Analysis of Complexities in Patenting AI and Big Data Inventions

Prajakta Kale(✉)

O P Jindal Global University, NCR of Delhi, India
Prajaktak290@gmail.com

Abstract. Legal protection through Intellectual Property Rights has become increasingly vital in the present age of ideas, knowledge, and competition. The paper traces importance of IPR, different forms of IPR and argues why Patent is the most appropriate option when it comes to protection of computer programs or software. It analyses the legal framework in different jurisdictions with regards to software patents. It further focuses on AI and Big Data based inventions and discusses challenges which could come in way of patenting these.

Keywords: Patents · Intellectual Property Rights (IPR) · Artificial Intelligence (AI) · Big Data

1 Introduction

Intellectual Property (IP) is creation of mind or intellect [1]. The word 'property' reflects intangible as opposed to tangible nature of physical property. This intangible nature is peculiar characteristic of IP [2]. Patents, Copyright, Trademark, trade secrets are different forms of IP. These forms create an exclusive set of rights. The protection offered by Intellectual Property Law is important for several reasons. Apart from the economic benefit it provides, it gives recognition to the 'labour' put in by the creator/ inventor and also acts as an incentive to innovate [3].

Legal protection finds particular relevance with computer programs and software as it is susceptible to unauthorized copying, modifying and counterfeiting [4]. Computer programs or software can be protected through Patents, Copyright and trade secrets. The paper intends to analyse protection offered to computer programs or software through patents. The analysis will then be extended to Artificial Intelligence and Big Data based inventions.

1.1 Why Patents?

Copyright is a form of IP which denotes a set of rights given to creators of literary and artistic works [5]. These works include computer programs, technical diagrams, databases amongst others. Copyright however protects the expression of idea and not the idea itself. Therefore, for a computer program a copyright would essentially protect

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the source code but not the algorithm. It is thus easy for competitors to infringe by using the algorithm with different text [6].

Trade secrets are form of IP for confidential information. Trade secrets appear as viable option as they don't need to be applied for but can be done through internal arrangements of confidentiality or non-disclosure agreements. It does makes difficult for outsiders to misuse the information, but nothing can prevent an independent researcher who works on the same information, benefitting from it. Neither it is possible to stop reverse engineering i.e., deconstructing the innovation and creating similar entity.

Patent on the other hand offers an exclusive set of rights for an invention. Such invention has to be a process or product providing new way of doing something or offers a new 'technical' solution to a problem [7]. An essential requirement to obtain a patent is the disclosure of technical information in the patent application. By its very nature then patents can protect functional aspects of any software [8]. It does not protect the code per se rather it protects a 'software engine' which takes inputs, works upon it and results in some output. Thus 'concept' behind a software is protected. And because this concept is of 'technical nature', patents seem the most appropriate alternative [9]. Apart from this, patent can also protect design of the software. The only pitfall with patents could be the cost and time involved to obtain it compared to other IP forms. Despite this, the advantages outweigh and therefore the paper focuses on patents.

2 Patentability Criteria

Patents are granted based on certain criteria. In Europe, for an invention to be granted a patent, I) the invention must be novel; II) should have an inventive step; III) capable of industrial application and IV) should not contain excluded subject matter. On the same lines, patentability requirement for US is that the invention should be new (novel), non-obvious and useful. In India, an invention is patentable subject matter if it meets the following criteria – i) It should be novel. ii) It should have inventive step or it must be non-obvious iii) It should be capable of Industrial application. iv) It should not attract the provisions of sections 3 and 4 of the Patents Act 1970 [10].

Analysing each criterion with respect to specific jurisdiction is beyond the scope of this paper. Hence, we shall broadly try to understand about these criteria.

2.1 Novelty

Novelty under the European Patents Convention (EPC) depends on whether the invention was part of the 'state of art' on the priority date. Priority date is the date on which application is filed. The scope of the term 'state of art' is hugely wide as it comprises all matter (whether a product, a process, information about either, or anything else) which has at any time before the priority date of that invention been made available to the public (whether in the United Kingdom or elsewhere) by written or oral description, by use or in any other way. The notion of novelty in India and US is broadly same. Prior art or state of the art is the key concept. So, the invention should be novel or new in the sense that nothing from the prior art should be reflected in it. Broadly prior art is all matter prior to filing of the patent but the composition differs slightly from jurisdiction to jurisdiction.

2.2 Inventive Step/Non-obviousness

The EPC provides inventive step as one of the criteria for the invention to be patentable. It further states that this step should be such that it is not 'obvious' to the person skilled in the art. In India an inventive step is that which involves technical advance as compared to the existing knowledge or have economic significance or both and makes the invention not obvious to a person skilled in the art. Thus broadly it can be inferred that inventive step means the invention in question should show some advancement as compared to the existing similar inventions. Further it also calls for non-obviousness and this non-obviousness is judged from the eyes of person skilled in the art. In US, person having ordinary skill in the art (PHOSITA) is a notional person with average technical knowledge of his field. Judges need to look at the case through his eyes not through their own or even a 'reasonable layperson' [11]. In EPC too, he is the key element and his skillset varies on parameter of normalcy in that field. Pertinent to note are the words 'average' and 'ordinary', implying that the said person is not extra-ordinarily brilliant but rather 'uninventive' and 'conservative', hesitant to explore new areas. So, basically this person skilled in the art is someone having knowledge of the concerned field of invention but need not be extra-ordinarily brilliant.

2.3 Subject Matter Eligibility

For an invention to be patented in any jurisdiction, it should fall within the eligible subject matter as specified in the Patent laws of each jurisdiction. The European Patent Convention (EPC), Article 52, paragraph 2, excludes from patentability, in particular 1. discoveries, scientific theories and *mathematical methods*; 2. aesthetic creations; 3. schemes, rules and methods for performing mental acts, playing games or doing business, and *programs for computers*; 4. *presentations of information*." European Patent Office has been following the principle established in the case *T208/84 VICOM/Computer related invention*, wherein a patent may be available for a computer program because it has technical character, a computer programmed to create technical effect and a computer program product which creates technical effects [12]. Thus software as such are not patentable under EPC [13]. EPC instead depends upon the concept of Computer invented inventions (CII) which are inventions using computer, computer network or other programmable apparatus. Broadly, EPC has a two-step approach on subject matter eligibility. First, novelty and second inventive step, both in context of section 56 of EPC.

The US Patent Act 1952 §101 states: 'Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title'. What is excluded from patentability is laws of nature, natural phenomena and abstract ideas [14]. The approach in US seems to be broad and liberal when it comes to patent eligibility. However, this liberal approach by US has evolved over time. For instance, in cases of *Gottschalk v Benson* [15] and *Parker v Flook* [16], both linked to computer related inventions, an algorithm or mathematical formula was considered like law of nature and thus no patent was granted in each case. US Supreme Court however changed its approach in the case of *Diamond v Diehr* [17] wherein a computer-controlled process for curing synthetic rubber was granted patent. Thus, it

made implicitly clear that computer programs and business methods are patentable in principle. However, in case of *Bilski v Kappos*, the Supreme Court emphasised that there is no broad patentability of business methods. The case proposed a 'machine or transformation test' wherein it said that a process can be patented if: 1) It can be performed on an apparatus; and 2) The process can transform an article into a different state [18]. Another notable authority, which was not directly related to software patents but to business methods involving software, is *Alice Corp v CLS Bank International.* In the said case, patent was not granted for a computer invented escrow service for financial transaction as it was an 'abstract idea' and thus did not satisfy subject matter eligibility [19]. The Alice case resulted in two-part test viz.: 1) Whether the claims in issue are directed to a patent ineligibility concept (i.e. law of nature, abstract idea or natural phenomena) and 2) If yes, then whether the claims contain an 'inventive concept' [20]. Uncertainties however still remain on what constitutes 'abstract idea' and what sufficiently more claim is required towards the 'abstract idea'.

3 Challenges in Patentability Due to AI and Big Data

To understand what are the challenges posed by AI, Big data it is important to understand what they mean. The earlier sections have discussed about computer programs, software patents with reference to patentability criteria. This section shall analyse issues with satisfying patentability criteria of inventions related to AI and Big Data.

3.1 About AI and Big Data

Artificial Intelligence (AI) in literal sense can be construed as field of activities in which computer or machines emulate human brain. Despite it being a decade old concept, past few years has witnessed a phenomenal rise in AI Technologies. In purely technical terms, AI are nothing but powerful algorithms which can acquire human like capabilities, for instance speech or vision [21]. Typically then AI systems are learning systems which are better at performing the task otherwise performed by humans, with minimum or no human intervention.

Machine learning is a branch or application of AI which involves analysing of data, learning from data or learning from 'experience' and identify patterns thereby contributing to decision making just as humans do but without any human intervention [22]. Any machine learning model mainly aims to identify and quantify certain 'feature' or characteristic from the data sets. Training data, machine learning algorithm, machine learning model and output are the important elements of machine learning. For instance, in a credit card company which wants to filter applications of customers likely to be filing for bankruptcy, the prior applications will be the training data, the mathematical exercise to extract the information is the machine learning algorithm, the mechanism used for such extraction will be the machine learning model and the result which the company will generate by inputting the personal data of the customers, is the output.

Big Data is intricately linked to Artificial Intelligence and Machine Learning Systems. Although, there cannot be one single definition of what big data is, one thing for sure is its larger scalability in comparison to traditional database systems. Traditional

mainstream software cannot grab this huge data. It is characterised by 3 Vs. i.e. Volume, Velocity and Variety. In simple terms thus, big data is larger, has complex data sets and comes from variety of data sources. Broadly therefore, big data means both huge data sets as well as data analytics, data mining and parallel processing capabilities. Complex though it may sound, it helps in tackling seemingly impossible business problems. From the above explanations of AI and Machine learning, their relationship with big data can be deciphered. AI systems are largely data driven. Be it voice assistants like Alexa or Siri, chatbots or other AI applications for fraud detection and prediction, all deal and generate huge data. This convergence of Big Data with AI has triggered rise in AI based solutions [23]. At the same time, AI can analyse huge data sets, recognise patterns which otherwise is not deciphered in small data sets. Thus, big data is used for making evidence-based decision making.

AI being a decades old technology had several scientific publications since its inception. However recent trends show a decrease in the ratio of scientific papers to inventions which essentially implies that commercial application has replaced mere theoretical expositions. AI related patenting has thus grown significantly. Notably, it is the machine learning component of AI which has amounted to maximum patent filings.

3.2 Subject Matter Eligibility

Considering the detailed earlier discussion on Patentable subject matter under US and EPC, and the technicality of AI and related technologies, we now analyse the impact of latter on the former. AI in its very raw form is nothing but a set of complex algorithms. In an advanced form, AI uses trained data sets for output, alternatively there is this machine learning component of AI. This also essentially points out to Big Data- AI, which uses algorithms to find rare relationships from very large 'training data'. Again, AI can be a tool which is giving technical effect. Example being AI in effective decision-making scenario. Thus, broadly there can be three types of AI Patenting: 1) 'Core AI', consisting of pure mathematical algorithms 2) Machine learning/ Trained models and 3) AI as a tool utilised in certain application [24]. Coming to Big Data, it is the extraction feature of big data which has the potential for providing best business solutions. This means best of the big data innovations need to be based on software. These software systems might be used for data collection, analysing unreliable data, aggregation of personal information data without adversely affecting consumer protection laws, etc.

It is evident from earlier explanations that core AI, the first of the three types, consisting of pure algorithms will not satisfy the eligibility criteria under EPC. However, the latter of the two types, which give rise to some 'technical effect', shall make it eligible under EPC. The approach under US, would however differ as Post Alice there remains a grey area with regards to what type of software is patentable. This is particularly relevant for big data innovations as they mostly rely on execution of common and simple algorithms on the computer. There have been instances in US, where patent applications have been rejected as they claimed some concept emulating human activity and the court believed them like 'abstract idea' under section 101 of US Patents Act, 1952 [25]. As the basic idea of AI is itself to emulate human activity, AI Patent applications shall continue to pose such challenge.

3.3 Novelty and Non Obviousness

When AI is used extensively for Research and Development, there are several layers and stages in that system. In such scenario, it is difficult to decide or know who is the actual inventor in the system? These can be conveniently grouped into three stages: 1) Computer as a mere tool to assist human inventor 2) Intermediary stage, for example a text generator being used for filling the gaps in a patent document and 3) Outputs by computers which could be called as patentable inventions [26]. There are projects like 'AllPriorArt' wherein patent claims are generated through autonomous technology [27]. Potential problems arise due to this as these texts can become part of 'state of art', thereby creating problem for novelty and inventive step criteria as discussed earlier. There is a danger of future patents being pre-empted completely [28].

The possibility of computers becoming drivers of innovation in fields like nanotechnology, health and pharmaceuticals is not far from real at all. Artificial Intelligence is used to develop inventive machines like Googles DeepMind or IBM's Watson [29]. Artificial Neural Network, a form of AI, which uses binary switches' collections to stimulate neurons in biological brain, has proved to be an efficient tool to create novel ideas. Dr. Stephen Thalers 'Creativity machines' is the perfect example which has used Artificial Neural Network to create new inventions.

Assessment of obviousness criteria by person having ordinary skills will prove to be challenging due to these developments. As mentioned earlier, for assessment of obviousness, PHOSITA is key element in both the systems. This hypothetical, non – inventive person is supposed to have knowledge only in technical fields of concern. Can the ordinarily skilled person remain central for assessment of inventiveness now? The possibility is that inventive machines are itself used as skilled person. If the skilled person fails to be in pace with real time changes, then this might affect the obviousness bar.

3.4 Inventorship

AI has the ability to learn [30]. Owing to this ability there are instances where AI is able to invent. However, several patent systems in general demand that the inventor is a human being and not machine [31]. It is important to know the inventor because it becomes straightforward to decide liability and other legal consequences. Thus, the issue of Inventorship is a challenge which jurisdictions need to find a way to deal with. A government report in India, for instance admits how the present patent law in India are not adept to tackle the issue of AI Inventorship and how it has created obstacles in patenting 'AI induced innovations' [32].

4 Conclusion

Considering AI based patent applications in US, subject matter ineligibility has been a major problem. Although there has been positive development Post *Alice* case, there is no concrete solution. Therefore, it is important to frame sound strategies while claiming AI as Patent Eligible subject matter. It is vital that the patent claims are made narrowly, the solutions and problem be rooted to specific technology and there is no focus on

algorithm [33]. The system under EPO is commendable as interdisciplinary software applications are examined by three examiners with diverse technical backgrounds [34]. Also, there are special EPO Guidelines for Artificial Intelligence and Machine learning which may help simplify AI and Machine Learning claims as it explicitly comments about subject matter eligibility [35].

The main challenge due to AI Inventions Systems will be the role of skilled person and its relevance in the assessment of obviousness. There will certainly be limit on what the skilled person would know. If machines or AI system themselves be the judge, the existence of patent system will itself become questionable. Avoiding this extreme, the change of definition of skilled person as propounded in EPO Conference, seems to be a balanced approach. It has suggested "skilled human using a machine" as the definition of skilled person.

Determination of novelty and inventive step has always been challenging in respect of innovations involving software patents. Sheer volume of state of the art is an issue. Simultaneous innovations take place in the software arena. The pace at which this happens is immense as compared to innovations in another fields. Prior art becomes obsolete quickly as many software have short life spans, so quick that they end even before the patent is issued [36]. Problems are also created when prior art searches are carried on database of existing patents. It is also usually seen that software are granted at higher level of abstraction. Basically, what any software does is to gather and manipulate data as per desired output. And the fact remains that there can be many novel ways to achieve the output. Unfortunately, patents are granted only for such ways thereby ignoring the initial steps. Thus, the patents are broad and overclaim the true novelty. Considering the software innovations which are patented owing to the mentioned emerging technologies, the above problems persist. In fact, they might seem to escalate. For example, AI based tools are used for prior art searches as seen earlier. Most of the software use 'functional claiming' i.e., patenting the problem to be solved rather than method to be solved [37]. When it comes to AI and Big data innovations, functional claims always carry a risk of broad interpretation. Careful drafting of functional claims so that the patent specifications explain functional limitation and providing examples of implementation can be a good strategy.

The relationship between AI and Intellectual Property is sure to see a surge with passing times. While there will be need of patent protection due to these technologies, these technologies shall further contribute for administration of patent technologies. In this dynamic environment, law should adopt a balanced approach, keeping in mind the basic philosophy behind patents.

References

1. WIPO. What is Intellectual Property? wipo.int. [Online] [Cited: May 29, 2022.] https://www.wipo.int/about-ip/en/.
2. Bentley, Lionel. Intellectual Property Law. s.l.: Oxford University Press, 2001.
3. Verkey, Elizabeth. Intellectual Property. s.l.: Eastern Book Company, 2014.
4. Patent, Copyright and Trade Secret Protection in software. Donovan, Stephen. s.l.: IEEE Potentials, 1994, Vol. 13.

5. WIPO. Copyright. wipo.int. [Online] [Cited: May May, 2022.] https://www.wipo.int/copyright/en/.
6. Think Big! The need for patent rights in the era of Big data and Machine Learning. Jin, Hyunjong Ryan. s.l.: New York University Journal of Intellectual Property and Entertainment Law, 2018, Vol. 7 (2).
7. WIPO. Trade Secrets_Everything you need to know. wipo.int. [Online] [Cited: May 29, 2022.] https://www.wipo.int/tradesecrets/en/.
8. Teska, Kirk. Software Patents 101- To protect your Intellectual property, choose the best tool for each stage in its creation. IEEE Spectrum. [Online] [Cited: May 29, 2022.] https://spectrum.ieee.org/software-patents-101.
9. WIPO. Patent Expert Issues: Computer Programs and Business Methods. wipo.int. [Online] [Cited: May 22, 2022.] https://www.wipo.int/patents/en/topics/software.html.
10. Office of CGPDTM, INDIA. Frequently Asked Questions- Patents. ipindia.gov.in. [Online] [Cited: May 30, 2022.] https://ipindia.gov.in/writereaddata/Portal/Images/pdf/Final_FREQUENTLY_ASKED_QUESTIONS_-PATENT.pdf.
11. Rethinking the PHOSITA in Patent Litigation. Reilly, Greg. s.l.: Loyola University Chicago Law Journal, 2016.
12. Bainbridge, David. Information Technology and Intellectual Property Law. s.l.: Bloomsbury Professional, 2014.
13. Piroozi, Christopher J. White and Hamid R. Drafting Patent Applications covering Artificial Intelligence Systems. americanbar.org. [Online] 2019. [Cited: May 30, 2022.] https://www.americanbar.org/groups/intellectual_property_law/publications/landslide/2018-19/january-february/drafting-patent-applications-covering-artificial-intelligence-systems/.
14. WIPO. Patenting Software. wipo.int. [Online] [Cited: May 30, 2022.] https://www.wipo.int/sme/en/documents/software_patents_fulltext.html.
15. Gottschalk v Benson. 409 US 63, 1972.
16. Parker v Flook. 437 US 584, 1978.
17. Diamond v Diehr. 450 US 175, 1981.
18. Bilski v Kappos. 561 US, 2010.
19. Alice Corp v CLS Bank International. 573 US 208, 2014.
20. Pearson, Douglas, Shentoy, Ognion and Kukkanen, Carl. Protecting Artificial Intelligence and Big Data Inventions through Patents: Subject Matter Eligibility. https://www.lexology.com/. [Online] [Cited: May 30, 2022.] https://www.lexology.com/.
21. WIPO Technological Trends 2019: Artificial Intelligence. wipo.int. [Online] [Cited: May 30, 2022.] https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf.
22. Li, Hui. Machine Learning: What it is and Why it matters? www.sas.com. [Online] [Cited: May 30, 2022.] https://www.sas.com/en_in/home.html.
23. Katherine Stephens, Toby Bond. Artificial Intelligence: Navigating the IP Challenges. www.twobirds.com. [Online] [Cited: May 30, 2022.] https://www.twobirds.com/en/insights/2018/uk/artifical-intelligence-navigating-the-ip-challenges.
24. Summary Artificial Intelligence Conference. EPO. Munich: EPO, 2018.
25. Intellectual property Protection for Artificial Intelligence. DeCosta, Frank A and Carrano, Alizza. s.l.: Westlaw Journal Intellectual Property, 2017.
26. I Think therefore I Invent: Creative Computers and the Future of Patent Law. Abbott, R. s.l.: Boston College Law Review, 2022, Vol. 57.
27. Fighting Patent trolls with stuff and nonsense. [Online] 2016. [Cited: May 30, 2022.] https://www.cbc.ca/player/play/2686963191.
28. Fraser, Erica. Computers as Inventors: Legal and Policy Implications of Artificial Intelligence on Patent Law. scripted. [Online] 2016. [Cited: May 30, 2022.] https://script-ed.org/wp-content/uploads/2016/12/13-3-fraser-1.pdf.

29. Everything is Obvious. Abbott, Ryan. 2, s.l.: UCLA Law Review, 2019, Vol. 66.
30. Malhotra, Rajiv. Artificial Intelligence and the Future of Power. s.l.: Rupa Publications, 2021.
31. EPO. Artificial Intelligence. epo.org. [Online] [Cited: June 5, 2022.] https://www.epo.org/news-events/in-focus/ict/artificial-intelligence.html.
32. Sabha, Rajya. Review of Intellectual property rights regime in India. s.l.: Rajya Sabha, 2021.
33. Challenges in drafting Patent Applications for AI- related Inventions. Bai, Benjamin. s.l.: EPO- Patenting Artificial Intelligence Conference, 2018.
34. Gin, Aaron and Wilson, Margot. Global Artificial Intelligence Patent Survey. [Online] 2019. [Cited: May 30, 2022.] https://insidebigdata.com/2019/02/22/global-artificial-intelligence-patent-survey/.
35. EPO. Guidelines for Examination. [Online] 2018. https://www.epo.org/law-practice/legal-texts/guidelines.html.
36. Goldman, Eric. The Problem with Software Patent. [Online] 2012. [Cited: May 30, 2022.] https://www.forbes.com/sites/ericgoldman/2012/11/28/the-problems-with-software-patents/?sh=7f95602a4391.
37. —. How to fix Software Patents. [Online] [Cited: May 30, 2022.] https://www.forbes.com/sites/ericgoldman/2012/12/12/how-to-fix-software-patents/?sh=4524726a430f.