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Do Artificial Intelligence-created Inventions qualify for Patent Protection?

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Abstract. Artificial Intelligence (AI) is a modern concept that was first conceptualized in the 50s but its practical approach can only be made possible with the advancement of the present-day technology. The field of AI is growing at a rapid pace and encompassing greater areas of human life in terms that we never even thought of, from transforming the businesses to revolutionizing the way humans interact. It was truly held by Klaus Schwab that AI will bring the Fourth Industrial Revolution. The amount of data and algorithms used to teach a computer to perform a certain task is unimaginable and this is where the AI or machine learning start to behave and think like humans. AI has produced and will produce creations that will lead to greater economic growth and make a country even more technologically advanced. The COVID-19 pandemic has shown the power of having a technological edge and to keep an environment of innovation and creation we need to give this technological innovation some degree of protection. A patent right is a powerful tool which in the past has given us the solution to protect the inventions and, in the future, it is no doubt that AI will create innovations that are patentable which can be granted the patent protection. Some AI and machine learning processes generate patentable innovation and be given patent protection. Granting patent protection will create a constructive culture of innovation with the sense of security for the developer and owner of the AI. The present paper discusses various aspects that can be taken into considerations while looking at AI or computational innovations. AI will remain in our lives and its involvement will increase over time. There is a need for serious discussion by the policymakers, Patent Office and courts on the patentability aspects of some AI creations. Taking inspiration from the available literature and cases this paper argues that AI invention should be considered for patent protection under the current patent legal regime with greater degree of regulations. By acknowledging the AI inventions and its patentability criteria the law-makers would incentivize the creation of intellectual property by encouraging the development of Artificial Intelligence created innovations that will help businesses and raise the standard of living. The present paper has

delved into the different AI features that lead to the creation of patentable innovation like humans-inventors and also tried to answer the various legal questions related to the AI inventorship among AI and humans. Then the paper talks about the legal implications of AI-created inventions and who could become the owner of AI among different stakeholders such as developer, user, data suppliers, investor and owner. AI patentability can create human-like inventions but their regulation should be different from human inventors, therefore, the paper also argues about the re-considering of the patentability test while determining the AI produced patent applications. The paper will highlight all these issues and how we can fill those gaps to provide a healthy environment for AI inventions. The paper is presented with the Indian patent laws in focus but help is being taken from US laws and cases wherever needed to support the research. The author has also made some recommendations which can be looked upon while considering the AI produced patent applications.
Keywords: Artificial Intelligence, Patent Law, Ownership Rights.

Introduction

Artificial Intelligence (referred to as AI) technology can be termed as the best or the worst creation by the humankind (MacDonald, 2016). In today's troubled and uncertain future this statement by Stephen Hawking holds great relevance as AI can lead to the advancement of the human race or it can destroy the same by taking over human functions. AI will lead to tremendous economic growth by its creative output and continued & faster computer power inventions. It is not naive to say that in the foreseeable future AI and computer & machine learning will replace humans as primary source of inventors and creators. This rapid technological growth possesses new challenges to the traditional patent law and patentability. Under various circumstances AI and computer software are generating patentable subject matter which satisfies the requirements of invention under current patent laws unlike human inventors. This generation of innovative products and processes can also be termed as 'computational invention' (Abbott, 2015). But it is doubtful to consider AI as an inventor or consider the invention as patentable (Clifford, 1997, p. 1681). Around the world and in different jurisdictions there is not a single statute which talks about AI invention or any precedent directly related to the subject or any considerate policy by Patent Offices (Glucoft, 2015, p. 44). It is pretty clear to the court and Patent Offices around the world that the current legal system and regulations needs reevaluation and new solutions rather than continuing insufficient framework (Deplorer, 2014, p. 1491). Inventors have ownership rights in their patents, and failure to list an inventor can result in a patent being held invalid or unenforceable (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1080). This paper tries to focus on how Patent law needs to adapt to the changing scenarios which will be led by the AI

invention of products and processes. This paper will also focus on whether AI inventions should be patentable or not.

We are already living in an era of self-driving cars, autonomous weapons, drug synthesis, disease identifications, medical symptom analysis, and investment advisory tools, as well as many other automated processes (Liu, 2018, p. 2219). Some other products such as face recognition in smartphones or answering machines have already become a part of our daily life (Scherer, 2016, p. 354). It is believed that what humans could not do in the past 1000 years, the AI has the capacity to do that in a few minutes. AI has truly taken us in 3A direction of an advanced, automated and autonomous world. Soon computers will be routinely inventing, and it may only be a matter of time until computers are responsible for most of our innovation (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1080). This paper will try to answer many questions such as does AI generate patentable inventions, if yes then can it be dealt with the current patent regime.

The research has been carried out primarily with the help of a comprehensive literature survey of available commentaries, texts and case laws. In addition, in order to give the study a wider perspective, wherever possible the legal regime in India has been compared with the regimes in other jurisdictions, namely the US to answer the question which the title of this paper presents.

Part II of the paper tends to focus on the AI's ability to produce and create inventions on their own or with the help of human assistance. There are at least five features which assist AI in creating inventions that are also needed for any human inventor to produce patentable inventions. the author contends that these five features give an AI human like status which qualify for AI patents.

Part III of the paper talks about the need for an inventorship to AI inventions to make them eligible for patent protection as without disclosing the inventor the patent cannot be granted. It further discusses whether inventorship should be given to an AI or a human or whether there can be a case for joint inventorship.

Part IV of the paper tries to find out the legal implications of the AI patents where the author had tried to answer who will own the patent created by an AI among the different stakeholders such as developer, user, data suppliers, investor or the owner of the AI. Also, if there can be a contractual basis for determining the owner of an AI patent.

Part V of the paper delves into the re-thinking of the patentability test while determining the AI patent application as too strict or too loose regulations which harm the

culture of innovation. The author contends that the test which determines the patentable invention needs to be strengthened while analyzing AI patent application.

Lastly, the author has given certain recommendations w.r.t., Indian Patent Laws which can be taken into consideration while looking at the AI patent application or AI patentability. The paper concludes with the final summary of the research where there is a need to give serious thought about the inventorship capability of the present or future AI as there will be a time where AI will create inventions.

Does AI Create Inventions?

To understand and to give patent protection to the AI innovations, we first need to understand the intelligence of AI to create products and processes which classify as patentable material, had they been created by the human inventor. AI cannot be defined or confined to a particular type of definition as there are many kinds of AI system which are based on different types of definition. Unfortunately, no widely accepted definition of AI exists, even among experts. But there is consensus among all the definitions which tend to focus on human functions such as the *ability to learn, consciousness and self-awareness, all of which are difficult to classify* (Scherer, 2016, p. 360). Even John McCarthy who first coined the term did not give any concrete definition or exhaustive list which can be considered as an AI, that can also include thinking like humans or rationally acting like them. An Artificial Intelligence system can be defined, based on its features, as one capable of performing tasks that normally require human intelligence, such as recognition, decision making, creativity, learning, evolving and communicating (Norvig, 2013, pp. 2-14) and an AI system is intelligent because it has creativity and knowledge as well as certain skills: problem solving, pattern recognition, classification, learning, induction, deduction, building analogies, optimization, surviving in an environment and language processing (Hutter, 2005, pp. 125-126) . For patent law consideration one is required to have an intelligence by which an individual can create an invention which can be patented, therefore the most appropriate definition could be "machines that are capable of performing tasks that, if performed by a human, would be said to require intelligence" (Scherer, 2016, p. 363).

There are at least five important features of AI systems that create new challenges to intellectual property law (Liu, 2018, p. 2226) more specifically patent law. Of all the AI products and processes in the world some or all of these features are present in one way or another. The AI system which involves these five features includes robots and computer software, which not only solve compound mathematical and technological problems but also generate inventive products & processes themselves. Each of the features has its own specific characteristics and functions but sometimes they tend to overlap in the AI system. This paper contends that all of these features are the driving

force behind the *3A era of advanced, automated and autonomous AI systems* (Liu, 2018, p. 2226) to create inventions through complex techniques which would be patentable if generated by human inventors.

1. Innovative – AI systems have the capacity to create and generate innovative product & processes and can also tremendously increase the capabilities of the existing ones. With the feeding of new & present data to the AI system, the reproduction capacity increases which creates new inventions on its own or with the human monitored system can create specific products & processes to cater to the existing or future needs. AI systems and computer-based AI software can invent and can draw, create designs and even produce inventions such as drugs and technical devices (Hutter, 2005, p. 231). Innovation and inventive process is one of the distinguished features of the AI system. Therefore, this feature is pivotal in the study of intellectual property considerations and most specifically to the granting of patentable invention protection to the AI system.

2. Unforeseeable Outcome – Another feature of AI systems is that sometimes the results which its produces are unimaginable by its user, owner or developer which can be seen by the patents granted to Dr. Thaler's 'Creativity Machine' which produced the results which were not foreseeable by its owner. The Creativity Machine is able to generate novel ideas through the use of a software concept referred to as artificial neural networks—essentially, collections of on/off switches that automatically connect themselves to form software without human intervention (Thaler, 2014, p. 75). The algorithms on which AI systems are based, is capable of creating random mutations that leads to an unimaginable process or way to find an optimal outcome which ultimately results in unforeseeable outcomes. The large amount of data collected and processed by the AI system, which are mostly target-oriented, can generate products or processes which are not anticipated by the user, owner or developer. The author contends that this unpredictability needs to be given patent protection in order to advance research & development (R&D) which can eventually be helpful to the needs of an industry or society or to the whole of the human race. Not affording the protection can lead to harmful results both to producers and also to the consumers at large who can be deceived if the product remains in public domain without patent protection. AI systems that work on developing new and innovative antibacterial drugs can process data from a large volume of microorganisms (i.e., bacteria), "break" the data into tiny (sometime nano) components and find similarities and patterns that the human involved has not observed and cannot identify, resulting in new and unexpected structural information for drug development (Hunter, 1995, p. 70).

3. Autonomous Creation – This is an important feature of AI generally to understand how the patent protection realm is needed for AI systems. It is difficult to define an autonomous AI system as it varies from industry to industry depending upon its

applicability in a particular industry or segment but there is some general characteristic associated with the AI autonomy. AI autonomy is based on the relevance of independency and innovative capacity. We can say that a device is independent and therefore autonomous to the extent that it accomplishes a high-level task on its own, without external (human) intervention (Weber, 2016, p. 39 & 40). The key to any autonomous system is its ability to perform certain tasks on its own without the assistance of any other entity and in case of AI without the assistance of human entities. Human intervention can occur in many phases of the process—observation, orientation, deciding and acting (OODA), resulting in different levels of independence (McNeil, 2013, pp. 1143-1149). Autonomy is greatly based on the thinking ability or cognitive capacity of the AI. With increase in cognitive capacity the AI system becomes more autonomous. Increased autonomy demands greater protection for the AI system and also for the creator of AI. When acting autonomously AI can generate and create innovations in the process which when identified by the human entity (whether owner, user, developer or creator) will lead to patent protection. The role of humans is important to identify the inventive product, to have its industrial application and also to file patent protection applications. The author does not contend to afford patents to AI systems but rather than to give that protection to the human involved in the process of creation. As AI is the ultimate creation of humans and they should be rewarded for their time and money and AI does not need any incentive to innovate.

4. Intelligent Thinking – Like humans the AI system is also capable of thinking rationally and intelligently in a given state of circumstances. An "intelligent machine" means a rational system that perceives data from the outside world and decides which activities to engage in or avoid to maximize its probability of success in achieving a certain goal (Norvig, 2013, p. 27). AI systems can solve problems by using features such as learning, induction, deduction, building analogies and optimization as well as using knowledge (Hutter, 2005, p. 231). This human-like cognitive skills and intelligent behavior makes them eligible for patent protection of their invention. This intelligence makes AI systems eligible to form abstract ideas, create inventive steps and develop the product or process which seems to be an invention just like a human inventor.

5. Result Oriented – The user or creator or developer fed large amounts of data to the AI system to get a preconceived result. Innovative AI has the tendency to arrive at that result among different alternatives with minimum time to achieve best output. Thus, AI systems can be said to be result oriented when a particular task is given to it by a human entity. Specific AI systems implemented in driverless cars process data in order to choose from different alternatives and decide on routes, speed and accident avoidance (Brock, 2015, pp. 770-773). AI has the capability to achieve a particular result when it is instructed by its owner or user or developer or creator with all the available data to create a particular invention then that final product or process can be

considered as a patentable invention under patent law. Therefore, AI systems with result-oriented algorithms that create inventions which have been created by humans will be considered as patentable creation.

Various kinds of AI systems & software have all or some of the above five characteristics in a certain way. These five features can be said to create the advanced, automated and autonomous AI system and software. These features allow AI systems to create and invent products and processes which would be worthy of patent protection had they been developed by humans (Liu, 2018, p. 2230). The current patent protection regime is lacking in giving protection to this invention when we understand that AI systems have the tendency to create independent and innovative output which are worthy of protection, specifically patent protection.

AI systems have become valuable for solving specific problems and now promise to improve specific human skills—not only accuracy, velocity and capacity to process vast amounts of data but also creativity, autonomy, novelty and other features that establish patentable innovations (Liu, 2018, p. 2231). Therefore, these are important considerations for the AI and Patent Law in the modern technology driven world where the society and nations will benefit from AI created inventions.

Artificial Intelligence Inventorship Under Patent Law

The need for inventorship is mandatory for the grant of patent. Under various Patent Law legislations in different jurisdictions the grant of patent requires that the patent application discloses the inventor of that patent which should be a human entity and not a juristic person such as company or corporation[1]. Inventors own their patents as a form of personal property that they may transfer by "assignment" of their rights to another entity[2] and in the US itself organizations own at least 93% of the granted patents rather than the human inventors. The grant of patent gives a very powerful right to the inventor who has the power or right to exclude any other person from using, selling, making, or offering for sale that invention throughout any specified geographical region set out by the respective patent legislation[3]. In case a patented invention has multiple owners then each of such patentee, unless a contractual agreement to the contrary is in force, has the right to use or exploit that patent without the

[1] *See* Indian Patent Act 1970 § 6, and 35 U.S.C. 1952 § 100(f).
[2] *See* U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE, § 300 (9th ed. Revision 7, Nov. 2015).
[3] *See* Indian Patent Act 1970 § 46 & § 48 and 35 U.S.C. 1952 § 154.

consent of other[4]. While considering the Patent Law protection for AI system inventions, all the above stated provisions and principles are necessary to be kept in mind for practical and theoretical purposes as inventors of the patent have ownership rights in the patented invention and not disclosing the true and legitimate inventor can result in failure of grant of patent protection to the inventions and render them invalid. Therefore, these issues are necessary to be addressed to effectively deal with AI inventions and innovative product & process.

In the patent law jurisprudence, the most basic concept for a person to be an inventor then he/she must contribute to the conception of the invention, in other words, the person should have come up with the abstract idea for that invention. Conception refers to, "the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice (Townsend v. Smith, 1929, p. 295)" as well as "the complete performance of the mental part of the inventive act" (Townsend v. Smith, 1929, p. 295). After that the subject matter of the invention should be able to be reduced into practice by the person of ordinary skill in the art. Reduction can be done by the inventor by actually making the working model of the invention or by explaining in writing by the inventor so that it can be comprehensively understood by the person of ordinary skill. This is done so because the invention created by the AI should be explainable in ordinary language and should also be capable of industrial application[5] which is also one of the requirements for the grant of patent protection. Individuals who simply reduce an invention to practice, by describing an already conceived invention in writing or by building a working model from a description for example, do not qualify as inventors (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1094).

The inventor should participate in the conception of an invention is crucial to the patented invention. This aspect can block the way for the AI invention where the AI system or software creates the invention without the initial conception of the idea. This happens in systems where AI generates material without supervision by the human entity. The instances can be where AI systems may assist the human inventor to reduce an invention to practice, but the computer is not participating in the invention's conception (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1094). Sometimes AI system and computers takes active role in the creation of an invention like *automated fashion, retrieving stored knowledge or by recognizing patterns of information* (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1094) which should be recognized but fails to get any attention from the law because of AI's ineligibility of having patent

[4] *See* §50, Indian Patent Act 1970.
[5] *See* Indian Patent Act 1970 § 2(1) (j).

protection. AI systems can be classified in two aspects i.e., one where AI assists humans in creation of an invention and another when AI independently creates invention on its own. In both the cases the invention should be granted patent protection and the human entity (owner, user, creator or developer) should be classified as inventor.

Human assistance in AI Invention – The creation of invention by AI systems is not possible or rather incomplete without the role of any human entity. AI has the capacity to function and creates invention on its own but negating the role of humans in this process will lead to many unimagined situations where AI could ultimately supersede humans and could pose a greater threat to human societies at large. Fortunately, in today's world there is no such AI which could completely and independently function on its own without the aid and assistance of humans. For example, before the Creativity Machine composed music, Dr. Thaler exposed it to existing music and instructed it to create something new (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1095). So, without humans the AI cannot invent in the first place and there will be no discussion about the AI inventions. Humans are the vital key to connect AI invention with patent law protection for better regulations with adequate safeguards. AI systems and computers still do not engage in reflection, which is, a software concept that refers to a computer program that can examine itself and modify its own behavior (and even its own code) (Malenfant, 2016). Neither the AI system nor the AI invention could or would exist without the assistance or input of data from human entities, therefore, while considering the patent protection for AI invention the role and contribution of humans needs to be taken account of.

Case for Joint Inventorship – There can be a case for a joint inventorship between human and AI systems. A computer may not be a sole inventor; the inventive process can be a collaborative process between human and machine (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1096). The requirement for such a provision is based on the "quantum of collaboration or connection" (Kimberly-Clark Corp. v. Procter & Gamble Distribution Co., 1992) between human and AI systems. For joint inventorship, "there must be some element of joint behavior, such as collaboration or working under common direction, one inventor seeing a relevant report and building upon it or hearing another's suggestion at a meeting (Kimberly-Clark Corp. v. Procter & Gamble Distribution Co., 1992)." This can be done in cases where humans provide sufficient input in the form of data to the AI system which is needed for the creation of an invention and then the AI system using that input, built upon the final invention which is then recognized by the human. This way the Patents can be issued and both can be classified as joint inventors or co-inventors. Leaving AI aside, invention rarely occurs in a vacuum, and there are often joint

inventors on patents (Manchikanti, 2013, p. 169) and also, it is not necessary that the inventive concept come to both the joint inventors at the same time (Moler & Adams v. Purdy, 1960, p. 279). This can remove another barrier to AI inventions and can be helpful in encouraging the development of AI inventions where humans also have some incentive to create better inventions.

Legal Implications of AI Patents: Who can be the Owner

The AI system can and will invent and there is a need to recognize them under the current patent protection. The question which now needs to be answered is who will own the AI invention, in technical terms, who will be the Patentee of AI system patent invention. AI and computers cannot own property, and it is safe to assume that "computer personhood" is not on the horizon (Winkler, Corporate Personhood and the Rights of Corporate Speech, 2007, p. 863). This issue possesses a great challenge for the recognition of AI invention as who will get the ultimate benefit from such a powerful monopolistic right. This scenario presents multiple aspects for ownership who can be considered as Owner such as AI's owner, AI's developer, AI's user, Data Suppliers or Investor (who funded AI projects). These are various stakeholders with different interests depending upon their contribution.

a. Developer or Programmer – for any AI system in the world the foundation of its development is laid down by the developer or programmer who writes the particular code or algorithm which results in the creation of AI. The software, based on which AI was developed, is behind the creation of invention by AI. Without the initial programming by the developer the AI could not even come into existence and hence, there also cannot be any kind of AI invention which needed patent protection. As the first developer or programmer of AI, they can be considered as the owner of AI invention but the problem arises when the AI is given to its owner for practical use which then may upon the instructions of the owner create the innovative product or process and the developer is not involved in the whole process. So, a developer or programmer can be considered as owner but the author contends that they do not seem to appropriately fit into the AI invention ecosystem.

b. User – it is the person who finally uses the AI system developed or created by the developer or programmer. AI user is important for the simple reason as user maybe the person who determines the invention created by AI or can give the inputs for the creation of AI invention as pre-determined by the user. It is simple logic to consider user the owner based on its contribution it has but this is not the case and it has some legitimate complication that render its ownership right. Consider the example of IBM's AI "Watson" which was first introduced to the world in the TV game show

Jeopardy (Best, 2013). IBM has made Watson available to numerous developers without transferring Watson's ownership (Upbin, 2013). To the extent that Watson creates patentable results as a product of its interactions with users, promoting user access should result in more innovation (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1116). The reason behind lending Watson to different users and developers was to provide access to modern AI technology and how AI (Watson) can engage in multiple tasks from winning game shows to cooking food with different taste and styles. The end user can perform various tasks that may result in patentable innovation but it does not seem feasible to assign them the ownership rights. If Watson invents while under the control of a non-IBM user, and the "default rule" assigns the invention to the user, IBM might be encouraged to restrict user access; in contrast, assigning the invention to IBM would be expected to motivate IBM to further promote access (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, pp. 1116-1117). Therefore, user might not be the best person to be considered as an owner.

c. Data Suppliers – for an AI to become truly intelligent the foremost requirement is to feed the large amount of data which the AI system can process to learn and execute that learning in making of product or processes. The next phase in the invention process is "exposing" the AI system to data that the system exploits to "learn" how to function and to achieve its goal efficiently (Liu, 2018, p. 2235). The role of data suppliers is usually undermined and not looked upon while discussing the AI system. Data Suppliers are needed to teach the AI that helps AI to learn about the existing product and process. Without the huge amount of data, the AI cannot function and perform the task of intelligence and learning. For example, in case of Facial Recognition, the supplier provides the system with millions and billions of datasets of people's pictures in various forms with different facing directions. But the problem arises while assigning ownership rights is how to identify who the true data supplier is or was. In many cases the data supplier is not one or two persons but actually the millions of persons who are using a particular app like Google's product Google Translate which uses its user as data suppliers, which can make the whole process very complicated. So, data suppliers are also not the correct choice while granting the ownership rights of the invention created by AI.

d. Investor – this aspect of AI is not even discussed while considering the ownership of AI invention. Like shareholders of a company who put their money into the company, investors are persons who provide an initial boost by investing his/her money in the AI by taking the huge risk. The investors are needed to put the idea of the creator into practical terms. Again, the author contends that investors cannot be considered as owners and risk can be rewarded in the form of monetary return.

Investor does not apply his/her mind for creating an AI which subsequently may create an AI invention. The intellect of an AI creator cannot and should not be measured by investors in the form of money or monetary value.

e. Owner – after highlighting the possible persons who can be considered as owners of AI invention, the author contends that the most appropriate person to be rewarded with ownership of AI's patented invention is the owner of the AI system. Ownership rights to AI inventions should vest in an AI's owner because it would be most consistent with the way personal property (including both AI and patents) is treated in the United States & other jurisdictions and it would most incentivize computational invention (Bridy, 2012), not just in US but in many other countries including India this is the most consistent way of ownership of property. Like in IBM's case, Watson instead of affording ownership to users, it is more convenient to give that right to the owner of AI which can further access the reach of AI to different businesses and persons. If under the control and direction of the user if AI creates any patented invention then both the user and owner can be considered as joint owners of that patent. This way AI's vast reach and owner's right over the property can be ensured. AI was the means through which the user got the end result of a patented invention, therefore, the owner of AI should also be awarded the patent. Similarly, patent ownership rights should be given to the owner rather than the developer of AI. Assigning owner that right would benefit developers only by way of increased demand for AI created inventions. Having assignment default to developers would interfere with the transfer of personal property in the form of computers, and it would be logistically challenging for developers to monitor computational inventions made by machines they no longer own (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1117). The owner assignment should also be based on the role played by them in the creation of an AI patent and not every owner should be awarded that right. Developers can be considered as the one by licensing that AI to the person for a limited term but this way that person becomes the user and not the owner. So, like traditional physical property any profit arising out of that property is considered to be the owner's profit, so, any new product or process created by AI which subsequently gets patent protection should be awarded to the owner with patent ownership.

The above-mentioned persons create many problems while identifying the ownership claim and who should be identified as the true and legitimate owner among various entities. The most sensible and logical way of associating ownership of AI patents could be based on the contractual terms entered between different persons such as developer, user, data suppliers, investor and owners, etc. While negotiating the contract this aspect of patent ownership can be substantially be looked upon by specifically setting out the rights and liabilities of each person related to the AI patent. The

ownership of AI patents also comes with the liability of any wrongdoing or breach done by the AI while performing its task. This again leads us back to our previous contention that owners of AI systems should be regarded as the Patent owner as it is practically the best way to enforce those rights and hold accountable for any breach committed by the AI in the whole process. If the contractual negotiation fails to arrive at any conclusion, then the best way in which the IP right of Patent could be awarded to, are the Owners of AI system.

Reconsideration of the Patentability Tests for AI Inventions

After looking into the AI inventions and the need for patent protection, another area of importance is to look upon the requirement of improved patent test for AI invention. The patent law requires an inventor to show substantially that the invention claimed for patent protection is useful (industrial application), novel (inventive step), non-obvious and sufficiently described in the patent application[6]. These criteria are essential for inventions to have patent protection whether they are made by humans or an AI. The most crucial aspect while studying AI invention patentability is the aspects of subject matter eligibility and non-obviousness of the invention.

Subject Matter Eligibility Doctrine – Section 2 (1)(j) of Indian Patent Act, 1970 explicitly defines the eligibility for patent protection which says any "new product or process involving an inventive step and capable of industrial application" and in US it means "process, machine, (article of) manufacture, or composition of matter[7]". The patent invention must be used for industrial application which does not mean that it has to be commercially exploited. The US Supreme Court has made three exception to patentable subject matter that are *the laws of nature, physical phenomena, and abstract ideas* (Diamond v. Chakrabarty, 1980, p. 309). These exceptions are recognizable in Indian patent law jurisprudence as these are the basic tools of scientific and technological work upon whom all the innovation and scientific advances are based upon. For AI invention, the subject matter eligibility is most closely related to the machine or transformation test. This test has been held to be the threshold for the process to be used for patent eligibility and the same can be used while determining the eligibility of AI invention. AI inventions are ultimately based upon the process through which AI performs and functions. Under machine or transformation test, two requirements need to be fulfilled for patent eligibility i.e., **a).** it is tied to a particular machine or apparatus and **b).** it transforms a particular article into a different state or thing (Bilski v. Kappos,

[6] *See* Indian Patent Act, 1970 § 2(1) (j), 2(1) (ja) & 2(1) (l) and 35 U.S.C., 2000 § 101, 102, 103, 112.

[7] 35 U.S.C., 2000 § 101.

2010, p. 617). Therefore, the AI system's created inventions can be conclusively patentable based on the subject matter eligibility doctrine. This doctrine is sufficient to even deal with the AI inventions and their patentability.

Principle of Non-Obviousness or Inventive Step – This is another requirement for patentability set-out in Sec. 2(1) (ja) under Indian Patent Act, 1970. In US patent law sec. 103[8] The Patent Act talks about the criteria of non-obviousness principle. Both the provisions state that for an invention to be patentable it should contain an inventive step which must not be obvious to the person having ordinary skill in the art (referred to as **PHOSITA**) at the time of filing of patent application. This concept has been adopted in various jurisdictions that being developed as a legal fiction that serve as a reference for determining whether an invention is nonobvious (Lemley, Is Patent Law Technology-Specific?, 2002, pp. 1188-1189). The person cannot claim patentability if PHOSITA has found the difference between new invention and prior art obvious. US Supreme Court in Graham v. John (Graham v. John Deere Co., 1966) had identified four evaluating factors that are: -

i. the scope and content of the prior art;
ii. the skill level of a PHOSITA;
iii. the differences between the claimed invention and the prior art's teachings; and
iv. any objective indicia of non-obviousness, such as commercial success.

Practically, no person would have all the information and knowledge about the applicant's patent but this fiction is necessary and bars the inventions which are based on public knowledge. Stopping obvious variations from being patented is important because that prevents the removal of knowledge from the public domain (Sakraida v. Ag Pro, Inc., 1976, p. 281). Inventions which are obvious to PHOSITA are within the realm of public knowledge. This makes proving patent claims more difficult but that *result is desirable because patents should not be granted lightly given their anticompetitive effects* (Eldred v. Ashcroft, 2003, p. 246). The author contends that AI patentability claims may require the legislators to redefine 'obviousness' and 'PHOSITA' criteria. Inventions by advanced AI systems with creative and non-obvious characteristics, however, have increased processing capacities, widen access to searchable information, and increase efficiency in analyzing information—all of which would merit a patent if a human invented them (Liu, 2018, p. 1120). Considering AI technical advancements and innovation created by it, the non-obviousness & PHOSITA criteria needed to be set accordingly. The bar cannot be set at too high standard because that restricts millions of patentable inventions unworthy of patent protection which ultimately harms

[8] 35 U.S.C., 2006 § 103(a).

and disincentivizes innovations. If the hurdle is too low, a flood of junk patents may cause true inventors to face more infringement lawsuits, which also disincentives innovation (Liu, 2018, p. 1121). Therefore, courts and patent offices have to adopt a more flexible approach on a case-by-case basis which was also held stated in Graham (Graham v. John Deere Co., 1966) case while deciding non-obviousness criteria. There is a greater need now than ever to expand the scope of PHOSITA to effectively judge the content for prior art which can be done for example by employing Watson like computer AI in the patent office for particularly dealing with inventions created by AI.

However, if the PHOSITA criteria is not feasible enough then the previous requirement of subject matter eligibility can address the issue of AI patentability under current patent law. Legislators can explicitly make the list of AI subject matter eligibility but need to revise that list frequently to keep up with faster technological advancements. It is necessary because *the obligation to determine what type of discovery is sought to be patented must precede the determination of whether that discovery is, in fact, new or obvious* (Parker v. Flook, 1978, p. 593). Subject matter eligibility can be helpful in scrutinizing the junk of AI patent applications and effectively promoting the eligible & legitimate AI patentable inventions.

Recommendations

- The definition of an invention under section 2(1) (j) of Patents Act, 1970 needed to be modified to include the inventions created by an AI system.
- The Patent and Trademark Office or Intellectual Patent Appellate Board (IPAB) should list the subject matter eligible for AI patentability which should be revised after a fixed period of time.
- Non-Obviousness or PHOSITA test should be made more stringent while testing the AI patentability claim.
- The Owner of the AI system should be by default considered as the owner of AI claimed patent unless any other contractual agreement exists to determine the same.
- AI system also should be regarded as joint inventor with human entity while granting the patent protection to AI's invention.

Conclusions

The policy makers have to give serious thought to the issue of AI's creation of inventions. The Patent Office and courts have to show the path by guiding this discussion forward as far as Indian patent provisions are concerned. Legislators have to

redefine the limits of patentability and also whether AI inventions can be patented or not. These questions needed to answer sooner than later for having an edge on the technological advances and AI invention protection. This will not only settle down legal conflicts but also provide businesses certainty and incentive to invest in their Research & Development capacity which can and will ultimately benefit consumers and the economy.

As Stephen Hawking once stated that "The short-term impact of AI depends on who controls it; the long-term impact depends on whether it can be controlled at all" (MacDonald, 2016). Conclusively determining this can guide us in regulating and protecting future technologies. Companies and businesses are heavily investing in AI technologies from making driverless cars to detecting new diseases. The current patent law and judicial precedents are unable to solve the riddles of AI invention patentability. The discussion needed to be started by scholars and policy makers to promote innovations and new scientific discoveries. Fourth industrial revolution will be led by AI, which may adversely affect the rights of citizens and their way of living. Consideration is necessary to protect liberty, national security and to create an environment of scientific development.

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