade association for the software and digital content industries. With over 800 member companies, SIIA is the largest association of software and content publishers in the country. SIIA members range from start-up firms to some of the largest and most recognizable corporations in the world. The innovative companies that make up SIIA’s membership rely on patents to protect their inventions, but also depend on the ability to manufacture, develop, and sell their products free from improper assertions of exclusive rights.

ACT | The Association represents more than 5,000 small technology development companies that create leading software and hardware solutions located across America. The ecosystem the Association represents is valued at approximately \$1.3 trillion and provides 5.7 million American jobs. The App Association is the leading global representative for the small-business innovator community on law and policy in intellectual property matters, including with respect to patents, and its members develop and leverage patented technology to innovate and compete across sectors and use cases, driving the growth of the Internet of Things.

¹ Internet Association’s members include scores of today’s most recognizable companies. A complete list is available here: <https://internetassociation.org/our-members/>.

We commend the USPTO for requesting public comments on patenting AI inventions and beginning this important dialogue with its stakeholders. We encourage the USPTO to continue this engagement through further exploration of the topics outlined in the request for comment.

II. Summary of Comments

The single most important thing the USPTO should do in the context of AI is improve the technical training given to examiners who plan to examine AI-related technologies in their technical field, whether that field relates to core AI technologies or is just one of the many fields (perhaps now all fields) impacted by AI-related technologies. The USPTO's existing approach to technical training includes ad hoc programs that depend on volunteer organizations to teach, and volunteer examiners to attend. While the Associations support the current programs and its members will continue to participate in them, we urge the USPTO to develop a more robust and mandatory technical training program. As with the current programs, a new program could also rely on volunteer instructors, but should have a detailed curriculum and should be mandatory for the relevant examiners. Such a program, if successful, could serve as a model for other technology areas. The Associations believe a renewed focus on technical training is critical in the AI space where the technology is complicated and evolving rapidly. Examiners unfamiliar with AI will be more likely to issue patents with claims that overreach or descriptions that under disclose.

As for the existing patentability standards, the Associations believes that current law is designed to apply to new technologies as they develop, and AI is no different. There are however, specific concerns that may arise for AI inventions when it comes to the various provisions of Title 35. Those concerns are discussed below in connection with the types of inventions that can be characterized as AI inventions. Such inventions include AI innovations, where the invention is an improvement in AI technology itself, and AI applications, where an existing AI system or model is applied to a different technological field. There may also be a third category of inventions that have been identified as *AI created* inventions. On closer inspection, such inventions are more correctly thought of as being created using AI as a tool, but not in the sense that a machine is an inventor, which it cannot be under existing law. Regardless of the nature of the invention claimed, the Associations stress throughout these comments that the USPTO's examination decisions are most critical in areas like AI where technology is emerging rapidly and unduly broad claims or inadequate disclosures can hinder future innovation.

III. The USPTO Should Place a Renewed Focus on Technical Training

A. The Existing Technical Training Programs Are Insufficient

A decade ago the USPTO announced the technical training program that still exists today.² The Patent Examiner Technical Training Program (PETTP) remains the USPTO’s principal effort to train patent examiners on technical rather than legal matters.³ It is an ad hoc, volunteer system in which scientists or experts in their fields provide lectures of their choosing, at their expense, to examiners who volunteer to attend them. The initial announcement identified the technical areas the USPTO thought would be most beneficial to examiners, listing more than 100 such areas arranged by Technology Centers.⁴ Notably, AI, including neural networks, was originally included among the topics the USPTO identified as a technical area of interest in Technology Center 2100, where applications directed to computer architecture software are examined.⁵ The USPTO maintains a list of topics that “may be of interest to examiners,” but that list no longer appears to include AI or neural networks.⁶

According to the USPTO’s website, the PETTP is “an opportunity to provide patent examiners with necessary training from scientists and experts working directly in the various technologies throughout the USPTO.”⁷ Essentially, the USPTO relies on skilled volunteers to provide the technical training it characterizes as “necessary” for examiners to do their jobs. The program appears to be successful, at least in its efforts to solicit volunteers. According to the USPTO’s website, approximately 130 speakers or groups volunteered to provide training to examiners in 2018—though many of the organizations providing volunteers are listed as law firms.⁸ There are, of course, many organizations involved in volunteering speakers, including members of the Associations, who will continue to participate in the program regardless of any additional technical training program that may be developed by the USPTO.

While the Associations commend the USPTO for its efforts to facilitate volunteer lecturers, the agency should reflect on whether that is the best way to reliably train examiners. The potential flaws in the current system are obvious. First, aside from the list of suggested topics, there appears to be no effort to design an actual technical curriculum for any examiner, nor does there appear to be any requirement that any examiner ever attend a lecture. Second, because the lectures are conducted by self-selected volunteers, there appears to be no ability for the agency to meaningfully guide or design the lectures so that they conform to any format or subject area. Third, there is no guarantee that any particular area will ever be addressed by a volunteer. Fourth, there is no way to determine whether the technical training is having the desired impact on improving the technical understanding of patent examiners. This approach to

² Patent Examiner Technical Training Program, Dkt. No. PTO-P-2010-0061, 75 Fed. Reg. 178, 56069-56061 (Sep. 15, 2010) (PETTP Announcement).

³ The USPTO also has a Site Experience Education (SEE) Program that funds travel costs for patent examiners to visit host organizations for the purpose of providing patent examiners with an opportunity to visit and learn about technology developments at the host organizations. The SEE Program appears to be a site visit program that provides no organized or targeted technical training.

⁴ 75 Fed. Reg. at 56060.

⁵ Id.

⁶ <https://www.uspto.gov/patent/initiatives/patent-examiner-technical-training-program/pettp-tech-fair-topics-interest#step3>

⁷ <https://www.uspto.gov/patent/initiatives/patent-examiner-technical-training-program#step1>

⁸ <https://www.uspto.gov/patent/initiatives/patent-examiner-technical-training-program/pettp-2018-organizations-and-speakers>

technical training stands in contrast to the proven legal training programs the USPTO provides to all its examiners.

B. The USPTO Should Provide Robust AI Technical Training

The Associations recommend that the USPTO take this opportunity to try a different approach to technical training. The USPTO's current focus on AI is a perfect opportunity to design a technical training program for those examiners who plan to examine any AI-related inventions, even if they do not yet regularly examine AI-related inventions. Such a program should be more than a one-time lecture but need not be a complete departure from the existing PETTP. Indeed, the Associations' member companies, and presumably other entities, would be more than willing to support a training program that continues to leverage volunteer lecturers from relevant organizations.

This would also be a good opportunity for the USPTO to direct a larger portion of collected fees towards up-front examiner training. As technologies evolve as a result of increasing R&D investments, it is imperative that the USPTO take the appropriate action to keep pace with innovation in all areas, not just AI. For example, blockchain and virtual reality technologies are also rapidly changing, independently of AI technologies. Such a training program should also consider use of online training that is available for free from academic institutions.⁹

The Associations believe there are four important components to a robust technical training program: it should have a targeted curriculum; it should evolve alongside technological developments; it should focus on technical issues relevant to statutory requirements and how those issues relate to novelty, enablement and obviousness; and it should be mandatory.

The most significant flaw in the PETTP is that it amounts to a voluntary buffet of lectures that are not coordinated in any way, either with respect to timing or subject matter. A reliable technical training program needs at least a high-level curriculum that is designed to cover subject matter over time and with increasing granularity, just as the USPTO currently trains its examiners on legal issues. The USPTO's current focus on AI is a perfect space in which to design such a curriculum, which could include lectures on AI fundamentals followed by more detailed lectures with narrowed focus on specific areas of technology. While the current PETTP focuses on what volunteer lecturers want to cover, when they want to cover it, a true curriculum in the AI space would create a template that could be used to solicit volunteer lecturers, but would also focus their attention on the specific building blocks of AI that examiners require to best understand the applications they are examining.

Any technical training program, like the technology itself, should evolve as the technology advances. It should also be designed in light of the statutory requirements that examiners must evaluate in considering applications. The USPTO is a perfect place to design such an evolving curriculum. As examiners pick up new applications, they may notice trends or a focus on areas of AI with which they are generally unfamiliar and could internally identify

⁹ See, e.g., Courseware, <https://www.coursera.org/learn/machine-learning>.

those areas as subjects for potential training. But even more promising, the USPTO could use data collected during its initial classification of incoming applications to identify areas where training might be most needed. And because applications are initially screened and classified prior to examination, there is the ability to target additional technical training as it is needed in real time. We recommend considering that possibility in the AI space.

Finally, any reliable technical training program must be mandatory for the relevant examiners. Just as all examiners are trained on legal issues, the Associations recommend that the USPTO make technical training equally mandatory. If the training covers the technological background necessary to examine in a particular art like AI, all examiners who might be assigned an application in that art should be equally well-trained. Moreover, the natural training curve that faces the USPTO in the examination space does not logically apply in the technology space. A senior examiner generally does not need as much legal training as a relatively junior examiner and so the USPTO has historically provided the bulk of its training to newer examiners. But when it comes to technical training, following that approach makes little sense. More experienced examiners have less time to devote to any single application and necessarily rely on their own understanding of an art as they examine. But when faced with an application in a rapidly evolving area, those senior examiners will necessarily be at a disadvantage because they have less time to consider and understand the technology.

The Associations believe that this final point is critically important and could easily be overlooked in practice. As discussed below, AI inventions may come in the form of either new AI innovations, or the application of AI to other areas. In the case of the latter type of invention, it is possible that a patent application directed to an application of AI may be classified in an art area that is typically distinct from what one might consider an AI field. Either way, any examiner who might face an AI invention should receive adequate technical training regardless of the nature of the art area the examiner typically examines.

C. The Failure To Adequately Train in Emerging Technologies Like AI Is Particularly Dangerous

The connection between patent quality and the time an examiner can spend on any given application is well-known if not universally accepted.¹⁰ For its part, the USPTO acknowledges the connection between the needed examination time and technology complexity.¹¹ There is necessarily a connection between the need for more time in the case of increasing complexity and the need for better examiner technical training.¹²

¹⁰ See, e.g., Michael D. Frakes & Melissa F. Wasserman, *Is the Time Allocated to Review Patent Applications Inducing Examiners to Grant Invalid Patents?: Evidence from Micro-Level Application Data*, 99 REV. ECON. & STAT. 550, 560 (2017) (suggesting that increasing time constraints leads to marginal increase in patent grants).

¹¹ “Examination Time Analysis (ETA),” presented at the Patent Public Advisory Committee Quarterly Meeting, August 3, 2017;

https://www.uspto.gov/sites/default/files/documents/20170803_PPAC_Examination_Time_Analysis.pdf.

¹² See, e.g., FED. TRADE COMM’N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY, 20 (2003) (observing that the recommendation that examiners be afforded more time and provided more training); <https://www.ftc.gov/sites/default/files/documents/reports/promote-innovation-proper-balance-competition-and-patent-law-and-policy/innovationrpt.pdf>

The possibility that the lack of technical understanding may lead to poor quality patent grants in the case of emerging technologies was described by the Federal Trade Commission in its 2003 report on the balance of competition and patent law. As the FTC observed, “in emerging areas, examiners necessarily lack experience reviewing the new industry’s patent applications and the body of prior art is slim.”¹³ The FTC’s particular concern was that “unwarranted upstream patents can hinder downstream innovation,”¹⁴ and while its concern was raised in the context of a recommendation that the USPTO’s “second-pair-of-eyes” program be expanded to emerging technology areas, those concerns are just as relevant to an examiner’s technical understanding of an invention.

The gap between examiner understanding and the cutting edge is getting worse, not better. Allowance rates at the USPTO are now 77%, up almost 10% in the past 3 years,¹⁵ and about 10% from the long-term observed allowance rate.¹⁶ For patents relating to AI, the allowance rates are currently much higher, for example, almost 91% for AI cases relating to self-driving cars and medical imaging and 82.3% for the average AI case.¹⁷ This signals to the Associations that examiners are not trained well enough on the AI fundamentals and the vast body of prior art in this space.

One concern is that an examiner who is unfamiliar with AI may incorrectly believe that claims are adequately described or enabled. Similarly, an examiner unfamiliar with AI may not readily understand the true breadth of the claims and inadvertently allow an application to issue with claims that cause the very downstream hindrance of innovation that concerned the FTC. When a technology like AI expands rapidly, applicants may engage in what amounts to a land grab, purposefully attempting to tie up as much scope as possible. In order to police that potential behavior, it is critical that the USPTO’s examiners be technically trained on the subject matter they are examining.

IV. Specific Answers to the RFC’s “Issues for Comment”

The above detailed discussion lays out the Associations’ views on the most significant issue raised in the context of patent applications drawn to AI inventions. Below are answers to the USPTO’s list of specific questions.

¹³ *Id.* at Ch. 6, p. 20.

¹⁴ *Id.*

¹⁵ USPTO. “Patent UPR Application Allowance Rate.” Updated Sept. 2019.

<https://www.uspto.gov/corda/dashboards/patents/kpis/kpiAllowed.kpixmap>.

¹⁶ Crouch, D. Patently-O. “USPTO Allowance Rate.” Posted Nov. 2, 2016.

<https://patentlyo.com/patent/2016/11/uspto-allowance-rate-2.html>.

¹⁷ Sutton, E. Patnotech. “Not Another AI Patent Article: Data-Driven Prosecution In The Field Of Artificial Intelligence.” Posted Oct. 4, 2019. <http://www.patnotech.com/2019/10/not-another-ai-patent-article-data.html>.

1. *What are elements of an AI invention?*

At the outset, the Associations agree with the suggestion in the RFC that there are multiple, distinct types of inventions that could be termed “AI inventions.” Those various types of AI inventions can be loosely separated into three categories: (1) inventions that embody an advance in the field of AI; (2) inventions that apply AI to another field; and, arguably, (3) inventions that are produced by AI. We refer to the first group as *AI innovations* and the second group as *AI applications*.

An *AI innovation* is an advance in the field of AI technology itself and might include, for example, a new neural network structure of an improved machine learning model or algorithm. Aside from their complexity, such inventions could be described, claimed, and examined in the same way other software inventions have been. As a result, there is no conflict with established claiming and disclosure practices, and these inventions are unlikely to present significant new challenges with respect to the application of substantive patentability requirements.

There will be, of course, AI innovations that present more complex examination difficulties that flow from the nature of machine learning, which is the dominant form of AI. Machine learning does not involve explicit instructions but instead the computer is “trained” using statistical methods that produce an analytical or mathematical model based on data analysis. Unlike a series of algorithmic steps, machine learning training produces a mathematical model that is derived by a computer and is expressed in a form that may not be comprehensible to human experts. The inability to describe precisely how particular results are produced by a trained model is often referred to as the “black box” or “interpretability” problem in AI. Innovations in this space will likely produce greater hurdles to disclosure and enablement requirements. But just as some pharmaceutical innovations, for example, may not operate in a way that is fully understood by their own inventors, so long as a skilled artisan can make and use the claimed invention and be assured that the inventors possessed it at the time of filing, those hurdles can be overcome. For example, if the inventor cannot explain exactly how the AI works, she may explain the various functions implemented in each element of the neural network along with the topology of the network and the type of data needed to build the model. In other words, existing patent principles that accommodate alternative ways to describe inventions can—and must—be applied even to complex AI innovations.

An *AI application* is just that—the application of AI to a particular field or problem. Just as the invention of computers naturally led to their use in conventional problem solving, and just as the internet led to its use in communications and commerce, AI will have natural benefits in existing fields. There may be technical difficulties to particular applications that amount to patentable inventions, but just as we have come to understand with computers or the internet, it is the technical advance that should be considered for patentability purposes and not simply the notion, or recitation in a claim, that AI be applied. As with AI innovations, and as discussed below, the Associations believe that existing laws are adequate to deal with patent applications directed to AI applications.

Finally, the Associations acknowledge the possibility of a third type of invention that one might call an *AI developed invention*. Specifically, an AI developed invention is an invention in any art that is developed by a machine rather than a human. As a threshold matter, the

Associations do not believe that machines can be inventors. On closer inspection, in many such instances it is likely the machine programmers who are the actual inventors. AI is used as a tool by these programmers to identify solutions to a problem already defined by human operators or to model alternative potential solutions in order to evaluate the suitability of each and identify the best one. As a result, consideration of a separate “developed by” category is not analytically useful. At least for now, the focus should be on the more meaningful distinction between AI innovations and AI applications.

The specific elements of an AI invention will not always be the same and will depend on the particular invention in question, as will the manner in which such elements should be incorporated into patent claims. Most AI inventions would logically include some or all of the elements suggested in the question, i.e., the structure of the database on which the AI will be trained, the algorithm itself, the training of the algorithm on the data, the output structures, etc.

2. *What are the different ways a natural person can contribute to conception of an AI invention and be eligible to be a named inventor?*

Conception of an AI invention should be assessed like any other invention and will thus depend on the characteristics of the invention claimed, as well as the development process that results in the invention. For inventions that are advances in the field of AI, AI innovations, the nature and development of the invention are likely to be very similar to those of existing software-related inventions, and the assessment of inventorship will generally be based on the same considerations and factors that are already employed with respect to software.

Inventorship is likely to be more challenging with respect to inventions in other fields that use AI, where the claims will often be directed to an AI application that involves a broader spectrum of opportunities to contribute to conception. Persons with expertise in the problem domain who conceive of a problem to be solved by AI or contribute to developing an AI solution that is suitable to solve that problem are potential inventors. So too are those who develop a particular software implementation and/or the hardware developers when specialized hardware is employed. Persons who contribute to the development or adaptation of an AI model that is suitable for a particular application and those who contribute to the successful training of an AI model (e.g., by developing training protocols and generating particular training data) are potential inventors.

Because the assessment of inventorship is fact dependent and because the potentially-qualifying contributions are numerous and varied, it is unlikely that all the ways in which a natural person might qualify as a named inventor can be anticipated *ex ante*, making it impossible to compile an exhaustive list.

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?*

No. the Associations do not believe that at present there is any problem that needs to be solved with respect to existing inventorship law and further does not believe there is any credible legal, economic, or policy argument in favor of extending inventorship to AI machines, systems,

or software. We generally agree with the conclusion reached in the study on this topic that was commissioned by the EPO and authored by Dr. Noam Shemtov that “at present there are no particular difficulties associated with ownership enquiries relating to inventions involving AI activities” and that the economic arguments for extending inventorship to AI machines, systems, or software are “not supported by empirical data or a credible economic model.”¹⁸

While the Associations do not advocate for the development of any specific laws or regulations directed to AI, there are specific considerations relevant to AI that the USPTO should consider as it assesses patentability under existing law, as discussed more fully below in answers to the specific questions posed by the RFC. There is one critical theme that runs throughout every patentability consideration discussed—the USPTO should be especially vigilant when assessing patentability in emerging technologies like AI, where inappropriately issued patents could slow the pace of innovation by erecting overly broad barriers to future developments.

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?*

No. For many of the same reasons discussed above with respect to inventorship, there does not appear to be any need for, or potential benefit from, permitting non-natural persons other than corporate assignees to have ownership rights in a patent. Current law governing the grant and ownership of patent rights is appropriate, and we do not believe that any change is advisable or potentially beneficial.

5. *Are there any patent eligibility considerations unique to AI inventions?*

No, the eligibility of AI inventions should be determined in the same way as the eligibility of any other type of invention. Due to the nature of AI inventions, they may be more likely to raise difficult eligibility concerns than a typical non-AI invention. This is not due to any unique considerations and does not provide any justification for a departure from the eligibility requirements that apply to other types of inventions. Rather, any increased difficulty of accurately assessing the eligibility of AI inventions simply indicates that USPTO should take greater care to ensure that examiners are provided the time, resources, and training that enables them to accurately assess eligibility. We outline some of those areas for concern below.

A. Data Gathering and Abstract AI

It is not hard to imagine why an AI invention, whether an AI innovation or application, would be subject to scrutiny under section 101. In the case of an AI innovation, the claims are likely to be drawn to particular software-implemented methods, data collection and arrangement techniques, etc. Many AI-related applications claim data-driven tasks performed in the same way that a human would perform (or even had already performed) the same task, only faster. These types of claims may trigger eligibility concerns. Likewise, for an AI application, where the claims might be drawn to the application of machine learning, questions might arise whether

¹⁸ Noam Shemtov, *A Study on Inventorship in Inventions Involving AI Activity*, 24, 34, (Feb. 2019); Study Commissioned by the European Patent Office, available at [http://documents.epo.org/projects/babylon/eponet.nsf/0/3918F57B010A3540C125841900280653/\\$File/Concept_of_Inventorship_in_Inventions_involving_AI_Activity_en.pdf](http://documents.epo.org/projects/babylon/eponet.nsf/0/3918F57B010A3540C125841900280653/$File/Concept_of_Inventorship_in_Inventions_involving_AI_Activity_en.pdf).

such claims amount to the routine application of existing technology in a new context. This is a common theme in the eligibility context.

AI does not transform ineligible subject matter into eligible subject matter when the AI is operating the same way as the human mind or other conventional techniques. There are some operations that are performed in a similar way in the mind and on a machine. For example, a human or a machine could sort items alphabetically, by size, or color hue by starting with a first item in the list and adding new items before or after certain items already in the list. At this basic level, there is nothing inherently distinct about the machine's involvement, even if the machine is using prior human judgments to drive its calculations.

Given the continued rapid growth of AI technology, there is an increasing likelihood of patent claims seeking to cover the application of AI to a particular technology. We are increasingly encountering claims that simply state that a desired result is achieved by, for example, an "expert system" or AI.¹⁹ As the Federal Circuit explained, such claims answer the question of how to improve a system by simply stating "use an expert system."²⁰ As was made clear in *Mayo* and *Alice*, adding "on a computer" to claims does not render them eligible. Examiners should be cautioned that the same is true of adding bare references to terms such as "expert system," "machine learning engine," or any other reference to AI technology.

B. USPTO Guidance

Whether the AI invention is an innovation or application of AI, the Associations urge the USPTO to focus on whether the claims represent a new technical solution, not just a new solution and not just a technical solution. Earlier this year the USPTO issued revised § 101 guidance.²¹ The linchpin in that guidance is the new inquiry into whether a claim recites a "practical application," which avoids the conclusion that the claim is directed to an abstract idea. The recent guidance cites *Eibel Process*²² and *Diehr*²³ to support its test. In both cases, the eligible invention improved the technology at issue. In *Eibel*, the claimed Fourdrinier machine made paper at a pace much faster than prior machines, and the claims, the Court noted, were "for an improvement on a machine."²⁴ Similarly, the Supreme Court has made clear that "the claims in *Diehr* were patent eligible because they improved an existing technological process."²⁵ Thus, under settled law, reciting a machine or technical process is not what makes the difference. Eligibility depends on whether the "practical application" is a new technical improvement.

¹⁹ See, e.g., *Vehicle Intelligence and Safety LLC v. Mercedes-Benz USA, LLC*, 635 F. App'x 914, 916 (Fed. Cir. 2015) (considering a claim where the purported innovation appears to be references to the use of "one or more expert systems" without any detail about the expert systems in the claims or specification). See also *Intellectual Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363 (Fed. Cir. 2015) ("Nowhere in these vague and generic descriptions of the [core of the invention] does Intellectual Ventures suggest an 'inventive concept.' Rather, the 'interactive interface' simply describes a generic web server with attendant software. . . .").

²⁰ *Id.* at 918.

²¹ 2019 Revised Patent Subject Matter Eligibility Guidance, Dkt. No. PTO-P-2018-0053, 84 Fed. Reg. 50 (Jan. 7, 2019).

²² *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 U.S. 45 (1923).

²³ *Diamond v. Diehr*, 450 U.S. 175 (1981).

²⁴ *Eibel*, 261 U.S. at 55, 70.

²⁵ *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208, 223 (2014).

In the AI context, the implications of cases like *Eibel Process*, *Diehr*, and their progeny make clear that the mere recitation of AI is not enough to render a claim patent eligible. What matters is whether the claims recite a new technical improvement. That might be an improvement in AI or a technical solution required to apply AI in a particular context, but the mere recitation of the presence of AI is not enough. The Associations urge the USPTO to apply its recent guidelines consistently with this case law and conclude that mere recitation of AI is not a sufficient “practical application” to render a claim patent eligible.

C. Disclosure of the *How* for the New Technical Solution

Not only does *Alice* require a new technical solution, but follow-on cases also require the specification to describe *how* the new technical solution is accomplished.²⁶ This case law should be consistently enforced at the USPTO because Section 112 is insufficient to address the issue. Section 112 requires an applicant to enable the invention for a person of ordinary skill to make and use it without undue experimentation. Section 112 does not adequately focus on the new technical solution to ensure that the applicant explained the *how* for that aspect that renders the claim potentially patent eligible. In *Vehicle Intelligence and Safety LLC v. Mercedes-Benz USA, LLC*, the Federal Circuit rejected the assertion that an “expert system” used to test a driver for sobriety could render the claim patent eligible even though there was no such expert system that existed at the time of filing. In invalidating the claim under 35 U.S.C. 101, the Federal Circuit explained that claims reciting an “expert system” fell short because the patent did not describe how the expert system improved the existing method.²⁷

An “expert system” is a computer system implementing artificial intelligence. The USPTO should be wary of claims like those in *Vehicle Intelligence*, where the *how* is not provided in the specification for the portion of the claim being highlighted as a new technical solution. Applicants should not be able to claim AI as applied to entire fields in this manner without disclosing anything of value to the public.

Section 112 may have been insufficient to address this issue in *Vehicle Intelligence*. If an expert system was a routine tool to a person of ordinary skill in the art, then the applicant might not have needed much explanation in terms of *how* if the tool itself was not the focus of the

²⁶ *Vehicle Intelligence and Safety LLC v. Mercedes-Benz USA, LLC*, 635 Fed.Appx. 914 (Fed. Cir. Dec. 2015) (“[N]either the claims [nor] the specification provide any details as to how this ‘expert system’ works or how it produces faster, more accurate and reliable results. . . . [C]ritically absent from the entire patent is how the existing vehicle equipment can be used to measure these characteristics.”). See also *Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343 (Fed. Cir. 2015) (“The mechanism for maintaining the state is not described, although this is stated to be the essential innovation. . . . [The] proposed interpretation of ‘maintaining state’ describes the effect or result dissociated from any method by which maintaining the state is accomplished upon the activation of an icon. Thus we affirm that claim 1 is not directed to patent-eligible subject matter.”); *Intellectual Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363 (Fed. Cir. 2015) (“Nowhere in these vague and generic descriptions of the [core of the invention] does Intellectual Ventures suggest an ‘inventive concept.’ Rather, the ‘interactive interface’ simply describes a generic web server with attendant software. . . .”); *In re TLI Communications LLC Patent Litigation*, 823 F.3d 607 (Fed. Cir. 2016) (“[The patent] fails to provide the requisite details necessary to carry out [the abstract] idea. . . . [S]teps that generically spell out what it means to ‘apply it on a telephone network’ . . . cannot confer patent eligibility.”).

²⁷ *Id.*

claimed innovation. *Vehicle Intelligence* solves this problem by first analyzing the new technical solution and then looking for the *how*.

D. Conventional AI Techniques and Tools

AI systems now exist for nearly every field of technology, and common AI algorithms are being applied in similar ways over and over again. Similarly, common AI platforms and tools are being used for their intended purposes to solve problems within the realm of what they were intended to solve. Wikipedia (see “machine learning,” “artificial intelligence,” and “cluster analysis”) explains several high-level machine learning algorithms and suggests ways they can be applied in different contexts.²⁸ Examiners should be familiar with these algorithms and their various applications. These conventional uses of AI technology are insufficient to transform an abstract idea into a patent-eligible application of that idea.

6. *Are there any disclosure-related considerations unique to AI inventions?*

While AI inventions as a class do not create unique considerations relating to disclosure, the same rules and principles that apply to all other types of inventions are appropriate in the AI context. Nevertheless, there are considerations relating to the fact that AI is a rapidly evolving technology likely to play a critical role in maintaining U.S. competitiveness and economic growth in the long term. Given that, it is critical to avoid misallocation of rights, and to ensure that a company’s development or adoption of AI technology does not subject it to unreasonable litigation or business risks as a result of the issuance of overly broad or invalid patents. The USPTO should increase its capabilities with respect to AI by hiring examiners who have the appropriate subject matter expertise and by providing substantial technical training on AI to examiners.

Regardless of the specific nature of the AI invention, the structure of the machine learning model, system, or software algorithm should be described with enough specificity to show possession of the model or improvement as claimed. If the claims are directed to a class of AI innovations, such as claims to achieving a result where the claims cover potential use of multiple different algorithms and not just a single algorithm, the specification should include language showing examples of or guidance for achieving the result using the class of algorithms, and not just a single example.

In the case of an AI application, a skilled artisan is already aware of an existing machine learning model or technique. Such a description should therefore include identification of an algorithm by name with additional descriptions of what portions of the algorithm have been modified to meet the application, and, if applicable, how different algorithms are connected to each other. If the purported AI invention is described as working with numerous types of artificial neural network algorithms, the application should describe whether and how the invention works with each of the type of artificial neural networks, such as what particular changes would be required to apply the invention as claimed.

²⁸ Wikipedia. “Machine Learning.” Accessed Oct. 29, 2019. [Wikipedia. “Artificial Intelligence.” Accessed Oct. 29, 2019. \[https://en.wikipedia.org/wiki/Machine_learning\]\(https://en.wikipedia.org/wiki/Machine_learning\); \[https://en.wikipedia.org/wiki/Artificial_intelligence\]\(https://en.wikipedia.org/wiki/Artificial_intelligence\).](https://en.wikipedia.org/wiki/Machine_learning) Wikipedia. “Cluster Analysis.” Accessed Oct. 29, 2019. https://en.wikipedia.org/wiki/Cluster_analysis.

Examiners should use care in the case of claims to an AI application to confirm that the inventor has sufficiently described possession of the application itself. Thus, one would expect to see detailed descriptions of the data inputs, training data or the coefficients that resulted from the training data and the outputs to the existing machine learning model needed to adapt it to the new application. The description would likely also need to describe the particular type and scope of data in addition to its structure because certain training algorithms may be dependent on the data's characteristics. To the extent that specific details on hardware (e.g., use of AI accelerator hardware) are needed to actually implement the invention or achieve the result claimed, the specification should include details on the hardware capabilities required.

Additionally, although AI inventions do not raise unique considerations or exhibit such significant differences from other inventions as to justify consideration of separate, technology-specific rules to AI, that does not mean that AI inventions will not pose certain challenges with respect to disclosure. The most significant of these involves the subset of AI patents that are directed specifically to trained models. A trained model is typically produced by an automated process performed by a computer with no direct involvement by human developers in prescribing how the trained model produces the desired result.

Because a trained model is not designed by human developers and is expressed as a mathematical model that may be difficult to understand, satisfying the written description and enablement requirements when an applicant seeks claims directed to a trained model may be equally difficult. Because the internal operation of the trained model may not be known or fully understood by the developer, applicants may sometimes lack some knowledge about the precise operation of their invention. With that difficulty in mind, the focus of enablement and written description should always remain on whether a person of ordinary skill in the art could make and use the claimed technology and confirm that the applicant was in possession of what she claimed. Examples of possible ways that applicants could address enablement are outlined above. If those requirements are satisfied, no other aspect of an AI invention should require a greater disclosure requirement.

Given the enormous importance of AI technology, the Associations believe that there would be significant benefits to having established practices for satisfying disclosure requirements with respect to inventions embodied in machine learning models and would encourage the USPTO to take the lead in discussing this issue with stakeholders and devising a consensus solution.

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

The law requires that the supporting description must enable any person skilled in the art to make and use the invention without undue experimentation. Continued vigilance regarding that requirement of 35 U.S.C. § 112(a) is particularly important so long as there is a debate regarding whether a machine can be an inventor. The statute requires enablement to be assessed from the point of view of a person skilled in the art and not from the point of view of an inventor. In other words, the question of whether a description is sufficient to enable a machine to make and use an invention is, and should remain, legally irrelevant.

Meanwhile, data is a critical input in the development of AI inventions based on machine learning. The operation, performance, and accuracy of a trained model is highly dependent on the quality and suitability of the training data set that was used. Using an incorrect, skewed, or otherwise inappropriate data set in training will result in the trained model working poorly or not working at all. Given that data is a critical element of AI inventions and plays a much more central role as compared to traditional software programming, a significant description of the relevant data set will frequently be essential to satisfying both the written description and enablement requirements. Because the data used to train a machine learning model in effect defines the operation of the trained model, most machine learning inventions cannot be adequately described or enabled absent some disclosure regarding training data. For example, the application could describe the general type of data used, the important features of that data, potential sources of the data, etc. This is another topic on which we believe examiner training would be beneficial.

8. *Does AI impact the level of a person of ordinary skill in the art?*

Yes, the Associations believe that when looking inventions related to the development of application of AI, the level of ordinary skill in the art should be assumed to be both knowledge typical in the particular applied field plus a working knowledge of existing of AI machines, systems, and software. Examiners, too, should have that same knowledge base. The Associations recommend that the USPTO provide the training necessary to permit examiners to properly evaluate the claims through the lens of a person having ordinary skill in the relevant art.

When it comes to determining whether a claimed AI invention is non-obvious over the prior art, the Associations believe the USPTO should carefully consider this level of ordinary skill in the art.²⁹ Examiners very rarely address this *Graham* factor. In fact, the MPEP advises that an examiner need not specify a particular level of skill in the art if the prior art reflects that skill level.³⁰ As AI tools become more prevalent and more accessible, one can assume that the ordinary skill in the art will include knowledge of existing prior art AI machines, systems, and software and the ability to apply them in obvious ways to existing problems. In other words, when the invention does not reside in the machine learning technique itself, but in the application of that technique, the appropriate skill level is knowledge of the applied field combined with the awareness of AI.

Because the knowledge of existing prior art AI machines, systems, and software should be charged to a person of ordinary skill in the art, inventions actually created by the mere application of AI are logically within the level of skill in the art as well. Should there be such a thing as an AI-created invention, the premise of such an invention is the pre-existence of the AI machine, system, or software that “created” the invention. Because that pre-existing AI technology is within the level of ordinary skill in the art, its output is presumptively obvious. As a result, to the extent that an AI-produced invention comes at some point after the development

²⁹ See *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966) (establishing that “the level of ordinary skill in the pertinent art” is one of the factors to be assessed when determining whether a claimed invention would have been obvious).

³⁰ Manual of Patent Examining Procedure, § 2141.03, II.

of the underlying AI machine, system, or software, the invention itself is likely presumptively obvious absent any human innovation necessary under the particular circumstances involved.

Beyond the ordinary-skill-level inquiry, and the ramifications of existing AI machines, systems, and methods being of part of that ordinary skill, patent applications directed to AI innovations may raise specific obviousness issues. Using an existing model for its intended purpose is likely obvious, as would the result, as discussed above. But in some cases, applying an existing machine learning model may not be simple, and hurdles overcome in order to achieve that application may render application claims non-obvious. For instance, a model developed in one domain may not always be easily adaptable to another, whether due to difficulties regarding data inputs, data labelling or how the model is used.

9. *Are there any prior art considerations unique to AI inventions?*

The relevant prior art considerations for AI inventions are like other types of complex inventions where the state of the art is advancing quickly. In such areas, the body of prior art may be less robust and more scattered. The Associations are aware of the USPTO's effort generally to improve its prior art searching abilities and believes those efforts should continue. However, given the higher allowance rate for AI related inventions, discussed above, the Associations also believe that the USPTO still may be missing the most relevant prior art during examination.

Just as with technical training, the USPTO is largely passive when it comes to the accumulation of prior art. Consistent with the suggestions above that the USPTO provide a more proactive approach to examiner technical training, the Associations recommend that the USPTO become more proactive when it comes to providing prior art to examiners. We are not aware of any organized efforts by the USPTO to proactively accumulate prior art in an emerging field. While various databases are made available to examiners, the USPTO should do more and dedicate resources specifically to identifying the best prior art for emerging technologies like AI, and train examiners on how to best access those resources.

In addition, as is the case with inventions for computer-related technologies, the best prior art is often found in non-patent literature, rather than in patent publications. The USPTO should explore how best to make sure the most relevant non-patent prior art is accessible to patent examiners.

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

No new forms of intellectual property protections are needed for AI inventions. The existing framework of IP protections through patent, copyright, and trade secrets provide coverage for innovations in AI without hindering continued innovation.

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

As discussed above, AI inventions present complex inventions for which most patent examiners have received little if any technical training. The USPTO should develop formal,

mandatory technical training programs that expand on the current PETTP. A specific AI curriculum should be developed to provide the needed technical training to all examiners who work on applications drawn to AI-related inventions. Similar approaches could be used for other emerging technologies, such as blockchain and virtual reality.

The Associations further note that the USPTO did not ask any questions about claim clarity in the AI space. We urge the USPTO to pay close attention to functional claims in the context of AI inventions. Too often, in cases involving computer-implemented functional claim limitations for emerging technologies such as AI, the scope of a patent claim does not become clear until the completion of lengthy and expensive litigation. This lack of clarity harms the public, raises litigation costs, and ultimately impedes innovation. When interpreting software-related patent claims, functional claim language can trigger 35 U.S.C. § 112(f) when the functional language (a) is not inherent in a general purpose computer³¹ and (b) has no “reasonably well understood meaning in the art” without “special programming”³². When the functional language triggers 35 U.S.C. § 112(f), the claim is indefinite unless the specification discloses an underlying algorithm for performing the function.³³ According to the MPEP, if the specification does disclose the underlying algorithm, examiners should consistently identify, on the record, the corresponding algorithm for claims being interpreted under 35 U.S.C. § 112(f).³⁴ Functional language can also trigger other downstream concerns, such as whether all the language in the claim is limiting, whether the full scope of the claim is described and enabled, and whether the claim should be limited by statements made during prosecution. The Associations urge the USPTO to focus its § 112 examination practice to better address each of those questions during prosecution, particularly in rapidly emerging areas like AI where inappropriately broad claim scope will only hinder future innovation.

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?

We urge the USPTO to work closely with its partners as it considers these issues. We support, for example, the announcement earlier this year that the heads of the IP5 have agreed to launch a New Emerging Technologies/Artificial Intelligence Task Force to explore these issues.³⁵ Working with other agencies is critical when many global patent offices appear to be considering AI issues in parallel, and some have already taken action. For example, the EPO has

³¹ *EON Corp. IP Holdings LLC v. AT&T Mobility LLC*, 785 F.3d 616 (Fed. Cir. 2015).

³² *Core Wireless Licensing S.A.R.L. v. Apple Inc.*, 2016 WL 3124614 (N.D. Cal. 2016) (“inserter” invoked 112(f) analysis); *Godo Kaisha IP Bridge 1 v. TCL Communication Technology Holdings Limited*, 2017 WL 1426045 (D. Del. 2017) (under appeal) (“pulse vector generator” invoked 112(f) analysis); *Skky, Inc. v. MindGeek, s.a.r.l.*, 859 F.3d 1014 (Fed. Cir. 2017) (“wireless device means” did not invoke 112(f) analysis); *Alarm.com Inc. v. ipDataTel, LLC*, 2018 WL 5113054 (S.D. Tex. 2018) (“means for receiving” and “means for storing” invoked 112(f) analysis “because the invention is premised on, and requires, special programming.”)

³³ *EON Corp. IP Holdings LLC v. AT&T Mobility LLC*, 785 F.3d 616 (Fed. Cir. 2015).

³⁴ USPTO. Manual of Patent Examining Procedure, Sec. 2181, Part VI (“the examiner should indicate that the claim was interpreted under the provisions of 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph in reasons for allowance if such an explanation has not previously been made of record[, and] the indication should also clarify the associated structure if not readily apparent in the specification.”)

³⁵ See Press Release, EPO, World’s Five Largest Patent Offices Agree on Joint Task Force for Emerging Technologies and AI (Jun. 13, 2019); <https://www.epo.org/news-issues/news/2019/20190613a.html>.

published a study it commissioned,³⁶ while Singapore has sped up its examination of AI-related patent filings dramatically.³⁷ The Associations recommend that the USPTO continue to collaborate with other major patent offices as it moves forward with its consideration of these issues.

In addition, the European Patent Office has a team-based approach to examining AI-related inventions, pairing examiners across art units if needed. That way, all examiners have access to someone with AI expertise, even if they have not been fully trained themselves. While we encourage the USPTO to provide robust technical training to all examiners handling AI-related inventions, the EPO's approach is an alternative that could be considered as well.

³⁶ See Shemtov, *supra* note 15.

³⁷ See Press Release, IPOS, Singapore Grants AI Patent to Alibaba in Record Time (Aug. 28, 2019) (announcing that the patent issued in three months rather than the typical two-four year period); <https://www.ipos.gov.sg/media-events/press-releases/ViewDetails/singapore-grants-ai-patent-to-alibaba-in-record-time-launches-new-initiative-to-grow-asean's-industry-4.0/>