The Intellectual Property Rights of Artificial Intelligence-based Inventions

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Abstract: **The role of Intellectual property rights of inventions based on Artificial Intelligence is discussed. The agency of WIPO has begun to engage the stakeholders through its "WIPO Conversation on IP and AI". The US, South Korea, Japan and China are leading in protecting their AI inventions. The guidelines of their respective patent offices will also matter. The pace of these AI based inventions has not really helped the fact that the IP laws are lagging behind. Meanwhile companies such as Google have come up with its own recommendations to protect its IP. In the broader scheme of things, the laws governing the AI inventions must be able to protect and reward the inventor for the benefit of the society. It should also provide for equitable distribution of the benefits of the invention across all sections of the society.**

Index Terms: **algorithm, deep learning, human intervention, industrial applicability, infringement, Invention, inventive step machine learning, non-obviousness, patent, WIPO**

I. THE REALM OF ARTIFICIAL INTELLIGENCE

Artificial intelligence is a branch of computer science (AAAI, 2003). It consists of artificial neural networks which are essentially computational models (Neural Network, Encyclopaedia Britannica). These computational models which are mathematical operations and a set of parameters, give output similar to human intelligence. The two main components of AI are Machine learning and Deep learning and AI is best described as "Deep supervised machine learning". (Allen, 2020)

With machine learning, the computer does not require step-by-step instructions to arrive at an output. The machine" learns' by itself to recognize patterns in data. Based on these patterns the machine or the hardware takes informed decisions just as a human would. The key word here is cognition (Jelinek, 1998). Just as human growth is defined by these four cognitive mental functions of perception, learning, memory and thinking, so is AI. The computer when thus allowed to learn cognitively, can handle, process and analyse large amount of unstructured data sets. Unstructured data is books, journals, metadata, analog data,

and text in emails, audio file, video file, webpage, health records and biomedical documents (Pearl, 2000 & Sowa, 2000). This unstructured data encompass the linguistic, auditory and visual forms of human communications. Machine learning uses these forms to tag unstructured data. In the field of Education, AI-based tutors can give customized training and attention to students. The needs of the students are addressed in a customised environment. In the field of health care, AI has boundless applications. For instance, it is used for hospital management, disease-diagnosis (Arbesu, 2016), Patient monitoring, Patient outcomes, optimization of health care processes and clinical decision making, clinical work flow augmentation and hospital optimization (Luger, 2002). With AI, scientists can find patterns they never knew existed. They can come up with new molecules to treat diseases.

AI is the umbrella term for tasks that can be performed by computers without the need for human intervention. The word "computer" can also be substituted with machine. Cognitive computing comprises of speech recognition (Libunao, 2015), sentiment analysis, Face detection, Risk assessment, Fraud detection and so on, Natural language interaction (Araoujo, 2007), Augmented Intelligence .

AI can be used in Industry to give real-time data in supply chain monitoring and real time alerts in production activities. Thousands of data sources - structured and unstructured, internal and external can be guarded. All this information can be channelized to create customised dashboards for customers. Automated vehicles driven with AI can compensate for human error (Siegwart, 2004). AI coupled with internet of things can help create smart cities where there will be no air-pollution and better traffic regulation (Li, 2018).

II. ARTIFICIAL INTELLIGENCE BASED INVENTIONS

AI systems are maturing to levels where not only there is no need for human intervention but also where the AI systems give creative output. In 2016, Google funded the a project titled, "The

Next Rembrandt" wherein a computer analysed thousands of works by the 17th century Dutch artist Rembrandt Harmanzoon van Rijn. The computer came up with a portrait of 17th century thirty-something man in black hat and white collar looks. A Japanese computer program in 2016 wrote a short novel which competed for national literary prize. Google owned AI Company DeepMind generates music.

The areas of fastest growth in AI are Deep learning and Robotics while AI patenting has seen fastest growth in Transportation Industry. Telecommunications follow closely. Personal devices, Life and Medical Science come next. The top five applicants in AI patenting are IBM (US), Microsoft (US), Toshiba (Japan), Samsung (South Korea) and NEC (Japan). The Chinese academy of sciences (CAS) is leading university in filing AI based patents. Since 2013 there has been sudden growth rate in filing of AI patents. While the field of AI began in 1956, optimism in this field returned around 1993. Around 1993 computing power began increasing. With increasing computing power, there became available structured training data. Structured data is organised data usually in form of spreadsheet having multiple rows and columns. Unstructured data is mix of images, graphics, audio, video, web pages, power point presentations etc. AI is assisted by structured data to learn and perform assigned tasks. AI became increasingly data driven and there were new breakthroughs from 2012 onwards.

A question of Intellectual Property (IP) protection in AI-based inventions is who owns the rights? A human thinks of an inventive step and comes up with an invention. The invention belongs to that human or to the employer of that human. If AI is being used as tool to make the invention then the person using that tool – in this case AI – is the inventor and the owner of the invention. Mere ownership of the tool will not qualify the person for the ownership. An AI invention in which there is no human intervention, the question arises if a machine can file for a patent. If "a machine" cannot file for the patent then does it fall in public domain? UKIPO (UK patent Office), USPTO (US patent Office), EPO (European Patent Office) have stated that AI cannot be an inventor in patent applications. An inventor has to explicitly indicate in the patent application that he is the inventor. An application for patent expressly specifies the name of the invention, name and address of the applicant and other matters. Therefore, legal provisions imply that only natural persons can be an inventor. However there is the possibility of creating legal subject status for AI. There is no obvious barrier, legal or otherwise, to recognising AI as an inventor. The developers of AI can enjoy the rights granted by patent protection. Patent protection rights can also be granted to the owner of the AI invention. There have been cases where AI has been named as inventor in the patent application.

III. A

The existing IP laws which include Patent and Copyright laws

must accommodate the AI-driven innovations which also include AI ethics, data security and privacy. The IP policy must also decide if AI algorithms are patentable or not. The view that AI can be inventor is accepted widely. Another question is that of joint inventorship. Can AI share a joint internship with a human? AI is playing increasing role in technology. It is considered only right that the owner of the invention should declare the use of AI application (Mathur, 2020).

In conventional applications, the boundary between inventors and ownership is clear. Here the applicant states that he is in possession of the invention. For AI inventions, the issue of ownership is not clear. Can we say that the persons who contribute financially to the AI inventions are the owners or the persons who own the AI equipment are the owners? What about those who help develop AI algorithm? Should they not benefit from patent protection? Patent protection requires full disclosure on part of the applicant. The rationale of full disclosure is very difficult to apply for AI –inventions. Simply disclosing the initial algorithm will not be sufficient because the output data depends on the input data. The raw data that goes into training an AI algorithm will also need disclosure. Furthermore, the human expertise involved in training data will also form or should form an important part of disclosure. Computer programs generally are protected by copyright. Laws on copyright should give clear guidelines as to whether the computer programs that are incorporated in AI attract copyright protection. Our present IP framework is evolving with the evolving influence of AI. Intellectual property laws should give guidelines in cases of infringement. In the traditional patent system, infringement is easier to detect but with AI, infringement is not easy to detect because so much information is not disclosed and can be likened to a "black box". There is a question as to who would take the liability if AI infringes an intellectual property. The ability of the IP laws to regulate AI based inventions for the benefit of the society is crucial. If these laws fail to protect the creators of AI based inventions, then the tendency to not patent will increase. IP laws should streamline the process of awarding the creator to prevent inhibiting our digital future. WIPO is playing a very important role in formulating intellectual property policy beginning with the question if AI inventions need IP incentives. A forum called "The WIPO conversation on Intellectual Property and Artificial Intelligence" was established, the first session of which was held in September 2019. Over 250 submissions were submitted by member states and stakeholders. The WIPO report is published on the WIPO website (WIPO, 2019).

IV. AI AND ETHICS

IP laws are designed to protect society from inventions that are unethical. The considerations of unethical inventions are the ones that will perpetuate chaos, disorder and disharmony with respect to society, human, animal and plant life. At the

intersection of AI and IP, these laws must be defined to single out AI inventions that are not worth granting IP protection. To begin with there is always a danger from IP perspective of granting too much power to a handful of inventors associated with the AI invention. One way could be granting a shorter patent term to compensate for possible abuse of IP rights. Then there is a question of how the AI algorithms must be used by a search engine. The search engine should give results that are not biased, for instance not biased against the representation of women in society (UNESCO, 2020). Such biased results by search engine could lead to further deepening of prejudices that are already rampant in a society. The judicial algorithms should not give recommendations for parole based on racial orientation. An advert targeting in digital marketing is again an area of concern where for instance the algorithm could target more high paying jobs to men. The ability of an autonomous vehicle to decide which lives should be saved is a matter of ethics. In general AI should work in a manner in which its decisions are not biased, discriminatory or inaccurate. Lack of knowledge of how AI tools work is a challenge (Arbesu 2017). The companies or the tech firms must provide this information to their customers or the affected parties. This kind of disclosure or transparency of how these algorithms work will prevent misuse of the algorithms and to some extent arrest, what we may call as algorithmic bias.

The infringement issues are complicated due to the inherent nature of the AI. Innovations are growing at a faster pace and existing legal frameworks are simply not catching up (Castets-Renard, 2020). In the first place it is the AI machine that infringes and not a human operator. More often than not the AI machine infringes without human intervention because AI evolves on its own in response to new data which is what machine learning is about. This gives rise to the most important question of was this infringement foreseeable at the time at which AI was programmed? Law requires that the person who breaks the law is aware that he is breaking the law but in this case the human who may be the machine operator or algorithm developer or a third party, is not in a position to know that the AI is going to infringe a patent because AI improvises from its own neural network to come up with novel ideas. In this scenario the AI is operating autonomously with the concerned human having no idea of the future events. Secondly, it becomes very difficult to point out when and where the infringement has taken place because of the black box nature of AI decision making, namely the cloud. Collecting evidences of infringement becomes a very difficult task for a patentee.

CONCLUSION

Where IP intersects with AI based inventions, there arises many challenges with respect to disclosure, infringement, identification of inventor and owner and copyright laws. The conventional IP laws are inadequate to address these issues. The existing laws have not been able to keep up with the rising number of complex and varied AI based inventions. However the WIPO conversation is an important platform that offers to streamline the IP laws with the complex nature of AI based inventions. Humans will always strive to make life better. The quest for automation will only lead to increase in these inventions. The laws while suitably rewarding the human inventors should also protect them from possible criminal liability of the AI. On the WIPO conversation it has been suggested that there should be a depository system of algorithms just as there is a depository system for microorganisms under the Budapest treaty. Meanwhile companies can have a proactive approach to protect their own IP by following best practices that address considerations unique to machine learning. An example of these is the general recommended practices of AI by Google.

REFERENCES

Allen, Gregory (April 2020). "Department of Defense Joint AI Center - Understanding AI Technology" (PDF). AI.mil - The official site of the Department of Defense Joint Artificial Intelligence Center. Archived (PDF) from the original on 21 April 2020. Retrieved 25 April 2020.

American Association for Artificial Intelligence (AAAI), Welcome to AI topics 2003, http://www.aaai.org/AITopics/ -- a Web-based library of introductory information about various areas of artificial intelligence; altogether, a resource with links to hundreds (thousands?) of sites, organized by an easy-to-use, interactive index

Araujo, L. (2007). How evolutionary algorithms are applied to statistical natural language processing. *Artificial Intelligence Review*, 28(4), 275-303

Arbesu, D. (2016, March 28). Computers may be able to translate language but will they convey its meaning. PBS. Org. Retrieved from https://www.pbs.org/wgbh/nova/next/tech/computers-may-be-able-to-translate-language-but-will-they-convey-its-meaning/

Castets-Renard, C (2020) The intersection between AI and IP: Conflict or Complementarity*? IIC-International Review of Intellectual Property and Competition* (51): 141-143

Dorrier, J. (2015, November 11). Exponential medicine: Deep learning AI better than your doctor at finding cancer. Retrieved from http://singularityhub.com/2015/11/11/exponential-medicine-deep-learning-ai-better-than-yourdoctor-at-finding-cancer

Jelinek, F. Statistical Methods for Speech Recognition. Cambridge, MA: MIT Press (1998).

Li H, Ota K, Dong M (2018) Learning IoT in edge: deep learning for the internet of things with edge computing. IEEE Netw 32(1):96–101 https://www.researchgate.net/publication/322728184

Libunao, J.(2015, Novenber 13) Artificial brains learns to use human language. Futurism. Retrieved from https://futurism.com/artificial-brain-learns-to-use-human-language-3/

Luger, G., Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Fourth Edition Addison-Wesley, 2002

Mathur, A. (2020) A Reflection upon the Digital Copyright Laws in India. Journal of Intellectual Property Rights 25:5-14

Neural network, *Encyclopaedia Britannica*. Retrieved from https://global.britannica.com/technology/neural-network

Pearl, J. Causality: Models, Reasoning, and Inference. New York: Cambridge University Press (2000).

See UNESCO, Artificial Intelligence: examples of ethical dilemmas Retrieved from: https://en.unesco.org/artificial-intelligence/ethics/cases

See WIPO, Artificial Intelligence and Intellectual Property Rights, Retrieved from: https://www.wipo.int/about-ip/en/artificial_intelligence/

See WIPO, The WIPO conservation on intellectual property rights and artificial intelligence, Retrieved from: https://www.wipo.int/about-ip/en/artificial_intelligence/conversation.html

See WIPO, The WIPO technology trends- Atificial Intelligence, Retrieved from: https://www.wipo.int/tech_trends/en/artificial_intelligence/

See WIPO, Conversation on Intellectual Property (IP) and Artificial Intelligence (AI): Draft Issues Paper on Intellectual Property Policy and Artificial Intelligence, WIPO IP/AI/2/GE/20/1, 13 December 2019

Siegwart, R. and Nourbakhsh, I.R. Introduction to Autonomous Mobile Robots Cambridge, MA: MIT Press (2004).

Sowa, J.F. Knowledge Representation: Logical, Philosophical, and Computational Foundations, Pacific Grove, CA: Brooks Cole. (2000).

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