

Legal Complexities: Ai's Role in Patent Law Challenges amidst the Age of Machine Learning

Dr. Sourabh Sharma

(LL.M. PH.D. LAW), Assistant Professor, Madhav Vidhi Mahavidhalaya ,Gwalior, Madhya Pradesh

ABSTRACT

This paper examines the legal ramifications of artificial intelligence (AI) in the field of patent law, with a specific emphasis on practical uses and technological benefits. It emphasizes the significance of detecting and eliminating interdependencies among data items in the intricate domain of AI and ML, facilitating concurrent processing, and averting periods of inactivity. The progress of AI has had a substantial impact on patent law, resulting in the creation of laws specifically tailored to AI-related patents. The paper examines the difficulties associated with obtaining patents for AI-related discoveries, with a specific focus on issues related to identifying the inventors and the eligibility of the patents. The study explores issues pertaining to intellectual property, questions about prejudice and fairness, and the need for regulation and governance. The text emphasizes the significance of copyright, patents, trade secrets, and data privacy in safeguarding the progress made in AI and ML. The paper highlights the significance of regulatory frameworks that effectively manage the balance between innovation and user safety. It draws upon ideas from Indian case law and the proposed AI regulatory framework.

Keywords: AI, ML, patent law, intellectual property, liability, accountability, bias, fairness, regulation, governance.

INTRODUCTION

In the dynamic landscape of technological advancements, integrating AI and ML into various domains has brought about unprecedented challenges, especially in patent law. This study explores the legal implications of AI navigating patent law challenges in the age of ML, with a focus on practical applications and technical advantages that overcome existing technical problems. One of the notable advantages of this system is the ability to identify and remove dependencies between data elements. This feature becomes crucial in AI and ML, where data interdependencies can be complex¹. The system enables parallel processing within the information system by eliminating links between data elements, thereby enhancing efficiency and throughput.²

The system's approach to preserving the values of data elements and their relationships while removing linkages provides a technical advantage. This preservation allows for successful processing by network devices, mitigating the negative impact of missing or erroneous data elements on overall system performance. Avoiding downtime and bottlenecks ensures the smooth operation of the information system.

The advancements profoundly influence the legal implications of AI in the context of patent law in ML technologies. With its innovative data ingestion device, the disclosed system addresses challenges related to data processing efficiency, dependency identification, and preservation of data values and relationships. This enhances the overall performance of information systems and provides a robust framework for navigating patent law challenges in the era of ML.³ As the legal landscape continues to evolve, the intersection of AI, ML, and patent law will require ongoing scrutiny and adaptation to ensure the effective protection of intellectual property rights in this rapidly changing technological landscape.⁴

AI AND PATENT LAW

AI has become a significant technological advancement, transforming every aspect of human existence and contributing to the reconfiguration of society. In 2022, the rapid evolution of AI and its interaction with patent law led to the development of AI-related patent regulations. The practical applications of learning algorithms in industry have been the driving force behind AI, which has its roots in computer science. The field has shifted from simulating "human-like intelligence" to developing robots for specific commercial uses.

Influencers like vacuum cleaners, thermostats, and refrigerators are equipped with AI gadgets transforming people's everyday lives. AI is also active on the web in bots, vehicles, and navigation systems, and people routinely avoid traffic

to get to work on time. The use of AI in the medical field has led to tailored treatments and more precise diagnoses. The advent of autonomous vehicles exemplifies how AI enhances safety and production.

However, AI also brings societal difficulties, such as technological unemployment, replacing human judgment, and privacy concerns, which pose serious ethical dilemmas. "AI" refers to computers that can perform activities that require human intellect. ML is making significant progress, accounting for 40% of all patents in the AI space. Deep learning and neural networks are revolutionizing ML, and leading academic institutions invest extensively in AI research. Big tech firms like Apple, Google, Facebook, IBM, Amazon, and Microsoft allocate significant funds to investigating AI applications they see as crucial to their future success.⁵

The rise in AI patent applications has raised concerns about inventorship and patent eligibility. Reputable institutions like patent offices and courts play a crucial role in settling questions of inventorship, using stringent inspection methods to ensure only legitimate inventors receive credit and protection for their innovations. The "European Patent Office" (EPO) initially rejected two patent applications ("EP 18275163 and EP 3563896") because the applicant did not name a human inventor. The ethics and law surrounding exclusive authorship of a human invention are heavily debated in the ensuing appeal.⁶

According to a recent USPTO public survey, the general public seems to agree that present AI capabilities do not yet include the potential for innovation. Many participants felt that current forms of AI lacked the creativity and originality required for independent innovation and writing. The "International Association for the Protection of Intellectual Property" (AIPPI) responded to the consultation, stating that the function of a human inventor in creating AI innovations cannot be fully excluded from the realm of possibility.

AI discoveries may entail complicated algorithms and data-driven processes, making explaining them in detail in a patent application difficult. Ethical problems have also arisen due to privacy-related ethical concerns around AI. Technology is evolving to monitor every facet of an individual's existence, and a person's digital footprint provides a more complete picture of their life than any self-revelation ever could. Data is a source of tremendous wealth for businesses but at the cost of individuals. It raises severe worries and consequences since it affects choices, governs behaviour, and makes democracy a hollow promise. The benefits of knowledge, communication, and technology often offset the costs of a loss of privacy.

The European Commission proposed the AI Regulation (the "EU AI Regulation") on April 21, 2021, to provide a comprehensive framework to control the introduction of potentially dangerous AI systems while protecting the rights and well-being of EU citizens in the face of AI's fast development.⁷

PATENTING ML INVENTIONS

The utilization and advancement of AI and ML technology are proliferating from specialized Silicon Valley software corporations to nearly all cutting-edge enterprises, including those outside the conventional software domain.⁸ Non-software organizations must have a well-defined plan for creating and implementing ML technologies and for developing intellectual property based on these innovations. Although several prominent software corporations have obtained patents for AI-related technology for over ten years, non-software enterprises may be relatively inexperienced in patenting such discoveries.

Applications of Machine Learning Technology Outside the Software Sector

Atomwise, a biochemical discovery business based in San Francisco, is one such company that uses ML technology but is not in the software industry. Atomwise's deep learning computer, AtomNet, tackled important, real-world problems with improving pesticides. Using deep learning, Atomwise's research team was able to simulate millions of molecules and identify the ones that are effective insecticides without posing a threat to humans or other beneficial creatures. It would be impossible to simulate millions of compounds using conventional research techniques. Atomwise has beat the competition by producing safer pesticide products more quickly because of this strategy. Rapid iteration is a key advantage of ML systems. Machines can produce and evaluate samples far more rapidly than people can. Scott Adams, creator of Dilbert, had a lot of failures under his belt before he found success with Dilbert. Adams spent a considerable amount of time iterating. However, this may be done considerably more rapidly by using a ML algorithm that creates cartoons. In a similar vein, Atomwise was able to beat out its rivals that relied on more conventional methods by rapidly iterating on their pesticide development.⁹

Not unexpectedly, there is a significant increase in patent application submissions for ML technologies, which will certainly continue. Either (1) novel applications of ML to challenges in the company's field or (2) novel ML technologies may qualify as patentable innovations.

Alternative Methods of Resolution

A non-software firm's industry may be used to decide whether or not an innovative approach to a problem can be patented by referencing the "*Diamond v. Diehr case*."¹⁰ The central matter in the case of "Diamond v. Diehr was the legality of U.S. Patent No. 4,344,142," entitled "Direct digital control of rubber moulding presses," granted to "James R. Diehr," residing in Troy, Michigan. The Supreme Court determined that managing the implementation of a tangible procedure via the operation of computer software did not exclude the possibility of obtaining a patent for the whole invention. The invention's uniqueness may reside in the computer software or the physical process.

Importantly, the Diehr patent does not cover any kind of advancement in ML. Indeed, it refers to computer technology from the past as it was formally recorded in 1975 and authorized in 1982. ML is absent from this development. Instead, it uses a simple computer from the 1970s that was already preloaded with the necessary software. The mold temperature is only one example of the kinds of information that may be gathered by the computer as part of the Diehr innovation. It then utilizes preprogrammed rules to make choices based on this data. The court deemed this to be enough for an innovation that is eligible for patent protection. Substituting predetermined regulations with a well-trained neural network (together with an explanation of the training procedure) might potentially result in a ML innovation that satisfies the patentability criteria outlined by the Supreme Court in the the case.¹¹

The use of trained neural networks to control chemical production or biological or medical compounds may be eligible for patent protection under the Diamond v. Diehr precedent. Nebojsa Jojic of Redmond, WA, was awarded "U.S. Patent No. 8,478,535" in 2013, which was filed on December 30, 2005, and awarded on July 2, 2013. The patent application was filed to combat rapidly evolving pathogens in response to the human immune system, and the working title of the paper is Systems and Methods That Use ML Algorithms to Simplify AIDS Vaccine Cocktail Assembly.

New ML Technologies

Companies outside the software industry may also apply for patents on ML innovations made by their staff. Different issues may need different ML technologies to address them. Software developers often resort to reusing old methods and tools when confronted with a novel machine-learning challenge. For instance, a human facial recognition model may be retrained on cat faces if that is the issue at hand. This, however, is not always guaranteed to be effective. Swapping off human features for cat ones might be one solution. However, replacing human faces with complicated molecules may be more challenging. Alterations may include

- (1) a different feature vector or other data analyzed by the neural network,
- (2) different sets of data used for training the neural network, and
- (3) a different structure for the neural network itself.

The patentability of novel ML approaches may instead depend on developments in computer science, as opposed to the use of computers to address problems in other disciplines. For instance, the approach may contain a brand-new neural network to govern a rubber-curing process rather than an old one.

It's possible that patent protection isn't available for technologies like mathematical and non-technological business algorithms. Investment risk hedging tactics and internal computer computations are examples of such technologies, and neither affect nor are affected by the performance of the computer outside of itself. The CPU, GPU, memory architecture, and data structure of a computer all contribute to its overall performance.

Artificial intelligence and machine learning are quickly becoming transformative technologies in many fields. There will be a \$8.8 billion market for ML services by 2022. Companies of all sizes, from the largest conglomerates to the newest startups, are curious about software patents related to AI and ML. However, the scope of what may be patented has been a contentious issue in recent times.¹²

The USPTO has issued rules specifying what may and cannot be protected in AI and ML. On the other hand, ML is the process by which a computer is taught to predict and improve its behaviour and calculations without human input.¹³

This raises the fundamental inquiry: can ML algorithms be patented?

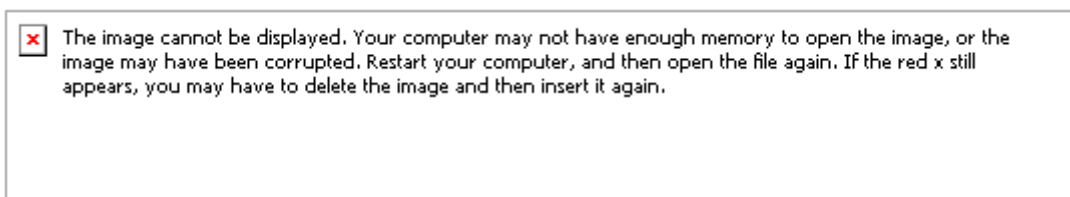
Indeed, the answer to this question is contingent upon one's definition of an algorithm. Under U.S. patent law, getting a patent for an algorithm is not permissible. Nevertheless, getting a patent for the sequence of actions inside your program is possible. According to U.S. patent law, an algorithm is seen as a sequence of mathematical instructions and processes.

Many individuals often conflate machine software with software patents. Software is eligible for patenting due to its classification as a finalized object, but ML methods are considered abstract.

Most AI and the leading American and Japanese IT companies have created ML patents. Chinese firms such as Baidu have been boosting their portfolio of patents in recent years. Their quality is the source of the problem. The number of patents covering AI has skyrocketed over the previous five years, as reported by the WIPO. Between 2013 and 2017, the number of patent applications worldwide relating to AI increased by an astounding 193%, according to the WIPO.¹⁴

The director-general of WIPO has indicated that the growth in patenting signals a substantial flood of new AI-based goods, apps, and methods that will have far-reaching implications on our everyday lives. Humans' interactions with the robots we design will change as a result of these breakthroughs. According to a WIPO study of mergers and acquisitions in the AI industry, 434 companies have been acquired since 1998, with over half of these transactions occurring in 2016 and later. AI and ML's contributions to innovation in many fields will continue to benefit companies who put a priority on safeguarding their intellectual property.¹⁵

Source: <https://www.ft.com/content/d93866aa-247d-11e9-b329-c7e6ceb5ffdf>



EXAMPLES OF PATENTS RELATED TOML

Samsung has developed a drone that can be controlled using facial recognition and hand gestures.

Samsung has recently received a patent for a drone that has a flying display that can scan a person's face, eyes, and hands to determine their identity. The camera is described in detail as a data transmission system that reports to the main control unit in the patent. As a result, it serves as an adequate input. The question of whether or not to utilize it persists, nevertheless. There is a prevailing belief that the main objective of this technology might be linked to the advertising sector, namely by displaying personalized advertisements to individuals when navigating through urban areas.¹⁶

Amazon has submitted a patent application for a technology capable of recording and storing the specific details of a conversation.

Smart speakers constantly monitor their surroundings. Amazon's most recent patent allows for activating the Alexa smart speaker not just by a trigger phrase but also by your preferences. As per the patent, Alexa will record terms with significant semantic significance. For instance, "I have a strong affinity for Italian cuisine." When a sentence including the word "love" is said, the intelligent speaker will assess this information and use it to customize advertisements. In the near future, you may expect to see advertisements promoting Italian cuisine.¹⁷

LIABILITY AND ACCOUNTABILITY

In the context of AI and ML systems in India, liability and responsibility are crucial considerations. Combining these technologies creates complexity in attributing blame and establishing AI entities' legal personalities. The purpose of this section is to inquire into the issues of legal responsibility and accountability in AI and ML systems.

A significant obstacle is determining who is liable when AI systems inflict damage or generate undesired consequences. Traditional legal frameworks may fail to ascribe culpability when AI systems function independently or make choices without human participation. Assigning legal rights and obligations to non-human beings has sparked discussion regarding whether or not AI creatures should be granted legal personhood.

Cases like "***LIC of India v. Consumer Education and Research Centre (1995)***",¹⁸ which were landmark decisions, shed light on liability and its implications in Indian law. In this decision, the Supreme Court of India used the theory of vicarious responsibility and ruled that insurance firms might be held liable for the misconduct of their agents. Although AI systems are beyond the scope of this case, it does highlight the need of holding corporations accountable for the acts of its agents and technology.

Approaching accountable decision-making from many perspectives is possible. The security and trustworthiness of AI technology may be improved by establishing clear criteria and rules for the creation and production of AI systems. In addition, frameworks might be created to divide responsibility for AI system failures among the many parties involved in their creation, distribution, and maintenance, considering issues of control, foreseeability, and carelessness.

Responsible AI development and deployment might be promoted by implementing regulatory frameworks. Organizations may need to keep logs of the AI algorithms and data they employ, undergo frequent audits, and set up systems to track and remediate any discriminating or biased results. Such methods may improve the legal frameworks around responsibility by fostering openness and accountability and ensuring that the relevant parties are held accountable for the effects of AI systems.

INTELLECTUAL PROPERTY

When it comes to using AI and ML technologies, intellectual property is vital in India. The development and use of novel algorithms, databases, and AI-generated outputs give rise to intricate legal concerns pertaining to ownership, safeguarding, and violation. Copyright is a crucial aspect of IP in the realm of AI and ML systems. Indian case law, such as the "*Ferid Allani v. Union of India case (2014)*",¹⁹ provides helpful guidance on how to safeguard your computer-generated works against piracy.

Protecting developments in AI and ML requires a robust patent system. Innovations that leverage AI and ML to overcome technical issues may be patentable, even if AI algorithms and models themselves are not. Companies working on AI and ML systems should carefully evaluate whether or not their findings are patentable in India, taking into account criteria including novelty, creativity, and practicality in industry. Patents provide creators exclusive protections, which encourages further investment and study into machine learning and artificial intelligence.

Trade secrets secure crucial AI and ML methodologies, datasets, and unique knowledge. Companies can't afford to lose their competitive advantage, thus protecting their sensitive information is crucial. Trade secrets in AI and ML systems must be protected by stringent contractual agreements, confidentiality agreements, and internal security procedures.

Incorporating external data into AI and ML systems introduces more intellectual property problems since the unlawful use of copyrighted datasets might result in legal repercussions and allegations of infringement. To effectively traverse the intricate domain of IP in AI and ML systems, enterprises should take proactive measures to safeguard their IP assets. This may be achieved by pursuing suitable registrations, establishing internal rules, and completing thorough due diligence.

BIAS AND FAIRNESS

The amalgamation of AI and ML technology gives rise to apprehensions about bias and equity. AI algorithms, which are created to generate predictions by analysing patterns and correlations in training data, have the potential to reinforce prejudices and uphold existing inequities. This might result in biased consequences in domains such as recruitment procedures, loan authorizations, criminal justice systems, and the availability of prospects.

Legal frameworks need to establish clear rules for recognizing and removing prejudice in AI and ML systems. Businesses using AI systems should conduct thorough bias analyses and implement safeguards to ensure fair algorithmic decision-making processes. This includes improving transparency, allowing individuals to challenge algorithmic decisions, and holding responsible parties accountable for bias and discrimination.

The ethical and legal issues posed by prejudice in AI and ML systems are explored in depth in Indian case law. For instance, the *K.S. Puttaswamy case*²⁰ and *Google India Pvt. Ltd. v. Visaka Industries Limited (2017)*²¹ emphasized the significance of equity and the absence of bias in AI systems. A more diverse and inclusive approach to developing and deploying AI and ML technologies is essential for ensuring social fairness and minimizing bias. This includes increasing the diversity of the people working on AI projects, including many perspectives in the development of algorithms, and regularly testing and overseeing systems to root out and correct for any discriminating or unfair outcomes.

Regulatory frameworks should promote gathering varied and inclusive data sets to guarantee equity and prevent the exclusion or marginalization of certain populations. Organizations must set explicit criteria to evaluate and rectify prejudice in their AI and ML systems, and they should face repercussions for engaging in discriminatory activities.

REGULATION AND GOVERNANCE

Since AI and ML are becoming more popular in India, strong regulatory frameworks are needed for widespread implementation and usage. There is room for legal confusion and potential worries due to the Information Technology Act of 2000's (the country's main statute) absence of established rules and standards for AI and ML systems. The Indian government has proposed an artificial intelligence regulatory framework to deal with this problem and guarantee the open, responsible, and ethical use of AI in all sectors. However, it is unclear how well it handles complex legal issues.

Finding a happy medium between fostering innovation and ensuring users' safety is essential for effectively regulating AI and ML systems. Frameworks for regulation should encourage ethical innovation and protect against risks, including data breaches, discrimination, and unfair decision-making. When AI systems inflict damage or breach legal or ethical norms, there should be clear principles and processes to assign blame and enforce accountability.

The Indian government is urged to establish comprehensive regulatory frameworks that address the challenges posed by AI and ML, requiring close coordination between politicians, legal experts, industry representatives, and civil society groups, while also being flexible enough to adapt to rapid technology development.

Cases from India's highest court, such as "*Sabu Mathew George v. Union of India (2018)*",²² highlight the need for strict data privacy laws and the function of the judicial system in protecting people's rights in the digital era.

ETHICAL CONSIDERATIONS

The widespread use of AI and ML technologies in India is a significant ethical issue, with ethical considerations such as "transparency, fairness, explainability, and accountability" playing a crucial role. Transparency is essential for the development and implementation of AI systems, as it can lead to issues of prejudice, discrimination, and unjust consequences. Increased trust and the capacity for end users to assess the algorithms' fairness and reliability may result from "explainable AI," in which the algorithms offer clear explanations for their judgments.

Fairness is also vital, since AI systems' unintended continuation of bias and prejudice might result in unequal treatment and detrimental social ramifications. To prevent AI systems from exacerbating societal inequalities, it is essential to identify and eliminate biases inside algorithms. Building and deploying AI and ML technologies may be done more fairly with the help of ethical norms and standards.

Particularly important is the capacity to explain the decisions made by AI and ML systems in highly sensitive areas such as healthcare, banking, and law enforcement. Those who are harmed by AI judgments should be allowed to see the justifications for them and dispute them if necessary. The right to explanation should be included into legal frameworks, and AI systems should be developed to provide meaningful explanations to affected individuals and stakeholders.

Regulation and governance frameworks for AI and ML should include accountability as a fundamental ethical principle. All parties involved in the development, production, and usage of AI systems should be held accountable for their decisions and the outcomes they produce. In the fast expanding realms of AI and ML, unambiguous rules and methods are vital.

Ethical decision-making in artificial intelligence and machine learning has been brought to light by high-profile case studies like India's Aadhaar initiative.

CONCLUSION

This study has examined the legal ramifications of using AI and ML in different settings. Legal issues, responsibility, culpability, transparency, and intellectual property concerns are just some of the topics that have been brought to light by this literature study.

A robust legal framework is necessary to address the risks and characteristics of AI systems, as shown by the findings. Algorithmic accountability and fault assignment in AI instances have been identified as important areas of inquiry.

In addition, the review's focus on AI and ML serves to underline the significance of the Personal Data Protection Act. There has to be a comprehensive examination and adaptation of provisions for privacy, consent, and data protection to account for the unique characteristics of AI systems.

The patenting, copyright, and trade secret implications of AI-generated innovations hamper efforts to encourage innovation while protecting artists' rights.²³

Additionally, the assessment stresses the need of guaranteeing justice and non-discrimination in AI systems, as well as tackling algorithmic bias. To develop reliable and fair AI systems, it is essential to use strategies to reduce bias and encourage responsible data collecting and algorithm design.

Last but not least, ethical concerns play a crucial part in the creation and implementation of AI and ML systems. To guarantee responsible and ethical AI activities, it is crucial to align AI systems with social values and norms and to embrace ethical frameworks and principles.

As a whole, this article is a great resource for learning about the present level of our understanding of the legal ramifications of machine learning and artificial intelligence. The findings from the literature review provide a foundation for future study, opening the door to a more comprehensive analysis of the legal difficulties and possible remedies in the Indian context. Facilitating the appropriate and positive integration of AI and ML technologies into society would be greatly aided by efforts to address these difficulties.

REFERENCES

- [1]. Thakkalapelli, D., Kavali, R. V. S., Randhi, V. R., & Dabbiru, R. (2022). "U.S. Patent No. 11,379,440. Washington, DC: U.S. Patent and Trademark Office."
- [2]. "The Legal Implications of Artificial Intelligence and Machine Learning: Navigating Complex Challenges in the Indian Context." StartupTimes. Retrieved November 8, 2023, from <https://startuptimes.net/the-legal-implications-of-artificial-intelligence-and-machine-learning-navigating-complex-challenges-in-the-indian-context>
- [3]. Thakkalapelli, & D. Vegulla, V. K., Kavali, R. V. S., Randhi, V. R., (2023). "U.S. Patent Application No. 17/680,561."
- [4]. T. A. (2023, September 18). "Artificial Intelligence and Patent Law: Navigating the Landscape in 2023." Lexology. Retrieved November 8, 2023, from <https://www.lexology.com/library/detail.aspx?g=d23352e1-5a22-4c77-85b4-4d80a5b47e51>
- [5]. Fan, S., Liu, G., Tu, Y., Zhu, J., Zhang, P., & Tian, Z. (2023). "Improved multi-criteria decision-making method integrating machine learning for patent competitive potential Evaluation: A case study in water pollution abatement technology." Journal of Cleaner Production, 403, 136896.
- [6]. "Patenting Machine Learning Inventions for Companies Outside the Software Industry." Retrieved November 8, 2023, from <https://www.aipla.org/list/innovate-articles/patenting-machine-learning-inventions-for-companies-outside-the-software-industry>
- [7]. Rapacke, A. (2023, June 2). "Are Machine Learning Algorithms Patentable? The Rapacke Law Group." Retrieved November 8, 2023, from <https://arapackelaw.com/patents/softwaremobile-apps/are-machine-learning-algorithms-patentable/>
- [8]. India, T. (2023, October 26). "Discussing About Artificial Intelligence (AI) in Data Science with DamodarraoThakkalapelli -Data Solutions Architect." Tribuneindia News Service. Retrieved November 8, 2023, from <https://www.tribuneindia.com/news/impact-feature/discussing-about-artificial-intelligence-ai-in-data-science-with-damodarrao-thakkalapelli-data-solutions-architect-556765>
- [9]. Xie, W. (2022, August 29). "How To Patent Artificial Intelligence and Machine Learning Models." Forbes. Retrieved November 8, 2023, from <https://www.forbes.com/sites/forbesbusinesscouncil/2022/08/29/how-to-patent-artificial-intelligence-and-machine-learning-models/>
- [10]. 450 U.S. 175 (1981).
 - a. "Artificial Intelligence Inventions Are Patentable Under U.S. Patent Law, Even If Artificial Intelligence Can't Be an Inventor: Crowell & Moring - Artificial Intelligence Inventions Are Patentable Under U.S. Patent Law, even if Artificial Intelligence Can't Be an Inventor." Retrieved November 8, 2023, from <https://www.crowell.com/en/insights/client-alerts/artificial-intelligence-inventions-are-patentable-under-us-patent-law-even-if-artificial-intelligence-cant-be-an-inventor>.
- [11]. Thakkalapelli, D., Randhi, V. R., Kavali, R. V. S., & Dabbiru, R. (2022). "U.S. Patent Application No. 17/830,849."
- [12]. Zaini, W. M. F., Lai, D. T. C., & Lim, R. C. (2022). "Identifying patent classification codes associated with specific search keywords using machine learning." World Patent Information, 71, 102153.
- [13]. Picht, P. G., Brunner, V., & Schmid, R. (2022). "Artificial intelligence and intellectual property law: from diagnosis to action." Max Planck Institute for Innovation & Competition Research Paper, (22-08).
- [14]. Verma, S. (2023, March 29). "Machine Learning Patents – Key Differences & Best Practices for Patent Drafting." Sagacious IP. Retrieved November 8, 2023, from <https://sagaciousresearch.com/blog/software-machine-learning-patents-key-differences-best-practices-for-patent-drafting/>
- [15]. bid
- [16]. 1995 AIR 1811, 1995 SCC (5) 482
- [17]. WP(C) 7 of 2014
- [18]. WRIT PETITION (CIVIL) NO. 37 OF 2015
- [19]. CRIMINAL APPEAL NO. 1987 OF 2014
- [20]. WRIT PETITION (CIVIL) NO. 341 OF 2008
- [21]. India, T. (2023, October 26). "Discussing About Artificial Intelligence (AI) in Data Science with DamodarraoThakkalapelli -Data Solutions Architect." Tribuneindia News Service. Retrieved November 8, 2023,

- from <https://www.tribuneindia.com/news/impact-feature/discussing-about-artificial-intelligence-ai-in-data-science-with-damodarrao-thakkalapelli-data-solutions-architect-556765>
- [22]. . Randhi, V. R., Thakkalapelli, D., Kavali, R. V. S., & Dabbiru, R. (2022). U.S. Patent Application No. 17/830,849.
- [23]. .Kavali, R. V. S., Randhi, V. R., Thakkalapelli, D., Vegulla, V. K., & Maramreddy, R. (2023). U.S. Patent Application No. 17/576,539.
- [24]. .Grandhye, N. B., Randhi, V. R., Vegulla, V. K., Kavali, R. V. S., & Thakkalapelli, D. (2023). U.S. Patent No. 11,716,278. Washington, DC: U.S. Patent and Trademark Office.
- [25]. <https://doi.org/10.1016/j.techfore.2017.10.002>
- a. .Vegulla, V. K., Kavali, R. V. S., Randhi, V. R., & Thakkalapelli, D. (2023). U.S. Patent Application No. 17/680,561.
- [26]. Talluri, S., Randhi, V. R., Thakkalapelli, D., & Kavali, R. V. S. (2022). U.S. Patent Application No. 17/307,173.
- [27]. India, T. (2023, October 26). Discussing About Artificial Intelligence (AI) in Data Science with Damodarrao Thakkalapelli -Data Solutions Architect. Tribuneindia News Service. Retrieved November 10, 2023, from <https://www.tribuneindia.com/news/impact-feature/discussing-about-artificial-intelligence-ai-in-data-science-with-damodarrao-thakkalapelli-data-solutions-architect-556765>
- [28]. Machine Learning Patents and Patent Applications (Class 706/12) - Justia Patents Search. (n.d.). Retrieved November 10, 2023, from <https://patents.justia.com/patents-by-us-classification/706/12>
- [29]. Desk, O. W. (2023, October 25). Discussing Real world Data Processing Problems and Solutions with Damodarrao Thakkalapelli -Data Solutions Architect. 32.<https://www.outlookindia.com/>. Retrieved November 10, 2023, from:
- [30]. <https://www.outlookindia.com/business-spotlight/discussing-real-world-data-processing-problems-and-solutions-with-damodarrao-thakkalapelli-data-solutions-architect-news-326551>
- [31]. Thakkalapelli, D. (2023). Cloud Migration Solution: Correction, Synchronization, and Migration of Databases. Tuijin Jishu/Journal of Propulsion Technology, 44(3), 2656-2660.
- [32]. Thakkalapelli D. (2022, April 12). Why Patenting Machine Learning Algorithm is Nearly Impossible? Analytics Insight. Retrieved November 10, 2023, from <https://www.analyticsinsight.net/why-patenting-machine-learning-algorithm-is-nearly-impossible/>
- [33]. Grandhye, N. B., Randhi, V. R., Vegulla, V. K., Kavali, R. V. S., & Thakkalapelli, D. (2023). U.S. Patent Application No. 17/583,634.
- [34]. Kavali, R. V. S., D'silva, L., Randhi, V. R., & Thakkalapelli, D. (2023). U.S. Patent No. 11,604,691. Washington, DC: U.S. Patent and Trademark Office.
- [35]. Randhi, V. R., Thakkalapelli, D., Kavali, R. V. S., & Dabbiru, R. (2022). U.S. Patent Application No. 17/830,849.
- [36]. Dr. Sourabh Sharma (2023), "The Recognition of Women Justice And Equality", Journal of Survey in Fisheries Sciences 10(1) 2953-2963.
- [37]. Dr. Sourabh Sharma (2023), "CHILDREN RIGHTS AND THEIR SOCIO -LEGAL PROBLEMS", International Journal of Research in Social Sciences 13;(3): 117-123.
- [38]. Thakkalapelli, D. (2023). Innovative Approaches to Address Multi-Objective Fractional Programming Problems using Advanced Mean Deviation Techniques and Point Slopes Formula. EDUZONE: International Peer Reviewed/Refereed Multidisciplinary Journal (EIPRMJ), 12(2), 263. Retrieved from www.eduzonejournal.com
- [39]. Bvuma, S., Sharma, S., & Thakkalapelli, D. (2023). Comparative Analysis of Data Storage Solutions for Responsive Big Data Applications. EDUZONE: International Peer Reviewed/Refereed Multidisciplinary Journal (EIPRMJ), 12(2), 244. Retrieved from www.eduzonejournal.com
- [40]. Sharma, Rahul. "Legal Challenges and Enforcement Mechanisms in India's Contract Act, 1872 for E-Commerce Transactions." EDUZONE: International Peer Reviewed/Refereed Multidisciplinary Journal (EIPRMJ), 12(2), 236. Retrieved from www.eduzonejournal.com, July-December 2023.
- [41]. Sharma, Sourabh, Bvuma, Stella, & Thakkalapelli, Damodarrao. "Corporate Patenting AI and ML in Healthcare: Regulatory and Ethical Considerations." International Journal of New Media Studies (IJNMS), 10(1), 226. ISSN: 2394-4331. Impact Factor: 7.786. January-June 2023.
- [42]. Bvuma, S. (2023). Patenting AI and ML Models. Sarcouncil Journal of Engineering and Computer Sciences, Volume Augie, M.A - 02, Issue 11, ISSN(Online): 2945-3585. DOI- <https://doi.org/10.5281/>. Review Article. Received: 14-09-2022 | Accepted: 15-10-2022 | Published: 14-11-2023.