

Patentability of Artificial Intelligence Innovations in India: Challenges and Future Directions – A Comparative Study of the United States and the European Union

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Abstract- Artificial Intelligence (AI) has emerged as one of the most transformative technological developments of the twenty-first century. AI systems are increasingly capable of generating innovative solutions, designing products, discovering pharmaceutical compounds, and optimizing industrial processes with minimal human intervention. These developments have created unprecedented challenges for intellectual property law, particularly patent law, which has traditionally been premised upon human creativity and inventorship. The growing involvement of AI in the inventive process raises fundamental questions concerning patent eligibility, inventorship, ownership, accountability, and public policy. This article critically examines the patentability of AI-related inventions under the Indian patent regime and compares India's position with approaches adopted in the United States and the European Union. The article argues that although the Indian patent framework can accommodate certain AI-assisted inventions, significant ambiguities remain regarding AI-generated innovations. Through a comparative and doctrinal analysis, the article highlights the inadequacies of existing legal frameworks and proposes reforms necessary for fostering innovation while maintaining legal certainty and public interest.

Keywords- Artificial Intelligence, Patent Law, Inventorship, Intellectual Property Rights, DABUS, Innovation, India, European Union, United States.

I. INTRODUCTION

Technological advancement has consistently challenged legal systems to adapt to changing realities. The emergence of Artificial Intelligence represents one of the most significant technological disruptions since the advent of the internet. Unlike conventional computer programs that merely execute predefined instructions, modern AI systems possess the ability to learn from data, identify patterns, generate predictions, and produce solutions that often surpass human analytical capabilities.

The increasing autonomy of AI systems has transformed the innovation landscape. AI is no longer merely a tool assisting inventors; in many cases, it actively contributes to the creation of inventions. Machine learning algorithms are now capable of identifying novel chemical compounds, designing engineering solutions, generating software architectures, and improving manufacturing processes. Such developments have challenged the traditional assumptions underlying patent law.

Patent systems worldwide were designed around the notion that inventions originate from human ingenuity. The concepts of inventorship, ownership, and inventive step are deeply rooted in the idea of human creativity. Consequently, the emergence of AI-generated inventions raises difficult legal questions. Can a machine be recognized as an inventor? Who owns inventions generated by AI? Should AI-generated inventions receive patent protection at all?

These questions have become particularly relevant in India, which has positioned itself as a major global technology hub. The country's rapid adoption of AI technologies in healthcare, finance, agriculture, and manufacturing necessitates a robust legal framework capable of addressing the intellectual property implications of AI-driven innovation.

This article examines the patentability of AI innovations under Indian law and compares India's approach with legal developments in the United States and the European Union. It argues that while existing legal principles provide partial guidance, substantial reforms are required to address the challenges posed by increasingly autonomous AI systems.

II. UNDERSTANDING ARTIFICIAL INTELLIGENCE AND THE NATURE OF AI-GENERATED INNOVATION

Artificial Intelligence generally refers to computational systems capable of performing tasks that normally require human intelligence. These tasks include learning, reasoning, pattern recognition, natural language processing, and decision-making¹.

AI technologies have evolved from rule-based systems to sophisticated machine learning and deep learning models capable of autonomous problem-solving. Modern AI systems derive their functionality from large datasets and computational models that continuously improve through experience.

The role of AI in innovation may be categorized into three stages.

First, AI functions as an assistive tool, helping human inventors perform research and analysis. In such cases, the inventive contribution remains predominantly human.

Second, AI operates as a collaborative partner, generating suggestions and solutions that significantly influence the inventive process.

Third, AI acts as an autonomous innovator, independently producing inventions with minimal human involvement.

The first category presents few legal difficulties because human inventorship remains evident. However, the second and third categories challenge traditional patent doctrines by blurring the distinction between human and machine creativity.

The increasing prevalence of AI-generated innovation has exposed fundamental weaknesses in patent systems worldwide. Existing laws generally assume that inventors are human beings capable of exercising legal rights and responsibilities. AI systems do not fit comfortably within this framework.

III. PATENTABILITY REQUIREMENTS UNDER INDIAN PATENT LAW

1. ¹ Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach* (4th edn, Pearson 2021).

The legal framework governing patents in India is contained in the Patents Act, 1970. To qualify for patent protection, an invention must satisfy three essential criteria: novelty, inventive step, and industrial applicability.

A. Novelty

Novelty requires that an invention must not have been disclosed to the public prior to the filing date². AI-generated inventions are often capable of satisfying the novelty requirement because machine learning systems can identify previously undiscovered relationships and generate unique technical solutions. However, the rapid generation of inventions by AI systems creates practical difficulties for prior art searches. Patent offices may struggle to assess novelty when AI technologies produce numerous innovations within short periods.

B. Inventive Step

An invention must involve a technical advance and should not be obvious to a person skilled in the relevant field.

The concept of inventive step becomes particularly problematic in the context of AI. Patent law traditionally evaluates obviousness from the perspective of a hypothetical skilled person. However, AI systems possess analytical capabilities far exceeding those of ordinary human experts.

This raises an important question: should obviousness be assessed against human knowledge or against the capabilities of advanced AI systems? If AI becomes a standard research tool, the threshold for inventive step may require significant reconsideration.

C. Industrial Applicability

Industrial applicability requires that the invention be capable of practical use in industry.

Most AI-related inventions readily satisfy this requirement because they are designed for commercial application in sectors such as healthcare, transportation, finance, cybersecurity, and manufacturing.

IV. SECTION 3(K): THE PRINCIPAL OBSTACLE TO AI PATENTING IN INDIA

The most significant statutory challenge to patenting AI innovations in India arises from Section 3(k) of the Patents Act, which excludes “a mathematical or business method or a computer programme per se or algorithms” from patentability.

Many AI technologies are fundamentally algorithmic. Machine learning systems, neural networks, and predictive models rely heavily on mathematical computations and software implementations. Consequently, patent applicants frequently encounter objections under Section 3(k).

However, Indian patent jurisprudence has gradually evolved toward a more flexible interpretation. The Indian Patent Office's Computer Related Inventions (CRI) Guidelines emphasize that inventions demonstrating a technical effect or technical contribution may qualify for patent protection despite involving software components³.

This approach has enabled patent protection for AI-related technologies used in areas such as medical diagnostics, image processing, industrial automation, and autonomous navigation.

Despite this progress, considerable uncertainty remains. Patent examiners often adopt inconsistent interpretations of Section 3(k),

resulting in unpredictability for innovators. The absence of a clear statutory definition of “technical effect” further complicates matters.

As AI technologies become increasingly sophisticated, legislative clarification of Section 3(k) will become essential.

V. The Inventorship Problem: Can Artificial Intelligence Be an Inventor?

The most controversial issue concerning AI-generated inventions relates to inventorship.

Patent law traditionally assumes that inventors are natural persons. The Patents Act, 1970, implicitly reflects this assumption through provisions concerning assignment, ownership, and legal rights.

AI systems, however, challenge this assumption by generating inventions without direct human intervention.

The global debate surrounding AI inventorship became prominent through the DABUS litigation initiated by computer scientist Stephen Thaler. DABUS (Device for the Autonomous Bootstrapping of Unified Sentience) allegedly generated inventions relating to food containers and emergency signaling devices. Patent applications naming DABUS as the inventor were filed in several jurisdictions.

The DABUS cases raised a fundamental legal question: can an AI system be recognized as an inventor?

Proponents argue that inventorship should be based upon actual contribution rather than legal status. If an AI system independently generates an invention, denying inventorship recognition may undermine the integrity of the patent system.

Opponents contend that inventorship entails legal rights and responsibilities that can only be exercised by natural persons. Since AI lacks legal personality, it cannot own rights, assign patents, or bear legal accountability.

Indian law currently favors the latter position. Nevertheless, as AI systems become increasingly autonomous, the pressure for reform is likely to intensify.

VI. COMPARATIVE ANALYSIS: THE UNITED STATES

The United States has emerged as a leading jurisdiction in addressing AI patent issues.

In *Thaler. Vidal*, the Federal Circuit held that only natural persons can qualify as inventors under the United States Patent Act. The court emphasized that statutory references to “individuals” indicate congressional intent to limit inventorship to human beings.

Although the decision excluded AI inventorship, it did not prohibit patents involving AI-assisted inventions. The United States Patent and Trademark Office subsequently clarified that inventions remain patentable where humans make significant contributions to the inventive concept⁴.

The American approach therefore draws a distinction between:

AI-assisted inventions (patentable), and

Fully autonomous AI-generated inventions (currently unpatentable).

This framework preserves traditional inventorship principles while accommodating technological innovation.

VII. COMPARATIVE ANALYSIS: THE EUROPEAN UNION

The European Patent Office (EPO) adopted a similar approach in the DABUS cases.

The EPO rejected applications naming DABUS as the inventor on the basis that inventors must possess legal personality. According to the EPO, inventorship carries legal implications that cannot be attributed to machines.

The European position prioritizes legal certainty and administrative practicality. By requiring human inventorship, the EPO avoids complex questions concerning machine rights and liability.

Nevertheless, the European Union has shown considerable interest in regulating AI through comprehensive policy initiatives. Discussions concerning AI governance increasingly recognize the need to address intellectual property challenges associated with autonomous systems.

Compared with India, the European approach provides greater regulatory clarity, although it remains grounded in traditional notions of human inventorship.

VIII. CHALLENGES FACING THE INDIAN PATENT REGIME

India faces several unique challenges in addressing AI-related inventions.

A. Legislative Silence

The Patents Act contains no provisions specifically addressing AI-generated inventions. This legislative silence creates uncertainty regarding patent eligibility and inventorship.

B. Inconsistent Patent Examination

The interpretation of Section 3(k) varies significantly among patent examiners, creating unpredictability for applicants seeking protection for AI innovations.

C. Ownership and Accountability

Where AI contributes substantially to an invention, identifying the rightful owner becomes difficult. Potential claimants may include programmers, employers, AI developers, and users.

D. International Competitiveness

India's ambition to become a global AI leader requires a predictable intellectual property framework. Uncertainty regarding patent protection may discourage investment and technological development.

IX. FUTURE DIRECTIONS AND RECOMMENDATIONS

Several reforms should be considered to strengthen India's approach to AI patenting.

First, the legislature should clarify the treatment of AI-generated inventions through statutory amendments or specialized regulations.

Second, India should adopt AI-specific patent examination guidelines addressing inventorship, disclosure requirements, and technical contribution standards.

Third, Section 3(k) should be reinterpreted or amended to distinguish genuine technological innovations from mere software implementations.

Fourth, policymakers should consider adopting a “human contribution” standard similar to that used in the United States. Under this approach, patents would remain available where humans make meaningful contributions to the inventive process.

Finally, India should actively participate in international discussions led by organizations such as the World Intellectual Property Organization to promote harmonized global standards concerning AI and intellectual property.

X. CONCLUSION

Artificial Intelligence is transforming the nature of innovation and challenging foundational assumptions of patent law. Existing patent systems were designed around human creativity, yet AI systems increasingly participate in or independently generate inventive activity.

India's patent framework currently provides limited guidance regarding AI-generated inventions. While AI-assisted inventions may obtain protection under existing legal principles, significant uncertainty remains concerning inventorship, ownership, and patent eligibility. The exclusion of computer programs under Section 3(k) further complicates matters.

Comparative analysis demonstrates that both the United States and the European Union continue to require human inventorship while accommodating AI-assisted innovation. India is likely to follow a similar trajectory in the near future.

However, merely applying traditional legal doctrines may prove insufficient as AI capabilities continue to evolve. The challenge for policymakers is to create a legal framework that encourages innovation while preserving accountability, transparency, and public interest. A balanced and forward-looking patent regime will be essential if India seeks to emerge as a global leader in the age of artificial intelligence.

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