The AIPLA/AIPPI/FICPI AI Colloquium Primer[1]

By Contributors[2]

I. Introduction[3]

While the concept of "Artificial Intelligence"[4] ("AI") has been with us since at least the 1950's, the accelerating real-world application of "thinking" machines is currently impacting aspects of intellectual property in new and fundamental ways. A defining feature of an AI entity is "the ability to reason, discover meaning, generalize, or learn from past experience."[5] Technological advances in data capacity and processing have paved the way for machine-learning[6] to use deep-learning[7] and big-data[8] techniques in today's businesses.[9] Although there has been much speculation of AI taking over the world; AI with learning capabilities sufficient to support such megalomaniacal behavior are not currently feasible and appear to be concerns for "down the road."[10] However, while human intervention may still be necessary to fully use today's AI, it does not take away from the real issues surrounding use of AI in Intellectual Property ("IP") issues. Almost all forms of IP (copyright, trademark, patent, trade secret) may have ownership issues when it comes to AI being involved with the creation of any apparel, manufactured item, a process,[11,12,13] a formulation,[14] a drug,[15] or any form of media.

This document addresses IP issues surrounding AI, distinguishing between issues related to Inventive AI and issues related to AI Inventions. Inventive AI refers to inventions that are derived, discovered, or otherwise arrived at primarily by the efforts of AI. Conversely, AI inventions are those innovations that incorporate the use of machine learning, big data analysis, and or deep data analysis to achieve a result. This document will use these terms to distinguish between IP issues arising from innovations made by AI as opposed to IP issues arising from attempts to procure rights for innovations that implement AI. For the purposes of clarity, the first two chapters of this document address the impact of AI on IP Offices and IP legal practice, and each subsequent chapter addresses issues related to a particular type of IP asset (*i.e.* patents, trademarks, trade secrets, or copyrights). The sections within each chapter are directed to specific international jurisdictions, and the IP issues surrounding AI and IP within those jurisdictions.

II. AI Impact of IP Offices

AI has important implications for the operations of all IP offices around the world. Primary uses of AI may include assisting in such things as translations, user trademark database searches, patentability examination searches, automatic patent classification, and many other uses. The World Intellectual Property Organization ("WIPO") has a list of AI initiatives supported by various IP offices throughout the world.[16] In September of this year, the United States Patent and Trademark Office ("USPTO") issued a request for information[17] to assess the industry's ability to assist with USPTO patent searches through the use of AI.[18] The WIPO and USPTO publications may be useful in obtaining additional information about IP Office initiatives.

III. AI Impact on the IP Profession around the World[19]

To evaluate the significance of AI to the day-to-day practice of IP law, it is helpful to look at the types of tasks done by attorneys, patent agents, paralegals, and support staff. At a high level, these tasks can be categorized into (1) those requiring judgement and creativity and (2) those which are mechanical, repeatable, and/or data intensive. AI innovations are being used more and more to take the burden of tasks in the second category off the shoulders of practitioners. The result is more time and better information to support tasks requiring human-level intelligence in the first category.

The applications of AI in IP practices can be grouped into three categories: document automation, process automation, and AI-enabled insights. Document automation entails the computer generation of documents based on learned behaviors. More than simple merges and form-filling, AI-based document automation can look at language in context, conformance with style, proper numbering, antecedence, and other written characteristics to create or fix the text. Examples of document automation in IP include automated patent or trademark application drafting[20], patent application-specific proofreaders[21], and auto-generating drawing figures.[22] Process automation leverages input data to perform what would be manually tedious processing of that data—generally non-writing tasks. This includes leveraging patent or trademark data for search purposes. The results are data sets and summaries for use by the practitioner. Examples of process automation include docketing,[23] generating office action shells,[24] automating filing documents,[25] performing patentability searches,[26] creating and managing information disclosure statements ("IDSs"),[27] and client reporting.[28] AI-enabled insights bring the technology a step closer to influencing judgement and creativity tasks by culling large datasets to provide insights, predictions, or suggestions for a practitioner to evaluate to make better informed decisions. Examples of AI-enabled insights include USPTO art unit prediction,[29] accessing subject matter eligibility,[30] predicting whether the next action will be an allowance or a rejection,[31] guiding prosecution strategy based on, for example, United States Patent and Trademark Office Patent Trial and Appeal Board results,[32] predicting behavior of examiners and art units in prosecution,[33] and of judges in patent litigation,[34] freedom-to-operation analysis,[35] patent landscaping,[36] and informing maintenance decisions.[37]

In the legal space, patents are somewhat unique due to the amount of publicly available information, spanning millions of published patent applications and grants, to terabytes of prosecution and litigation documents and data. As such, there are many opportunities for the development of AI technologies that rely on rich data for training and analysis. This is evidenced by the explosion in commercially available AI tools in the IP space over the past

few years,[38] which is in turn a reflection of increasing legal-technology investment and market interest.[39] As these new technologies mature, we may expect to see a shift in our profession akin to those experienced by architects[40] and accountants[41] with the advent of computer-aided drafting and electronic spreadsheets, respectively—a net positive for the industry with higher quality, higher efficiency, better access to services, and growth in the workforce.

IV. AI Impact on the practice of Patent Law

A sample of the patent-related issues that consistently appear across jurisdictions and societies represented herein are listed below. Some of these have cross-over to the various other IP areas. The sections of this chapter attempt to provide greater detail and discussion of many of these issues.

Inventorship

In most jurisdictions, an "inventor" is defined as either an individual, human or person (CN, JP, KR, US), or undefined entirely (EP). Might this be a case where for the good of all, a common definition is laid down for an inventor; such that an AI entity can be considered a co-inventor ("AI Invention")? Then the next step might be to figure out what happens if the AI is the sole inventor ("Inventive AI"). Does this mean that an invention involving an AI entity in the inventive process cannot be patented?

Patent eligibility

While many IP5 Offices[42] will indicate a willingness to allow AI Inventions, it is well known that AI capabilities rely primarily on software, processes and algorithms using machine learning and/or deep data. These are precisely the types of areas that IP5 Offices have the most difficult time in allowing. What special capabilities are needed in various regions of the world to overcome this hurdle and allow the Offices to issue patents for AI Inventions. Are specialty databases arranged in specific ways in combination with hardware needed to obtain allowance of AI inventions?

Adequacy of disclosure

Challenges existing in the area of disclosure adequacy are wide and deep, covering at least two major topics—claim scope and transparency. While disclosure would generally cover what was known at the time of training, a broader scope of claim may be needed to encompass *what the AI enabled invention does*. In fact, understanding exactly how the AI enabled invention gets to the end-result is problematic (e.g., this is analogous to a teacher admonishing a student for having the right answer without detailing how they got it). Additional problems may arise from the use of privacy restricted data pools in model training or deployment. Is the practitioner allowed to disclose details about the privacy restricted data pool? If not (such as in the EPO), how may a practitioner disclose the precise nature of machine learning models?

Assessment of inventive step

Many of the problems addressed this section relate to what an Ordinary Person Skilled in the Art ("OPSIA") really is for both AI Inventions and Inventive AI. Is there a different standard for review of patent applications directed to inventions by "persons," AI Inventions, and for Inventive AI? If patent applications for innovations by Inventive AI are allowable, then

is an OPSITA an AI entity? Further, the scope of the prior art available to the Examiner for examination purposes is based upon whom create it. If an AI entity creates lots and lots of patent applications, in what circumstances may the patent applications permissible for use as prior art?

These issues are addressed for each of China, Europe, Japan, Korea, and the United States in the below sections.

A. United States of America (US)

1. Inventorship[43]

As current technological advances occur in the use of AI and entities employing AI, not only are there potential issues with inventors determining how much protection will be given to the novel concepts being pursued by the inventors (AI Inventions), there is also the flip side of working out what protection is afforded to the AI entity "discovering" the novel concept (Inventive AI).[44] There are those that would consider the AI entities as inventors, some discuss public domain[45] as a potential alternative, while others suggest abolishing inventorship rights for any AI entity invention altogether.

The U.S. requires that the inventors or joint-inventors be named when a patent application is filed.[46] The case law in the U.S. states that to be an inventor there must be a "contribution to the conception" of the invention.[47] Similarly, 35 U.S.C. § 100(f) defines an "inventor" as "the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention." Therefore, there is a presumption under U.S. law that the inventors are human.[48]

Thus, the USPTO, at least, considers inventors to be people. This may seem at first glance, to be stating the obvious because inventorship requires contribution to the conception of the invention, which requires high cognitive reasoning. As the Court of Appeals for the Federal Circuit stated in *New Idea Farm Equipment Corp. v. Sperry Corp. and New Holland Inc.*, "people conceive, not companies[.]"[49]

However, the more advanced AI becomes, the more a non-human AI has the ability for cognitive reasoning, which has implications for patents and patent rights. One possible conclusion would be that whoever designs the input parameters, i.e. determines the data with which the AI will create, would be the inventor(s). However, there is a continuum in the involvement the program designer has in relationship to the final invention. For example, if there are only a few design parameters, then the designer may be relatively close to the invention that comes out the other side. However, if the AI is analyzing and modeling millions of variables, e.g. as it is typically done with AI developed drug compounds, the relationship between the program designer and a single possible drug candidate compound that is designed by the AI becomes very tenuous. As noted above, in the U.S., inventorship requires a contribution to the conception of the invention. The scientist or engineer who programs the AI to consider millions of variables to develop new compounds may be an inventor on the software used to program the AI; however, there is a significant question as to whether that person contributed to the conception of the invention, i.e. the new compound itself.

If the AI is determined to be the sole contributor to the conception of the invention and there are no human inventors, arguably the new compound cannot be patented in the U.S. The

USPTO Manual of Patent Examining Procedure ("MPEP")[50] and relevant patent rules refer to inventors as a "person." However, the underlying statutes are not as clear. As indicted above, 35 U.S.C. § 100 defines inventors as "individuals" and while 35 U.S.C. § 116 pertains to "inventors", this section of the statute discusses errors in inventorship, omitted inventors, etc., without explicitly precluding a non-human from being an inventor. The language of the statutes was, no doubt, drafted under the assumption that inventors are humans, as the possibility of an AI inventor did not exist at the time of drafting. However, to resolve this issue the U.S. will need to resolve conclusively the issues as to whether "inventors" must be human.

Finally, it is noted that the recently issued guidance of the USPTO on Subject Matter Eligibility under 35 U.S.C. § 101 and Computer-Implemented Functional Claim Limitations under 35 U.S.C. § 112 will not have any impact on the above-discussed considerations of inventorship. [51]

2. Patent eligibility[52]

The U.S. affords patent protection to "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof."[53,54]

On the subject of AI Inventions, patent eligibility is a significant hurdle to many software-based inventions. Since most AI Inventions to date are directed to software, there is limited guidance in the U.S. distinguishing the patent eligibility analysis for AI Inventions from software inventions more generally.[55] As a general principle, AI Inventions that simulate, supplement, or replace human thought will be subject to heightened scrutiny.[56] But where claims are focused on a specific means or method that improves the relevant computer technology,[57] courts have held that some "[p]rocesses that automate tasks that humans are capable of performing are patent-eligible."[58] Support for patent-eligibility of an AI Invention may be further bolstered by the fact that AI Inventions are not a naturally occurring phenomenon.[59] Recently, the USPTO released guidance further suggesting that claims directed to a "practical application" of otherwise patent-ineligible subject matter may be eligible for patent protection.[60] Nevertheless, affording patent protection to AI Inventions broadly capable of the ability to reason, discover meaning, generalize, or learn from past experience will likely "compound the public policy dilemmas already troubling the legal protection of computer programs."[61]

While the statute does not necessarily bar ownership of patents to Inventive AI entities,[62,63] U.S. courts have principally interpreted the contours of patent eligible subject matter with human inventors in mind—i.e., "anything under the sun made by man"[64]—and have excluded from patent protection claims directed to laws of nature, natural phenomena, and abstract ideas.[65] In 2014, the Supreme Court articulated a two-step framework for ascertaining patent eligibility: (1) "determine whether the claims at issue are directed to one of those patent-ineligible concepts;" and if so, (2) determine whether the elements of the claim, considered individually and as an ordered combination, "transform the nature of the claim into a patent-eligible application."[66,67] This flexible two-step framework, however, may be problematic when addressing the inventions of AI entities. For example, software-based inventions directed to "human" thought processes[68] are particularly vulnerable[69] under step one of this framework. Courts have not yet addressed whether or how an AI process that emulates or replaces human thought should be factored into this "mental steps" analysis. Indeed, because of the differences between human and machine "thought" processes,[70] some have advocated

that such a mental steps analysis should be wholly inapplicable in evaluating any AI-based innovation.[71] Likewise, under step two of the framework, claims that only recite "well understood, routine, conventional activity already engaged in by the scientific community" will be found patent-ineligible.[72] The question remains as to what happens when the relevant community consists of other Inventive AI entities.

3. Adequacy of disclosure[73]

The Court of Appeals for the Federal Circuit has consistently found that 35 U.S.C. § 112(a)[74] requires that the specification provides a written description of: 1) the invention; 2) the manner and process of making and using the invention; and 3) the best mode for carrying out the invention[75], noting that "a separate requirement to describe one's invention is basic to patent law. Every patent must describe an invention…"[76,77] These requirements are reiterated in the recently released guidance from the USPTO, which maintains the need for specification to disclose the algorithm for performing the claimed specific computer function in computer implemented inventions such as AI inventions.[78]

Thus, the adequacy of a patent's specification in the U.S. (regardless of whether the invention is directed to AI) hinges on whether the specification provides sufficient written description to clearly allow persons of ordinary skill in the art to understand that the inventor had possession of the claimed subject matter at the time of filing.[79] As noted in the recently released guidance from the USPTO "the specification must describe the claimed invention in sufficient detail such that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention at the time of filing."[80] The guidance goes on to state that "the specification must provide a sufficient description of an invention, not an indication of a result that one might achieve."[81] To evaluate the adequacy of a patent's specification for an AI-technology therefore requires consideration of the technologies being claimed, and must be adequate to enable one of ordinary skill in AI technology to prepare the claimed AI invention.[82]

The USPTO has defined AI to be any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.[83,84] Colloquially, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving."[85] Broadly, patents directed to AI may be categorized as inventions directed to: 1) an AI algorithm or AI program itself; and 2) an AI application to another technology. To satisfy the requirements of 35 U.S.C. § 112(a), the patent specification directed to the AI algorithm or AI program itself should provide a skilled AI programmer[86] the information necessary to prepare such an AI algorithm/program.[87] Similarly, the patent specification directed to an application of AI to another technology should provide a skilled AI programmer, as well as one of ordinary skill in the art of the applied technology, the information needed to make and use the invention.[88] Further, as AI inventions will necessarily be computer-implemented inventions, the specifications must disclose both the hardware and software to enable any computer-implemented functional claims to be achieved.[89,90]

Additionally, adequacy of disclosure for either an AI algorithm/program type invention or an application of AI to another technology type invention hinges on the scope of the claims under U.S. patent law. To meet the written description requirements, a patent specification must teach how to use the AI invention as broadly as it is claimed.[91] Though a fact based issue, more than one species may be required to be disclosed to adequately support claims to a

genus.[92] Unless an invention is a new form of AI, the invention recited in the claims is likely to be directed to the application of AI to a problem[93] by training a machine learning algorithm with a particular data set in order to solve that problem. Regarding AI patents, the disclosure of species examples supporting genus type claims issue may most often apply in deep machine learning type inventions. Deep machine learning is a subset of machine learning in AI that has networks capable of learning unsupervised from data that is unstructured or unlabeled.[94] Claiming a deep machine learning algorithm's application to any type of data may require disclosing enough species of data set types to which the algorithm is applied to thereby enable the genus of all data set types.

Thus, to satisfy § 112(a), the data set used for training the learning algorithm (be it an inference machine, binary logic tree, or neural network) will need to be disclosed in the application to enable others to use the same or similar data sets to practice the claims. On the one hand, given the central nature of the training dataset, if only one data set is disclosed, the claims will necessarily be limited to that dataset.[95] If the applicant seeks to broaden the claim scope, more than one data set will need to be disclosed. However, a data set that is merely more of the same type of data will not suffice in supporting broader claims under § 112(a). On the other hand, a clearly different data set will train the learning algorithm to do a different thing. Thus, unless there is a way to show that two different data sets can be used to train the AI system to do the same thing (i.e., the claims of the invention), the disclosure requirements under 35 U.S.C. § 112(a) are likely to limit the scope of the claims to the specific disclosed training data sets and their respective disclosed training outcomes. In order to obtain claim scope that encompasses additional training outcomes, the specification will likely need to further disclose the training data sets used to obtain the desired training outcomes. Accordingly, should the goal of an AI application be to support the broadest AI invention claims possible, the adequacy of the disclosure will likely require disclosure of many examples of application of the AI invention.

4. Assessment of inventive step[96]

In this section, we will look at the inventive step aspect from two broad perspectives. One perspective is where AI technology provides the inventive aspect of the invention, herein called "AI invention." The other perspective is where the AI technology is the "inventor," herein called "Inventive AI." For this particular section of the document, it will be presumed that Inventive AI is considered to be valid for all other purposes of patentability in the US.

In United States patent law, inventive step is generally equivalent to the nonobviousness standard[97] and 35 U.S.C. § 103[98] defines the statutory terms. The U.S. Supreme Court in *Graham v. John Deere*[99] articulated a general framework for evaluating obviousness as a question of law based on the following underlying factual inquiries: (1) the scope and content of the prior art; (2) the level of ordinary skill in the prior art; and (3) the differences between the claimed invention and the prior art[100], often referred to as the Graham factors.[101] The USPTO, in the Manual of Patent Examining Procedure, provides additional guidance regarding nonobviousness under the statutory law and judicial decisions.[102] Patentability of AI inventions including patents based on AI inventive contributions has been long established in the US.[103] The USPTO has an entire classification section dedicated to AI.[104] As a general proposition, there is no particular obviousness bar or special requirements for AI inventions in terms of nonobviousness.[105]

Regarding a potential Inventive AI and its impact on nonobviousness, 35 U.S.C. § 103[106] reads in part that patentability "shall not be negated by the manner in which the invention was made." A broad reading of this statute would support that an Inventive AI would not present any bar as presumably the "manner" can include being invented by AI. However, other parts of § 103 may prove to be more problematic in the context of Inventive AIs, for example, "a person having ordinary skill in the art." As noted above, this section presumes that the Inventive AI is valid, so the question of "person" is not addressed. However, whether the Inventive AI could have the same standard of (1) the scope and content of the prior art and (2) the level of ordinary skill in the prior art, as part of the Graham factors[107] must be considered. Current law generally limits the scope of the relevant art to analogous prior art and inventors can rely on this to argue against combinations that are alleged to be obvious.[108] However, with an Inventive AI, "the scope and content of art" may be expanded to go beyond analogous art, given that the Inventive AI would most likely be presumed to be capable of knowing and processing virtually all of the prior art, at least all that is online or otherwise accessible.[109] Likewise, the "level of ordinary skill in the prior art" may be different for Inventive AIs relative to human inventors, or may evolve so that the standard is the Inventive AI.[110] Finally, it is possible that the Inventive AI may be presumptive evidence of obviousness itself, assuming that similar AI machines would arrive at the same invention[111] or render all inventions obvious as AI becomes more complex and powerful.[112] At the present time, in the U.S., there are no specific judicial decisions or statutory laws to address these potential problem areas in the nonobviousness standard for Inventive AIs, but these will become issues if Inventive AIs become recognized as inventors in the future.

B. China (CN)[113]

1. Inventorship

The three following candidates might be understood as contributing to an AI invention: (1) the AI machine or system (i.e., not a natural person, may be an Inventive AI or part of an AI invention); (2) the developer of the AI; and (3) the user of AI (e.g., the operator of the system, etc.).

In this regard, under Rule 13 of Chinese Patent Law Implementing Regulations, an "inventor" or "designer" means "any person who has made creative contributions to the substantive features of an invention-creation."[114] Further, the Examination Guidelines[115] explain that the "inventor" shall be an individual, and an organization or company is not qualified to be "inventor." Therefore, the distinction between an AI Invention and an Inventive AI is moot since a "person" means a human. Thus, only a human can be an inventor and an invention wholly created by AI cannot be patented since it would not qualify as an "inventor" under the Chinese Patent Law Implementing Regulations and Examination Guidelines. In other words, Inventive AI would not be recognized as an inventor, and only the developer or the user of AI can be recognized as an inventor under current Chinese law. The contribution of the developer or the user may be small compared to the AI system, but by definition, only the developer or user can "invent" something not obvious to a person skilled in the art.

Scholars have argued that a new definition of "inventor" is necessary given the rapid development of AI technology. For example, issues such as whether a machine can be listed as an inventor and the rights of Inventive AI as a potential inventor need further clarification.[116]

2. Patent Eligibility

AI inventions fall in the scope of computer program related inventions. The China National Intellectual Property Administration ("CNIPA") is widely understood to be in the progress of drafting a new Examination Guidelines regarding Computer-Implemented Inventions ("CII"), and will specifically address AI inventions. However, because the new Guidelines have yet to be published, the following discussion will rely on the current Examination Guidelines of 2010 (as revised in 2017)[117] and practice.

According to the Examination Guidelines, computer programs *per se*, pure algorithms or mathematical rules are excluded from patentability.[118] But a solution capable of being implemented by using a computer program *is patentable* if the solution solves a technical problem, employs technical means, and achieves a technical effect. Usually, when an AI invention is used in a certain scenario and satisfies "technical" requirements, it is patentable as long as it is within the context of an AI invention and not an Inventive AI.

In this regard, a legal definition of the term "technical" is not included in the Examination Guidelines.[119] Therefore, we can gain insight from day-to-day practice. In practice, taking technical effect as an example, an effect that can be measured physically and with certainty is usually regarded as "technical," while an effect that might be changed case by case is usually not regarded as "technical." For example, where the effect is concerned with user experience, the psychological feeling a user experiences is not regarded as "technical" because the feeling might be different depending on different users. However, an effect that can be measured such as looking, hearing, smelling, or tasting is usually regarded as "technical" because the feeling is measurable and with certainty.

3. Adequacy of disclosure

Under Article 26.3 of the Chinese Patent Law, an invention patent or utility model application must have a description that is sufficiently clear and complete to enable a person skilled in the art to understand and carry out the invention. Because Inventive AI is not recognized as a person, patent application drafters of AI inventions should be sure the description is sufficiently clear and complete for a human to understand.

More specifically, the Chinese Patent Examination Guidelines ("Guidelines") explains Article 26.3 as requiring clarity, completeness, and enablement. While the Guidelines do not provide instructions for AI specifically, they do provide instructions for computer-implemented inventions[120] which would include AI. Regarding drafting of the description, the Guidelines state that drawings must include a principal flow chart of computer programs.[121] The description must include an explanation of every step of the computer program in chronological order, in natural language, and based on the principal flow chart. A person (not an AI) skilled in the art should be able to produce the computer program based on the flow chart and related description. Note that source code is not required in the description but can be included if helpful. If an invention patent application includes modified hardware, a hardware diagram and description should be included.

A relevant case between Apple and Shanghai Zhizhen regarding a chatting Robot patent[122] (related to the Siri function) is currently ongoing and will be informative to patent drafters as to how a description of an AI algorithm needs to be formulated. This case is regarded as the first AI invention infringement and invalidation case in China (litigation was raised in

2012). The Beijing High People's court ruled that the patent does not sufficiently disclose the mechanism of chatting robot so that persons in the art cannot obtain the technical effect of how user interacts with the chatting robot to play games (which is regarded as the distinguishing feature of the invention over the prior art). In particular, the description does not clearly describe how to analyze the input format sentence and/or natural language and then send the content related to game to the game server. The case is now being reviewed in the Supreme Court. Two of the key issues to be addressed in the case are: (1) who is the skilled person in the art for the patent; and (2) to what extent details of an AI invention must be described. The Supreme Court's forthcoming decision will help patent drafters understand "a skilled person in the art" for AI inventions and how the description of the AI algorithm needs to be formulated for clarity.

4. Assessment of inventive step

Since there can be no Inventive AI under current Chinese Patent Law and Implementing Regulations, there is no specific statutory, administrative, or judicial guidance on how inventive step might be analyzed in the case of an invention wholly created by an AI.

If it is presumed that an AI invention meets all other patentability requirements (e.g., inventorship, subject matter, and disclosure requirements), then there are no special inventiveness issues. Such AI inventions are analyzed under the standard problem and solution approach using a three-step analysis of: (1) determining the closest prior art; (2) determining the distinguishing features of the invention and the technical problem actually solved by the invention; and (3) determining whether or not the claimed invention is obvious to a person (human) skilled in the art.[123] Therefore, if these three factors are satisfied for the AI Invention, with the presumptions stated, then Inventive Step would be met.

C. Europe (EP)[124]

1. Inventorship

Art. 60(1) of the European Patent Convention (EPC) states that the inventor or his successor in title is entitled to the right to a European patent. The EPC does not define the term 'inventor'. Under Art. 81, R. 19 (1) EPC, a European patent application must designate the inventor(s) and a formal statement indicating the applicant's right to the grant of a patent must be filed. Failure to do so within the required period results in the refusal of the application. Unsurprisingly, there is no European Patent Office (EPO) case law relating to the naming of anyone other than a natural person as an inventor so the question of whether a legal person[125] or an Inventive AI (which is neither a natural person nor a legal person, but possibly could be considered as a class of electronic person[126] under recent European Union (EU) draft proposals) can be named has not arisen.

The EPO assumes the applicant named in the Request for Grant when the application is filed is procedurally entitled to the grant of a European patent (Art. 60(3) EPC). This procedural right is to be distinguished from a substantive right to the grant of a patent, which is a matter of national law of the relevant contracting state. Furthermore, the EPO assumes that the correct inventors have been named and does not verify the accuracy of the designation of inventor (R.19 (2) EPC).[127]

The EPO has no power to determine questions of, or indeed disputes over, inventorship and entitlement in terms of substantive law (see item 3 of Reasons for the decision in G3/92).[128] Instead, according to Art. 1 (1) of the Protocol of Recognition,[129] which is incorporated under Art. 164(1) EPC within the EPC, the courts of contracting states have exclusive jurisdiction to decide entitlement claims. Implementation of any such decision from a national court is governed by Art. 61 EPC.

2. Patent eligibility

The EPO highlights its consistent approach to computer implemented inventions (CII), although with that it deviates from the normal examination practice of inventions. The Index for Computer-Implemented Inventions[130] provides a collection of sections of the Guidelines for Examination[131] particularly for CII inventions where one or more features are realized by means of a computer or computer program.

Generally, computer programs[132] are excluded from patentability at the EPO, but the exclusion does not apply to computer programs having a technical character and producing a further technical effect. However, a legal definition of the term "technical" is still missing and leaves some room for interpretation. Also, on the list of exclusions[133] are AI and machine learning, which include, e.g. neural networks, genetic algorithms, support vector machines, k-means, kernel regression, and discriminant analysis.

Guidelines[134] on the patentability of AI and machine learning technologies came into force in November 2018. Computational models and algorithms are generally considered to be of a mathematical nature. However, a mathematical method[135] may contribute to the technical character of an invention, i.e. contribute to producing a technical effect that serves a technical purpose, by: i) its application to a field of technology, and/or ii) being adapted to a specific technical implementation.

If an AI algorithm fulfills these and other criteria, and depending on how it is claimed, it will be patentable. If an invention results from the application of AI technology to a new situation or to new data to produce a new result the same criteria will apply. The challenge will be to claim this appropriately.

3. Adequacy of disclosure

Article 83[136] of the EPC requires that a European patent application shall disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The Guidelines for Examination does not discuss AI inventions specifically in view of sufficiency of disclosure, however, GL F-III 1. paragraph 4[137] mentions that for the requirements of Art. 83 and of Rule 42(1)(c) and Rule 42(1)(e)[138] to be fully satisfied, it is necessary that the invention is described not only in terms of its structure but also in terms of its function, unless the functions of the various parts are immediately apparent. Indeed, in some technical fields (e.g. computers), a clear description of function may be much more appropriate than an over-detailed description of structure. Since AI inventions are implemented as software it can be assumed that minimum requirements for sufficiency of disclosure are at the same level as for computer programs in general.

Additional problems may arise if an invention relying on AI technology is claimed but it is not explained in detail how the AI technology is brought to a working implementation.

This often involves specific training or other adjustments. For example, if an AI technology is implemented in the form of a neural network, it may be necessary to describe in detail the network topology and how the weights are set. This was indeed the case in T 0521/95,[139] wherein the board concluded that the application did not give specific information required to set up the network. However, in that case the network topology was considered to be new and based on recent physiological research, and to not be known to a person skilled in the art.

Even if the requirements of Article 83 EPC seem to be easy to fulfill, the sufficiency of disclosure may be important when determining patent eligibility and inventive step. As mentioned above, a mathematical method may contribute to the technical character of an invention, i.e. contribute to producing a technical effect that serves a technical purpose. Thus, it is recommended to describe the way a mathematical method, or an AI algorithm, contributes to the technical character of the invention. The same disclosure may be relevant to the assessment of inventive step as explained below.

4. Assessment of inventive step

Whether or not a patent can be obtained for a CII, including AI inventions is generally determined by a "two-hurdle" approach where the inventive step assessment falls within the second hurdle. In order to overcome the first hurdle (Article 52(2) and (3) EPC[140]) the claimed subject-matter must have a technical character, but the claims may contain a mix of technical and non-technical features.

In a further step, to overcome the second hurdle, novelty (Article 54 EPC[141]) and inventive step (Article 56 EPC[142]) are examined. All features contributing to the technical character are taken into account for the assessment of inventive step. It is checked whether the steps, e.g. of a mathematical method, contribute to the technical character of the invention. There are two dimensions to contribute to the technical character. Technical character can be attested if the invention is adapted to a specific technical implementation, but also if its application is to a field of technology.

Dimension 1: A claim directed to a specific technical implementation may comprise an AI algorithm specifically adapted for an implementation or an AI technology motivated by technical considerations of the internal functioning of the computer. Generally not sufficient are a generic technical implementation, a mere programming, or an algorithm merely more efficient than in the prior art.

Dimension 2: A technical application is given if the AI algorithm serves a technical purpose. This can be if it solves a technical problem in a technical field, is specific (not generic), or the claims are functionally limited to a technical purpose. As AI technology fields are considered, e.g. image or speech processing, fault detection with predictive maintenance, medical analysis, or self-driving cars.

The problem and solution approach for claims comprising technical and non-technical features is regularly applied to determine inventive step for CII and AI inventions (Guidelines for examination G-VII, 5.4[143]). In practice the inventive step condition is often used to reject non-technical inventions.

D. Japan (JP)[144]

1. Inventorship

In order to be 'an inventor', an inventive entity must be a natural person. Thus, AI itself cannot be an inventor regardless of the AI's contribution during the invention process. A problem may occur when a person (Person A) uses AI to complete an invention. Is Person A an inventor of the invention when he/she used AI to complete the invention?

The AI inventorship situation is similar to 'joint invention' in which two natural humans collaborated to create a single invention. Based on a Tokyo District Court decision[145] if a person conceived of the means for solving the problem, he/she is highly likely to be considered to be an inventor.

Based on the ruling of the Court, if a person only presented the problem, he/she may be considered to be an inventor if the problem itself is a feature of the invention. On the other hand, if a person only took general or comprehensive administrative actions, he/she is not considered to be an inventor.

Taking this ruling into consideration, it may be assumed that inventorship of the above example case shall be determined based on how much contribution Person A made to the invention. In particular, Person A may be considered as an inventor if the he/she presented a problem that relates to a feature of the invention to AI so that AI can solve the problem. Person A may thus be the only inventor of the invention. Conversely, Person A may not be considered an inventor if the problem presented by Person A is merely a general or vague problem or the problem is irrelevant to the feature of the completed invention.

2. Patent eligibility

Inventions Related to AI technology

Computer software inventions are patentable in Japan even if they are business related. If AI-inventions can be claimed as computer-implemented methods, computer systems or data structures without reciting any human or operator intervention, the inventions may be patentable if they satisfy the usual patentability requirements such as novelty, inventive step, enablement, support and clarity. During substantive examination by the Japan Patent Office (JPO), these requirements are evaluated for AI inventions under the same standards as in other fields such as electronics or information technologies.

The JPO recently published an update on "business-related inventions" which, according to the JPO, relate to business methods using information and communication technologies.[146] Even if an inventor has a remarkable idea relating to sales or production management, such an idea alone is not patent eligible in Japan. However, if the idea is practiced using computers or other hardware resources and is claimed as such, it may be patentable. According to the JPO, the allowance rate of such business-related inventions currently stands at about 70%.

Inventions Created by the Application of AI Technology

The patentability of AI-created inventions has been discussed in different government committees, but no conclusions have emerged. The current Patent Act is entirely premised on

the assumption that a patentable invention is created by a natural person.[147] Thus, the patentability of AI-created inventions is still an open question in Japan.

Thus, AI technology can be the subject of patent applications as an invention requiring the computer software or system, or an invention of data structure. During examination of a patent application, JPO examiners determine the eligibility of an invention directed to AI technology in accordance with the JPO's Examination Guidelines.[148] This examination is identical to the determination of eligibility for other computer software or data structure inventions, *etc*. The result of the examination is a determination as to whether the invention amounts to "a creation of the technical idea utilizing a law of nature as a whole". The JPO has recently added additional examples for AI inventions to its Examination Handbook.

3. Adequacy of disclosure

The JPO does not have any special requirements on disclosure in AI patent applications. Patent applications directed to AI technologies must fulfill the normal requirements for claim support and enablement.

In general, the claimed invention must be sufficiently supported by the specification. Additionally, the specification must clearly and sufficiently disclose the particular means of achieving the invention so that the skilled person can carry out the invention based on the disclosure. There are no clear standards as to how specific the disclosure of AI elements such as a neural network or black box algorithm must be in order to comply with the Examination guidelines.

Based on current practice, it is advisable to take the following into consideration:

- When the invention is directed to a specific neural network structure, it may be preferable to disclose particular algorithms to fulfill the enablement requirement and to differentiate it from prior art;
- When the invention is directed to a learning method, it may be preferable to disclose the input data, how the input data is processed and the nature of the output data;
- When the invention is directed to a trained model, it may be preferable to disclose the particular calculation program and the particular process of how the program uses hardware resources; and
- When the invention is directed to an application of AI technology, the particular input and output data as well as the particular process of how the program uses hardware resources should be disclosed.

4. Assessment of inventive step

The JPO recently provided helpful suggestions and examples on how to apply the current Examination Guidelines and the rules set forth in the Examination Handbook to patent applications directed to AI technology. In particular, the JPO has provided guidance as to how to examine novelty and inventive step by using practical case examples for IoT and AI technologies. In this guidance, the JPO indicates that mere replacement of the prior art by a neural network model does not have inventive step.

E. Korea (KR)[149]

1. Inventorship

Current Korean laws consider individuals as inventors. There has been little discussion as to whether to admit Inventive AI as an inventor under Korean law because Inventive AI is generally considered to be an object that is embodied in hardware by a human being.

Meanwhile, the Korean Patent Act[150] addresses whether to admit any meaningful results or technical creations produced by the AI as an invention. Such results produced by the AI, however, are generally interpreted as a process of creating something by a human being and cannot be an invention under Korean Patent Act.

Against this backdrop, some argue that technical creation by AI invention should be interpreted as an invention under the Korean Patent Act. In order to clearly admit an AI invention and clarify an inventorship for such invention, there have been several proposals for legislation: i) legislation of a special law to define the act of invention by the AI and to regulate relationship of rights by the AI-created invention; ii) revisions to the Korean Patent Act[151]; and iii) revisions to the Korean Invention Promotion Act.

2. Patent eligibility

Korean law specifies that patent-eligible subject matter includes "the highly advanced creation of a technical idea utilizing the laws of nature."[152] Under current Korean law, an AI algorithm embodied in software/hardware would most likely not be patent-eligible.

In the case of an invention combining AI and specific components to which AI technology is applied ("AI Invention"), patent-eligibility can be established if the invention meets certain requirements.[153] According to the guidelines of the Korean Intellectual Property Office ("KIPO"), computer-related inventions are considered to be patent-eligible where information processing by software is implemented in detail by using hardware.[154] For example, an information processing device (machine) operating in conjunction with software, an operating method thereof, and a computer-readable medium having recorded thereon the software are recognized as a creation of technical ideas using the laws of nature. Accordingly, if a software algorithm generated by a future AI Invention is combined with hardware, Korean patent law may recognize the patent eligibility of such inventions. In this way, an Inventive AI may also be considered patent eligible.

Meanwhile, for business model-related inventions, although it is essential that the invention should be combined with the computer-implemented technology in order to satisfy the patent eligibility requirements of the invention, the essence of a business model-related invention is that the technical and industrial value is the business model itself.[155] Therefore, in a case where a solution for solving a problem such as climate, security, and crime prevention (so-called business model) is derived by an AI invention or Inventive AI, with computer-implemented technology providing the solution, it can be said that the essence of the business model-related invention is created by AI Invention or Inventive AI. Thereby, it can be recognized that the actual creation of the business model invention through the use of AI has been conclusively accomplished.

3. Adequacy of disclosure

The Korean Patent Act has requirements for clear understanding for a reduction to practice for an OPSIA as well as requirements for descriptive support. [156]

The Korean Intellectual Property Office (KIPO) does not have an examination guideline specially drafted for AI, but it has an examination guideline for computer-related inventions.[157] Therefore, the remainder of the section will base interpretations of AI Invention or Inventive AI through the existing guidelines for computer-related inventions.

The following are examples of violations of the enablement requirement as explained in the examination guideline for a computer related invention:

a) Uncommon technical terms,[158]

b) Abstracted descriptions of technical steps or functions,[159]

c) The description via figures or flow chart is not specific enough,[160] and

d) Claimed invention is defined by functions but flowcharts do not clearly describe the function of the claims.[161]

The examination guideline for a computer related invention further states that a section of code may be included to help an OPSIA understand the claimed invention.[162]

Regarding enablement, the Supreme Court has addressed a situation where "based on the description and drawings, a computer program should repeatedly execute some procedures and fall into an infinite loop. Although this error is highly likely to be corrected by a normal simulation process when adopting the claimed invention and creating a program, it is not considered that the description is written for a person skilled in the art to correctly understand and reproduce the claimed invention."[163] Thus, it is understood that an error in the explanation of an algorithm may lead to non-compliance with the enablement requirement, regardless of whether or not an OPSIA can easily find the error in description of the algorithm and fix it when working with the claimed invention. Furthermore, the Court rendered that the "claims and disclosure in the description are the same to each other and thus, one skilled in the art cannot easily understand technical structures covered by claims, combination of the technical structures, nor their technical effects."[164] This means that having only the same disclosure in the description as in the claims may comply with the descriptive support requirement but result in non-compliance with the enablement requirement.

In the meantime, there is no distinction in claim construction between means-plus-function limitations and normal limitations in Korea because the Korean Patent Act does not include provisions corresponding to 35 U.S.C. § 112(f). That is, scope of claim shall be construed based on claim languages and description, and is not limited to the corresponding structure, material, or acts described in the specification and equivalents thereof. Thus, it seems that an applicant does not necessarily need to disclose every possible example corresponding to means-plus-function limitations at the time of filing. The Patent Court stated that it should be construed that functional claim is not limited to examples disclosed in the description or drawings, but has broader scope covering all of technical structures identified from a technical idea.[165]

4. Assessment of inventive step

Korean Patent Act Article 29, requirements for patent registration,[166] is simple and too inclusive. For this reason, the article of the inventive step has never been affected or revised due to the appearance of new technology. The Patent Examination Guidelines of KIPO has also never been affected or revised due to the appearance of new technology or new concepts of invention such as business method inventions.[167] It has also not been reported yet regarding the change of the inventive step standard due to AI technology.

As discussed under the patent-eligibility section, since AI technology itself such as AI algorithm does not meet the eligibility requirement, it shall not go through a determination of the inventive step. For AI inventions, the criterion of the inventive step would not have any difference with those for the conventional inventions or general software related inventions.

A governmental policy regarding a specific technical field would affect a threshold of the inventive step examination which determines patentability. It appears that KIPO tends to keep high level of threshold of the inventive step for an AI invention, as they have been doing for software inventions.

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[1] Circulated February 2019. This primer is designed to orient attendees on the subject matters to be discussed at the forthcoming AIPLA-AIPPI-FICPI Colloquium (March 28-29, 2019 in Turin, Italy). This first edition of the primer is directed to patents, the primary focus of the Colloquium. Ideally it should be reviewed prior to the Colloquium. While not comprehensive, the contributors sought to provide an overview of the state of law as of the date of publication in at least the jurisdictions covered by the IP5 Offices (U.S. Patent and Trademark Office, European Patent Office, Japan Patent Office, Korean Intellectual Property Office, and National Intellectual Property Administration of China)

The next edition of the primer is already being prepared for sending prior to the Colloquium and will include sections on trade secrets, copyrights, and trademarks. Those topics will also be briefly discussed during the Colloquium to provide a better understanding of the universe of possible IP protection of AI, as well as consideration of the interplay between the various types of protection.

The purpose of this document is to provide educational and informational content and is not intended to provide legal services or advice. The opinions, views and other statements expressed by the contributors are solely those of the contributors and do not necessarily represent those of AIPLA, AIPPI and FICPI.

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[4] The first conference devoted to the study of AI took place at Dartmouth College in 1955. *See* John McCarthy et al., *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence, August 31, 1955*, 27 AI MAGAZINE 12, 12-14 (2006),

http://www.aaai.org/ojs/index.php/aimagazine/article/view/1904/1802(reproducing part of the Dartmouth summer research project and summarizing its proposal)); *see also* Daniel Crevier, *AI: The Tumultuous History of the Search for Artificial Intelligence* (1993) ("the conference is generally recognized as the official birthdate of the new science.").

[5] *See Artificial Intelligence*, ENCYCLOPEDIA BRITANNICA ONLINE, https://www.britannica.com/technology/artificial-intelligence (last visited Jan. 22, 2019).

[6] *See Machine Learning*, WIKIPEDIA, https://en.wikipedia.org/wiki/Machine_learning (last visited, Jan. 24, 2019).

[7] *See Deep Learning*, WIKIPEDIA, https://en.wikipedia.org/wiki/Deep_learning (last visited, Jan. 24, 2019).

[8] *See Big Data*, WIKIPEDIA, https://en.wikipedia.org/wiki/Big_data (last visited, Jan. 24, 2019)

[9] *See generally, Need An AI Primer For 2018?*, IBM, https://www.ibm.com/blogs/ibm-anz/need-an-ai-primer/ (last visited, Jan. 24, 2019).

[10] *See generally*, Clive Thompson, *How To Teach Artificial Intelligence Some Common Sense*, WIRED (Nov. 13, 2018), https://www.wired.com/story/how-to-teach-artificial-intelligence-common-sense/.

[11] AIPLA Annual 2017:
https://www3.aipla.org/learningcenter/library/papers/am/AM17/2017sessionMatrerials/Hyams_Paper.pdf

[12] AIPLA Mid-Winter 2018:
https://www3.aipla.org/learningcenter/library/papers/MWI/mw18/2017MWI_Materials/Duncan_Paper.pdf

[13] AIPLA Spring 2018:

Getting to Allowance: Strategies for Overcoming Examiner Rejections Off the Merits

Moderator: Elise J. Selinger, Patterson + Sheridan, LLP, Dallas, TX

Patenting Artificial Intelligence Technology

Slides

Sandy Swain, Microsoft Corporation, Redmond, WA

Jian Mia, Microsoft Corporation, Redmond, WA

https://blogs.microsoft.com/blog/2018/01/17/future-computed-artificial-intelligence-role-society/

Using Big Data to Predict the Future at the USPTO

Slides; Paper

Jeremy Sanders, TerraPower, Inc., Seattle, WA

[14] AIPLA Annual 2017:
https://www3.aipla.org/learningcenter/library/papers/am/AM17/2017sessionMatrerials/Freiwirth_Paper.pdf

[15] Daniel A. McKinley, *Artificial Intelligence – How Patent Law In The U.S. And Internationally Will Deal With The Next Frontier In Medical Technology*, AIPLA Conference Spring 2017:
https://www3.aipla.org/learningcenter/library/papers/SM/SM17/SM16Materials/McKinley_Paper.pdf

[16] *See* WIPO, Index of AI initiatives In IP Offices, available at https://www.wipo.int/about-ip/en/artificial_intelligence/search.jsp (last visited Jan. 22, 2019).

[17] On September 13, 2018, the USPTO issued a request soliciting information on AI technologies that might improve patent search and examinations. *See* USPTO, USPTO's Challenge to Improve Patent Search with Artificial Intelligence, Solicitation No. RFI-USPTO-AI-PATENT-SEACH-18, (Sept. 13, 2018), available at https://www.fbo.gov/index?s=opportunity&mode=form&id=9af5c1a672b3c93e44bfc2502cfa9052&tab=core&_cview=1.

[18] *See* Aaron Boyd, *Patent Office: Can AI, Quantum Determine If A New Idea Is Really New?*, NEXTGOV (Sept. 14, 2018), https://www.nextgov.com/emerging-tech/2018/09/patent-office-can-ai-quantum-determine-if-new-idea-really-new/151275/.

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[20] *See, e.g.*, Specifio, a company that utilizes natural language processing to generate draft patent applications. For more information on Specifio, *see* https://specif.io/ (last visited Jan. 23, 2019).

[21] *See, e.g.*, ClaimMaster, https://www.patentclaimmaster.com/CMFeatures.html (last visited Jan. 23, 2019); PatentOptimizer by LexisNexis, https://www.lexisnexis.com/en-us/products/patent-optimizer-for-legal.page(last visited Jan. 23, 2019); PatentBots, https://www.patentbots.com/ (last visited Jan. 23, 2019); RoboReview by Turbopatent, https://turbopatent.com/roboreview/ (last visited Jan. 23, 2019) (provides patent proofreading automation).

[22] *See, e.g.*, Specifio, *supra* note 20 (generates basic drawing figures based on patent claims).

[23] *See, e.g.*, Black Hills IP, *supra* note 19; AltLegal, https://www.altlegal.com/ (last visited Jan. 23, 2019) (provides AI-driven patent and trademark docketing).

[24] *See, e.g.*, ClaimMaster, *supra* note 21; PatentBots, *supra* note 21; Smart Shell by Turbopatent, https://turbopatent.com/smartshell/ (last visited Jan. 23, 2019) (automatically generates office action response shell documents).

[25] *See, e.g.*, Automated Intellectual Property Patent Forms Filing docs by LexisNexis, https://store.lexisnexis.com/products/lexisnexisreg-automated-intellectual-property-patent-forms-skusku11580290/details (last visited Jan. 23, 2019) (provides automation with USPTO and PCT forms).

[26] *See, e.g.*, Legit, https://legit.ai/ (last visited Jan. 23, 2019); XLPat Labs, https://www.xlpat.com/ (last visited Jan. 23, 2019); Ambercite, https://www.ambercite.com/ (last visited on Jan. 23, 2019); IP Logic, http://www.iplogic.ai/ (last visited Jan. 23, 2019) (leverages AI technology to help review inventions and their novelty).

[27] *See, e.g.*, SyncIDS, https://www.syncids.com (last visited Jan. 23, 2019); ClaimMaster, *supra* note 21 (creates and manages information disclosure statements (IDSs)).

[28] *See, e.g.*, Black Hills IP, *supra* note 19 (generates client reporting communications).

[29] *See, e.g.*, Juristat, https://www.juristat.com/drafting1 (last visited Jan. 23, 2019); RoboReview by Turbopatent, *supra* note 21 (predicts which USPTO art unit a patent application will be assigned to, based on the language of the claims and/or specification).

[30] *See, e.g.*, Juststat, *supra* note 29; RoboReview by Turbopatent, *supra* note 21 (predicts whether claimed invention is subject matter eligible).

[31] *See, e.g.*, Black Hills IP, *supra* note 19 (predicts whether the next office action in a patent case will be an allowance or a rejection).

[32] *See, e.g.*, Anticipat, https://anticipat.com/ (last visited Jan. 23, 2019) (analyzes specific rejections based on ex parte appeals data).

[33] *See, e.g.*, BigPatentData, https://bigpatentdata.com/ (last visited Jan. 23, 2019); Patent Prufer, https://www.patentprufer.com/ (last visited Jan. 23, 2019); Juststat, *supra* note 29; RoboRevview by Turbopatent, *supra* note 21; PatentAdvisor by LexisNexis, https://www.lexisnexisip.com/products/patent-advisor/ (last visited Jan. 23, 2019) (provides insights into expected examiner and art unit behavior based on prior activity).

[34] *See, e.g.*, LexMachina, https://lexmachina.com/ (last visited Jan. 23, 2019) (predicts judge behavior in patent litigations based on prior cases).

[35] *See, e.g.*, Clearstone IP, https://www.clearstoneip.com/ (last visited Jan. 23, 2019) (provides intelligent platform for freedom-to-operate analysis and management).

[36] *See, e.g.*, AcclaimIP, http://www.acclaimip.com (last visited Jan. 23, 2019); PatSeer, https://patseer.com (last visited Jan. 23, 2019); Patent iNSIGHT, https://www.patentinsightpro.com/ (last visited Jan. 23, 2019); Zuse Analytics, https://ipwe.com/zuse-analytics (last visited Jan. 23, 2019) (uses AI to analyze patents and portfolios).

[37] *See, e.g.*, Black Hills IP, *supra* note 19 (mines patent data to assist in patent maintenance decisions).

[38] *See* Kay Firth-Butterfield, et al., *Artificial Intelligence Collides with Patent Law*, WORLD ECON. FORUM, Center for the Fourth Industrial Revolution (April 20, 2019), available at https://www.weforum.org/whitepapers/artificial-intelligence-collides-with-patent-law.

[39] *See LegalTech Hits $1 Billion Investment As Lawyers Embrace Automation*, LAWGEEX BLOG (Dec. 3, 2018), https://blog.lawgeex.com/legaltech-hits-1-billion-investment-as-lawyers-embrace-automation.

[40] *See* James A. De Lapp, et al., *Impacts of CAD On Design Realization*, 11 Engineering, Construction and Architectural Management, Issue No. 4 (2004), available at https://doi.org/10.1108/09699980410547630.

[41] *See* Jacob Goldstein, *How The Electronic Spreadsheet Revolutionized Business*, NPR (Feb. 27, 2015), https://www.npr.org/2015/02/27/389585340/how-the-electronic-spreadsheet-revolutionized-business; *see also* Lisa Cumming, *After VisiCalc Revolutionized Accounting In The 70s, AI Is The Next Big Breakthrough*, BLUE J LEGAL (June 22, 2018), https://www.bluejlegal.com/blog/single-post/2017/12/05/after-visicalc-revolutionized-accounting-in-the-70s-ai-is-the-next-big-breakthrough.

[42] The IP5 Offices are U.S. Patent and Trademark Office (USPTO), European Patent Office (EPO), Japan Patent Office (JPO), Korean Intellectual Property Office (KIPO), and National Intellectual Property Administration of China (CNIPA).

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[44] In an interview with The Verge (an American news and media network focused on technology), a computational neuroscientist explained the concept of "deep learning" as it relates to generative adversarial networks:

> They are, in a sense, generating internal activity. This turns out to be the way the brain works. You can look out and see something and then you can close your eyes and you can begin to imagine things that aren't out there. You have a visual imagery, you have ideas that come to you when things are quiet. That's because your brain is generative. And now this new class of networks can generate new patterns that never existed.

Angela Chen, *A Pioneering Scientist Explains 'Deep Learning'*, THE VERGE (Oct. 16, 2018), https://www.theverge.com/2018/10/16/17985168/deep-learning-revolution-terrence-sejnowski-artificial-intelligence-technology (interviewing Terrence Sejnowski, a computational neuroscientist at the Salk Institute for Biological Studies).

[45] *See* Bruce Grain, *When Machines Create Intellectual Property, Who Owns What?*, INTELLECTUAL PROPERTY WATCH (February 2, 2016), http://www.ip-watch.org/2017/02/16/machines-create-intellectual-property-owns/ (highlighting arguments that machine-created inventions and works should be in the public domain).

[46] *See* 35 U.S.C. § 102; Manual of Patent Examining Procedure § 2137.01, Inventorship (9th ed. Rev. Jan. 2018), available at https://www.uspto.gov/web/offices/pac/mpep/s2137.html.

[47] *See Fina Oil & Chemical Co. v. Ewen*, 123 F.3d 1466, 1473 (Fed. Cir. 1997) ("An individual must make a contribution to the conception of the claimed invention that is not insignificant in quality, when that contribution is measured against the dimension of the full invention." (emphasis added)); *Fiers v. Revel*, 984 F.2d 1164, 1168 (Fed. Cir. 1993).

[48] The USPTO has enacted regulations in the Manual of Patent Examining Procedure that require an oath or declaration by the inventor in order to obtain a patent. The regulations states in relevant part:

> a) The inventor, or each individual who is a joint inventor of a claimed invention, in an application for patent must execute an oath or declaration directed to the application, except as provided for in § 1.64. An oath or declaration under this section must: (3) Include a statement

> that the person executing the oath or declaration believes the named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application for which the oath or declaration is being submitted; and (4) State that the application was made or was authorized to be made by the person executing the oath or declaration.

37 C.F.R. §1.63(a)(3)-(4); *see also* Manual of Patent Examining Procedure § 602, Oaths and Declarations (9th ed. Rev. Jan. 2018), available at https://www.uspto.gov/web/offices/pac/mpep/s602.html.

[49] 916 F.2d 1561, 1566 n. 4 (Fed. Cir. 1990).

[50] Available at: https://www.uspto.gov/web/offices/pac/mpep/index.html

[51] *See* 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (January 7, 2019); Examining Computer-Implemented Functional Claim Limitations for Compliance with 35 U.S.C. 112, 84 Fed. Reg. 57 (January 7, 2019).

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[53] 35 U.S.C. § 101.

[54] The Manual of Patent Examining Procedure provides the following as non-limiting examples of claims that are not directed to any of the statutory categories:

> [p]roducts that do not have a physical or tangible form, such as information (often referred to as "data per se") or a computer program per se (often referred to as "software per se") when claimed as a product without any structural recitations; [t]ransitory forms of signal transmission [], such as a propagating electrical or electromagnetic signal or carrier wave; and [s]ubject matter that the statute expressly prohibits from being patented, such as humans per se, which are excluded under The Leahy-Smith America Invents Act (AIA), Public Law 112-29, sec. 33, 125 Stat. 284 (September 16, 2011).

Manual of Patent Examining Procedure § 2106, Patent Subject Matter Eligibility (9th ed. Rev. Jan. 2018), available at https://www.uspto.gov/web/offices/pac/mpep/s2106.html.

[55] *See, e.g.*, Ben Hattenbach & Gavin Snyder, *Rethinking the Mental Steps Doctrine and Other Barriers to Patentability of Artificial Intelligence*, 19 Colum. Sci. & Tech. L. Rev. 313, 320 (2018) ("The scope has also aligned because no judicially-recognized distinctions between software in general, and artificial intelligence software in particular, have yet arisen.").

[56] *See, e.g., CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1371 (Fed. Cir. 2011). Likewise, certain computer-implemented inventions for performing diagnosis of medical conditions and disorders have also been held patent-ineligible. *See Mayo Collaborative Servs. v. Prometheus Labs, Inc.*, 556 U.S. 66 (2012); *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371 (Fed. Cir. 2015).

[57] *See, e.g., Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335 (Fed. Cir. 2016) ("we find it relevant to ask whether the claims are directed to an improvement to computer functionality versus being directed to an abstract idea, even at the first step of the *Alice* analysis") (citing *Alice Corp. Pty Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2355 296 (2014)).

[58] *See, e.g., McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1307 (Fed. Cir. 2016) (upholding as patent-eligible claims directed to a method for "automatically … producing accurate and realistic lip synchronization and facial expressions in animated characters" previously performed by humans).

[59] *See, e.g.*, Elizabeth Rocha, *Sophia: Exploring the Ways AI May Change Intellectual Property Protections*, 28 DePaul J. Art Tech. & Intell. Prop. L. 126, 138 (2018) (discussing that humanoid robot Sophia granted citizenship by Saudi Arabia "may act and function as a natural person, but she is a creation of a lab technician" and is therefore not "naturally occurring").

[60] *See* 2019 Revised Patent Subject Matter Eligibility Guidance, *supra* note 51, 84 Fed. Reg. at 50 ("A claim is not 'directed to' a judicial exception, and thus is patent eligible, if the claim as a whole integrates the recited judicial exception into a practical application of that exception."). The guidance further synthesizes key

concepts identified by the courts as abstract ideas to explain that the abstract idea exception includes "[m]athematical concepts[,] . . . certain methods of organizing human activity, [] and mental processes [] performed in the human mind". *Id*. at 52.

[61] J.H. Reichman, *Electronic Information Tools—The Outer Edge of World Intellectual Property Law*, 17 Dayton L. Rev. 797, 833 (1992).

[62] The statute, however, begins with "*[w]hoever* invents or discovers . . .", which may suggest human inventorship. 35 U.S.C. § 101 (emphasis added).

[63] Inventive AI is already a reality of today. *See, e.g.*, Susan Y. Tull, *Patenting the Future of Medicine: The Intersection of Patent Law and Artificial Intelligence in Medicine*, LANDSLIDE: Publication of the ABA Section of Intellectual Property, Vol. 10 No. 3, pp. 40, 41 (January/February 2018), available at https://www.finnegan.com/en/insights/patenting-the-future-of-medicine-the-intersection-of-patent-law-and-artificial-intelligence-in-medicine.html (last visited Jan. 24, 2019) ("AI computers are diagnosing medical conditions and disorders at a rate equal to or better than their human peers, all while developing their own software code and algorithms to do so.").

[64] *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980).

[65] *See, e.g.*, *Diamond v. Chakrabarty*, 447 U.S. 303 (1980); *Ass'n for Molecular Pathology v. Myriad Genetics*, 569 U.S. 576 (2013); *Bilski v. Kappos*, 561 U.S. 593, 617 (2010); *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014).

[66] *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014).

[67] Recent guidance from the United States Patent and Trademark Office breaks step one of the two-part test into a two-prong inquiry: "[i]n Prong One, examiners evaluate whether the claim recites a judicial exception[]" and in "Prong Two, examiners evaluate whether the claim recites additional elements that integrate the exception into a practical application of that exception." 2019 Revised Patent Subject Matter Eligibility Guidance, *supra* note 51, 84 Fed. Reg. at 54. The guidance further explains that a "claim that integrates a judicial exception into a practical application will apply, rely on, or use the judicial exception in a manner that imposes a meaningful limit on the judicial exception, such that the claim is more than a drafting effort designed to monopolize the judicial exception." *Id*.

[68] Occasionally referred to as the "mental steps" doctrine, human thought processes, sometimes assisted with the use of a pen and paper, are generally found to be unpatentable abstract ideas. *See, e.g.*, *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1371 (Fed. Cir. 2011) ("methods which can be performed mentally, or which are the equivalent of human mental work, are unpatentable abstract ideas—the 'basic tools of scientific and technological work' that are open to all.") (quoting *Gottschalk v. Benson*, 409 U.S. 63, 65 (1972)); *Versata Dev. Group v. SAP Am., Inc.*, 793 F.3d 1306, 1335 (Fed. Cir. 2015).

[69] *See, e.g.*, Robert Sachs, *The Mind as Computer Metaphor: Benson and the Mistaken Application of Mental Steps to Software*, BILSKIBLOG (Apr. 6, 2016), http://www.bilskiblog.com/blog/2016/04/the-mind-as-computer-metaphor-benson-and-themistaken-application-of-mental-steps-to-software.html ("Between the June 2014 *Alice* decision and March 29, 2016, there have been 175 federal court decisions invalidating patents under Section 101, and 24% of those decisions relied upon the 'mental steps' doctrine. The eighty-two patents thus invalidated were not limited to suspect categories such as 'business methods,' but included electronic design automation, computer and database security, information retrieval, microbiology, user interfaces for interactive television, telecommunications, and digital image management."); *see also Coffelt v. NVIDIA Corp*., 680 F. App'x 1010 (Fed. Cir. 2017); *FairWarning IP, LLC v. Iatric Sys., Inc.*, 839 F.3d 1089, 1094-95 (Fed. Cir. 2016); *Intellectual Ventures I LLC v. Erie Indem. Co.*, 711 F. App'x 1012, 1013-14 (Fed. Cir. 2017); *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1371 (Fed. Cir. 2011).

[70] For example, unlike human thought processes, many AI "thought processes" may require physical transformations or the architecture of the machine itself. *See, e.g.*, Steven B. Roosa, *The Next Generation of Artificial Intelligence in Light of In re Bilski*, 21 Intell. Prop. & Tech. L.J. 6, 6-7 (2009); *see also* Dr. Shlomit Yanisky Ravid & Xiaoqiong (Jackie) Liu, *When Artificial Intelligence Systems Produce Inventions: An Alternative Model for Patent Law at the 3A Era*, 39 Cardozo L. Rev. 2217, 2223-29 (2018).

[71] Some have advocated that such a "mental steps" doctrine should not apply to AI inventions generally. *See, e.g.*, Ben Hattenbach & Gavin Snyder, *Rethinking The Mental Steps Doctrine And Other Barriers To*

Patentability of Artificial Intelligence, 19 Colum. Sci. & Tech. L. Rev. 313, 328-29 (2018) ("The fact that an artificial intelligence invention replicates human thought—particularly in outcome—should certainly not end the patentability analysis; indeed, it arguably should not even be a factor weighing against patent-eligibility."); *but see Gottschalk v. Benson*, 409 U.S. 63, 65 (1972) ("A digital computer, as distinguished from an analog computer, operates on data expressed in digits, solving a problem by doing arithmetic as a person would do it by head and hand.").

[72] *Mayo Collaborative Services v. Prometheus Labs., Inc*., 566 U.S. 66, 79-80 (2012); *see also Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014).

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[74] 35 U.S.C. § 112(a) ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention."); *see also* Manual of Patent Examining Procedure § 2161, Three Separate Requirements for Specification Under 35 U.S.C. 112(a) or Pre-AIA 35 U.S.C. 112 (9th ed. Rev. Jan. 2018), available at https://www.uspto.gov/web/offices/pac/mpep/s2161.html.

[75] *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1344 (Fed. Cir. 2010).

[76] *Id*. at 1345.

[77] *Id*. ("It is part of the *quid pro quo* of a patent; one describes an invention, and, if the law's other requirements are met, one obtains a patent. The specification must then, of course, describe how to make and use the invention (*i.e.,* enable it), but that is a different task. A description of the claimed invention allows the United States Patent and Trademark Office ("PTO") to examine applications effectively; courts to understand the invention, determine compliance with the statute, and to construe the claims; and the public to understand and improve upon the invention and to avoid the claimed boundaries of the patentee's exclusive rights.").

[78]*See* Examining Computer-Implemented Functional Claim Limitations for Compliance with 35 U.S.C. 112, *supra* note 51, 84 Fed. Reg. at 59 ("For a computer-implemented 35 U.S.C. § 112(f) claim limitation, the specification must disclose an algorithm for performing the claimed specific computer function, or else the claim is indefinite under 35 U.S.C. § 112(b).") (citing *Net MoneyIN, Inc. v. VeriSign, Inc*., 545 F.3d 1359, 1367 (Fed. Cir. 2008)).

[79] *See LizardTech, Inc. v. Earth Res. Mapping, Inc.*, 424 F.3d 1336, 1346 (Fed. Cir. 2005).

[80] Examining Computer-Implemented Functional Claim Limitations for Compliance with 35 U.S.C. 112, *supra* note 51, 84 Fed. Reg. at 61.

[81] *Id*.; *see also Vasudevan Software, Inc. v. MicroStrategy, Inc*., 782 F.3d 671, 682-683 (Fed. Cir. 2015).

[82] *See e.g., In re Naquin*, 398 F.2d 863, 866 (C.C.P.A. 1968).

[83] *See* USPTO, Patent Public Advisory Committee Quarterly Meeting: IT Update (Aug. 2, 2018), available at https://www.uspto.gov/sites/default/files/documents/20180802_PPAC_AI_IT_Update.pdf.

[84] *See generally* USPTO, Class 706: Data Processing – Artificial Intelligence (last modified Jan. 24, 2019), available at https://www.uspto.gov/web/offices/ac/ido/oeip/taf/def/706.htm.

[85] USPTO, Patent Public Advisory Committee Quarterly Meeting: IT Update, *supra* note 83.

[86] The state of the prior art and the relative skill of those in the art are fact based considerations that govern the reasonableness of the disclosure and sufficiency of enablement of the claims. *See e.g., Vasudevan Software, Inc. v. MicroStrategy, Inc.*, 782 F.3d 671, 681-85 (Fed. Cir. 2015). In this article we have operated under the assumption that one of ordinary skill in the art would be a skilled AI programmer. However, as the USPTO classification definition for "Class 706: Data Processing – Artificial Intelligence" covers a wide range of subject matter, in a given application one of ordinary skill in the art might be anything from a more generally trained programmer skilled in any data processing system that emulates intelligence to a more narrowly experienced

programmer specifically skilled in a subset of AI type programing such as artificial neural networks, as two disparate examples.

[87] *See e.g.*, *In re Naquin*, 398 F.2d at 866.

[88] Manual of Patent Examining Procedure § 2164.05(b), How to Make the Claimed Invention (9th ed. Rev. Jan. 2018), available at https://www.uspto.gov/web/offices/pac/mpep/s2164.html.

[89] *See* Examining Computer-Implemented Functional Claim Limitations for Compliance with 35 U.S.C. 112, *supra* note 51, 84 Fed. Reg. at 61.

[90] Adequacy of disclosure is generally considered synonymous with the requirements under 35 U.S.C. § 112(a). However, the requirements of 35 U.S.C. § 112(a) often interact with the requirements of 35 U.S.C. § 112(b) in functional claiming of computer-implemented inventions. Per USPTO guidelines, failure to disclose sufficient corresponding structure for a claimed function under 35 U.S.C. § 112(b) may mean a claim also lacks written description under 35 U.S.C. § 112(a). *See, e.g.*, Examining Computer-Implemented Functional Claim Limitations for Compliance with 35 U.S.C. 112, *supra* note 51, 84 Fed. Reg. at 61. Thus, if AI inventions are to be claimed functionally, there must be further consideration as to whether the specification discloses the full algorithm to perform the functions of the claim. *See id*. at 59-62.

[91] *See e.g.*, *In re Vaeck*, 947 F.2d 488, 496 (Fed. Cir. 1991).

[92] *See e.g.*, *id*.

[93] For purposes of this article, the problem may be a new problem unique to AI technology or a known problem solved in a new way using AI technology.

[94] USPTO, Patent Public Advisory Committee Quarterly Meeting: IT Update, *supra* note 83.

[95] *See e.g.*, *In re Vaeck*, 947 F.2d at 496.

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[97] United States patent laws include various sections to test whether an invention qualifies for patent protection, including: 35 U.S.C. § 101 (subject matter and enablement); 35 U.S.C. § 102 (novelty); and 35 U.S.C. § 103 (nonobviousness).

[98] 35 U.S.C. § 103 ("A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made."). *Note*, for the purposes of this discussion, the details between pre-AIA 35 U.S.C. § 103 and post- AIA 35 U.S.C. § 103 are not considered.

[99] 383 U.S. 1 (1966).

[100] *Id*. at 17.

[101] These factors have been repeatedly referenced by the Supreme Court and inferior courts and are still relevant today, for example, reaffirmed in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 402 (2007).

[102] *See* Manual of Patent Examining Procedure § 2141, Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 (9th ed. Rev. Jan. 2018), available at https://www.uspto.gov/web/offices/pac/mpep/s2141.html.

[103] *See* Ryan Abbott, *Everything is Obvious*, 66 UCLA L. Rev. 2, 4 (2019), available at https://www.uclalawreview.org/everything-is-obvious/.

[104] *See* USPTO, Class 706: Data Processing – Artificial Intelligence, *supra* note 84.

[105] *See, e.g.*, 2019 Revised Patent Subject Matter Eligibility Guidance, *supra* note 51, 84 Fed. Reg. at 55 ("Examiners should note, however, that revised Step 2A specifically excludes consideration of whether the additional elements represent well-understood, routine, conventional activity. Instead, analysis of well-

understood, routine, conventional activity is done in Step 2B."). AI, like other computer-related inventions, will normally have stricter scrutiny under 35 U.S.C. § 101. Interpreting 35 U.S.C. § 101, the Supreme Court has indicated that obvious, "well-understood, routine, and conventional activity" already engaged in by the scientific community is not enough to confer patent eligibility. *Mayo Collaborative Servs. v. Prometheus Labs, Inc.*, 556 U.S. 66, 79 (2012). *See also Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014).

[106] 35 U.S.C. § 103.

[107] *Graham v. John Deere Co.*, 383 U.S. 1 (1966).

[108] *See* Manual of Patent Examining Procedure § 2141(a), Analogous and Nonanalogous Art (9th ed. Rev. Jan. 2018), available at https://www.uspto.gov/web/offices/pac/mpep/s2141.html.

[109] Abbott, *supra* note 103, at 37 ("However, a machine is capable of accessing a virtually unlimited amount of prior art.").

[110] *Id.* at 20-22. *See also* Tull, *supra* note 63 ("At some point, AI may become the "person" of skill in the art, possessing actual knowledge of all known publications, patents, and prior art, transforming the hypothetical construct into reality.").

[111] Bera, Rajendra K., Comment Letter in Response to "Notice of Roundtables and Request for Comments Related to Patent Subject Matter Eligibility," 81 Fed. Reg. 71,485 (Oct. 17, 2016), at 3 (Dec. 11, 2016), available at https://www.uspto.gov/sites/default/files/doc%20uments/RT2comments%20Rajendra%20K%20Bera.pdf ("if one of them produces a novel and nonobvious invention, then, at least all clones, or members of the same robot class *en masse* can independently produce the same invention if required to do so.").

[112] Abbott, *supra* note 5, at 20-22; *See also* Ben Hattenbach & Joshua Glucoft, *Patents in an Era of Infinite Monkeys and Artificial Intelligence*, 19 Stan. Tech. L. Rev. 32 (2015).

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[114] Chinese Patent Law Implementing Regulations, Rule 13

[115] Chinese Examination Guidelines, part I, Chapter 1, Section 4.1.2: Formality Examination of Invention Patent Application

[116] Dialogue: The Challenge of Artificial Intelligence to Legal Protection of Intellectual Property, Wu Handong, Zhang Ping, Zhang Xiaojun, 02/2018, China Law Review

[117] Chinese Examination Guidelines, part II, Chapter 9:, Several rules regarding examining invention applications relating to computer program

[118] Chinese Examination Guidelines, part II, Chapter 9, Section 2: Several rules regarding examining invention applications relating to computer program

[119] *Id.*

[120] *Id.*

[121] *Id.* at Part II, Chapter 9, Section 5.1

[122] Patent in issue 200410053749.9, "a chatting robot",

[123] Chinese Examination Guidelines, Part II, Chapter 4, Section 3.2.1.1

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[125] https://en.wikipedia.org/wiki/Legal_person

[126] https://en.wikipedia.org/wiki/Electronic_persons

[127] https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/r19.html

[128] https://www.epo.org/law-practice/case-law-appeals/recent/g920003ex1.html

[129] https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/ma4.html

[130] https://www.epo.org/law-practice/legal-texts/html/guidelines/e/j.htm

[131] https://www.epo.org/law-practice/legal-texts/html/guidelines/e/f_iii_1.htm

[132] https://www.epo.org/law-practice/legal-texts/html/guidelines/e/g_ii_3_6.htm

[133] https://www.epo.org/law-practice/legal-texts/html/guidelines2018/e/g_ii_3.htm

[134] https://www.epo.org/law-practice/legal-texts/html/guidelines2018/e/g_ii_3_3_1.htm

[135] https://www.epo.org/law-practice/legal-texts/html/guidelines2018/e/g_ii_3_3.htm

[136] https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/ar83.html

[137] https://www.epo.org/law-practice/legal-texts/html/guidelines/e/f_iii_1.htm

[138] https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/r42.html

[139] https://www.epo.org/law-practice/case-law-appeals/recent/t950521eu1.html#q

[140] https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/ar52.html

[141] https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/ar54.html

[142] Technical steps or functions corresponding to the claimed invention may be abstractly described in the description of a specification where the description does not clearly describe how a hardware or software executes or realizes the steps or functions. For example: b-i) Claims recites an information processing system to execute a business method or a game method; however, the description does not explain how a computer implements steps or functions for the methods, or b-ii) A computer display e.g., a graphical user interface is used to explain computer operating procedures in the description, but how the computer operating procedure is fulfilled on the computer is not disclosed. *See* Korean Intellectual Property Office, Guidelines for Examination, Ch.10, § 1.2.2, examples 1 and 2 (Aug. 1, 2018), available at http://www.kipo.go.kr/kpo/user.tdf?a=user.html.HtmlApp&c=3073&catmenu=m04_01_03 (accessed Feb. 5, 2019)

[143] The description explains the hardware or software that executes the functions of claimed invention using functional block diagram or rough flowcharts, but it is unclear how the hardware and software are configured in view of the explanations using the functional block diagram or rough flowcharts. *See* Korean Intellectual Property Office, Guidelines for Examination, Ch. 10, § 1.2.2, example 3 (Aug. 1, 2018), available at http://www.kipo.go.kr/kpo/user.tdf?a=user.html.HtmlApp&c=3073&catmenu=m04_01_03 (accessed Feb. 5, 2019).

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[145] Dated January 31, 2006, *Hanrei Jihou* No.1929, at 92

[146] *See* an article published in No. 63, August 2018 issue of the "WINDS from Japan" (a newsletter published by LES Japan). The JPO counted patent applications that have been assigned to the IPC class G06Q (since January 2006) or G06F17/60 (up to December 2005). A sharp increase in 2000 in the filing of applications claiming business-related inventions was triggered by the 1998 U.S. Federal Circuit decision in the State Street Bank case and the ensuing media hype. The allowance rates for such applications filed around 2000 were low at less than ten percent. As the JPO updated examination guidelines on software-related inventions and improved examination practice, standards emerged among examiners and applicants, and the JPO now has a fairly high allowance rate of nearly 70%. This rate of allowance is defined as the number of allowed applications divided by the total number of allowed cases, applications rejected in the first office action, and applications abandoned or withdrawn after the first office action.

[147] Article 29(1) of the Patent Act stipulates that: "An inventor of an invention that is industrially applicable may be entitled to obtain a patent for the said invention, except for the following:" (provisions for novelty and inventive step requirements follows.)

[148] *See generally,* the English translation of the Examination Guidelines

(*available at* https://www.jpo.go.jp/tetuzuki_e/t_tokkyo_e/1312-002_e.htm); and

the English translation of Examination Handbook

(https://www.jpo.go.jp/tetuzuki_e/t_tokkyo_e/handbook_sinsa_e.htm)

at the JPO website. The JPO publishes the "Examination Guidelines for Patent and Utility Model in Japan" and the "Examination Handbook for Patent and Utility Model in Japan," these will be referred to as "Examination Guidelines" and "Examination Handbook." The Examination Handbook is meant to supplement the Examination Guidelines.

See also the "Examination Guidelines pertinent to IoT related technologies" page of the JPO website

(https://www.jpo.go.jp/tetuzuki_e/t_tokkyo_e/iot_examination_e.htm), and in particular, a page entitled "2-2. Major Examination Guidelines, etc. associated with IoT related technologies" for references to particular portions of the Examination Guidelines and Examination Handbook.

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[150] Article 2 of the Korean Patent Act defines an invention as "the highly advanced creation of a technical idea utilizing the laws of nature." Republic of Korea, Patent Act (Act No. 950 of Dec. 31, 1961, as amended up to Act No. 14112 of Marc. 29, 2016), Art. 2(1).

[151] Possible revisions to Korean Patent Act may include one or more of the following:

a) to include, in the definition of invention, a creation by the AI in accordance with direction or manipulation by a human being;

b) to admit, as an inventor, one who has substantially contributed to an AI-created invention;

c) to reduce the patent term of an AI-created invention to less than 20 years (e.g., 3 or 5 years) since AI technology may invent much more rapidly than human beings; and

d) to narrowly interpret infringement of an AI-created patent to the creation of an identical copy.

[152] *See* Republic of Korea, Patent Act (Act No. 950 of Dec. 31, 1961, as amended up to Act No. 14112 of Marc. 29, 2016), Art. 2, para. (1). If the claims are purely entitled to formulas or mathematical algorithms, they are not patentable because the formula or mathematical algorithm itself is not an invention utilizing the laws of nature.

[153]*See, e.g.*, Korean Intellectual Property Office, Outline of business method (BM) patent, "Judging Criteria," available at http://www.kipo.go.kr/kpo/user.tdf;jsessionid=9863ca6b30d691a1b30b093b4a1f8983ea930a2406a8.www2?a=user.html.HtmlApp&c=8061&catmenu=m11_02_10_01 (accessed Jan. 28, 2019).

[154] *See* Korean Intellectual Property Office, Guidelines for Examination (Aug. 1, 2018), available at http://www.kipo.go.kr/kpo/user.tdf?a=user.html.HtmlApp&c=3073&catmenu=m04_01_03 (accessed Jan. 28, 2019).

[155] *Id*.

[156] Article 42(4)(i) of the Korean Patent Act also states "claim(s) shall be supported by a description of a specification."

[157] *See* Korean Intellectual Property Office, Guidelines for Examination (Aug. 1, 2018), available at http://www.kipo.go.kr/kpo/user.tdf?a=user.html.HtmlApp&c=3073&catmenu=m06_01_04 (accessed Jan. 28, 2019).

[158]Uncommon technical terms may include abbreviations or symbols that are used without any definitions found in the description and their meanings are unclear.

[159] Technical steps or functions corresponding to the claimed invention may be abstractly described in the description of a specification where the description does not clearly describe how a hardware or software executes or realizes the steps or functions. For example: b-i) Claims recites an information processing system to execute a business method or a game method; however, the description does not explain how a computer implements steps or functions for the methods, or b-ii) A computer display e.g., a graphical user interface is used to explain computer operating procedures in the description, but how the computer operating procedure is fulfilled on the computer is not disclosed. *See* Korean Intellectual Property Office, Guidelines for Examination, Ch.10, § 1.2.2, examples 1 and 2 (Aug. 1, 2018), available at http://www.kipo.go.kr/kpo/user.tdf?a=user.html.HtmlApp&c=3073&catmenu=m04_01_03 (accessed Feb. 5, 2019)

[160] The description explains the hardware or software that executes the functions of claimed invention using functional block diagram or rough flowcharts, but it is unclear how the hardware and software are configured in view of the explanations using the functional block diagram or rough flowcharts. *See* Korean Intellectual Property Office, Guidelines for Examination, Ch. 10, § 1.2.2, example 3 (Aug. 1, 2018), available at http://www.kipo.go.kr/kpo/user.tdf?a=user.html.HtmlApp&c=3073&catmenu=m04_01_03 (accessed Feb. 5, 2019).

[161] The claimed invention is defined by functions, and the description uses flowcharts to explain the claimed invention but it is not clear how functions of claims correspond to flowcharts in the description. For example: d-i) A business support information processing system is claimed by a plurality of functional means, while the description only describes the operational flow of the business. It is not clear how the functional means recited in claims correspond to the operational flow in the description.

[162] "[A] short program list written in a language well known to those skilled in the art that is useful for understanding the invention and attach an adequate explanation thereto can be included in specification or drawings. Program list may also be presented as reference material. However, it is not possible to amend the specification based on the reference material." *See* Korean Intellectual Property Office, Guidelines for Examination (Aug. 1, 2018), available at http://www.kipo.go.kr/kpo/user.tdf?a=user.html.HtmlApp&c=3073&catmenu=m06_01_04 (accessed Jan. 28, 2019).

[163] Supreme Court case no. 2003Hu2089, decided on Nov. 24, 2006.

[164] *Id*.

[165] Patent Court case no. 2007Heo9798 & 9989, decided on August 22, 2008.

[166] Korean Patent Act Article 29(2) stipulates that "an invention easily creatable by a person with ordinary knowledge in the technical field of the invention . . . shall not be patentable."

[167] According to Patent Examination Guidelines of KIPO, the examination of the inventive step goes through specifying a claimed invention, choosing the closest prior art reference, making a clear difference by comparing the prior art reference with the claimed invention, and finally determining whether the claimed invention would have been easily made by a person skilled in the art in view of the prior art reference, considering the technical field, technical problem, disclosure of prior art, technical effect and so on. *See* Korean Intellectual Property Office, Guidelines for Examination (Aug. 1, 2018), available at http://www.kipo.go.kr/kpo/user.tdf?a=user.html.HtmlApp&c=3073&catmenu=m04_01_03 (accessed Jan. 28, 2019).