

● PATENTABILITY OF ARTIFICIAL INTELLIGENCE CREATIONS: ISSUES AND CHALLENGES



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Abstract

Artificial Intelligence has transformed the role of computers from being a simple calculating machine to an autonomously creative work generating system. Artificial Intelligence is helping machines to not only understand complex data and learn from it but also to generate novel works which are historically associated with human ingenuity. The rise of inventive Artificial Intelligence has created a stir in the traditional paradigm of patentability. Artificial Intelligence creations has posed a challenge to the inventorship criteria in patent system which does not recognize nonhuman entities as inventors. The recognition of Artificial Intelligence driven machines as inventors could lead to further complicated issues which the present patent system may not be able to accommodate. Rise in instances of independently generated creations by Artificial Intelligence raises certain issues with regard to patentability of such creations. This Article addresses this new phenomenon of Artificial Intelligence and instances where machines have created inventions with no or minimum human interventions. This article would further delve into the issues related to AI inventorship and what implications it would have for the current patent system.

Key words

Artificial Intelligence, Patentability, Inventorship.

I. INTRODUCTION

Three thousand years back Greek poet Homer described mechanical tripods created by god Hephaestus which could assemble itself automatically without any human assistance. Isaak Asimov in his science fiction book 'I, Robot' has written about robots with abilities to perform human tasks with ease and intelligence in 1950. The idea of intelligent machines has always been a part of myths and science fictions. But the development of Artificial Intelligence (AI) in the last three decades has certainly turned the science fictions into real science. AI systems are the new technological marvel of the digital revolution we are witnessing in the 21st century. We are living in an era where computers are not mere number crunching machines but are now performing those tasks which require intelligence when performed by humans. Be it Google's AI AlphaGO machine beating world champion Lee Sedol in the board game 'GO' or Tesla's self-driving cars, AI systems are peaking the interests of scientists and investors worldwide. According to World Economic Forum, the estimated global revenue from AI systems is expected around 47 billion by 2020¹.

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¹Centre for the Fourth Industrial Revolution, Artificial Intelligence Collides with Patent Law, World Economic Forum (Aug. 2, 2019, 5:04 PM), http://www3.weforum.org/docs/WEF_48540_WP_End_of_Innovation_Protecting_Patent_Law.pdf.

AI systems are growing at an exceptional rate today, with more sophisticated forms of software being incorporated in them². This rise has created ripples in the traditional paradigm of patentability. Now with the help of AI, machines are generating creative and novel works autonomously. From being used as a mere tool for invention, the AI driven machines are now creating inventions, leading to questioning of the status of human inventor in the patent system. This question further leads us to some more intricate issues which will be highlighted by this paper. The first part of the paper explains the concept of AI and what are the features of an AI driven machine. The second part explores instances where machines have actually created patentable inventions. The third part deals with certain issues related with the patentability of the AI creations which have posed a challenge to the traditional patent system. The paper concludes by providing certain recommendations on these issues.

II. WHAT IS ARTIFICIAL INTELLIGENCE?

It is impossible to provide a concrete definition of AI because of its diverse subjects and dynamic nature. The term AI includes a broad area that comprises reasoning and knowledge representation, robotics, natural language processing and machine learning making³ it really difficult to confine the essence of this term in a few words. However, we shall look into various definitions which have defined AI in a holistic way so that we could have a general understanding of the concept. The earlier usage of machines was confined to calculations and performing task based on pre-programmed software. However, for the past few decades the development in the field of AI has changed the role of computers from merely being a calculating device to a problem-solving device which can understand language, store information and can learn from its experiences, just like a human brain. The term AI was coined by John McCarthy at the Dartmouth conference 1956. According to McCarthy, "Artificial Intelligence means science and engineering of making intelligent machines, especially intelligent computer programs."⁴ The definition by McCarthy does not independently provide a definition of AI rather it states the goal of AI, which is to develop machines that behave as though they were intelligent. Elaine Rich has aptly described AI as the study of how to make computers do things which, at the moment, people do better⁵. AI is now moving towards making autonomous machines which could perform tasks which are currently exclusive to human beings.

Now the question arises what is intelligence? According to R Sternberg, "Intelligence is the cognitive ability of an individual to learn from experience, to reason well, to remember well, to remember important information and to cope with demands of daily living"⁶. "Anything can be called intelligent if it has general ability to learn, process and

²Swapnil Tripathi and Chandni Ghatak, Artificial Intelligence and Intellectual Property Law, 7 CHRIST UNIVERSITY LAW JOURNAL, 83, 84 (2017).

³Ana Ramalho, Patentability of AI Generated Inventions: Is a Reform in Patent System Needed? SSRN (Aug. 5, 2019, 11:32 AM), <https://dx.doi.org/10.2139/ssrn.3168703>.

⁴Beatriz Guillen Torres, The True Father of Artificial Intelligence, Open Mind (July 15, 2019, 2:05 PM), <https://www.bbvaopenmind.com/en/technology/artificial-intelligence/the-true-father-of-artificial-intelligence/>.

⁵ELAINE RICH, KEVIN KNIGHT & SHIVASHANKAR B NAIR, ARTIFICIAL INTELLIGENCE 3 (3 ed. Tata McGraw Hill Education Private Limited 2010).

⁶STEPHEN LUCCI & DANNY KOPEC, AI in 21st CENTURY: A LIVING INTRODUCTION 5 (2 ed. Mercury Learning and Information 2016).



solve problems in normal course⁷. Intelligence is the computational part of the ability to achieve goals in the world⁸. We measure another person's intelligence by conversing with them, posing questions to them and observing their responses. AI is the art of making machines act as if they are intelligent. It means that machines perform those tasks which require intelligence when performed by humans⁹. Since the machines lack conscience, hence the word 'Artificial' is attached with intelligence to denote intelligence displayed by a nonhuman entity. But since machines do not have a conscience, how can we say that a machine is an intelligent machine? Alan Turing tried to answer this question by defining machine intelligence in operational terms by applying 'Turing Test'. According to this test a human interrogator will sit in one room and two participants, one machine and other human in another room. The interrogator will ask questions to both of the participants through computer and the participants shall answer the questions through computer only, eliminating the chances of determining identity of the participants through voice or handwriting. The interrogator has to identify on the basis of the responses of the participants which one is machine and which one is a human. If the machine is successful in deceiving the interrogator, it passes the 'Turing Test' and would be considered as an intelligent machine¹⁰. AI is largely focused on simulating human intelligence and applying it for problem solving. The World Intellectual Property Organization (WIPO) has considered AI systems as learning systems, machines that can become better at a task typically performed by humans with minimum or no human intervention¹¹.

III. INVENTIVE AI

The advancement AI has taken machines from being a mere tool for creation to an important contributor towards creation. AI machines are being used by the medical community for drug discoveries. Microsoft is working on a machine called 'Hanover' which will store all the data related to medicines used for cancer treatment and by using all the data will help in predicting the amalgamation of drugs that would be more efficacious for the diagnosis of individual patient¹². These machines are called inventive AI, which produce new creations with minimum or no human intervention. We will look into two prominent inventive AI machines which have been contributing towards creating new inventions.

The "Creativity Machine" created by Dr. Stephen Thaler has been generating autonomous creations since 1994. This machine "came to the closest yet to emulating

⁷Prof. Dalwinder Singh Grewal, A Critical Conceptual analysis of Definitions of AI as applicable to computer Engineering, 16IOSR-JCE 9 (2014).

⁸John McCarthy, what is AI, STANFORD (Jul. 27, 2019, 11:16 AM), <http://jmc.stanford.edu/articles/whatisai/whatisai.pdf>.

⁹Raymond Kurzweil, What is AI Anyway? 73 AMERICAN SCIENTIST 258, 262 (1985).

¹⁰STUART RUSSELL & PETER NORVIG, ARTIFICIAL INTELLIGENCE: A MODERN APPROACH 5 (Prentice Hall, Englewood Cliffs 1995).

¹¹WIPO Technological Trends 2019, Artificial Intelligence, WIPO (Jul. 20, 2019, 4:33 PM), https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf.

¹²Prashansa Agrawal, AI in Drug Discovery and Development, 6 JOURNAL OF PHARMACOVIGILANCE 1 (2018).

the fundamental neurobiological mechanisms responsible for idea formation.¹³ The machine has an artificial neural network which is a collection of on/off switches that automatically connect themselves to form software without human intervention¹⁴. The machine is first being fed a large amount of data and the artificial neural network will automatically work out which data is useful which is not in creating a new creation. Dr. Thaler exposed the machine to his favorite music and the machine went on to create eleven thousand new songs in a single weekend¹⁵. Not only music, the machine also generated the design of cross bristle design of Oral-B cross action toothbrush.

Another example is IBM's Watson of Jeopardy! fame. It created headlines when it defeated former Jeopardy! winners Ken Jennings and Brad Rutter on the show in 2011. The game show is a quiz competition in which participants are provided general knowledge clues in form of answers and the participants have to phrase their responses in form of questions. What makes special is that it has capacity to store 200 million pages of contents and when asked a question it would analyze it by using more than 100 algorithms and after finding possible answers it would evaluate the best possible answers by using million logic rules¹⁶. Now IBM has decided to put Watson to more productive uses including healthcare and drug discovery for cancer. It has stored millions of data and by analyzing these data in couple of minutes, it will provide therapy alternatives for a single patient based on the type of cancer it has.

IV. IMPLICATIONS OF AI CREATIONS FOR PATENT SYSTEM

The above examples show the potential of AI and how AI driven machines could not only contribute in the development of a country's economy but could also generate inventive output which could be utilized for the betterment of the society. However, AI creations have created ripples in the traditional paradigm of patentability. This new technology has posed new challenges to the patent system which calls for a brief analysis of certain issues which are relevant from patent perspective.

(A) Inventorship of AI creations

The patent system provides a limited monopoly over the invention to the inventor. The inventor is the owner of the patent rights and if inventor is not disclosed then patent may be held unenforceable. The issue with inventive AI is that if a machine is generating an independent creation, can the machine be called an 'inventor' and who will own the rights of patent in AI creation. Section 6(a) of the Indian Patent law allows patent application by any person claiming to be the true and first inventor of the invention¹⁷. Similarly, under the US law inventor is defined as an individual who invented or

¹³Imagination Engines, what is the ultimate idea,Imagination-Engines (Jul.17, 2019, 9:27 PM),<http://www.imagination-engines.com/>.

¹⁴Ryan Abbott, I Think Therefore I Invent: Creative Computers and the Future of Patent Law, 57 B.C.L. Rev. 1079, 1084 (2016).

¹⁵Tina Hesman, Stephen Thaler's Creativity Machine, Free Republic (Aug. 5, 2019, 5:47 PM),<http://www.freerepublic.com/focus/f-news/1073587/posts>.

¹⁶Katherine Noyes,It's (not) Elementary: How Watson Works, Network World, (Jul. 28, 2019, 9:30 PM), <https://www.pcworld.com/article/3128401/its-not-elementary-how-watson-works.html>.

¹⁷Indian Patent Act 1970.



discovered the subject matter of the invention¹⁸. It can be safely said that the word 'inventor' is presumed to be a person or an individual. In the case of *Diamond v. Chakrabarty*¹⁹, which actually expanded the subject matter criteria for patents in US, the court observed that "anything under the sun that is made by man is patentable". The reason for such an approach was to make sure that invention remain under the control of that individual who has actually conceived it rather than in the hands of a legal entity like a company because people conceive not companies²⁰.

The inventor is a person who actually "conceives" of an invention, that means some mental application goes into it. In *Townsend v. Smith*, the word conception was described as "a formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is therefore to be applied in practice."²¹ The invention must reveal the flash of creative genius, not merely the skill of the calling²². Such forms of idea can only come in human minds alone. However, the US patent law was changed in 1952 and the mental act requirement was done away by adding the following words in 35 U.S.C. 103 "Patentability shall not be negated by the manner in which the invention was made." The lawmakers indicated that what matters is the advancement of science or useful arts achieved by the invention, not the inventor's mental process²³. It is obvious that lawmakers would have not in mind the AI development which could take place in future but this came as a blessing in disguise for AI creations, especially for those who advocate for including inventive AI under the ambit of inventor. But still, the legal position is far from clear. Giving inventor status to inventive AI could incentivise the scientists and could motivate further research and development in these machines leading to benefit of the society. On the other hand, it is argued that AI does not require patent protection because there are certain non-economic incentives like recognition, scientific curiosity which are enough to motivate research in this area. AI machines require a huge amount of investment in terms of resources and only a handful of big corporations are capable of providing that. Patent protection to AI creations could lead to monopoly of patent rights in the hands of these big corporations.

(B) Ownership of Patent Rights in AI Creations

Even if we assume that an inventive AI is eligible for patent, in whom the rights of patent will vest? The machine is incapable of holding the rights simply because it not considered as a legal entity. Also, the AI machines presently don't have the capability to exercise the rights autonomously. Another argument against giving inventor status to inventive AI is that it would fail to provide any incentive to the machine. The AI machines till now have not reached the level of emoting, and therefore patent incentive would be of no use to them. Instead of machine, therefore the ownership of the rights

¹⁸35 USC§100(f).

¹⁹447 U.S. (1980).

²⁰New Idea Farm Equip. Corp. v. Sperry Corp. 916 F.2d 1561,1566 (1990).

²¹36 F.2d 292,295 (1929)

²²Cuno Eng'g Corp. v. Automatic Devices Corp. 314 US 84, 90-91(1941).

²³Helen Li, Can a Computer be an Inventor, BILSKI BLOG, (Jul. 23, 2019, 10:47 AM),<https://www.jdsupra.com/legalnews/can-a-computer-be-an-inventor-11706/>.

must be vested in a human entity who could use these rights effectively. Another way is to make machine a joint inventor, vesting the ownership of the rights in the person jointly associate with it.

Now the question arises whether the owner of the machine will own the rights or the developer who has programmed the machine's software or the user who is actually giving tasks to the machine. If we take the user as the owner of the patent rights, it could turn out to be problematic. For instance, IBM's Watson is capable of interacting many numbers of users at the same time and IBM has made it available to medical sectors also. If Watson invents under the control of a user, then by the rule the user will become the owner of the that invention, which would encourage IBM to restrict user access²⁴. While on the other hand if the ownership of the invention lies with IBM, then it would be motivated to grant more access to others. So, it is preferable to vest patent rights in the owner of the AI machine rather than the user of that machine. There are chances that this could lead to greater consolidation of patent rights in the hands of big corporations, but the benefits derived by it may outweigh the cost of such outcome²⁵.

Similarly, in case of developer also, the patent ownership right is better in the hands of owner of the machine rather than the developer of the software. The reason being that owner assignment would provide a direct economic incentive for developers in the form of increased consumer demand for creative computers. Having assignment of rights in favor of developers would interfere with the transfer of personal property in the form of computers, and it would be difficult for the developer to monitor inventions made by the machines they no longer own.²⁶ However, the developers provide a strong case for joint inventorship provided that they have been working towards the same end. A developer who merely wrote a general-purpose code would not be considered as an important contributor towards the claimed invention. Instead, they would merely have contributed a tool used by others to generate such contributions themselves²⁷. They must have the idea of what specific end their software would be used to work to claim joint inventorship. But this approach may not be uniform in all the patent systems. In the EPO conference held in Munich in 2018, it was agreed that 'user' meaning the programmer, developer or implementer could be the inventor in case of AI generated inventions²⁸. Since the personhood of computers is still not on the horizon, it is better to confine inventorship to humans only, even if an AI creates an invention autonomously.

(C) Liability Issue

Given the speed by which we are moving towards creating autonomous AI which can create on its own, the issue of liability in case of patent infringement by AI will surely

²⁴Ryan Abbott, I Think Therefore I Invent: Creative Computers and the Future of Patent Law, 57 B.C.L. Rev. 1079, 1115 (2016).

²⁵Id. at 1119.

²⁶Id. at 1116.

²⁷Ben Hattenbach & Joshua Glucoft, Patents In An Era Of Infinite Monkeys and Artificial Intelligence, 19 STAN. TECH. L. REV. 32, 49 (2015).

²⁸European Patent Office, Patenting Artificial Intelligence, Conference summary 30 May 2018, Munich, EPO (Aug. 2, 2019, 12:43 PM), https://e-courses.epo.org/pluginfile.php/23523/_mod_resource/content/_2/Summary%20Artificial%20Intelligence%20Conference.pdf.



pose a challenge to the patent system. As we have seen, inventive AI requires only minimum assistance by humans and it produces a unique product on its own. An AI machine created by Dr. John Koza which he calls as 'inventive machine' has already created independent invention on its own in which there are instances where it has duplicated or infringed an already existing patent²⁹. There will be situations like these where the AI would create something which infringes the rights of an existing patent holder then question arises that who will be held responsible for the actions of AI? Currently, the patent system does not recognize non-human entity as an infringer. If we go by this practice, then most likely the owner or the user in few cases of the AI would be held liable for the infringement. But to what extent the liability would go? Since human intervention is limited to exposing the machine to already existing knowledge, any result which is autonomously being derived by the AI machine by using machine learning and various other logic algorithms is out of control of the owner of the machine and therefore tracing liability back to the owner would prove really difficult.

One way to resolve this issue is by applying the 'absolute liability' principle where in case of any potential infringement of patent by an AI machine, the owner will be held responsible. This principle may solve the liability issue, but it could seriously hamper the research and development in inventive AI machines where the companies would not be willing to invest in AI due to the risk of absolute liability, leading to a stagnation of innovation in this field which has the potential to transform the society. On the other hand, if there is a failure to identify infringer then it would encourage patent infringement through AI which would be against the interest of the patent holder as well of the society. The European Parliament Resolution on Robotics³⁰ provides some helpful guidance in regard to liability issue. The resolution explains that today, AI cannot be held liable and liability has to be traced back to a human agent which could be the owner, user or the developer if they could have foreseen and avoided the infringement. Their liability should be proportional to the actual level of instructions and training given by them to the AI machine. The greater a machine's learning capability and training, the greater the responsibility of its owner should be³¹. But the speed by which development is taking place in the AI field especially in cognitive and autonomous feature, the liability issue calls for a detailed look. The resolution suggests for a comprehensive insurance scheme where the patent infringement could be covered in cases where there was no part of a human agent. The resolution also acknowledges the fact that in future, AI may have to be clothed with legal personality, making it liable for its actions. The liability issue has surely made one thing clear that for a truly autonomous AI, the traditional rules may not suffice to give rise to legal liability for damage caused by an AI, since they would not make it possible to identify the party responsible for providing compensation³².

²⁹J.R. Koza, Human Competitive Results, (Aug. 5, 2019, 8:25 PM), <https://doi.org/10.1007/s10710-010-9112-3>.

³⁰European Parliament, European parliament resolution on civil law rules on robotics adopted on 16 Feb 2017, EUROPEAN PARLIAMENT (Aug. 9, 2019, 7:32 PM), http://www.europarl.europa.eu/doceo/document/TA-8-2017-0051_EN.html?redirect#title1.

³¹European Parliament, supra note 30.

³²supra note 1.

(D) Prior Art and Inventive AI

Prior art is an important threshold which a patent applicant has to fulfill to make sure that his invention is novel. An invention would be part of prior art if it was publicly known, used or was published to the public before the filing of the claimed invention³³. Any document which is in public domain and there is unrestricted public access to it would come under the ambit of prior art. Now the issue here is whether AI generated claims could be considered as prior art? A patent applicant is presumed to be well versed in prior art related to their invention. For the purpose of determining non obviousness also, the applicant is presumed to be aware of all the pertinent prior art.³⁴ But the amount of information generated by AI is huge which cannot be expected to be read by a human being in his lifetime. This problem is mitigated in part because the applicant is required to know only about those prior art which are related the field of his invention. Bur even if we restrict the scope of prior art, the information is so huge that it becomes really difficult to filter relevant information and go through each of such information³⁵.

The amount of information generated by AI is enormous and since these machines are connected to the web, it results in cluttering of the internet with useful as well as irrelevant date which could pose a serious challenge in determining what is relevant and what is not from the view point of prior art. This could lead to rise in defensive publication, in which an entity discloses and disseminate an invention to the public as prior art to prevent its competitors from filing patent on the same invention, forcing them to narrow their claims, raising the bar for obtaining patent. Lowering this threshold of prior art would be harmful for the society as it would lead to patenting of knowledge already existing in the public domain, which would go against the principles of patent law. On the other hand, it is unrealistic to expect a human to have all the information analogous to his invention in the age of internet and AI which is creating date by combining many fields of knowledge at the same time. The possible solution to this issue would be to emphasis on the quality of the information generated by AI not the quantity. The manner of online publication and the ease of locating such information shall also serve to improve the quality of prior art information. Adding useless data would dilute the set of actual public knowledge which could eclipse the genuinely useful information leaving society worse off³⁶. The distribution of quality information on the other hand would enrich the existing pool of knowledge benefitting the society. Only those autonomous AI generated information which is relevant for the case in hand and is analogous to the claimed invention shall be qualified as part of prior art.

³³35 USC§102(a), Indian Patent Act 1970 sec. 64(e).

³⁴Custom accessories vs Jeffrey Allen industries F.2d. 955,962 (1986).

³⁵Ben Hatten bach & Joshua Glucoft, Patents In An Era Of Infinite Monkeys and Artificial Intelligence, 19 STAN. TECH. L. REV. 32, 40 (2015).

³⁶Ibid.



V. CONCLUSION

Patent law is unique in the sense that it is a meeting point of science and law. It presents a harmonious relationship between science and law. However, the patent system currently is experiencing growing pains in this era of AI. The speed at which the technology is advancing, it becomes imperative for patent system throughout the globe for a relook at the traditional principles of patent system. It is an undeniable fact that AI generated inventions will become more and more visible in coming future leading to rise of more complicated issues for the patent system. There is a requirement for a concerted effort globally to deal with such issues posed by AI and to equip international instrument like the TRIPS to provide for a common guideline for dealing with the issue of inventive AI. It is important that patent system must be adequately equipped to deal with future technological advancements like AI so that the interest of the society and the motivation for innovation for an individual remains balanced. This requires a dynamic approach in law to accommodate changes necessary to further the interest of the society. Some of the issues discussed can be resolved under present patent system but that does not mean that the future issues could also be resolved within the existing patent system. The patent system including the judicial set up is also need to be appraised with sufficient knowledge and resources to deal with AI generated inventions and how they should be treated under the patent system.