INTERNATIONAL JOURNAL OF LEGAL SCIENCE AND INNOVATION

[ISSN 2581-9453]

Volume 6 | Issue 2

2024

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Role of Artificial Intelligence in Intellectual Property Rights

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ABSTRACT

With the advancement in technology, the role of technology in the field of law can be observed vividly and the emerging role of artificial intelligence (AI) in intellectual property rights (IPR) can also be regarded widely. The use of artificial intelligence in intellectual property rights has the potential to revolutionize the way we approach issues related to patents, copyrights, and trademarks and has the potential to make the process more efficient, accurate, and cost-effective. Artificial intelligence has an influence on various applications in intellectual property rights, including patent search and analysis, copyright infringement detection and trademark search has been significant and far-reaching. The involvement of technology in the field of intellectual property rights lays positive aspects and also there are some challenges associated with it. Based on the analysis there is a need for ongoing research and development to ensure that artificial intelligence is used responsibly in the area of intellectual property rights.

Keywords: *Artificial Intelligence (AI), Intellectual Property Rights (IPR), Convolutional Neural Networks (CNN), Machine Learning (ML), Natural Language Processing (NLP), Artificial Neural Networks (ANN).*

I. INTRODUCTION

In today's world, the effect of technology is visible in every part of our lives, and it also includes intellectual property rights (IPR). The United Nations has also duly considered the technology of artificial intelligence (AI) as it has the capability to positively impact various Sustainable Development Goals (SDGs) related to intellectual property rights [1]. For eg. it can improve innovation, infrastructure, and management of intellectual property rights such as trademarks and patents, contributing to SDG 9. AI can also help reduce waste and prevent counterfeiting and piracy, supporting SDG 12. Additionally, it can aid in resolving disputes related to intellectual property rights and support the development of solid institutions, contributing to SDG 16. Lastly, AI can facilitate collaboration between stakeholders in intellectual property rights, including government agencies, businesses, and civil society

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organizations, contributing to SDG 17. In the present time, it can be seen that AI is playing an important role in advancing attempts toward sustainable development throughout the globe [2].

The idea of artificial intelligence has been around for over a hundred years, with Greek myths being the first to explore the concept of artificial humans and robots. Over time, there have been several crucial advancements in AI, such as the development of Turning Tests to assess intelligence by Alan Turning, a characteristic language program for computer training [3]. While some may have doubted the transformative impact of previous technological advancements, there is now general agreement that a major technological revolution is currently taking place. This has increased intellectual property rights, with the abundance of intellectual property data available across various channels and platforms. However, integrating and comprehending this diverse array of data is challenging due to its vast volume, variety, and velocity. By bringing together different types of intellectual property data, an open ecosystem for innovation is formed, necessitating appropriate tools and techniques to extract maximum value. It is vital to identify and utilize the most effective sources of intellectual property data and ensure that suitable means are accessible for intellectual property management and broader societal benefits. Moreover, the emergence of an open intellectual property landscape presents a chance to utilize AI in creating knowledge [4].

AI has various practical applications in the domain of intellectual property rights. These applications include the creation, management, and enforcement of intellectual property. AI can help create intellectual property by analyzing data and generating new ideas. It can also help companies manage their intellectual property assets, monitor for infringement, and prevent it by identifying counterfeit products and piracy [5]. Furthermore, AI can support legal research and analysis regarding intellectual property laws and assist in patent examination by analyzing patent applications and identifying potential issues like prior art and patentability problems. For example, brand image is translated by WIPO search using AI-based applications for automated translation and image recognition. Around the world, several IP offices have evolved and utilized various AI applications [6].

The key contribution of the study is as follows:

- The integration of AI in various intellectual property rights like patent, copyright, and trademark have been evaluated in different applications.
- Advancement of AI in intellectual property rights has been briefed and vital recommendations for future enhancement have been provided.

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II. ENABLING TECHNOLOGIES

AI is a field of research that focuses on developing systems that can assess their surroundings, behave independently and exhibit intelligent behavior to achieve specific goals. At the Dartmouth meeting that established AI as a distinct field of study, John McCarthy and Marvin Lee Minsky popularized the term "AI" in 1956. AI systems can replicate mental processes like learning and problem-solving seen in human and animal brains. Despite decades of ups and downs, AI is a vital component of our daily lives, from personal or virtual assistants to semi-autonomous vehicles. AI is also increasingly being employed in various industries including medicine, law enforcement, and justice to tackle challenging issues. AI's adaptability has expanded its potential uses, including natural language processing, machine learning, knowledge representation, robotics, computer vision, and automated reasoning [7].

Machine learning (ML) is a fundamental concept in AI research, where computer algorithms can improve their performance through experience. There are two main types of ML: supervised learning and unsupervised learning [8]. One of the most advanced machine-learning approaches is Convolutional Neural Networks (CNNs) which uses multiple hidden layers for image classification. Natural language processing (NLP) is another important aspect in the field of AI which allows the computer to communicate with humans using natural language with the development of new techniques and theories involved[9].

III. TECHNOLOGICAL INTERVENTION IN IPR

The field of IP laws is continuously evolving with technological advancement, and legislation must keep up with all these changes and which normally results in costly legal disputes. To resolve potential conflict, the lawmakers must be anticipating and dynamic. This is important in the rapidly growing field of AI, where authors and inventors may not be well-versed in legal matters and require clear legal protection to encourage innovation [10].

(A) AI in Patents

Patents are complex legal documents with a wide range in length and a lot of technical jargon, acronyms, and specialized vocabulary. Their language and structure follow a rigid format that is standardized. In order to increase the scope of patent protection, patent holders may develop their own vocabularies to describe their inventions[11]. A word that previously had a clear definition may now have different connotations due to changes in the language used in patents. Furthermore, patents frequently include a variety of informational formats, such as diagrams, chemical composition, genetic sequences, or mathematical equations, which require the use of specialized techniques for their practical analysis.

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With several advantages like improved management of IP portfolios, streamlined patent application processes, and advanced patent analysis, AI is rapidly revolutionizing the world of patents. The search and analysis of prior art is one of the most important uses of AI in patents. The main goal of this procedure is to locate prior art that might affect a new application's patentability[12]. Patentees often design their search queries for prior art using relevant keywords and Boolean logic. NLP has developed an alternative approach called word embeddings to acquire meanings directly from the text because standard lexico-semantic resources have limits. Distributional semantics, which assigns similar meanings to words with similar distribution is used by word embedding techniques like word2vec and GloVe. By using a lot of textual data, ML approaches can improve the development of NLP tools. When it comes to creating tools for prior art searches, ML makes sense given the huge number of currently available patents [13]. The International Patent System(IPC) is used to categorize patents after they have been granted making it an ideal dataset for building supervised classification models for applications. The strategy is advantageous because it helps examiners quickly evaluate pertinent papers related to a specific topic. In order to concentrate on the most relevant patents for categorizing the remaining patents, a similarity metric might be used. The WIPO community is aware of the potential of advanced AI for managing and analyzing IP. In terms of information extraction, management, and economic value, they have examined 11 key technologies[14].

Figure 1 outlines the methods for doing prior art searches and filtering patent data as follows. The examiner draughts a search statement and question after reading the patent application. The machine then organizes the application into categories, extracts pertinent keywords, and suggests new words that are connected to the original question. Before starting the search to obtain papers from the right classes the examiner then analyses and modifies the search query. The system groups the documents and sets illustrative keywords. The most pertinent topics to the application are chosen by the examiner, and the documents under each topic are ranked according to how closely they resemble the patent application. At last, the system makes use of color coding to show the importance of each document.

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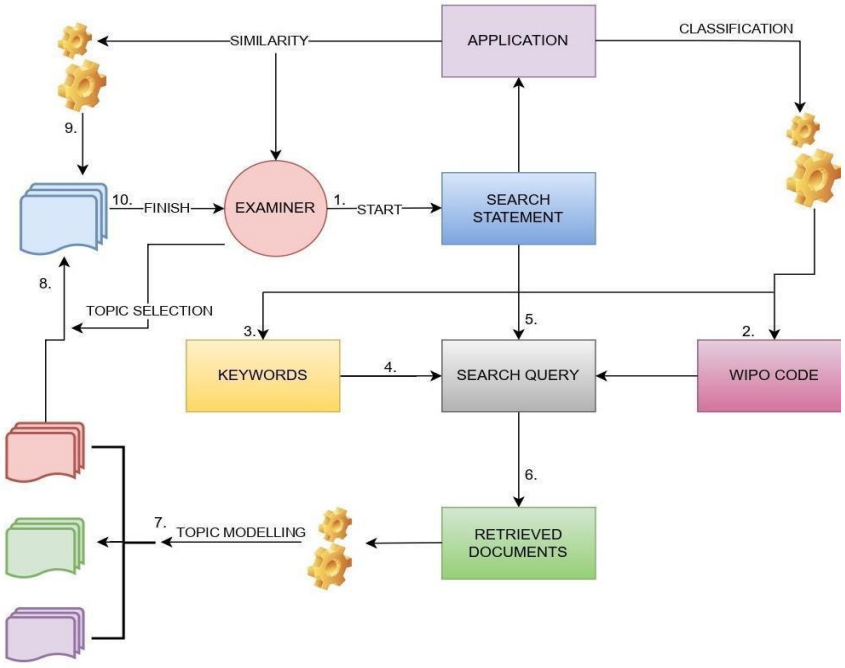

Figure 1. The experimental platform of the prior art search and filtering of patent information.

(B) AI in Copyright

Copyright is a form of IP that protects original creative works, such as musical, dramatic, literary, and artistic works. Computer-generated works are also included in these categories and copyright provides the authors with certain rights to prevent others from using their works without permission. One of the important differences is that copyright protection only extends to the expression of an idea, not the idea itself and it is important for authors to record their ideas in tangible form, such as writing them down or recording them to establish their ownership and provide evidence of their creation [15]. AI can be used in many different ways in the context of copyright which includes content identification and infringement detection, licensing and royalty management, content creation, and data analysis. AI algorithms can help to detect copyright infringement in digital content and also ensures that the authors are remunerated fairly for their creation. AI can also be used in analyzing the data related to copyright, such as sales figures or usage patterns to help inform decisions about distribution, pricing, and licensing. Copyright infringement detection is one of the most applications where AI is used. As the sheer amount of digital information produced and exchanged online has increased in recent years, the function of AI in copyright infringement detection has assumed growing significance.

ML, NLP, picture recognition, and audio fingerprinting are some of the AI approaches that are

frequently used in copyright infringement detection. Huge amounts of digital content are analyzed using ML algorithms to identify patterns and similarities that could indicate copyright violations. Text-based content is analyzed using NLP algorithms in order to identify potential matches to so far existing copyrighted material. Digital photos are analyzed using image recognition algorithms to search for potential matches to already-existing copyrighted materials. By examining the different audio patterns and properties of a specific recording, audio fingerprinting technology can be used to recognize audio content that is protected by copyright [17].

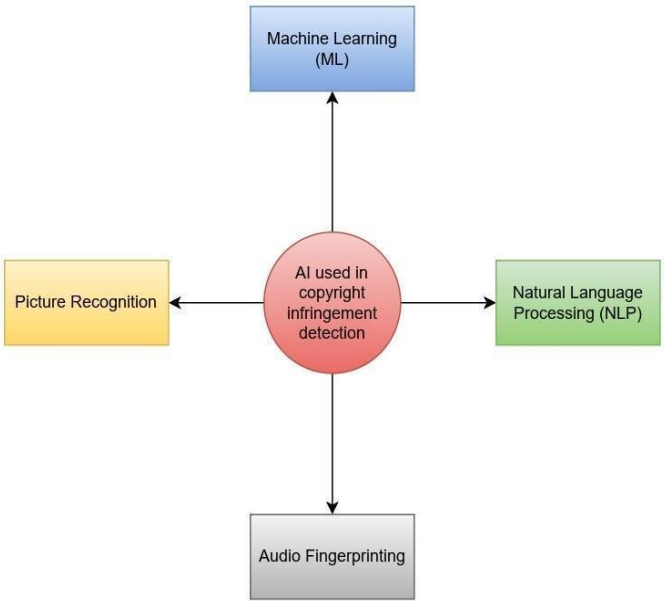

Figure 2: AI in the detection of copyright infringement

Another component of AI that is important for copyright is ANN. ANNs can help with the enforcement of copyright laws by identifying protected content, preventing piracy by monitoring the web, examining court records pertaining to copyright law, and analyzing data pertaining to copyright infringement. ANNs can support the rights of content producers, the detection of unauthorized use of IP by content owners and distributors, the development of more potent anti-piracy tactics, and the protection of owner's rights [17]. In content identification, the ANNs approach is frequently used in supervised learning, in which an ANN is trained on a sizable dataset of labeled examples, where each example is labeled as either copyrighted or non-copyrighted content. An extensive dataset of copyrighted and non-copyrighted content is collected and labeled in order to train an ANN for content identification. The content's features are retrieved, and the ANN is trained to identify the characteristics of copyrighted content by modifying its weights until it can correctly identify items as being

copyrighted or not. By approving new unlabeled content through a neural network and examining the output, the ANN can be trained to recognize copyrighted content in it [18].

(C) AI in Trademark

A trademark is any symbol, phrase, word, or combination of these that identifies and distinguishes one company's goods and services apart from those of others on the market. It is a type of IP that grants the owner the sole right to use the trademark in connection with their products or services and prevents third parties from using a mark that is similar and might lead to confusion. Brand names, logos, slogans and even sound or scents connected to a specific brand or business can all be trademarks. They are crucial for companies to build their brand and reputation in the marketplace and protect clients from uncertainty or deceit. AI in trademarks can be used for a variety of tasks including conducting thorough trademark searches to identify potential conflicts, monitoring trademarks to detect potential infringement issues, assessing the strength of a trademark in terms of its uniqueness, marketability, and chances of confusion with other trademarks, and assisting with the trademark registration process, including preparing and filing applications with relevant agencies. These applications of AI can speed up the trademark application process, reduce mistakes and delays, and allow businesses to make well-informed choices regarding trademark protection [19].

Different types of AI can be employed for trademark-related tasks, which include data mining, image recognition, ML, and NLP. NLP is utilized to search for similar trademarks and examine trademark infringement on internet platforms. Large amounts of trademark data can be analyzed using ML to spot trends and patterns. Analyzing trademark designs and looking for comparable trademark logos may both be done using image recognition. Trademark data from many sources can be analyzed using data mining to spot patterns and trends. In all these applications, trademark search is the most common application where AI is used [20]. Trademark search is the process of researching and identifying existing trademarks that may conflict with a proposed trademark. The goal of a trademark search is to avoid potential infringement issues and to ensure that the proposed trademark is available for registration. AI can be used in trademark search in various ways, including automating the search process, using NLP to analyze trademarks, using image recognition to find similar trademark logos and designs, and predicting the probability of a trademark being accepted for registration. The trademark search procedure is faster, more effective, and more accurate with the use of AI, thereby assisting businesses make informed decisions about registering a particular trademark [21]

In order to identify trademark logos and names, CNNs are increasingly used in trademark enforcement. They are used to compare potentially infringing products with original trademarks through similarity analysis, and they can help with trademark registration by leading out potential conflicts with already registered marks. For using CNN in trademark, the process includes collecting the dataset of trademark images, the dataset is processed to make it suitable for use in the CNN, a CNN model is trained on the processed dataset, the model's performance on the separate set of images is assessed, the model to automatically deployed, trademark infringement is detected, and the model is continuously monitored to maintain its efficacy over time [22].

Technology	Key Benefits	Advantages	Limitations
Machine Learning (ML)[23]	Prior Art Identification	Providing greater accuracy, efficiency, and insights than traditional methods.	Limited Human Oversight
Natural Language Processing (NLP)[24]	Document analysis and classification	Language translation, sentiment analysis, and knowledge extraction.	Ambiguity and Complexity
Artificial Neural Network (ANN)[25]	Predictive analytics	Automation and Adaptability to changing IPR-related data and trends	Lack of Interpretability
Convolutional Neural Network (CNN)[26]	Intellectual Property monitoring.	Flexibility and Scalability	Limited Domain Expertise

IV. CHALLENGES

1. Lack of transparency: AI algorithms can be difficult to understand and ambiguous which could be challenging in the case of transparency, which is important for the protection of IPR.

2. Bias: AI systems can sustain bias, which can result in prejudiced practices when it comes to granting and enforcing IPR.
3. Quality control: AI technology is in the developing phase so the reliability and accuracy of AI-generated data can vary from which the quality of IPR data can be questioned.
4. Legal uncertainty: The legal inference of using AI in IPR is still unsettled, mainly in the case of the liability and accountability of AI-generated decisions.

V. SUGGESTIONS

1. Transparency: To diminish the challenge of transparency, AI algorithms should be designed to provide clear explanations of how the decision is made associated with IPR.
2. Diversity and inclusivity: It is important to ensure that the AI systems are trained and designed to avoid bias with the help of the involvement of a diverse group of people in the process.
3. Quality control: A robust system of data verification and validation should be established to ensure the quality of AI-generated data of IPR.
4. Legal clarity: The legal inference of using AI in IPR should be elucidated through policy and legislation to administer clarity on issues such as liability and accountability for AI-generated decisions.

VI. CONCLUSION

The use of AI in the field of IPR is fast growing, especially in the administration of trademarks and patents, the enforcement of copyrights, and the safeguarding of trade secrets. IPR-related processes such as prior patent searches, trademark enforcement, copyright infringement detection, content identification, trademark searches, and trademark enforcement can be automated and streamlined with the aid of AI tools, including machine learning (ML), natural language processing (NLP), artificial neural network (ANN), and convolutional neural network (CNN). Overall, for better protection of intellectual property assets and to gain a competitive edge in the market, the role of AI in IPR is likely to grow in the coming years as organizations seek to leverage the benefits of these technologies. However, it is important to carefully consider the implications of these technologies and ensure that they are being used in a responsible manner.

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