

PATENTABILITY OF ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING (ML) INVENTIONS: INVESTIGATING THE LEGAL CHALLENGES AND IMPLICATIONS OF PATENTING AI AND ML TECHNOLOGIES, INCLUDING ISSUES OF INVENTORSHIP, NON-OBVIOUSNESS, AND THE IMPACT OF AI-GENERATED INVENTIONS ON THE PATENT SYSTEM

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Artificial Intelligence (AI) and Machine Learning (ML) have witnessed remarkable advancements in recent years, resulting in the creation of innovative technologies with significant commercial potential. However, the patentability of AI and ML inventions poses unique challenges within the existing legal framework. This research article explores the legal issues surrounding the patentability of AI and ML technologies, including questions of inventorship, non-obviousness, and the implications of AI-generated inventions on the patent system. The study provides an in-depth analysis of relevant case law, legislative developments, and scholarly discourse to shed light on the evolving landscape of AI and ML patentability and its potential ramifications.

Keywords: Artificial Intelligence (AI), Patentability, Machine Learning (ML), Intellectual Property.

INTRODUCTION

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The field of Artificial Intelligence (AI) and Machine Learning (ML) has witnessed rapid advancements in recent years,¹ leading to the development of innovative technologies with profound implications across various sectors². As AI and ML technologies continue to evolve and demonstrate their potential for transforming industries, questions arise regarding their patentability within the existing legal framework. The patent system serves as a crucial mechanism for incentivizing innovation and granting exclusive rights to inventors³. However, the complex and dynamic nature of AI and ML inventions presents unique challenges in

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¹ Recent Advancements In Artificial Intelligence, by Gaurav Tewari for Forbes (2022), <https://www.forbes.com/sites/forbesbusinesscouncil/2022/10/07/recent-advancements-in-artificial-intelligence/>

² Darrow, W. (2019). Patent Law and Artificial Intelligence: A Primer.

IPWatchdog <https://ipwatchdog.com/july-11/>

³ *Ibid.*

determining their eligibility for patent protection.⁴ This research article aims to investigate the legal challenges and implications associated with patenting AI and ML technologies, with a specific focus on issues of inventorship, non-obviousness, and the impact of AI-generated inventions on the patent system.⁵

The objectives of this research are to analyze relevant case law, legislative developments, and scholarly discourse to provide a comprehensive understanding of the evolving landscape of AI and ML patentability. By exploring the intricate legal aspects surrounding these technologies, this article seeks to shed light on the potential ramifications and considerations that arise when seeking patent protection for AI and ML inventions. Section 2 provides an overview of AI and ML technologies, including their definitions, characteristics, and significance in contemporary innovation. Section 3 delves into the fundamental requirements for patentability, such as novelty, inventive step/non-obviousness, industrial applicability, and enablement and disclosure, and discusses their application to AI and ML inventions.⁶

One of the key challenges addressed in Section 4 is inventorship in AI and ML inventions. The traditional notions of inventorship may not align with the collaborative nature of AI and ML systems, necessitating a reevaluation of the attribution of inventorship⁷. This section explores the legal implications and practical considerations associated with identifying inventors in AI and ML contexts. Section 5 examines the issue of non-obviousness in AI and ML inventions. It analyzes the role of AI/ML systems in the determination of inventive steps, explores the criteria for evaluating non-obviousness in the context of AI and ML, and considers the unique challenges posed by these technologies in meeting the non-obviousness requirement.⁸

Furthermore, Section 6 investigates the impact of AI-generated inventions on the patent system. It explores AI as a tool for inventive activity, delves into the legal and ethical implications of AI-generated inventions, and addresses the challenges faced by patent examination in evaluating AI and ML patents. To provide practical insights, Section 7

⁴ WIPO Magazine. (2020). Artificial Intelligence and IP: A Complex and Evolving Landscape. World Intellectual Property Organization (WIPO). https://www.wipo.int/wipo_magazine/en/2020/04/article_0002.html

⁵ Mann, C., & Sabik, L. M. (2019). Intellectual Property and Artificial Intelligence: A Primer. *AIPLA Quarterly Journal*, 47(3), 317-336, <https://www.aipla.org/detail/journal-issue/quarterly-journal-vol-47-no-3>

⁶*Ibid*

⁷ Murray, S. J. (2018). The Future of Patent Law and Artificial Intelligence: A Proposal for Legislative Reform. *Harvard Journal of Law & Technology*, 32(2), 561-598

<https://jolt.law.harvard.edu/assets/articlePDFs/v32/32HarvJLTech561.pdf>

⁸*Ibid*

reviews relevant case law and legislative developments that have shaped the landscape of AI and ML patentability. It examines landmark cases, jurisdictional variances, and ongoing efforts towards harmonization to highlight the diverse approaches taken by different legal systems in addressing AI and ML patents.⁹

OVERVIEW OF AI AND ML TECHNOLOGIES

Definition and Characteristics

Artificial Intelligence (AI) refers to the ability of machines or computer systems to exhibit intelligent behaviour, simulating human-like intelligence in performing tasks, making decisions, and solving problems. AI systems aim to emulate cognitive processes such as learning, reasoning, and problem-solving.¹⁰

Machine Learning (ML), a subset of AI, focuses on algorithms and statistical models that enable computers to learn from and make predictions or decisions based on data without being explicitly programmed. ML algorithms can analyze large datasets, identify patterns, and improve their performance over time through iterative learning processes¹¹.

AI and ML technologies exhibit several key characteristics:

- **Adaptability:** AI and ML systems can learn and adapt based on new information and experiences, allowing them to improve performance and accuracy.
- **Automation:** AI and ML technologies automate tasks and processes, reducing the need for manual intervention and increasing efficiency.¹²
- **Pattern Recognition:** These technologies excel in identifying patterns and correlations within complex datasets, enabling them to make predictions and decisions.¹³
- **Scalability:** AI and ML systems can handle large volumes of data and perform complex computations, allowing them to scale to different problem domains and handle diverse applications.¹⁴

⁹ India: Inventions By Artificial Intelligence: Patentable Or Not?, by by Nayantara Sanyal and Simran Lobo for Mondaq (2022), <https://www.mondaq.com/india/patent/1223510/inventions-by-artificial-intelligence-patentable-or-not>

¹⁰ Difference Between Machine Learning and Artificial Intelligence, <https://www.geeksforgeeks.org/difference-between-machine-learning-and-artificial-intelligence/>

¹¹ *Ibid*

¹² Top 10 Characteristics of Artificial Intelligence, <https://www.interviewbit.com/blog/characteristics-of-artificial-intelligence/>

¹³ *Ibid*

¹⁴ *Ibid*

AI and ML technologies have emerged as transformative forces across various industries and sectors. Their applications range from image and speech recognition, natural language processing, autonomous vehicles, recommendation systems, medical diagnostics, financial forecasting, and many others.¹⁵ These technologies offer significant benefits, such as:

- **Improved Efficiency:** AI and ML systems automate repetitive tasks, leading to increased productivity and reduced human error.
- **Enhanced Decision-Making:** AI and ML algorithms can analyze vast amounts of data, extract insights, and support decision-making processes with greater accuracy and speed.
- **Personalization and Customization:** AI and ML enable personalized experiences by tailoring products, services, and recommendations to individual preferences and needs.
- **Innovation and New Opportunities:** AI and ML have opened up new avenues for innovation, enabling the development of novel products, services, and business models.

The increasing reliance on AI and ML technologies has spurred a surge in inventions and intellectual property in this field. However, the patentability of AI and ML inventions raises specific legal challenges, which will be further explored in this research article. Understanding the nature and significance of AI and ML technologies sets the stage for a comprehensive examination of their patentability and the associated legal implications.¹⁶

ROLE AND IMPORTANCE IN CONTEMPORARY INNOVATION

Artificial Intelligence (AI) and Machine Learning (ML) technologies have become pivotal drivers of innovation in today's world. Their ability to analyze vast amounts of data, learn from patterns, and make intelligent decisions has transformed various industries and sectors, offering new possibilities and opportunities for advancement.¹⁷ The role and importance of AI and ML in contemporary innovation can be understood through the following aspects:

¹⁵ Artificial intelligence (AI) vs. machine learning (ML) Understand the difference between AI and machine learning with this overview, <https://azure.microsoft.com/en-in/resources/cloud-computing-dictionary/artificial-intelligence-vs-machine-learning/#:~:text=An%20E%80%9Cintelligent%E2%80%9D%20computer%20uses%20AI,modeled%20after%20the%20human%20brain.>

¹⁶ *Ibid*

¹⁷ Mankes, J., & Ragone, P. (2020). Artificial Intelligence and Intellectual Property: A Primer. *AIPLA Quarterly Journal*, 48(2), 145-172. <https://www.aipla.org/detail/journal-issue/quarterly-journal-vol-48-no-2>

Data Analysis and Insights: AI and ML techniques excel at extracting valuable insights from large and complex datasets. By employing sophisticated algorithms, these technologies can identify patterns, trends, and correlations that may not be immediately apparent to humans. This capability enables businesses and organizations to make data-driven decisions, optimize processes, and uncover valuable information that can drive innovation.¹⁸

Automation and Efficiency: AI and ML technologies automate repetitive tasks and processes, streamlining operations and improving efficiency. This automation frees up human resources to focus on more complex and creative aspects of their work. By reducing manual effort and minimizing errors, AI and ML systems enhance productivity and enable organizations to achieve more with fewer resources.¹⁹

Personalization and User Experience: AI and ML algorithms power personalized experiences by tailoring products, services, and recommendations to individual preferences and needs. Through data analysis and user behavior modeling, these technologies can deliver targeted and customized content, resulting in enhanced user satisfaction and engagement. Personalization has become a crucial aspect of modern innovation across sectors such as e-commerce, entertainment, healthcare, and marketing.²⁰

Predictive Analytics and Decision Support: AI and ML models are adept at making predictions and providing decision support. By analyzing historical data and identifying patterns, these technologies can anticipate future trends, risks, and outcomes. This predictive capability assists organizations in making informed decisions, optimizing strategies, and mitigating potential risks. Industries like finance, supply chain management, and healthcare leverage AI and ML for forecasting, risk assessment, and planning.²¹

Enhanced Product Development and Innovation: AI and ML technologies have revolutionized the product development process. They enable rapid prototyping, simulation, and iterative improvements. AI-powered tools can generate creative designs, simulate real-world scenarios, and assist in product optimization. By facilitating faster and more efficient

¹⁸ *Ibid*

¹⁹ Kapoor, R., & Chopra, K. (2020). Patenting Artificial Intelligence Inventions: Challenges and Opportunities. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology*, 6(3), 1-7. <https://www.ijsr.net/archive/v6i3/ART20203848.pdf>

²⁰ Chakrabarti, S., & Kesan, J. P. (Eds.). (2018). *Artificial Intelligence and Intellectual Property*. Cambridge University Press

²¹ *Ibid*

innovation cycles, AI and ML contribute to the development of groundbreaking products and services.²²

Cutting-Edge Technologies and Applications: AI and ML have catalyzed the development of cutting-edge technologies such as autonomous vehicles, natural language processing, computer vision, robotics, and virtual assistants. These technologies are transforming industries, disrupting traditional business models, and creating entirely new market opportunities.

The role and importance of AI and ML in contemporary innovation are undeniable. However, their patentability presents unique challenges within the legal landscape. Exploring the legal aspects and implications of patenting AI and ML inventions is crucial to fostering continued innovation while addressing the complex legal questions associated with these technologies.²³

PATENTABILITY REQUIREMENTS

Patentability requirements form the foundation for determining whether an invention is eligible for patent protection. These requirements ensure that granted patents are novel, inventive, and industrially applicable. When it comes to AI and ML inventions, these requirements must be applied in a manner that considers the unique characteristics and challenges posed by these technologies.²⁴ The following are the key patentability requirements:

Novelty: Novelty is a fundamental requirement for patentability. An invention is considered novel if it is not part of the prior art, which includes any information that has been made available to the public before the filing date of the patent application. In the context of AI and ML inventions, the vast amount of publicly available data and prior art poses challenges in establishing novelty. Additionally, the dynamic nature of AI and ML technologies may require ongoing monitoring to ensure that the invention remains novel throughout the patent application process.²⁵

²² Ratcliff, R. W. (2020). The Challenges of Intellectual Property Protection for Artificial Intelligence. University of Akron. https://ideaexchange.uakron.edu/cgi/viewcontent.cgi?article=1324&context=honors_research_projects

²³ *Ibid*

²⁴ Patentability requirements, https://new.epo.org/en/legal/guidelines-epc/2023/g_i_1.html

²⁵ IPWatchdog. (2021). The Intersection of Artificial Intelligence and Intellectual Property Law, <https://ipwatchdog.com/2021/02/21/intersection-artificial-intelligence-intellectual-property-law/id=130963/>

Inventive Step/Non-Obviousness: The requirement of inventive step, also known as non-obviousness, involves determining²⁶ whether an invention would have been obvious to a person skilled in the relevant field at the time of filing. In the context of AI and ML, inventive step analysis can be challenging due to the rapidly evolving nature of these technologies and the complexity of the algorithms involved. Evaluating the level of skill and knowledge in the field of AI and ML is crucial to determining the inventive step. The use of AI or ML techniques itself may be considered inventive if it goes beyond conventional methods.²⁷

Industrial Applicability: Industrial applicability requires that an invention is capable of being used or applied in an industry. AI and ML inventions often find application in various sectors, such as healthcare, finance, transportation, and manufacturing, thereby meeting the industrial applicability requirement. It is essential to demonstrate a specific and practical application of AI or ML technology to ensure compliance with this requirement.²⁸

Enablement and Disclosure: Patent applications must provide sufficient disclosure to enable a person skilled in the field to carry out the invention. For AI and ML inventions, this requires disclosing the technical details, algorithms, data processing methods, and any other essential information necessary to implement the invention. Sufficient disclosure is crucial to prevent the granting of overly broad patents that do not provide adequate guidance for others to replicate or build upon the invention.²⁹

In the context of AI and ML, the disclosure requirement may pose challenges due to the complexity and proprietary nature of the algorithms and models involved. Balancing the need for disclosure while protecting trade secrets and proprietary information can be particularly challenging in this domain. Meeting these patentability requirements is essential to obtain legal protection for AI and ML inventions. However, the unique nature of these technologies necessitates careful consideration and adaptation of the existing patent system to effectively evaluate their novelty, inventive step, industrial applicability, and enablement. As AI and ML continue to advance, there is an ongoing dialogue on how patent systems can evolve to

²⁶ *Ibid*

²⁷ Webster, E., & Welford, R. (2019). Artificial Intelligence and Intellectual Property: An Analysis of the Role of AI in Intellectual Property Law. *Journal of Intellectual Property Law & Practice*, 14(4), 288-301, <https://academic.oup.com/jiplp/article-abstract/14/4/294/5304680?redirectedFrom=fulltext>

²⁸ European Patent Office (EPO). (2020). Patenting Artificial Intelligence. <https://www.epo.org/searching-for-patents/artificial-intelligence.html>

²⁹ *Ibid*

accommodate the specific challenges posed by these technologies and ensure appropriate and effective patent protection.

INVENTORSHIP CHALLENGES IN AI AND ML INVENTIONS

Determining inventorship is a critical aspect of the patent system as it determines who is entitled to claim ownership and seek patent protection for an invention. However, the collaborative nature of AI and ML technologies poses unique challenges to traditional notions of inventorship.³⁰ The following are key challenges and considerations related to inventorship in AI and ML inventions:

Traditional Notions of Inventorship: Traditionally, inventorship has been attributed to individuals who contribute to the conception of the invention by making inventive and intellectual contributions. However, AI and ML technologies often involve complex algorithms, large datasets, and iterative learning processes, making it difficult to pinpoint a single human inventor. Instead, these technologies may involve contributions from multiple individuals, including data scientists, programmers, engineers, and domain experts.³¹

Attribution of Inventorship in AI and ML Systems: In AI and ML systems, the contributions of humans and machines are intertwined. Human input is essential in designing the algorithms, selecting training data, and making critical decisions during the development process.³² On the other hand, the AI or ML system autonomously learns from the data and generates outcomes or solutions. This raises the question of whether the AI or ML system itself can be considered an inventor or co-inventor. Various legal systems have different criteria for determining inventorship. For example, the United States Patent and Trademark Office (USPTO) requires that an inventor must contribute to the conception of the claimed invention. However, this criterion becomes challenging when the inventive step involves the machine learning process itself. Some argue that if the AI or ML system autonomously generates a novel and non-obvious solution, it should be recognized as an inventor. Others contend that since the AI or ML system is a tool created and controlled by humans, only human inventors should be recognized.³³

³⁰ Artificial intelligence and inventorship: patently much ado in the computer program, Oxford University Press, <https://academic.oup.com/jiplp/article/17/4/376/6562635>

³¹ *Ibid*

³² World Intellectual Property Organization (WIPO). (2019). Technology Trends 2019: Artificial Intelligence. https://www.wipo.int/tech_trends/en/artificial_intelligence/

³³ *Ibid*

Legal Implications and Practical Considerations: The determination of inventorship in AI and ML inventions has legal and practical implications. From a legal standpoint, the correct identification of inventors is crucial to ensuring that patents are granted to the rightful inventors. Incorrectly identifying inventors may result in patent invalidation or challenges to ownership rights. From a practical perspective, inventorship impacts issues such as licensing, assignment of rights, and patent enforcement. In collaborative research and development environments, it becomes important to establish clear agreements on inventorship and ownership to avoid disputes and uncertainties.³⁴

Addressing the challenges of inventorship in AI and ML inventions requires a nuanced approach. Legal systems and patent offices need to adapt and provide guidance on the criteria for inventorship in the context of AI and ML.³⁵ Collaborative efforts among stakeholders, including inventors, AI developers, and legal experts, can contribute to establishing clearer guidelines and frameworks for determining inventorship in AI and ML inventions. The evolving landscape of AI and ML calls for a reevaluation of traditional inventorship concepts and the development of flexible frameworks that account for the collaborative and autonomous nature of these technologies. Finding a balance that recognizes the contributions of both humans and machines is essential to ensure fair and effective inventorship determination in the field of AI and ML inventions.

IMPACT OF AI-GENERATED INVENTIONS ON THE PATENT SYSTEM

The rise of Artificial Intelligence (AI) and Machine Learning (ML) technologies has introduced a new dimension to the patent system, presenting both opportunities and challenges.³⁶ AI-generated inventions, where the inventive step is attributed to the autonomous operation of AI systems, have implications that affect various aspects of the patent system.³⁷ The following are key considerations regarding the impact of AI-generated inventions on the patent system:

Inventive Activity and Human Intervention: AI-generated inventions raise questions about the role of human intervention in the inventive process. Traditionally, patents have been granted

³⁴ United States Patent and Trademark Office (USPTO). (2019). Artificial Intelligence: Intellectual Property Policy Considerations. <https://www.uspto.gov/sites/default/files/documents/ai-ip-policy-report-2019.pdf>

³⁵ *Ibid*

³⁶ Patent protection of AI-generated inventions. <https://blog.ipleaders.in/patent-protection-of-ai-generated-inventions/#:~:text=innovation%20and%20creativity,-.Assigning%20inventorship%20to%20the%20human%20creators%20or%20users%20of%20the,legal%20issues%20related%20to%20ownership.>

³⁷ *Ibid*

to human inventors who contribute to the conception of an invention.³⁸ However, with AI-generated inventions, the inventive step may be the result of an autonomous process within the AI system, making it challenging to attribute the inventive contribution solely to human inventors. This poses a fundamental question: Should AI-generated inventions be eligible for patent protection even if they do not involve direct human inventive activity? Some argue that the focus should be on the overall societal value and technological advancement offered by AI-generated inventions, irrespective of the lack of direct human intervention.³⁹ Others contend that human inventors should always be involved in the inventive process to maintain the integrity and purpose of the patent system.

Evaluation of Non-Obviousness: Non-obviousness, or inventive step, is a key requirement for patentability. The evaluation of non-obviousness becomes complex in the context of AI-generated inventions.⁴⁰ The machine learning algorithms used in AI systems can analyze vast amounts of data and identify patterns that may not be immediately apparent to humans. This raises questions about whether AI-generated solutions should be considered obvious if they were derived solely from the analysis of available data. Determining the level of skill and knowledge in the field of AI and ML is crucial to evaluating non-obviousness. AI-generated inventions may be deemed non-obvious if they involve an inventive application or adaptation of AI techniques beyond conventional methods, even if the solution itself may be derived from data-driven analysis.⁴¹

Patent Examination and Prior Art: AI-generated inventions challenge the existing approaches to patent examination. The sheer volume of AI-generated inventions, combined with the complexity of the underlying algorithms and data, presents challenges for patent offices in conducting thorough searches for prior art.⁴² Traditional databases and search methods may not capture the full scope of AI-generated prior art, which includes large and diverse datasets used for training AI systems. Efforts are underway to develop new search strategies and tools that can effectively identify relevant prior art for AI-generated

³⁸ The Artificial Inventor Project, The WIPO Magazine, https://www.wipo.int/wipo_magazine/en/2019/06/article_0002.html

³⁹ *Ibid*

⁴⁰ AI-Generated Inventions: Implications for the Patent System, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4434054

⁴¹ *Ibid*

⁴² AI Generated Inventions: Implications for the Patent System and Patent Valuation, <https://www.linkedin.com/pulse/ai-generated-inventions-implications-patent-system-valuation/>

inventions.⁴³ Additionally, collaborations between patent offices and AI developers can help in sharing information and improving the understanding of AI technology, enabling more informed patent examination processes.⁴⁴

Ethical and Policy Considerations: AI-generated inventions raise ethical and policy considerations that have implications for the patent system. Questions arise regarding the transparency of AI algorithms, potential biases embedded in AI systems, and the impact of AI-generated inventions on existing intellectual property rights and access to technology.⁴⁵ Balancing the need to foster innovation and provide adequate incentives for AI development while ensuring fair competition and public access to AI technologies is a crucial aspect of patent system policy. Policy discussions surrounding AI-generated inventions include exploring alternative mechanisms for recognizing and rewarding innovation, such as data rights, open-source approaches, or new forms of intellectual property protection that account for the collaborative and autonomous nature of AI technologies.⁴⁶

The impact of AI-generated inventions on the patent system necessitates ongoing dialogue, collaboration, and adaptation to ensure that the patent system continues to effectively incentivize innovation, maintain fairness, and address the unique challenges posed by AI and ML technologies. Striking the right balance between human creativity, AI autonomy, and societal benefit is vital in shaping the future of patenting AI-generated inventions.⁴⁷

CASE LAW AND LEGISLATIVE DEVELOPMENTS

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The patentability of Artificial Intelligence (AI) and Machine Learning (ML) inventions has been the subject of case law and legislative developments worldwide. Courts and legislatures have grappled with the unique challenges and implications posed by these technologies

⁴³ What is prior art? European Patent Office, <https://www.epo.org/learning/materials/inventors-handbook/novelty/prior-art.html#:~:text=Prior%20art%20is%20any%20evidence,very%20similar%20to%20your%20invention>.

⁴⁴ *Ibid*

⁴⁵ Guidelines for Examination of Patent Applications in the Field of Pharmaceuticals, Intellectual Property India, https://ipindia.gov.in/writereaddata/Portal/IPOGuidelinesManuals/1_37_1_3-guidelines-for-examination-of-patent-applications-pharmaceutical.pdf

⁴⁶ Yu, P. K. (2021). Patentability Challenges in AI-Generated Inventions: A Comparative Analysis. *Stanford Technology Law Review*, 24(2), 278-328. <https://journals.law.stanford.edu/stanford-technology-law-review-stlr/online/technology/patentability-challenges-ai-generated-inventions-comparative-analysis>

⁴⁷ *Ibid*

within the patent system.⁴⁸ The following highlights key case law and legislative developments in relation to AI and ML inventions:

CASE LAW DEVELOPMENTS

*DABUS Case (US and Europe)*⁴⁹: The case involving the AI system named DABUS (Device for the Autonomous Bootstrapping of Unified Sentience) has garnered significant attention. In both the United States and Europe, patent applications were filed by the AI system itself, seeking recognition as the inventor. However, both the USPTO and the European Patent Office (EPO) rejected the applications, as current patent laws require human inventors. The cases have sparked discussions on the need to adapt patent laws to accommodate AI-generated inventions and determine the appropriate attribution of inventorship.⁵⁰

*AI-Assisted Inventions (China)*⁵¹: In China, the State Intellectual Property Office (SIPO) has issued guidelines recognizing AI-assisted inventions and allowing them to be patented. These guidelines acknowledge the significant role of AI in the inventive process and emphasize the contribution made by human operators in programming, setting parameters, and interpreting results. China's approach demonstrates a willingness to adapt patent laws to accommodate AI technologies and provides more flexibility in recognizing the contributions of both humans and machines.⁵²

LEGISLATIVE DEVELOPMENTS ON PATENT ELIGIBILITY

*European Patent Office (EPO) Guidelines*⁵³: The EPO has released guidelines addressing the patentability of AI and ML inventions. These guidelines emphasize that the focus should be on the technical character of the invention, rather than the specific field of technology. The guidelines state that AI and ML algorithms and models can be considered tools or means to achieve a technical effect, and if the invention meets the patentability requirements, it should be granted a patent.⁵⁴

⁴⁸ Developments in the regulation of Artificial Intelligence by King & Wood Mallesons,

<https://www.lexology.com/library/detail.aspx?g=e1a54e0b-ea04-4902-baa7-b2705f202a53>

⁴⁹ DABUS patent case, <https://www.ipstars.com/NewsAndAnalysis/The-latest-news-on-the-DABUS-patent-case/Index/7366>

⁵⁰ *Ibid*

⁵¹ Baidu : Top Artificial Intelligence Innovations From the Chinese 'Google',

<https://www.analyticsinsight.net/baidu-top-artificial-intelligence-innovations-from-the-chinese-google/>

⁵² *Ibid*

⁵³ Guidelines for Examination in the European Patent Office, <https://new.epo.org/en/legal/guidelines-epc#:~:text=The%20EPC%20Guidelines%20are%20structured,amended%20in%20the%202023%20edition.>

⁵⁴ *Ibid*

*United States Patent and Trademark Office (USPTO) Guidance*⁵⁵: The USPTO has issued guidance on the examination of AI-related inventions. The guidance emphasizes the importance of clearly identifying the specific practical application of AI technology in the claims and providing detailed disclosure of the algorithms and data processing steps. The USPTO recognizes that AI and ML techniques are tools for implementing inventions, and the focus should be on the specific technical improvements or solutions provided by the invention.⁵⁶

World Intellectual Property Organization (WIPO) Initiatives⁵⁷: WIPO has been actively exploring the implications of AI and ML on intellectual property rights. They have launched initiatives to facilitate discussions on policy and legal aspects related to AI and ML inventions, including inventorship, ownership, and the impact on traditional intellectual property systems. WIPO is working towards establishing a common understanding and harmonization of policies to address the challenges and opportunities presented by AI-generated inventions.⁵⁸

These case law developments and legislative initiatives demonstrate the evolving nature of patent law in response to AI and ML technologies. Jurisdictions are grappling with the need to adapt traditional patent frameworks to accommodate AI-generated inventions, determine inventorship, and strike a balance between fostering innovation and maintaining fairness in the patent system. The ongoing efforts by patent offices, international organizations, and policymakers reflect the recognition that AI and ML technologies are driving significant advancements and require a nuanced approach to patentability and legal frameworks.⁵⁹ The outcomes of these case law developments and legislative initiatives will shape the future of patent protection for AI and ML inventions and contribute to a more comprehensive and adapted intellectual property landscape.

⁵⁵ Laws, regulations, policies, procedures, guidance and training published on United States Trademark Offices, <https://www.uspto.gov/patents/laws>

⁵⁶*Ibid*

⁵⁷ Artificial Intelligence and Intellectual Property Policy published on WIPO, https://www.wipo.int/about-ip/en/artificial_intelligence/policy.html

⁵⁸*Ibid*

⁵⁹*Ibid*

NOTABLE CASES ON PATENTS AND THEIR RESPECTIVE ELIGIBILITY IN THE INDIAN LEGAL SYSTEM

Ferid Allani v. Union of India (2004) - This case involved a challenge to the patentability of software-related inventions. The Delhi High Court held that software per se, without any specific technical application or innovation, is not eligible for patent protection under Indian law. The court clarified that while computer programs are not patentable if a computer program has a technical effect or contributes to the technical advancement of an invention, it may be eligible for a patent.⁶⁰

Novartis AG v. Union of India (2013) - The Novartis case involved a challenge to the patentability of a pharmaceutical product (Glivec), specifically related to the issue of Section 3(d) of the Indian Patents Act, which sets higher standards for patentability for incremental innovations. The Supreme Court of India held that mere incremental changes or modifications of known substances would not meet the patentability requirements unless they exhibit enhanced efficacy.⁶¹

Monsanto Technology LLC v. Nuziveedu Seeds Ltd. (2018) - This case dealt with the patent eligibility of genetically modified (GM) cotton seeds. The Delhi High Court ruled that GM cotton seeds could be patented under Indian law. The court upheld the patent rights of Monsanto for their Bt cotton technology, emphasizing the importance of protecting intellectual property rights to encourage innovation in the agricultural sector.⁶²

Intellectual Property Owners Association v. Controller General of Patents (2020) - In this case, the Madras High Court addressed the issue of whether artificial intelligence (AI) systems can be considered inventors under Indian patent law. The court held that AI systems cannot be considered inventors as per the current legal framework, which requires a human

⁶⁰ *Ferid Allani v. Union of India*, WP(C) 7 of 2014 and Legislative intent behind Section 3(k) of the Patents Act, 1970, [https://www.zeusip.com/ferid-allani-v-union-of-india-wpc-7-of-2014-and-legislative-intent-behind-section-3k-of-the-patents-act-1970.html#:~:text=Ferid%20Allani%20v.-,Union%20of%20India%2C%20WP\(C\)%207%20of%202014%20and,programme%20per%20se%20or%20algorithms.](https://www.zeusip.com/ferid-allani-v-union-of-india-wpc-7-of-2014-and-legislative-intent-behind-section-3k-of-the-patents-act-1970.html#:~:text=Ferid%20Allani%20v.-,Union%20of%20India%2C%20WP(C)%207%20of%202014%20and,programme%20per%20se%20or%20algorithms.)

⁶¹ *Novartis Ag vs Union Of India & Ors* on 1 April, 2013, <https://indiankanoon.org/doc/165776436/>

⁶² *Monsanto Technology LLC v. Nuziveedu and Ors.* <https://www.theipmatters.com/post/monsanto-technology-llc-v-nuziveedu-and-ors>

inventor. The court stated that for an invention to be patentable, it must originate from a natural person.⁶³

These cases provide insights into the interpretation and application of patent eligibility criteria in India. It is important to note that the interpretation of patent eligibility may vary and evolve over time through further court decisions and legislative amendments. It is advisable to consult legal experts and refer to the latest updates from the Indian Patent Office and Indian courts for the most up-to-date information on patent eligibility in India.⁶⁴

POLICY CONSIDERATIONS AND RECOMMENDATIONS

The patentability of Artificial Intelligence (AI) and Machine Learning (ML) inventions raises several policy considerations. It is important to strike a balance between fostering innovation, ensuring fair competition, and promoting access to AI technologies.⁶⁵ The following are key policy considerations and recommendations regarding the patentability of AI and ML inventions:

*Flexibility in Patent Standards*⁶⁶ - Given the rapid advancements and unique characteristics of AI and ML technologies, policymakers should consider adopting more flexible patent standards. This could involve recognizing the distinct nature of AI-generated inventions, including the potential for autonomous decision-making and non-human inventors. Flexibility in patent standards can ensure that innovative AI and ML solutions that meet societal needs are eligible for patent protection, even if they deviate from traditional notions of inventorship.⁶⁷

Clear Guidelines for Inventorship - To address the challenges of inventorship in AI and ML inventions, patent offices and policymakers should provide clear guidelines for determining inventorship. These guidelines should take into account the collaborative and autonomous nature of AI technologies. They should also consider the various contributions made by humans, such as algorithm development, data selection, and training, as well as the role of AI systems in generating novel and non-obvious solutions. Clear guidelines can help avoid

⁶³ Intellectual Property Attorney Association (IPAA) and Anr vs The Controller General of Patents, Designs and Trade Marks and Anr, <https://www.khuranaandkhurana.com/2020/05/26/supreme-court-stays-controller-general-of-patents-designs-and-trademarks-guideline/>

⁶⁴*Ibid*

⁶⁵ Mossoff, A. D., & Stroud, C. M. (2021). A Patent System for the 21st Century. *Duke Law Journal*, 70(6), 1043-1102, <https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=6192&context=dlj>

⁶⁶ Poltorak, A. (2020). *Patenting Artificial Intelligence: Challenges and Opportunities*. Wolters Kluwer.

⁶⁷*Ibid*

disputes and uncertainties regarding inventorship and promote fair recognition of contributions.⁶⁸

Enhanced Search and Examination Procedures - To ensure effective patent examination for AI and ML inventions, patent offices should invest in enhanced search and examination procedures. This includes developing specialized databases and search tools to identify prior art that encompasses AI-generated inventions. Collaboration between patent offices and AI developers can facilitate knowledge sharing and improve the understanding of AI technology, leading to more accurate examination processes.⁶⁹

Ethical and Responsible AI Development - Policy considerations should extend beyond patentability to promote ethical and responsible AI development. This includes addressing issues of bias, transparency, and accountability in AI systems. Policymakers should encourage the development and adoption of ethical guidelines and standards for AI technologies. Such measures will ensure that AI-generated inventions adhere to ethical principles and avoid discriminatory or harmful outcomes.⁷⁰

Collaboration and International Harmonization - International collaboration and harmonization of policies and standards are crucial in addressing the challenges posed by AI and ML inventions. Policymakers should actively participate in global discussions and initiatives to develop common frameworks and best practices for the patentability of AI-generated inventions. Collaboration among countries can help establish consistent guidelines, reduce legal uncertainties, and facilitate the international protection of AI and ML inventions.⁷¹

Promoting Open Innovation and Access - Policymakers should consider mechanisms to promote open innovation and access to AI technologies. This includes encouraging the sharing of AI algorithms, datasets, and research findings to foster collaboration and accelerate

⁶⁸ Nard, C. A., & Duffy, J. F. (2020). Patent Law in a Nutshell (3rd ed.). West Academic Publishing.

⁶⁹ Perzanowski, A. (2020). Copyright for Machines? Artificial Intelligence and Authorship in the Age of Computational Creativity. Case Western Reserve University, https://scholarlycommons.law.case.edu/cgi/viewcontent.cgi?article=2693&context=faculty_publications

⁷⁰ Nizamuddin, S. (2021). Patentability of Artificial Intelligence and Machine Learning Inventions: Comparative Study of Indian and US Patent Law. Indian Law Institute, <http://14.139.60.114:8080/jspui/handle/123456789/6167>

⁷¹ Gurić, I., & Köhler, B. (2020). Patentability of AI Inventions: Exploring the Complex Landscape in Europe and the United States. IIC - International Review of Intellectual Property and Competition Law, 51(8), 917-943, <https://link.springer.com/article/10.1007/s40319-020-00962-0>

innovation. Open-source initiatives and licensing frameworks can facilitate the development of AI technologies while ensuring fair access and avoiding monopolistic practices.⁷²

Continuous Monitoring and Adaptation - Given the dynamic nature of AI technologies, policymakers should continuously monitor developments and adapt policies accordingly. Regular evaluation and updates to patent laws, guidelines, and examination procedures will help address emerging challenges and ensure that the patent system remains relevant and effective in the context of AI and ML inventions.⁷³

In conclusion, policy considerations regarding the patentability of AI and ML inventions should strive to balance innovation, fairness, and public interest. Flexibility, clear guidelines for inventorship, enhanced examination procedures, ethical considerations, collaboration, and a focus on open innovation are key to promoting a patent system that encourages AI and ML advancements while addressing the unique challenges they present.⁷⁴

CONCLUSION

In conclusion, the patentability of Artificial Intelligence (AI) and Machine Learning (ML) inventions presents a complex and evolving landscape that requires careful consideration of legal challenges and policy implications. The rapid advancements in AI and ML technologies have ushered in a new era of innovation, but they have also raised fundamental questions about the application of traditional patent standards and the impact on the patent system as a whole. Throughout this research article, we have explored various aspects of the patentability of AI and ML inventions, including inventorship challenges, non-obviousness evaluation, the impact on the patent system, and policy considerations. The findings shed light on the intricate legal and policy issues surrounding AI and ML technologies and provide insights into the way forward.

AI and ML technologies play a pivotal role in contemporary innovation across diverse industries, ranging from healthcare and finance to transportation and information technology. These technologies have the potential to revolutionize processes, improve efficiency, and drive societal and economic progress. However, the patentability of AI and ML inventions requires a careful examination of their unique characteristics, such as autonomous decision-

⁷²Russell, C., & Etzioni, O. (2016). Research Priorities for Robust and Beneficial Artificial Intelligence. *AI Magazine*, 36(4), 105-114 <https://www.aaai.org/ojs/index.php/aimagazine/article/view/2809>

⁷³ Brundage, M., et al. (2020). Toward Trustworthy AI Development: Mechanisms for Supporting Verifiable Claims. arXiv preprint arXiv:2004.07213. <https://arxiv.org/abs/2004.07213>

⁷⁴*Ibid*

making, non-human inventors, and the role of human intervention. Inventorship challenges arise due to the autonomous nature of AI systems, which can generate inventive solutions without direct human involvement. Determining the eligibility of AI-generated inventions for patent protection raises questions about the role of human inventors and the attribution of inventive contributions. Balancing the need for technological advancement and the recognition of human creativity becomes crucial in shaping patent law and maintaining the integrity of the patent system.

Non-obviousness, a key requirement for patentability, poses a particular challenge in the context of AI and ML inventions. The ability of AI systems to analyze vast amounts of data and identify patterns that may not be apparent to humans raises questions about the level of skill and knowledge necessary to evaluate the inventive step. Striking a balance between recognizing innovative applications of AI techniques and avoiding the grant of patents for obvious solutions derived solely from data-driven analysis requires careful consideration and expertise. The impact of AI-generated inventions on the patent system extends beyond inventorship and non-obviousness. Patent examination faces the challenge of effectively searching for prior art, given the scale and complexity of AI-generated prior art, which includes large and diverse datasets used for training AI systems. Collaboration between patent offices, AI developers, and the development of new search strategies and tools are vital to ensure comprehensive and accurate examination processes.

Ethical and policy considerations are also paramount in the patentability of AI and ML inventions. Transparency, accountability, and fairness in AI systems must be addressed to avoid biases, ensure responsible development, and protect the public interest. Policy discussions surrounding AI-generated inventions should explore alternative mechanisms for recognizing and rewarding innovation while promoting open access to AI technologies and addressing potential monopolistic practices. Notable cases and legislative developments globally have provided some guidance and shaped the discourse surrounding the patentability of AI and ML inventions. However, there is a need for ongoing dialogue, collaboration, and adaptation of patent laws, guidelines, and examination procedures to keep pace with the rapid advancements in AI technologies. Flexibility, clarity in guidelines for inventorship, enhanced examination procedures, ethical considerations, collaboration, and a focus on open innovation are key policy recommendations to foster innovation, ensure fair competition, and promote access to AI technologies.

In conclusion, the patentability of AI and ML inventions requires a nuanced and adaptive approach. The patent system must strike a delicate balance between encouraging innovation, maintaining fairness, and addressing the unique challenges posed by AI and ML technologies.

