

**AIPPI JAPAN's Comments in Response to
Federal Register Doc. 2019-18443:
"Request for Comments on Patenting Artificial Intelligence Inventions"**

'19/10/29

Definition and classification of "AI invention" used as a basis for our comments:

Considering the purpose of this Request for Comments, we will answer the questions with the understanding that the term "AI invention" (artificial intelligence invention) herein refers to an invention related to AI technologies that have been making a breakthrough in the past few years, mainly due to machine learning and deep learning.

Question 1 mentions two types of AI inventions: "inventions that utilize AI" and "inventions that are developed by AI." In our comments, however, to answer the questions as adequately as possible, we will use a classification¹ made by the Japan Patent Office. In accordance with the JPO's classification, the above-mentioned "inventions that utilize AI" are divided into "AI-core inventions" and "AI-applied inventions": the former is characterized by mathematical or statistical information-processing technologies that serve as a base for AI; and the latter is characterized by the application of AI in information-processing and control technologies. We will answer the questions in relation to each of the three types: "AI-core inventions," "AI-applied inventions" and "inventions that are developed by AI."

We need to be careful when answering the questions in relation to the "inventions that are developed by AI," which may include inventions with different degrees of contribution by a natural person. To be more specific, at the current level of machine-learning and deep-learning technologies, it is only possible to achieve "Weak AI", a tool used to replace part of human intelligence, not "Strong AI" that is truly able to perform reasoning and problem solving and to make a comprehensive judgment autonomously. Since it is unlikely that there is a situation where AI develops an invention by itself, it seems indispensable that a natural person be substantively involved in some way in the development of an invention. However, depending on the learning ability² of AI and on

¹ https://www.jpo.go.jp/e/system/patent/gaiyo/ai/document/ai_shutsugan_chosa/report.pdf

² The degree of contribution by a natural person needed may also differ greatly depending on the types of learning: "supervised learning" to infer a function that maps an input to an output based on a sample in which output values are already known; "unsupervised learning" to find previously unknown patterns in data set without pre-existing labels; and "reinforcement learning" to learn "how to take actions so as to maximize the value" through trial and error.

how AI is used in its development process, there may be a great difference in the degree of contribution by a natural person needed for the development³. Therefore, we will carefully consider the degree of contribution by a natural person when answering the questions.

Question 1

"1. 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."

The "elements of an AI invention" vary depending on the type of AI invention.

In the cases of "AI-core inventions" and "AI-applied inventions," AI serves as a base for the technical features (or at least, part thereof) of an invention. Therefore, various matters related to AI can be "elements of an AI invention." The elements of an AI invention can include all the items mentioned in the question ("the problem to be addressed (e.g., application of AI)... the policies/weights to be applied to the data that affects the outcome of the results").

In the case of "inventions that are developed by AI," AI is merely a tool used to develop an invention. Therefore, most of the matters related to AI cannot be "elements of an AI invention." Among the items mentioned in the question, only "the results of the AI invention through an automated process" can be an "element of an AI invention."

Question 2

"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

³ In the fields of information processing and control technologies, in particular, it is possible that when algorithms are output with the use of pre-trained AI, they can become the subject matter of an invention without being processed by a natural person.

weighting adaptations; structuring the data on which the algorithm runs; running the AI algorithm on the data and obtaining the results."

We think, for the three types of AI inventions, a natural person can contribute to conception of an AI invention and be eligible to be a named inventor.

There is need for contribution by a natural person: for "AI-core inventions," at the time of developing mathematical or statistical information-processing technologies that serve as a base for AI; for "AI-applied inventions," at the time of applying AI in information-processing and control technologies; and for "inventions that are developed by AI," at the time of using of AI in the development process.

In these cases, it is possible for a natural person to make some contribution to conception of an AI invention in different ways as mentioned in the question ("designing the algorithm and/ or weighting adaptations... running the AI algorithm on the data and obtaining the results").

For "AI-core inventions" and "AI-applied inventions," it seems indispensable that a natural person make a substantive contribution. In the case of "inventions that are developed by AI," however, there may be a great difference in the degree of contribution by a natural person needed for the development, depending on the learning ability of AI and on how AI is used in its development process, as described above. Therefore, when determining the eligibility of a named inventor for this type of invention, the degree of contribution by the natural person should be considered carefully.

Question 3

"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?"

"AI-core inventions" and "AI-applied inventions" are practically conceived by a natural person. For "inventions that are developed by AI," AI can be substantively involved in the conception of an invention. To take into account the possibility that an entity or entities other than a natural person can be eligible to be a named inventor, the current laws and

regulations regarding inventorship may be revised.

However, at the current level of machine-learning and deep-learning technologies, it is unlikely that there is a situation where AI develops an invention by itself, as described above. It seems indispensable that a natural person substantively intervene in some way in the development of an invention, which must be a creation as prescribed in the patent law. Therefore, for "inventions that are developed by AI," a natural person can be named as an inventor if the degree of contribution by that person to the development process is carefully considered. Consequently, it does not seem really necessary to revise the definition of "inventor" (35USC100) in such a way that an entity or entities (AI, etc.) other than a natural person may be eligible to be a named inventor. In the future, AI may become capable of developing an invention by itself or practically by itself. In that case, there will be need for further discussion about this issue, along with "new forms of intellectual property protections" (in Question 10).

Question 4

"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?"

Judging from the example given in the second sentence, this question seems to be mainly relevant to "inventions that are developed by AI." To be more specific, this question asks whether an entity or entities other than a natural person or company should be able to own a patent on an AI invention when the company trains AI to produce a desired output and uses that pre-trained AI to develop the said AI invention.

As described above, at the current level of machine-learning and deep-learning, existing AI cannot develop an invention autonomously. To use AI in the process for developing an invention, it is necessary to provide AI with a substantial amount of training. There may also be need for a substantial amount of processing and verification of outputs produced by that pre-trained AI. Therefore, if such training of AI and processing/verification of outputs done by a company are found to be indispensable for the creation of essential features of that invention, the company (to which an employee

assigns his/her AI invention) should be able to own a patent on the AI invention.

Question 5

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

"AI-core inventions" are characterized by mathematical or statistical information-processing technologies that serve as a base for AI. The subject matter of such an invention is mainly a machine-learning algorithm or training data and therefore, an issue to be considered in many cases may be related to the eligibility for patent. For certain "inventions that are developed by AI" whose subject matters are mainly outputs from AI (various kinds of algorithms and data), an issue to be considered may also be related to the eligibility for patent. Moreover, for some types of "AI-applied inventions" that are related to fundamental economic practices, certain methods of organizing human activities, or idea of itself, an issue to be considered in many cases may be related to the eligibility for patent. Therefore, in view of the need for protection to promote AI inventions and for mitigation of adverse effects such as exclusive possession of ideas and patent thickets, it may be necessary to properly redefine the scope of eligibility for patent.

However, these types of inventions can be treated as part of computer (software) - implemented inventions. It is possible to determine the eligibility based on the same requirements as in the case of computer-implemented inventions. Consequently, we do not think there are patent eligibility considerations unique to AI inventions.

According to Example 39 of the Patent Eligibility Guidance published by the USPTO on January 7, 2019, a claim is found eligible because it does not recite any of the judicial exceptions. One of the reasons for this decision is "the claim does not recite a mental process because the steps are not practically performed in the human mind." However, this reason could be interpreted as meaning that if the claims recite "training of neural network" and not any "mathematical concepts" or "methods of organizing human activity," any types of invention will be found eligible. Such a uniform way of analysis is not reasonable. We hope the eligibility of an invention will be determined properly based on what is described in the claims.

Question 6

"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?"

We do not think there are such considerations unique to "AI-core inventions" and "inventions that are developed by AI," because it is possible to determine the sufficiency of disclosure based on the existing criteria.

However, there may be considerations unique to "AI-applied inventions" that are characterized by the application of AI in information-processing and control technologies. Such an invention is considered to be complete if the functional elements (or at least, part thereof) of the information-processing and control technologies are implemented by AI. In many cases, it does not matter what type of AI is used to implement these functional elements or what are the run-time environment and conditions (e.g. the name of software used to realize AI, the names and specifications of the computer's CPU and memory, as well as its computation speed and capacity). When a multi-layer neural network is created within pre-trained AI, made up of the said elements, it is so complicated that it is almost impossible to describe it. Moreover, a third party can implement the same functional elements of an AI invention, in many cases, by the use of a different type of AI or different run-time environment and conditions. In that case, a multi-layer neural network created within pre-trained AI will probably be different from that of the applicant. In spite of this, if the compliance with the written description requirement is determined based on the same criteria as in the case of an invention in the field of chemistry, the applicants may have to shoulder a disproportionate burden of providing such unimportant information and the resulting scope of patent rights may be extremely limited. We hope that sufficient consideration will be given in order to avoid such excessively strict criteria for the determination of compliance with the written description requirement.

Question 7

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

As in our answer to Question 6 above, we do not think there are such considerations unique to "AI-core inventions" and "inventions that are developed by AI," because it is possible to determine the compliance with the enablement requirement based on the existing criteria.

However, there may be considerations unique to "AI-applied inventions" that are characterized by the application of AI in information-processing and control technologies. Such an invention is considered to be practicable if the functional elements (or at least, part thereof) of the information-processing and control technologies are implemented by AI. In many cases, it does not matter what type of AI is used to implement these functional elements or what are the run-time environment and conditions (e.g. the name of software used to realize AI, the names and specifications of the computer's CPU and memory, as well as its computation speed and capacity). When a multi-layer neural network is created within pre-trained AI, made up of the said elements, it is so complicated that it is almost impossible to describe it. In spite of this, if the compliance with the enablement requirement is determined based on the same criteria as in the case of an invention in the field of chemistry, the applicants may have to shoulder a disproportionate burden of providing such unimportant information and the resulting scope of patent rights may be extremely limited. We hope that sufficient consideration will be given in order to avoid such excessively strict criteria for the determination of compliance with the enablement requirement.

As mentioned in the question, AI systems vary in the composition, the learning ability, as well as the predictability in terms of outputs produced from training data. Therefore, it would be desirable to decide, to what extent the run-time environment, conditions etc. must be described in order to enable the claimed invention to be made and used, on a case-by-case basis, depending on AI's composition, learning ability, and training data to be used.

Question 8

"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?"

This question seems to be mainly relevant to "inventions that are developed by AI." It is expected that, due to advances in the future, AI technologies will significantly facilitate and automate various tasks to be done in the phases from the conception to the development of an invention (e.g. thorough search for prior art and means for solving the problem). We think this question is about whether to raise the level of ordinary skill in the art for determination of inventive step, by taking into account an increase in the degree of contribution by such AI technologies.

We do not think, however, the level of ordinary skill in the art should reflect the increase in the degree of contribution by AI technologies. In the first place, the facilitation of process for developing an invention has been brought about not only by advances in AI but also in all other fields of science and technology. These advances have been reflected in the determination of inventive step in the form of improvement of technology level. Consequently, the facilitation of process for developing an invention due to advances in AI technologies should be reflected in the determination of inventive step in the form of improvement of level of technology used by a person skilled in the art in the process for developing an invention.

Since, at the current level of machine-learning and deep-learning technologies, it is unlikely that AI can develop an invention by itself, as described above, it seems indispensable that a natural person be substantively intervened in the development of an invention. However, due to advances in AI technologies in the future, it may become possible to achieve "Strong AI" that is truly able to perform reasoning and problem solving and to make a comprehensive judgment autonomously. Then, AI may become capable of developing an invention by itself. In that case, there will be need for further discussion about the level of ordinary skill in the art to be referred to at the time of determining inventive step.

Question 9

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

This question also seems to be mainly relevant to "inventions that are developed by AI." It is expected that, due to advances in the future, AI technologies will significantly facilitate and automate the tasks of thoroughly searching for prior art and of finding means for solving the problem (e.g. adoption of technical means from a totally different field). We think this question is about whether, in such a situation, there are considerations in relation to the interpretation of prior art to be referred to at the time of determining novelty and inventive step of AI inventions.

However, such facilitation and automation of the tasks have been brought about not only by advances in AI but also in all other fields of science and technology. Although AI technologies are extremely versatile, compared to other technologies, we do not think that considerations should be made only to AI inventions, in relation to the interpretation of prior art to be referred to at the time of determining novelty and inventive step.

However (as in our question to the preceding question), due to advances in AI technologies in the future, it may become possible to achieve "Strong AI" that is truly able to perform reasoning and problem solving and to make a comprehensive judgment autonomously. Then, AI may become capable of developing an invention by itself. In that case, there will be need for further discussion about the interpretation of prior art to be referred to at the time of determining novelty and inventive step.

Question 10

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

We think there are many types of inventions that cannot be adequately protected by the existing forms of IP protection (patent, copyright, etc.) in the United States, e.g.: pre-trained AI algorithms and their parameters, data optimized for a particular type of machine learning, training data set, and outputs produced by AI algorithms as deliverables. Moreover, when AI becomes capable of developing inventions by itself, due to advances in AI technologies in the future, the existing forms of IP protection will not be able to provide adequate protection to these AI inventions. We see the need for discussion on improvement of IP protections in various aspects, including the creation of

a form of protection not yet available in the US (such as data protection), and the expansion of the existing systems for trade secret protection (Uniform Trade Secrets Act, Defend Trade Secrets Act, etc.).

Question 11

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

No.

Question 12

"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?"

The EPO and the JPO make available their guidelines that include many specific examples for use as criteria in examination of AI inventions. We hope USPTO will also provide criteria in the guidelines with many specific examples.

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