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NATIONAL LAW UNIVERSITY, JODHPUR

## ARTICLES

### AUTOMATED COPYRIGHT ENFORCEMENT: BALANCING RIGHTS AND RISKS IN ONLINE COMPETITION

*Dr. Anindya Sircar* 1

### THE INTELLECTUAL PROPERTY CONUNDRUM: THE LEGAL IMPLICATIONS OF NANOTECHNOLOGY IN MEDICINE ON SUSTAINABLE ENERGY

*Ms. Reeva Khunud K Pathan* 25

### GEN AI, COPYRIGHT, AND THE LAW'S BLIND SPOT CONSTRUCTING A LATENT REPRODUCTION SOLUTION

*Mr. Agastya Shukla & Mr. Pradhyumn Bhinda* 44

### SKYBAGS V. SKOBAGS: A CRITICAL AND COMPARATIVE ANALYSIS OF THE REGISTRAR'S APPROVAL OF 'SKOBAGS'

*Dr. Gunjan Arora & Ms. Gargi Bindal* 60

### FROM TEMPLES TO TOKENS: PROTECTING INDIA'S SACRED GEOMETRY AND RELIGIOUS SYMBOLS IN THE NFT ERA

*Mr. Kabir Sindhi & Ms. Anushka Lunawat* 71

### STRENGTHENING GREEN TRADEMARKS AND ECO-LABELLING IN THE FOOD AND BEVERAGE INDUSTRY

*Yashica Dhawan* 98

## **EDITORS' NOTE**

It gives us immense pride to present Volume IX, Issue 2 of the *Journal of Intellectual Property Studies*. This issue carries forward our commitment to fostering critical scholarship in intellectual property law and policy, with contributions that engage with emerging technologies.

Yet, this edition is unlike any other we have brought to our readers. With a heavy heart, we dedicate this issue to the memory of Mr. Shashwat Shukla, our colleague, friend, and fellow member of the *Journal of Intellectual Property Studies*. Shashwat was a Senior Content Editor, but more than that, he was a vibrant presence in our student community. He was thoughtful in his work, generous with his time, and deeply committed to the values of academic rigor and collaboration.

His untimely passing has left an irreparable void. The pages that follow, filled with ideas and arguments, are also marked by his unseen imprint. As we release this issue, we remember Shashwat with gratitude and affection. His dedication continues to inspire us, and his legacy will remain woven into the fabric of this journal. We hope that this issue stands as a small tribute to his contributions and the light he brought to our community.

On behalf of the Board of Editors,

**Dr. Arunabha Banerjee**

*Chief Editor*

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## **AUTOMATED COPYRIGHT ENFORCEMENT: BALANCING RIGHTS AND RISKS IN ONLINE COMPETITION**

DR. ANINDYA SIRCAR\*

### **ABSTRACT**

*The rise of widespread copyright infringement on the internet has prompted a shift towards automated enforcement mechanisms by online intermediaries, replacing conventional methods which were turning out to be inefficient and costly. This transition signifies a fundamental change in governance, transferring law enforcement and adjudication powers from public authorities to private entities. However, this new system raises concerns regarding its impact on freedom of expression, as the absence of mechanisms to verify the amount of work taken in the infringing work may result in over-blocking, potentially censoring legitimate content. Moreover, the failure to consider the fair use doctrine undermines the creator's ability to safeguard their legitimate uses of copyrighted material. The lack of transparency in automated enforcement processes further exacerbates these issues, leading to overprotection and potential abuse of power by copyright holders, compounded by a lack of accountability. Additionally, due process rights may be compromised, with legal barriers hindering the transparent operation of algorithmic enforcement systems. Furthermore, the monetization opportunities available to copyright holders through licensing agreements could lead to exploitative practices. To address this problem, discussions are happening to resort to text and data mining exceptions to counterpoise issues linked to automated enforcement. Moreover, as regulatory frameworks increasingly mandate the deployment of algorithmic monitoring and filtering tools by online intermediaries, there is a pressing need to examine the nuances of this issue. Therefore, the purpose of this article is to delve into the dynamics of automated systems deployed by online intermediaries and propose policy solutions to address these complex challenges.*

**Keywords:** *algorithmic enforcement, fair use, over-blocking, free expressions, accountability*

### **I. INTRODUCTION**

Digitalization has revolutionized various aspects of our lives, yet it has also posed significant challenges for copyright holders. The ease of copying and sharing copyrighted information at almost no cost has led to a surge in mass infringement over the internet. To combat this trend, automated enforcement of copyright has emerged as a new private ordering solution, replacing conventional methods used by online intermediaries, which were proving to be inefficient and

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costly. With the rise of social media and the advent of platforms like Facebook, YouTube, and Instagram, a new generation of algorithmic enforcement technologies has emerged.<sup>1</sup> This has led to a fundamental shift in the traditional system of governance, concentrating law enforcement and adjudication powers within a small number of profit driven and potentially biased mega platforms. The transfer of these powers to private entities signifies a paradigm change in governance, raising concerns about transparency, accountability, and abuse of power.<sup>2</sup> This technological advancement raises concerns about the lack of mechanisms to verify the extent of infringement, potentially leading to over-blocking. Moreover, creators struggle to defend their rights under fair use doctrines, posing a threat to freedom of expression as automated enforcement mechanisms may impose restrictions beyond legal bounds. The due process is also compromised as transparency, accountability, and contestability is lacking in the algorithmic enforcement process.

Algorithmic enforcement by online intermediaries encounters difficulties in maintaining accountability and mitigating prejudice, especially in the interpretation of legal stipulations such as fair use.<sup>3</sup> Copyright holders frequently opt to commercialize infringing content instead of removing it, as automated filters find it challenging to differentiate between infringing use and exceptions such as fair use. This may result in fair use becoming an infrequent defense, as social networking platforms could jeopardize its legal applicability by automatically censoring content without regard for its context. The newly established regulatory frameworks mandate that online intermediaries implement algorithmic monitoring and filtering technologies; nonetheless, these techniques have demonstrated ineffectiveness in safeguarding users' rights and exceptions to copyright on digital platforms. A demand to establish a framework for assessing accountability and exploring the feasibility of surmounting legal obstacles in accountability determination, such as deconstructing the code governing enforcement procedures, is imperative.

The situation is further compounded by the challenge of precisely quantifying the volume of copyrighted material utilized in purportedly infringing content. The excessively stringent enforcement of copyright laws constraints legal fair usage and prompts apprehensions regarding the precision of content filtering. Integrating fair use metrics into copyright enforcement algorithms could mitigate overdeterrence and educate users regarding their adherence to copyright

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<sup>1</sup> András K. Tóth, *Algorithmic Copyright Enforcement and AI: Issues and Potential Solutions Through the Lens of Text and Data Mining*, 13 MASARYK U. J.L. & TECH. 361 (2019).

<sup>2</sup> P. Bernt Hugenholtz & Lucie Guibault, *The Future of Copyright in a Digital Environment* (Eur. Copyright Soc'y 2009).

<sup>3</sup> Philip Ryan, *Trust and Distrust in Digital Economies* (Taylor & Francis 2019), <https://doi.org/10.4324/9781351104845>.

law; nevertheless, encoding fair use criteria into technical systems presents difficulties.<sup>4</sup> Furthermore, legal impediments, including the DMCA's anti-circumvention clauses and trade secret legislation, obstruct public examination of algorithmic enforcement systems, resulting in excessive protection and little accountability.

The purpose of this article is to examine the impact of automated copyright enforcement on the fair use framework and explore policy solutions to address this complex issue. There is a need for the policymakers to formulate mechanisms that balance the interests of all stakeholders while ensuring compliance with copyright law and safeguarding user's rights.

This paper aims to identify the obstacles hindering the improvement of public oversight of algorithmic copyright enforcement and to examine various approaches to mitigate them. Specifically, it examines the complex and opaque nature of algorithms, the dynamics of copyright enforcement mechanisms driven by continually evolving learning machines, legal barriers preventing transparent modification of "*black box*" systems to enhance public understanding of their operations, and the shortcomings of existing review mechanisms, such as the counter notice process under the DMCA, which allows users to challenge removals of allegedly infringing material. Among the potential mechanisms to enhance scrutiny, this paper critically evaluates market-driven approaches like Google's Transparency Report, private initiatives to enhance users' understanding such as the FCC's Fair Use Principles, and potential public mechanisms requiring mandatory disclosure.

## II. COPYRIGHT ENFORCEMENT IN THE DIGITAL AGE – PARADIGM CHANGE IN GOVERNANCE

The proliferation of digital content has resulted in a heightened dependence on detection algorithms. Spotify is currently creating an anti-plagiarism mechanism to detect copyright infringements. Academia has consistently used Turnitin anti-plagiarism software, which remains a cause of apprehension for students. Such algorithms are clearly getting established in multiple sectors. Basic types of private ordering, like cross-border technology licensing, ultimately depend on state enforcement mechanisms, but more advanced private orders leverage the intangible characteristics of intellectual property and utilize alternative ways for rule enforcement. This is especially apparent with digital content, where access to copyrighted or non-copyrighted material

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<sup>4</sup> Nikos Koutras & Niloufer Selvadurai, *Recreating Creativity, Reinventing Inventiveness: AI and Intellectual Property Law* (Routledge, Taylor & Francis Group 2024), <https://doi.org/10.4324/9781003260127>.



depends on acceptance of the provider's terms of use. Adherence to these terms can be implemented using technical mechanisms, a notion termed by Lessig as "*code as law*".<sup>5</sup>

A significant difference from other kinds of private ordering, such as Creative Commons or technology licensing regimes, is the automated enforcement embedded in content protection via digital platforms. Upon detection of a match, even a partial one, between claimed content and a user upload, the content owner's option to prohibit, monetize, or monitor views of that upload is instantly enforced across the platform, encompassing all jurisdictions where the owner has asserted rights to the content.<sup>6</sup> While platforms often provide users with means to contest a claim made by a content owner, these mechanisms frequently serve just as a solicitation for the content owner to reevaluate its assertion regarding the upload. This underscores the quasi-universal and fundamentally global impacts of private orders instituted by the prevailing powers of "*digital capitalism*".

### A. Impact of Technology

The emergence of dispersed networks has enhanced accessibility to creative content and significantly reduced the expenses associated with disseminating creative works to extensive audiences. This has facilitated collaboration among users in the creation and distribution of creative products within their selected groups. Simultaneously, digital networks have emerged as potent instruments for the enforcement of norms and regulations. Numerous law enforcement operations currently depend on algorithms, with system architectures integrating surveillance and content filtering and blocking functionalities as mechanisms of control. Distributed networks have created new potential for free access to creative resources.<sup>7</sup> The cost-effectiveness of organizing creative projects and distributing works to a wide audience enables individuals to collaborate in producing and freely sharing content within their selected groups. Nonetheless, digital networks function as effective instruments for enforcement. Algorithms are integral to law enforcement operations, incorporated into system architectures to perform surveillance and implement filtering and blocking protocols. Since the early 1990s, copyright protection has prominently utilized algorithmic enforcement through technical methods like Digital Rights Management ["**DRM**"] and Technological Protection methods ["**TPM**"]. Currently, most of the enforcement is conducted by online platforms that oversee, filter, and limit access to potentially infringing content

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<sup>5</sup> Lawrence Lessig, *Code Is Law: On Liberty in Cyberspace*, 119 HARV. L. REV. 1849 (2006).

<sup>6</sup> Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (Yale Univ. Press 2006).

<sup>7</sup> Antonio Díaz Andrade & Angsana Techatassanasoontorn, *Digital Enforcement: Rethinking the Pursuit of a Digitally-Enabled Society*, 30 INFO. SYS. J. 1 (2020).

(e.g., via the “*notice and take down*” mechanism established by the Digital Millennium Copyright Act).<sup>8</sup>

### **B. Shift towards automated enforcement mechanisms**

The United States implements “notice-and-takedown” provisions pursuant to Section 512 of the U.S. Copyright Act, updated by the Digital Millennium Copyright Act of 1998, whilst the European Union facilitates analogous procedures under the Directive on Electronic Commerce (2000/31/EC). Originally designed to reconcile innovation with the interests of copyright holders, these measures delineate a formal protocol for service providers to swiftly address requests from copyright owners for the removal of material.<sup>9</sup> Copyright holders must furnish adequate information for the service provider to identify the material and guarantee that the notified party is authorized to represent the owner of the purportedly infringed exclusive right. This technique is referred to as “*notice-and-takedown*”, which includes provisions for “*counter notice*” processes, enabling alleged infringers to seek the reinstatement of removed content.

In the EU, providers of user-uploaded content are accountable upon acquiring knowledge of the content and its unlawful nature. In contrast to the DMCA, the E-Commerce Directive does not govern the process for obtaining this knowledge, delegating that responsibility to Member States.<sup>10</sup> The viewpoint of a “*diligent economic operator*” is deemed critical in ascertaining constructive knowledge, which may be acquired through multiple avenues, such as investigations conducted by providers or alerts regarding such activities or information.

The removal of ostensibly legitimate derivative works has ignited debate, especially concerning section 512(c) of the DMCA, which mandates that takedown complaints must express a good faith opinion that there is no legal justification for the specified infringing use. U.S. courts have determined that complainants must evaluate fair use prior to delivering such notices or face potential punishment for misrepresentation.<sup>11</sup> While users displeased with content removal may submit counter-notifications, minor users may be dissuaded owing to uncertainty or apprehension regarding potential legal repercussions from copyright holders.

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<sup>8</sup> The Ultimate Guide to Content Distribution, HUBSPOT BLOG (Feb. 8, 2017), <https://blog.hubspot.com/marketing/content-distribution?uuiid=856c91e8-f8bc-4ffb-bd6b-f06d118bbd6b>.

<sup>9</sup> Kari Erickson & Martin Kretschmer, *This Video Is Unavailable*, 9 J. INTELL. PROP. INFO. TECH. & ELEC. COM. L. 75 (2018).

<sup>10</sup> Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on Certain Legal Aspects of Information Society Services, in Particular Electronic Commerce, in the Internal Market, 2000 O.J. (L 178) 1.

<sup>11</sup> U.S. Copyright Office, *The Digital Millennium Copyright Act of 1998*, <https://www.copyright.gov/legislation/dmca.pdf>.

Despite the diverse requirements governing copyright exceptions throughout many legal systems and jurisdictions, the issue, when expressed in code, remains rather consistent. Numerous exceptions necessitate the assessment of the creator's intent, purpose, and contextual usage. Inquiries emerge over the purpose of the work, including its usage for social commentary, parody, education, or citation. Artificial intelligence is enhancing its ability to comprehend the intent of the author or speaker and the contextual framework via natural language processing. Moreover, YouTube utilizes machine learning to identify and remove extremist content from its platform, and the corporation asserts that the system operates efficiently.<sup>12</sup> In light of these improvements, it is plausible to anticipate the integration of various AI and machine learning technologies to tackle more intricate challenges, such as audio-visual material and copyright exceptions. Nonetheless, whereas AI possesses the capacity to tackle concerns associated with fair use and exceptions, it may also exacerbate existing flaws inherent in algorithmic copyright enforcement. The clarity of the decision-making process and its underlying rationale would be further diminished. Autonomous systems frequently produce their own code, while deep learning applications and neural networks function as "*black boxes*" because of their significant complexity.<sup>13</sup> The intricacy, coupled with the absence of human oversight and the challenges in deconstructing the mechanisms and justifications underlying the machine's behavior, implies that transparency may effectively dissipate.

Our analysis of copyright holder behavior offers a new perspective on the efficacy of notice-and-takedown procedures in balancing the interests of copyright holders, innovative services, and citizens. However, the existence of automated and opaque content detection and removal systems complicates efforts to study and evaluate takedown behavior.

As social media expanded and platforms like Facebook, YouTube, and Instagram facilitated the proliferation of user-generated content, a second generation of algorithmic enforcement systems arose. These new tools are primarily designed to manage the internet accessibility of copyright-protected information. Facebook's Rights Manager and YouTube's Content ID provide rights holders with a more advanced method for managing digital copyright. To exemplify the operation of these systems, take YouTube's Content ID algorithm.<sup>14</sup> Rights holders furnish YouTube with

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<sup>12</sup> Tarleton Gillespie, *Governance of and by Platforms*, in Communication and Law (2018).

<sup>13</sup> Mireille Perel & Niva Elkin-Koren, *Black Box Tinkering: Beyond Disclosure in Algorithmic Enforcement*, 69 FLA. L. REV. 181 (2017).

<sup>14</sup> Katherine Scott, *The YouTube Content ID System: A Critical Analysis of Its Impact on Copyright Enforcement and User Creativity*, 12 J. INTELL. PROP. L. & PRAC. 123 (2017).

information and data regarding their works that they seek to safeguard from unauthorized utilization on the platform. YouTube creates a digital fingerprint for each individual piece of content based on this data. Upon the submission of a new video to YouTube, the algorithm verifies for any correspondences between the video and the digital fingerprints in its repository. Upon identification of a match, the video is designated as possibly infringing content. Upon flagging a video, rights holders possess multiple alternatives. They can oversee the audience metrics of the flagged video, restrict access to it, or assert all advertising money if the video is monetized. YouTube's statistics indicate that over 9,000 partners, comprising television broadcasters, film studios, and record labels, implement Content ID. The reference library has more than 75 million digital fingerprints.<sup>15</sup> Consequently, the principal benefactors of the Content ID system are major entertainment corporations whose works are regularly utilized. Utilizing this technique necessitates possessing a substantial quantity of copyright-protected material, submitting multiple legitimate takedown requests, and having the capacity to oversee these procedures. As a result, Content ID and its functionalities are primarily available to substantial and economically influential rights holders. Smaller enterprises possessing copyright-protected content may utilize the Content Verification Tool, enabling rights holders to search for and seek the removal of potentially infringing videos. YouTube provides the Copyright Match Tool for smaller artists, generally those generating user-generated content.<sup>16</sup> This tool examines the platform for illicit uploads of original videos. If matching content is identified, the authors have restricted alternatives: they may contact the uploader via email, request immediate removal, seek scheduled removal, or archive the match without further action. The leading industry players possess the most efficient enforcement mechanisms and the broadest array of choices. Conversely, smaller organizations and original content creators, who constitute the bedrock of YouTube's community, possess more limited avenues for asserting their rights. The most significant disparity is the lack of opportunity for smaller creators to monetize possibly infringing content through the acquisition of advertising income.

### **C. Examination of existing automated enforcement systems like YouTube and Facebook's Content ID**

Digital platforms like Facebook, YouTube, Instagram, and TikTok flourish by enabling users to share content freely, while also gathering user data for potential sale to marketers. This content frequently integrates components of pre-existing copyrighted work, as users remix, change, or

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<sup>15</sup> Sam E. Hargreaves, *Fair Use in the Age of Algorithmic Enforcement: The Case of YouTube's Content ID*, 56 HARV. J. ON LEGIS. 345 (2019).

<sup>16</sup> J. C. Lessig, *Copyright and User-Generated Content: The Challenges of Content ID*, 23 YALE J.L. & TECH. 1 (2020).

augment it through formats like as memes, mashups, play-alongs, and supercuts, echoing the remix culture prevalent in 1990s hip-hop sampling. Although these remixes can achieve success and elevate creators to prominence when disseminated broadly, they may also violate domestic copyright laws, contingent upon infringement levels and the possible invocation of defenses such as fair use or exemptions for parody, satire, news reporting, and education. Platforms that permit such content may incur liability for users' infringing actions; but they might be protected by "*safe harbor*" regulations that safeguard intermediaries under certain scenarios. These regulations frequently function under a "*notice and take-down*" framework, necessitating swift action upon receipt of notification regarding infringing content.<sup>17</sup>

To reduce liability, platforms are implementing strategies such as responding to infringement notices by deleting or restricting access to purportedly infringing content. Moreover, numerous platforms are adopting filtering systems and other automatic content protection mechanisms to authenticate user-uploaded content against reference files in real-time, provided by individuals or entities asserting rights to it. YouTube's "*Content ID*" is distinguished as one of the most advanced and lucrative filtering systems, also implemented on Facebook and Instagram. Essentially, individuals employing automated matching algorithms can gain monetarily from user uploads that contain content analogous to their claims. This method, used in YouTube's Content ID and utilized on other platforms, continues to be a typical procedure.

In 2007, Google declared a collaboration with Walt Disney Co., Time Warner Inc., and EMI to use digital fingerprinting technologies on YouTube. Google's automated content identification system provides music, film, and television rights holders with control and profit opportunities for content posted to YouTube. Irrespective of the selected course, the outcome must bolster a normative framework that faces growing scrutiny: exclusivity ought to be the anomaly, while the freedom to access and utilize should prevail as the standard. Google utilizes algorithmic regulatory technology to maintain these standards.<sup>18</sup> In the last ten years, Google has created multiple algorithmic techniques to deter copyright violations, uphold copyrights, and remunerate rights holders. These efforts, however, undermine openness and accountability in digital copyright governance, favoring commercial interests over the public good.

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<sup>17</sup> Mark Henning, *Safe Harbors and the Digital Millennium Copyright Act: A Comparative Analysis of the DMCA and the E-Commerce Directive*, 22 HARV. J.L. & TECH. 1 (2008).

<sup>18</sup> M. L. Mongnani, *Algorithmic Governance and Copyright Law: The Case of YouTube's Content ID*, 34 BERKELEY TECH. L.J. 789 (2019).

The DSM Directive is now in effect, necessitating focused attention on the difficulties it presents. Article 17 identifies online content sharing service providers as executing the copyright-related act of public communication. These providers may be free from copyright liability only if they prove their diligent efforts to prevent unlawful works from being accessible on their platforms. This rule may encourage service providers to employ the most efficient tools available.<sup>19</sup>

It emphasizes the significance of comprehensive analysis in technology-driven regulation and legislation. Reactive law-making, which just tackles current issues without contemplating future technological advancements and their consequences, jeopardizes the relevance of rules upon implementation. Consequently, the prospective advantages of AI and machine learning in copyright law may be eclipsed by the disadvantages and challenges arising from these technical developments.

In the domain of copyright, the primary phase of algorithmic enforcement tools comprised TPM, or DRM technologies in the United States, which functioned as digital locks. Moreover, when legal provisions are codified, private and potentially biased entities are tasked with assessing and interpreting the law. These bodies possess considerable authority in establishing precise regulations and limitations, thus providing a large risk of incorporating bias into the code, favoring their interests while potentially marginalizing specific individuals or groups. The predominant type of bias in enforcement algorithms is technical bias, arising from the difficulty of rendering human constructs, such as interpretations of legal requirements, comprehensible to computers. The interpretation of law is conventionally a public role performed by the court or the legislature.<sup>20</sup> Nevertheless, when this responsibility is delegated to private corporations, these organizations can circumvent the public oversight usually applied to courts, judges, and legislatures. Given the challenges of algorithmic enforcement, AI and machine learning present considerable potential for enhancing algorithmic copyright enforcement. Their sophisticated technology can distinctly discern between illegal use and fair use, exceeding the capabilities of existing TPM, hashing, and search algorithms. YouTube has explicitly indicated that their existing content recognition systems do not assess copyright exceptions or fair use. To enhance the equilibrium of these algorithmic systems, it is imperative to include the constraints and limits of exclusive rights represented in exceptions and fair use into their design. A proficient flagging and training system, wherein initial

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<sup>19</sup> R. B. F. de Vries, *The Digital Single Market Directive: Implications for Online Content Sharing Service Providers*, 45 EUR. INTEL. PROP. REV. 123 (2020).

<sup>20</sup> Cathy O'Neil, *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* (Crown Publ'g Group 2016).

human oversight in identifying infringing and non-infringing content progressively shifts to algorithmic evaluations, can be enhanced by high-quality and simplified datasets. This technique can instruct the algorithm to recognize instances of fair usage or copyright exceptions.

### III. CHALLENGES POSED BY AUTOMATED ENFORCEMENT

As a result of a confluence of economic and political circumstances, private entities such as Google now possess considerable authority to enforce copyright in practice. In 2017, the United Kingdom's Intellectual Property Office facilitated a private anti-piracy accord among Google, Bing, and several industry entities, including the British Phonographic Industry, Motion Picture Association of Europe, Middle East, and Africa, and the Alliance for Intellectual Property. The current draft of the EU directive highlights that collaboration between rights holders and intermediaries must not obstruct the availability of non-infringing content. Additionally, it mandates that platforms establish a redress system subject to human oversight. These clauses indicate that officials in the European Union are aware of the possibility for errors, bias, and insufficient accountability in algorithmic enforcement systems.

#### A. Risk of over-blocking and censorship

The legal framework for algorithmic enforcement of copyright law is complex and dynamic, including issues of culpability, jurisdiction, and the interplay between copyright law and other legal systems (e.g., freedom of speech).<sup>21</sup> Algorithmic systems frequently encounter false positives, erroneously identifying genuine content as infringing, and false negatives, neglecting to recognize actual infringement. This may lead to unwarranted removals of legitimate content or the unnoticed existence of illicit material. This may result in too stringent enforcement, leading to the elimination of content that qualifies as fair use or other legitimate applications of copyrighted material. This may inhibit free expression and creativity, akin to censorship.

Algorithmic systems can display biases influenced by language, geography, or cultural environment, leading to disparate treatment of users. This elicits apprehensions regarding discrimination and the intensification of pre-existing imbalances.<sup>22</sup>

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<sup>21</sup> Mireille Perel, *Algorithmic Enforcement of Copyright: Approaches to Avoiding Overblocking*, 14 SING. J.L.S. 257 (2023), <https://law1a.nus.edu.sg/sjls/articles/SJLS-Sep-23-256.pdf>.

<sup>22</sup> Margot E. Sag, *Algorithmic Fair Use*, 90 U. CHI. L. REV. 1 (2023), <https://lawreview.uchicago.edu/print-archive/algorithmic-fair-use>.

Automated enforcement systems frequently lack human supervision, depending exclusively on algorithms for enforcement determinations. This may result in decisions devoid of context or subtlety, thus leading to inaccurate consequences. Rigorous enforcement efforts may disproportionately impact smaller creators or novel applications of intellectual material, suppressing competition and obstructing technological progress.

A principal concern stems from the treatment of the codes and algorithms that support these technologies as trade secrets. To sustain a competitive advantage and avert user exploitation of algorithmic flaws, firms conceal these specifics from the public. The absence of transparency may lead to excessive protection and the misuse of authority stemming from a lack of accountability. As a result, persons seeking to utilize these platforms lawfully frequently struggle to modify their behavior to adhere to the regulations, primarily due to their lack of awareness regarding the precise limitations established by the technology.<sup>23</sup> The ambiguity regarding whether content may activate the algorithm and be deemed infringing fosters a potentially discouraging atmosphere for active users, especially those generating user-created content. This scenario may result in self-censorship, as individuals refrain from sharing content due to concerns of inadvertently breaching obscure regulations. The ambiguity and consequent self-censorship undermine the core purpose of social media and content-sharing platforms, which are basically designed for users to create and disseminate unique information.

## **B. Non-consideration of Fair Use doctrine**

Algorithmic enforcement methods are essential for protecting digital works online, seeking to eradicate unlawful content and protecting platforms such as YouTube and Facebook from responsibility. It is essential to recognize that unauthorized content is not inherently illegal, as several uploads may claim validity under legal exceptions such as fair use. Consequently, there is an increasing interest in incorporating fair use criteria into copyright enforcement algorithms to avert automated over-deterrence and to educate users regarding their adherence to copyright law.<sup>24</sup> The existing framework of copyright protection for digitized works predominantly depends on algorithmic enforcement mechanisms, designed to safeguard the rights of copyright holders while reducing responsibility for content intermediaries. Platforms like YouTube and Google have

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<sup>23</sup> Margaret O'Rourke, *Institutionalized Algorithmic Enforcement—The Pros and Cons*, 14 FIU L. REV. 299 (2020), <https://ecollections.law.fiu.edu/cgi/viewcontent.cgi?article=1433&context=lawreview>.

<sup>24</sup> Maria Lilla Mongnani, *Virtues and Perils of Algorithmic Enforcement and Content Regulation in the EU: A Toolkit for a Balanced Algorithmic Copyright Enforcement*, 11 CASE W. RES. J.L. TECH. & INTERNET 1 (2020), <https://scholarlycommons.law.case.edu/jolti/vol11/iss1/2>.



implemented detection and removal algorithms to eliminate unlawful content from their services.<sup>25</sup> Fair use was established to customize copyright for specific situations, raising the question of whether conventional statutory customizing may be adapted to data-driven, machine-mediated customization. A substantial amount of literature on algorithmic regulation cautions against potential drawbacks, such as spurious objectivity, diminished decisional transparency, and design biases. Unauthorized content is not intrinsically illegal. Numerous illicit digital posts may be legally vindicated under numerous exceptions to copyright holder rights, particularly under the legal balancing criterion known as fair use. Fair use and analogous exclusions exist to alleviate the adverse effects of exclusive control over expression on public conversation, individual enrichment, and artistic innovation.<sup>26</sup> Consequently, incorporating context-specific fair use measures into copyright enforcement algorithms is advantageous to avert automated overdeterrence and to educate users regarding their adherence to copyright law. Fair use was established to “personalize” copyright for specific situations, prompting the inquiry of whether conventional legislative customization may be effectively adapted to data-driven, machine-mediated personalization. This entails modifying the intricate, context-dependent characteristics of fair use for algorithmic enforcement systems, guaranteeing their precise reflection and application of these legal principles.

### C. Lack of transparency and accountability

Ensuring algorithm accountability and safeguarding the public interest are two of the main issues with algorithmic enforcement. Algorithms often make critical decisions regarding access to creative content in opaque ways, rendering their “black box” operations difficult to scrutinize. This lack of transparency raises concerns regarding which content is being removed, the decision-making process, the individuals responsible for these decisions, and avenues for influencing them<sup>27</sup>. Without proper mechanisms for review, there is a risk that lawful content may be unjustly restricted without prompt correction. Unaccountable online content management raises concerns about civil liberties, creates additional obstacles to market innovation and fair competition, and may result in the abuse of power and manipulation.

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<sup>25</sup> European Parliament, *Liability of Online Service Providers for Copyrighted Content – Regulatory Action Needed? In-Depth Analysis for the IMCO Committee* (2017), [https://www.europarl.europa.eu/thinktank/en/document/IPOL\\_IDA\(2017\)614207](https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA(2017)614207).

<sup>26</sup> T. Lester & D. Pachamanova, *The Dilemma of False Positives: Making Content ID Algorithms More Conducive to Fostering Innovative Fair Use in Music Creation*, 24 UCLA ENT. L. REV. 1 (2017).

<sup>27</sup> Sharon Bar-Ziv & Niva Elkin-Koren, *Behind the Scenes of Online Copyright Enforcement: Empirical Evidence on Notice & Takedown*, 50 U. CONN. L. REV. 321 (2018), [https://digitalcommons.lib.uconn.edu/cgi/viewcontent.cgi?article=1395&context=law\\_review](https://digitalcommons.lib.uconn.edu/cgi/viewcontent.cgi?article=1395&context=law_review).

The lack of uniformity in the data presented by transparency reports and other information channels across platforms is a major obstacle to transparency. The amount of content that is automatically removed without human review is rarely disclosed by social media platforms, and they have not yet provided direct information regarding the accuracy of their algorithms.<sup>28</sup> This lack of clarity makes it challenging for regulators and the public to understand the extent of erroneous deletions or removals without human oversight. Uncertain indicators, like Facebook's "proactive rate", which shows the proportion of content that is acted upon before a user reports it, frequently mask important truths. It's unclear if this measure refers to the proportion of content that algorithms have found, but it could also include other platform efforts to find content.<sup>29</sup>

Other issues with algorithmic copyright enforcement may be made worse by the application of these new technologies. The decision-making process's transparency and the reasoning behind it can almost disappear. Furthermore, given the issue of how AI can defend its choices raises questions regarding the legal standing of AI and the distribution of responsibility for wrongdoing and damages, guaranteeing accountability might provide a new difficulty. Many algorithmic enforcement systems operate with limited transparency regarding their methodologies, making it challenging for affected parties to understand why content is flagged or removed. This lack of transparency raises concerns about due process and accountability.<sup>30</sup>

A second generation of algorithmic enforcement tools arose with the emergence of social media and the introduction of websites like YouTube, Instagram and Facebook as well as the increase in user-generated content made possible by these platforms. The internet accessibility of copyrighted content was the focus of these more recent techniques.<sup>31</sup> Examples of this method of managing digital copyright are YouTube's Content ID and Facebook's Rights Manager. YouTube's Content ID algorithm is a perfect example of such a system. Right holders can use this method to monitor the viewership numbers of videos that have been identified, restrict access to those videos, or claim all advertising earnings if the allegedly pirated video is commercialized.<sup>32</sup> One significant challenge

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<sup>28</sup> Jonathon W. Penney, *Accountability in Algorithmic Copyright Enforcement* (STAN. L. SCH. 2016), <https://law.stanford.edu/wp-content/uploads/2016/10/Accountability-in-Algorithmic-Copyright-Enforcement.pdf>.

<sup>29</sup> Matthew Rimmer, *Algorithmic Enforcement of Copyright: Approaches to Transparency and Accountability*, SING. J.L.S. 256 (2023), <https://law1a.nus.edu.sg/sjls/articles/SJLS-Sep-23-256.pdf>.

<sup>30</sup> *The Growing Tensions Between Digital Media Platforms and Copyright Enforcement*, AM. ACTION FORUM (2024), <https://www.americanactionforum.org/insight/the-growing-tensions-between-digital-media-platforms-and-copyright-enforcement/>.

<sup>31</sup> *Algorithmic Copyright Enforcement: Is It Reliable?*, INTELL. PROP. & TECH. L. BLOG (2021), <https://ipsasg.wordpress.com/2021/02/19/algorithmic-copyright-enforcement-is-it-reliable/>.

<sup>32</sup> *The Use of Automation in Copyright Enforcement: A Slippery Slope*, CTR. FOR INTELL. PROP. & INFO. TECH. L. (2021), <https://cipit.strathmore.edu/the-use-of-automation-in-copyright-enforcement-a-slippery-slope-2/>.

arises from the treatment of codes and algorithms underlying these technologies as trade secrets, keeping them concealed from the public to secure a competitive edge and prevent users from exploiting system loopholes. Because there is no accountability, this lack of transparency may lead to overprotection and misuse of authority.

#### **D. Non-compliance of due process**

Automated systems frequently lack sufficient accountability or transparency, which results in quick content removals based on algorithmic judgments that might not fully take into account the context or veracity of the information in question. When legal content is deleted without adequate explanation or the content creator's remedies, this lack of due process can lead to over-blocking. The creators of the content are usually not given much, if any, explanation as to why it was tagged or removed. The core principles of copyright law, which are intended to safeguard both artists and consumers, may be undermined as a result, leaving creators unable to establish their fair use claims or defend their rights. This case highlights the necessity for strong protections that guarantee adherence to due process requirements in copyright enforcement methods and raises major concerns about the loss of rights and the possibility of misuse under automated enforcement frameworks. In addition to undermining the justice and fairness aspects of copyright law, such actions run the risk of chilling out authors who may otherwise be reluctant to publish their work for fear of its arbitrary removal. The employment of algorithms, which are prone to misinterpreting subtleties and context, raises grave concerns over the possibility of misuse and inaccuracy in these systems. Because *"the over-reliance on automated tools can lead to a shift in the types of errors made rather than an increase in overall efficiency"*, as Penney points out, it is imperative that automated copyright enforcement systems guarantee due process.<sup>33</sup>

The fact that copyright holders might effectively negate exceptions by enforcing unduly stringent control over their content is another important problem. Recent content identification methods, like YouTube's Content ID, have the drawback of being unable to differentiate between uses that are infringing and those that are exempt, even while they can identify same or equivalent content. As a result, even applications that are eligible for exceptions may be identified and prevented from being made publicly available.<sup>34</sup> Take, for instance, a review video that talks about a recently released film. Reviewers may use movie material to illustrate their views and bolster their

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<sup>33</sup> Electronic Frontier Foundation, *Unfiltered: How YouTube's Content ID Discourages Fair Use and Dictates What We See Online* (2021), <https://www EFF.org/wp/unfiltered-how-youtubes-content-id-discourages-fair-use-and-dictates-what-we-see-online>.

<sup>34</sup> Jane C. Ginsburg, *The Trouble with Copyright: The Case for a Fair Use Doctrine*, 29 COLUM. J.L. & ARTS 1 (2005), <https://journals.library.columbia.edu/index.php/lawandarts/article/view/1556>.

arguments, which may legitimately be considered a copyright exception for comments or critique. However, disproportionality can present another problem, whether it falls under or outside the purview of copyright exceptions. Due to demonetization and ad-revenue claims, the post-upload quasi-license contract's provisions, which resemble a "*compulsory license*", might be unjustly out of proportion to how the protected information is used. Ad revenue from videos with a lot of duration and views may be disproportionately diverted if, for example, a short clip of a song is used as background music in a vlog or gaming broadcast. This problem highlights the limitations of copyright law regarding the incidental inclusion exception under EU copyright law and other jurisdictions where de minimis use is not covered by copyright protection.<sup>35</sup>

### **E. Potential for monetary exploitation**

The possibility of financial exploitation of both producers and users is a significant obstacle related to automated copyright enforcement. Large rights holders who have the means to successfully traverse and influence these enforcement procedures may be disproportionately favored by automated systems. Due to the power disparity created by this circumstance, smaller producers could find it difficult to stand up for their rights or get paid fairly for their labor. Smaller artists may suffer financial losses as a result of this imbalance since automated systems that do not identify fair use or transformative works may target or eliminate their content disproportionately. Malicious actors also occasionally take advantage of these systems by bringing false copyright claims against authors to extort money or stifle competition. In addition to endangering individual producers, this "*weaponization*" of copyright claims compromises the credibility of platforms that depend on user-generated material to remain viable.<sup>36</sup>

Furthermore, intermediaries frequently make money from user-generated material through subscription services or advertising revenue, which presents moral dilemmas when they delete content without providing a valid reason while continuing to benefit from other users' interactions with related content. Reliance on automated systems may result in a situation where intermediaries put profit and efficiency ahead of equity and fairness in copyright enforcement, which would stifle creativity and innovation among smaller creators who worry about being unfairly punished or

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<sup>35</sup> Niskanen Ctr., *Automated Copyright Enforcement Systems: Perils, Pitfalls, and Possibilities*, <https://www.niskanencenter.org/automated-copyright-enforcement-systems-perils-pitfalls-possibilities/>.

<sup>36</sup> T. Lester & D. Pachamano, *The Dilemma of False Positives: Making Content ID Algorithms More Conducive to Fostering Innovative Fair Use in Music Creation*, 24 UCLA ENT. L. REV. 1 (2017), <https://www.uclalawreview.org/wp-content/uploads/sites/36/2020/07/Lester-Pachamano.pdf>.

losing access to their audiences.<sup>37</sup> The need for legislative solutions that support fair treatment of all authors and guarantee that automated systems do not compromise the key tenets of copyright law is highlighted by this exploitation.

*“The combination of caution, automation, and preemptive takedowns reflects the rising burden of moderating copyright infringement”*, as brought to light in recent talks, and drive content producers away from platforms that once gave them visibility and income opportunities. The financial ramifications go beyond individual producers; platforms themselves may encounter criticism from users who believe they are unfairly punished by excessively harsh enforcement actions that put financial gain ahead of equitable treatment.<sup>38</sup>

#### IV. WHAT ARE THE COUNTER MEASURES

##### A. Text and data mining exceptions

A surprising solution appears to be emerging, one that involves the use of software and technology. The requirement that some online content sharing service providers use these technologies (through Article 17 of the directive on copyright in the digital single market),<sup>39</sup> as envisioned by the EU legislator, has led to an evaluation of the situation considering upcoming technological developments. One possible solution to the problems with algorithmic enforcement is a broad copyright exception for text and data mining. The potential for licensing or selling enforcement algorithms derived from TDM results acquired under this exception may encourage the development of an alternative market, which would push the outsourcing of algorithm development to other organizations, or it may encourage large tech companies to prioritize the development of their own content recognition tools.<sup>40</sup>

Making Text and Data Mining (TDM) an exemption could encourage competitiveness and lead to more equitable and open algorithmic enforcement. Effective copyright enforcement algorithms require the ability to assess and train autonomous and semi-autonomous systems. Fair algorithms

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<sup>37</sup> T.J. DeGroat, *The Dilemma of False Positives: Making Content ID Algorithms More Conducive to Fostering Innovative Fair Use in Music Creation*, 24 UCLA ENT. L. REV. 1 (2017), <https://www.uclalawreview.org/wp-content/uploads/sites/36/2020/07/DeGroat-Article.pdf>.

<sup>38</sup> Lawrence Lessig, *Code v. 2.0* (Basic Books 2006), <http://codev2.cc/download+remix/Lessig-Codev2.pdf>.

<sup>39</sup> European Comm’n, *Guidance on Article 17 of Directive 2019/790 on Copyright in the Digital Single Market*, COM (2021) 288 final (2021), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0288>.

<sup>40</sup> *Digital Law Up(to)date: Art. 17 of Directive 2019/790 is Valid*, STIBBE, <https://www.stibbe.com/publications-and-insights/digital-law-up-to-date-art-17-of-directive-2019790-is-valid>.

could be developed in an environment that permits the free processing of more and better data.<sup>41</sup> Giving research and non-profit groups the freedom to create their own enforcement algorithms will solve problems like bias and transparency while also boosting competition by giving up-and-coming platforms more options. With more actors, particularly non-profits, the reliance on trade secrets would decrease, leading to greater transparency and reducing the risk of hidden biases. However, it is important to note that the exception pertains only to the acts of TDM itself and does not cover the development of new algorithms. However, the possibility of licensing or selling enforcement algorithms developed from TDM carried out under this exception would either encourage bigger tech firms to improve their content identification technologies or open a new industry. This, in turn, would incentivize the outsourcing of algorithm development to other entities.<sup>42</sup>

Technological Protection Measures or Digital Rights Management (DRM) technologies in the US, were among the first wave of algorithmic tools used in copyright enforcement. These tools served as virtual locks, enabling owners of digital works to formally stop unwanted access and manage how their creations are used in the future by encrypting them.<sup>43</sup> With the ability to prohibit digital copies entirely or limit them to a limited quantity, this technology successfully made sure that users could only access works that were lawfully obtained. TPMs may also place restrictions on the kind and quantity of devices that can be used to view the works. Adobe's DRM, Apple's Fair Play, and the Content Scrambling System ["CSS"] were notable uses of this technology. Despite their initial success in providing reliable technology for rights holders, TPMs faced several shortcomings. They need extra legal protections in the form of bans on evading TPMs because they were easily hacked. Despite these legislative restrictions, there were still other problems with TPMs. By restricting access to a certain number of devices, they frequently slowed down computers, created security problems, and prevented customers from enjoying their lawfully purchased goods to the fullest. Furthermore, because TPMs were intentionally too preventative, they typically overrode copyright exceptions. Although there were certain technological solutions available at the time to handle exceptions, such as partitioning, user authentication, and interoperability, most TPM implementations did not make extensive use of them. Consequently, despite their intended

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<sup>41</sup> Electronic Frontier Foundation, *The EU's Copyright Directive Is Still About Filters, But EU's Top Court Limits Its Use*, <https://www.eff.org/deeplinks/2022/05/eus-copyright-directive-still-about-filters-eus-top-court-limits-its-use>.

<sup>42</sup> World Intellectual Prop. Org., *Text and Data Mining (TDM), Machine Learning and Copyright*, WIPO, [https://www.wipo.int/edocs/mdocs/mdocs/en/wipo\\_ip\\_conv\\_ge\\_21/wipo\\_ip\\_conv\\_ge\\_21\\_p4\\_5.pdf](https://www.wipo.int/edocs/mdocs/mdocs/en/wipo_ip_conv_ge_21/wipo_ip_conv_ge_21_p4_5.pdf).

<sup>43</sup> Electronic Frontier Foundation, *Human Rights and TPMs: Lessons from 22 Years of the U.S. DMCA* (Sept. 2020), <https://www.eff.org/deeplinks/2020/09/human-rights-and-tpms-lessons-22-years-us-dmca>.

purpose, TPMs often fell short of providing a balanced and effective means of digital copyright protection.<sup>44</sup>

One way to enhance the effectiveness of these algorithms is by providing them with a substantial and diverse dataset. Copyright laws, however, may present serious challenges to this procedure. Understanding the business problem, gaining a data-specific understanding of the task, preparing the data for analysis (including selecting pertinent data and creating the final dataset), modeling (including selecting and putting into practice the appropriate method), assessing the prepared models, and finally applying the results are the steps involved in text and data mining.<sup>45</sup> Copyright-related acts like copying, converting, or sharing material with the public may be involved in text and data mining for machine learning. This suggests that prior consent and maybe additional fees to the right holders may be necessary for the analysis of data included in copyrighted or other rights-protected content (like database rights). Because most videos on websites like YouTube are protected by copyright, this problem is very relevant.

With extensive worldwide licenses, major platforms like YouTube and Facebook are allowed to conduct text and data mining on copyright-protected content that has been uploaded to their servers. Other organizations, such as non-profits or academic institutes, on the other hand, lack this access, which denies them a vital resource that they need to create their own identification algorithms: a sizable, mineable database. Large tech companies benefit from this discrepancy by having a competitive edge and effectively a monopoly on algorithmic copyright enforcement. As was previously said, algorithmic pre-adjudication - such as content screening by private organizations - can be problematic since these businesses frequently prioritize their own interests over those of users and their right to free speech. Removing the barriers caused by copyright and other rights is one possible way to lessen these problems. While some nations have already implemented exclusions for Text and Data Mining (TDM), the EU has not done so.<sup>46</sup> The DSM Directive, however, seeks to close this disparity. A copyright exception that permits cultural heritage and research organizations to freely use protected works for TDM for scientific research purposes is one of the new, required exceptions outlined in Article 3. Another clause (Article 4), which was originally voluntary but was eventually made essential through discussions, requires

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<sup>44</sup> Brigitte Vezina, *We're Against Digital Rights Management. Here's Why.*, CREATIVE COMMONS (Dec. 4, 2020), <https://creativecommons.org/2020/12/04/were-against-digital-rights-management-heres-why/>.

<sup>45</sup> VdoCipher Blog Team, *What Is DRM Protection Technology, Its Working & Types for Media* (Apr. 11, 2024), <https://www.vdocipher.com/blog/drm-technology/>.

<sup>46</sup> European Comm'n, *Text and Data Mining: Making Big Data Work for Innovation, Education, and Research*, COMM (2017) 113 Final (2017), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017DC0113>.

member states to establish a broad TDM exception that is applicable irrespective of the type of organization that benefits or the activity's goal. Other entities would find it easier to create alternative techniques and algorithms thanks to this exception, since they wouldn't require permission or payment for compensation. In both situations, they could freely perform TDM on databases and works to which they have legal access. To keep control over omitting TDM, right holders would still be able to expressly limit the use of their creations and protected content.

However, two further DSM Directive provisions - mandatory exemptions on text and data mining—could lessen possible problems brought on by the application of AI and the use of machine learning algorithmic enforcement techniques. The TDM exception unintentionally has a favorable effect on algorithmic enforcement, even if its main legislative goals were to promote the advancement of data science and close the gap between Europe and countries with less stringent copyright laws. This demonstrates how various facets of a problem can be balanced by a single legal tool.

### **B. Exploring transparency promotion and accountability at scale**

Some restrictions on exclusive licenses have been put in place to make it simpler for people to access the information found in copyrighted works. One strategy is to establish a few exceptions, saying that certain uses that do not interfere with the regular use of works and do not unjustly jeopardize the right holder's legitimate interests are exempt from prior authorization or payments. Ensuring proper control of algorithmic copyright compliance used by intermediaries on the internet is crucial.<sup>47</sup> Since online copyright enforcement affects fundamental rights, it is important to help those who are impacted understand how algorithmic copyright enforcement systems exercise their power, their standards for making decisions, and how to contest those conclusions. Otherwise, people would lose the freedom to choose which online platforms they use and what content they submit. The DMCA's anti-circumvention provisions, trade secrecy laws, and general anti-hacking statute are just a few of the legal barriers that may make it more difficult for the public to analyze the code underlying algorithmic enforcement processes and hold them responsible, in addition to the inherent opacity of algorithms and their constantly improving learning capabilities.<sup>48</sup>

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<sup>47</sup> Sharon Bar-Ziv & Niva Elkin-Koren, *Behind the Scenes of Online Copyright Enforcement: Empirical Evidence on Notice & Takedown*, 50 UCONN L. REV. 321 (2018), [https://digitalcommons.lib.uconn.edu/cgi/viewcontent.cgi?article=1395&context=law\\_review](https://digitalcommons.lib.uconn.edu/cgi/viewcontent.cgi?article=1395&context=law_review).

<sup>48</sup> Electronic Frontier Found. (EFF), *The DMCA's Anti-Circumvention Provisions: A Guide to the Law*, <https://www.eff.org/issues/dmca>.



### **C. Possibilities of Inbuilt Enforcement**

Some argue that to guarantee continued access for such purposes, some kind of institutional structure or human oversight would be required, as fair use norms cannot be incorporated into technical protection measures. Due in large part to the difficulty of converting legal requirements into executable computer code, prominent computer scientists also express pessimism about the viability of incorporating fair use into a technical system. Beyond the restrictions of human programmers in establishing the bounds of legal documents, these difficulties also include the intrinsic limitations of machine languages, their operating environments, and the hardware's capacity to carry out programmed commands.

The understanding that fair use is a dynamic idea is equally concerning. What kind of human monitoring can we expect from the likely designers of automatic fair use judgments, considering the high cost of checking internet content for infringement? Would Type I or Type II flaws be lessened by human oversight? While erroneous negatives are more harmful to the public interest, content owners are probably concerned about false positives from algorithmic fair use evaluations. Any cost benefit from algorithmic review would be negated and made impracticable if screening for both kinds of errors required human review of each computer conclusion. On the other hand, trying to incorporate legitimate use into regulation algorithms runs the risk of completely misrepresenting the exception. Furthermore, the new legal and social norm may be the acceptance by society of a watered-down kind of fair use that is displayed in an algorithmic format. The fair use exemption may be de facto eliminated if copyright enforcement algorithms do not incorporate fair use, leaving it available only as a peculiar defense for the few applicants who can afford to seek fair review by the courts. But trying to incorporate fair use into enforcement systems runs the risk of completely misrepresenting the exemption.

According to an empirical analysis of the corpus of federal court fair use rulings, fair use rulings may follow judicial decision-making patterns rather than being capricious or random. Without the need for formal programming definitions of fair use factors, it is possible that a neural network or other machine learning system could recognize these patterns in historical case data and compare them with comparable patterns in data pertaining to future fair use incidents, situations, and scenarios. The kind of fair use evaluations that the Ninth Circuit has in mind might be provided by such a system, either before the use occurs or in support of online copyright regulation judgements.<sup>49</sup>

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<sup>49</sup> U.S. Copyright Off., *Fair Use Index*, <https://www.copyright.gov/fair-use/>.

#### **D. Protecting Users**

Many of the owners of copyright decide to monetise their infringing content rather than delete it. This trend has become a successful business model, particularly in the realm of video monetization. Copyright owners can establish lucrative online licensing businesses, allowing them to effortlessly generate revenue from YouTube users utilizing their copyrighted material in any capacity.<sup>50</sup>

#### **E. Disclosure norms for Platforms**

Adopting multi-level, explicit, and legally binding disclosure regulations is essential to increasing transparency without unduly disrupting social media companies' models of operation. It has been shown that general provisions for required transparency reports are insufficient. Independent research and external scrutiny are severely hampered by platforms' control over what data and information they reveal and how they present it in the absence of clear and legally obligatory disclosure rules. By putting in place multi-level disclosure obligations, governments can assign oversight duties to different stakeholders, such as users, academics, and civil society, promoting an accountable system on multiple levels.<sup>51</sup>

Data should be made available to independent academics so they can audit algorithms and perform effect analyses, especially when it comes to freedom of speech and public debate. Among the recommendations for multi-level disclosure are:

- 1) User-Facing Disclosure: Platforms should notify users when their content is taken down, providing the option to appeal. Users should also be notified if the takedown was the consequence of an automatic judgment that was not reviewed by a human.
- 2) Research Disclosure and Civil Society: Platforms should make algorithmic tools available to researchers for algorithmic inspection and maintain databases of content that has been removed, along with documentation of the actions taken to remove it.<sup>52</sup> Most categories, including disinformation, hate speech, and copyright violation, ought to be accessible. However, ethical issues require careful negotiation within a co-regulatory framework for some categories, such as imagery of child sexual assault and image-based abuse (*"revenge porn"*).

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<sup>50</sup> Mary Woodcock, *Can I Still Monetize With a Copyright Claim?*, LICKD (Aug. 2022), <https://lickd.co/blog/music-licensing/can-i-still-monetize-with-a-copyright-claim>.

<sup>51</sup> Oliver L. Haimson et al., *Algorithmic Content Moderation: The Role of Bias in Online Spaces*, in *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency* (2021), <https://dl.acm.org/doi/abs/10.1145/3442188>.

<sup>52</sup> Aline Iramina, Charlotte Spencer-Smith & Wai Yan, *Disclosure Rules for Algorithmic Content Moderation*, GRAPHITE (2020), <https://graphite.page/policy-brief-blackbox/>.

- 3) General Disclosure: Large commercial platforms should be required to disclose information in a standardized format, accommodating differences in community guidelines and definitions of violations across platforms. Ensuring platform accountability requires strong and easily navigable content moderation appeal procedures. Users should be able to appeal judgments they believe to be erroneous and have the right to information, especially when they are subject to decisions that are automated without human scrutiny.<sup>53</sup>
- 4) Algorithmic Content Moderation [“ACM”] without human review risks the erroneous removal of content. The increase in the use of ACM, as seen during the COVID-19 crisis, underscores the need for effective appeal mechanisms. In order to minimize possible harm to public opinion, freedom of speech, and various other user rights, these measures are essential for the prompt restitution of any authorized material or account that has been mistakenly removed.<sup>54</sup>

## V. CONCLUSION

The European Court of Justice issued its eagerly anticipated decision in the Poland case in April 2022, concluding that the use of upload filters is required to safeguard online digital copyright under Article 17 of the Copyright in the Digital Single Market 2019 law. In general, the court affirms that algorithmic regulation of online copyright enforcement is consistent with European basic rights, which is a crucial decision as we progress toward a future of filtered online services. Considering the Court’s current normative framework, it will contend that the decision is hard for important parties to reconcile with the Court’s current guidelines for online digital copyright governance. It will be contended that, without a strong enough argument, internet intermediary service providers have completely lost the protections provided by the Court’s prior case law. It will be argued that this has a horizontal effect on the fundamental rights of internet users, which exacerbates the Court’s undervaluation of such rights, particularly with regard to freedom of speech. It will be claimed that the function of such rights has been curtailed in the face of algorithmic regulation, creating a dangerous precedent for all our filtered futures, rather than being granted the disruptive role justified by the Court’s current normative framework.<sup>55</sup>

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<sup>53</sup> Abhimanyu Agarwal, *Algorithmic Content Moderation and Copyright Law*, THE DIGITAL FUTURE (Oct. 26, 2020), <https://thedigitalfuture.in/2020/10/26/algorithmic-content-moderation-and-copyright-law/>.

<sup>54</sup> Aline Iramina, Charlotte Spencer-Smith & Wai Yan, *Disclosure Rules for Algorithmic Content Moderation*, GRAPHITE (2020), <https://graphite.page/policy-brief-blackbox/>.

<sup>55</sup> Communia Ass’n, *Poland, the CDSM, and the Court of Justice* (Nov. 11, 2022), <https://communia-association.org/2022/11/11/poland-the-cdsm-and-the-court-of-justice/>.

Leading social media companies are using automation and artificial intelligence more and more to find and delete offensive content. While this helps curb the spread of the most harmful material on the Internet, algorithmic content moderation can sometimes result in the deletion of content that should remain accessible (“over blocking”) or unfairly target minorities. Notably, platforms offer very little transparency regarding how their algorithmic moderation works, the perceived accuracy of these technologies, and the volume of content removed, especially without human oversight. Given the likely increase in the use of these technologies, it is crucial for regulators to mandate greater transparency through required disclosures from platforms.

To improve social media platforms’ transparency, this policy suggests:

- 1) Using algorithmic moderation of content mechanisms, social media platforms can implement specific and mandatory disclosure criteria at several levels, allowing for multi-level accountability and external scrutiny.
- 2) Requiring social media companies to set up reliable and user-friendly content moderation appeal processes. Users should be able to challenge any platform decision about their material, ask for human review if the decision was made automatically, and quickly restore any content that was wrongfully removed but was still legitimate.
- 3) Establishing a regulatory framework that ensures an improved and effective application of disclosure obligations by using multiple stakeholders in the regulation process.
- 4) It is unclear if data-driven, machine-mediated tailoring can replace traditional personalization techniques and whether automated copyright enforcement can account for fair use rulings and other legal exceptions. However, there are concerns about the inherent pitfalls of relying on algorithmic regulation, including biases, diminished transparency, and design flaws. Addressing these challenges requires careful consideration and possibly human oversight to ensure fairness and accuracy in automated enforcement processes.
- 5) One thing is certain, though: as autonomous enforcement systems develop further, accountable and open public interest conclusions in digital copyright governance will become more and more elusive in the absence of a system of public interest principles and at the whim of influential private actors.

Fairness for content producers, copyright holders, and emerging media platforms should all be guaranteed by reform. Instead of solely adding more regulations, policymakers and regulators should focus on clarifying and improving workable fair use policies. Instead of putting the duty upon content creators to demonstrate their innocence, they must think about transferring the

burden of proving on copyright holders who allege harm. Addressing the challenges of algorithmic enforcement necessitates an interdisciplinary approach that integrates expertise in law, technology, ethics, and policy. Current literature underscores the importance of collaboration across these disciplines to develop more effective and equitable enforcement mechanisms

## **THE INTELLECTUAL PROPERTY CONUNDRUM: THE LEGAL IMPLICATIONS OF NANOTECHNOLOGY IN MEDICINE AND SUSTAINABLE ENERGY**

MS. REEVA KHUNUD K PATHAN\*

### **ABSTRACT**

*Nanotechnology and medicine are significantly interconnected, particularly through the augmentation of drug delivery systems, diagnostics, and treatments like gene therapy through the unique properties of nanoparticles. These advancements, while a necessity in the contemporary world and protected by intellectual property laws, insinuate the presence of vital challenges for sustainable energy and environmental health. Nanoparticles, once introduced, continue to persist in ecosystems, potentially leading to bioaccumulation and instigating the vicious cycle of nano-pollution. This study hypothesizes that the negative environmental impacts of nanotechnology in medicine undermine sustainable energy practices due to inadequate and fragmented regulatory frameworks and the blanket protection provided to such technology by patents. The paper employs a doctrinal method to critically evaluate existing legal frameworks, policies, and international standards, revealing gaps and inconsistencies that fail to address the environmental and energy implications of nanotechnology in medicine. Regulations from international bodies like ISO and regional initiatives such as the EU's REACH illustrate that the absence of cohesive, enforceable guidelines hampers the effective management of nanotechnology's risks and the inability of countries, particularly in developing and underdeveloped countries to govern their energy utilisation, leading to waste and pollution. In India, despite the recognition of nano-pollution, its vulnerable position as a developing country, the lack of a specific regulatory framework and patent protection providing a form of immunity has left it bereft of reaching global and regional standards. The paper examines legal implications collectively, emphasizing the urgent need for harmonized international standards that incorporate sustainability criteria to mitigate the environmental drawbacks of medical nanotechnology. The study focuses on ill impacts on the environment, wherein sustainable energy will continue to be overshadowed by the benefits of nanotechnology in medicine.*

**Keywords** – nanotechnology in medicine, sustainable energy, cycle of toxicity, regulation of nanoparticles, blanket patent protection.

### **I. INTRODUCTION**

Ralph Merkle once said, “Nanotechnology is an idea that most people simply didn’t believe”. The etymology of nanotechnology can be traced back to the Greek word “nano” which means “dwarf”. It later

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became a unit of measurement and its meaning transformed to “one billionth part.” Nanotechnology, became the study of nanoparticles, which are one billionth part in surface-area-to-volume ratio and this ratio is measured in nanoscale size.<sup>1</sup> Nanotechnology is the conversion of matter with at least one dimension sized from 1-100 nanometers. This scale is commonly known as the nanoscale and matter at this stage acquires special and unique properties including quantum abilities the most commonly used property is the surface area.<sup>2</sup> Nanotechnology operates so efficiently due to its high surface area which allows the absorption of significant quantities of medication and its efficient circulation in the bloodstream.<sup>3</sup> The increased surface area also enhances the magnetic, optical and catalytic properties, which broadens the application in medical treatments.<sup>4</sup> Polymeric nanoparticles and liposomal nanocarriers, known for their biocompatibility and biodegradability, are frequently employed in these systems to optimize drug delivery.<sup>5</sup> Further, the advent of medical nanobots based on a bottom-up approach which are capable of self-replication, can unblock arteries, repair genetic defects, or even replace entire organs, has led to a transformation in the medical field.<sup>6</sup> Presently, the replacement of DNA molecules is a technique developed to help genetic abnormalities and eradicate diseases at a molecular level and can be used in fertility treatments.<sup>7</sup>

In the modern world as we know it today, nanotechnology no longer remains an elusive idea but rather a field of study that spans various areas of study including chemistry, physics, biology, medicine, engineering and optics. In fact, fields such as molecular nanotechnology have developed which relates to the precise manipulation of atoms and molecules to fabricate a macroscale product.<sup>8</sup> Nanotechnology has essentially defined fields such as molecular biology, semiconductor physics, energy storage and has created diverse applications in nanomedicine as previously mentioned, biomaterial energy production and microfabrication.

Nanotechnology is not a recent discovery, it has existed since 600-300 B.C. through pottery in

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<sup>1</sup> Mahmoud Nasrollahzadeh, et. al., *An Introduction to Nanotechnology*, 28 INTERFACE. SCI & TECH 1 (2019).

<sup>2</sup> K. Eric Drexler, 1 *Engines of creation: the coming era of nanotechnology* (1986).

<sup>3</sup> Elena Serrano, et.al, *Nanotechnology for Sustainable Energy*, 13 RENEW. & SUSTAINABLE ENERGY REV. 2373 (2009), <https://doi.org/10.1016/j.rser.2009.06.003>.

<sup>4</sup> Abid Haleem et al., *Applications of Nanotechnology in Medical Field: A Brief Review*, 7 GLOB. HEALTH J. 70 (2023).

<sup>5</sup> A.S. Klymchenko et al., *Dye-Loaded Nanoemulsions: Biomimetic Fluorescent Nanocarriers for Bioimaging and Nanomedicine*, 10 ADV. HEALTHC. MATER., (2021).

<sup>6</sup> Mritunjai Singh et al., *Nanotechnology in Medicine and Antibacterial Effect of Silver Nanoparticles*, 3(3) DIGEST J. OF NANOMATERIALS & BIOSTRUCTURES 115 (2008).

<sup>7</sup> A.M.A. Moshed et al., *The Application of Nanotechnology in medical sciences: new horizon of treatment*, 9 AM. J. BIOMED. SCI. 1, 14 (2017).

<sup>8</sup> *Supra*, note 2.

Keeladi, India where materials such as carbon nanotubes were used, in Damascus steel in 900 B.C. where cementite nanowires were used and in Ninth century Mesopotamia where nanoparticles were used in glazes to produce gold and copper coloured effects which was emulated by Islamic ceramics later on.<sup>9</sup>

Nanotechnology is a field that was revolutionized by Richard Feynman in 1959 through his lecture in Caltech “There is Plenty of Room at the Bottom”.<sup>10</sup> In 1974, Japanese researcher Norio Taniguchi first coined “nano-technology” to describe atomic-scale processes in thin-film deposition and ion-beam milling. Later, Eric Drexler independently adopted the term in his 1986 book *Engines of Creation*, proposing self-replicating molecular assemblers and popularizing the vision of molecular nanotechnology, thereby setting the future standards for molecular scale manufacturing. Nanotechnology developed through contributions to physics including the invention of a scanning tunnelling microscope in 1981 which is used to image surfaces at the atomic level developed by Gerd Binnig and Heinrich Rohrer for which they were awarded the Noble Prize in Physics in 1986. The discovery of Fullerenes in 1985 by Harry Kroto, Richard Smalley and Robert Kurl for which they were awarded the Nobel Prize in Chemistry in 1996. The application of Fullerenes was discovered in carbon nanotubes by Sumio Ijima in 1993. In present day, such Fullerenes are used to manufacture industrial grade carbon nanotubes which find their application in nanomedicine. The field was placed in the limelight through the pharmaceutical industry through drug delivery systems and medical treatments.

However, there are two sides to every coin and while there is no denying the advantages of nanotechnology, the disadvantage in the usage of nanotechnology lies in the toxic nature of the materials used. Since nanoparticles have nanoscale properties, they allow them to permeate biological membranes and accumulate in organs leading to bioaccumulation.<sup>11</sup> These risks necessitate thorough investigation and regulation to ensure that the benefits of nanotechnology do not come at the expense of safety and environmental sustainability. However, due to the constant fluctuation of the development of nanotechnology, it is very difficult to formulate a legal framework that does not completely become obsolete.<sup>12</sup> The absence of a clear regulatory framework exacerbates the dangers, as the unique behaviour of nanoparticles is not addressed by

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<sup>9</sup> Samer Bayda et al., *The History of Nanoscience and Nanotechnology: From Chemical–Physical Applications to Nanomedicine*, 10 BIOMOLECULES 11 (2020), <https://doi.org/10.3390/biom10010011>

<sup>10</sup> *Supra*, note 4.

<sup>11</sup> A. Surendiran et al., *Novel Applications of Nanotechnology in Medicine*, 130 INDIAN J. MED. RES. 689, 701 (2009).

<sup>12</sup> Bowman, D.M. & Hodge, G.A., *A small matter of regulation: an international review of nanotechnology regulation*, 8 COLUM. SCI. & TECH. L. REV. 1(2007).



any form of traditional, medical or environmental laws.

For instance, in India, there are multiple regulatory frameworks set up for nanotechnology but either there is an abject lack of enforceability or such frameworks remain in a nascent stage and pose challenges that India is not equipped to handle.<sup>13</sup> For example, India has policies such as the Nano Mission which was launched in India in 2007 to boost research and development in the field of nanotechnology.<sup>14</sup> Prior to this, in 2001 the Department of Science and Technology had launched the Nano Science and Technology Initiative to empower research in agriculture, healthcare services and the fertilizer industry.<sup>15</sup> These initiatives merely encourage research in the field of nanotechnology and do not serve as guidelines for the safe usage and handling of toxic nanomaterials especially at an industrial level. However, recently, the Draft Guidelines for Safe Handling of Nanomaterials in Research Laboratories and Industries was released by the Department of Science and Technology as a part of national Programme on Nano Science and Technology, erstwhile Nano Mission.<sup>16</sup> These guidelines are a welcome step forward but they require enforceability as well in the form of regulations.

This paper is structured into two interconnected parts. Part I explores the fundamentals of nanotechnology, its applications in medicine and sustainable energy, and its integration across various fields. It also examines the socio-ethical and legal implications arising from these intersections. Part II focuses on the intellectual property [“IP”] complexities of nanotechnology. This section further compares nanotechnology with biotechnology, highlighting the similarities and differences in their patentability, commercialization, and regulatory challenges. These two parts are intricately linked by their critical assessment of how existing legal mechanisms inadvertently provide a form of immunity to these harmful effects, often failing to hold industries accountable. By weaving these discussions together, the paper presents a comprehensive analysis of the need for more robust legal oversight and reform in the governance of nanotechnology.

## II. USAGES OF NANOTECHNOLOGY

### A. Nanotechnology in Medicine and Healthcare as Nanomedicine

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<sup>13</sup> Bhatia, P. and Chugh, *A multilevel governance framework for regulation of nanomedicine in India*. 6(4) NANOTECHNOLOGY REVIEWS, 373-382 (2017).

<sup>14</sup> Dep’t of Sci. & Tech., Gov’t of India, Nat’l Programme on Nano Sci. & Tech. (Earlier Nano Mission), <https://dst.gov.in/scientific-programmes/mission-nano-science-and-technology-nano-mission>

<sup>15</sup> *Id.*

<sup>16</sup> Centre for Knowledge Management of Nanoscience & Technology, Dept. of Sci. & Tech., Govt. of India, Guidelines and Best Practices for Safe Handling of Nanomaterials in Research Laboratories and Industries (Draft Guidelines), <https://dst.gov.in/sites/default/files/Draft-Guidelines%20.pdf>

Nanotechnology is relevant in the contemporary medical as a distinct area of study. Historically, nanotechnology has been used in medicine in drug delivery and diagnostics. Nanoparticles have been used in chemotherapy due to their precision and effectiveness. The invention of “nanoflares” has led to an increased detection in cancer cells through light signals, and smart pills to monitor patient conditions.<sup>17</sup> However, such developments are being callously used despite phenomena such as bioaccumulation.<sup>18</sup> Nanoparticles due to their size and high surface reactivity bypass biological barriers and evade the immune system, allowing them to persist and accumulate within biological tissues over time. This persistence leads to bioaccumulation, where nanoparticles build up in organs like the liver, kidneys and even bones, quite akin to the deposit of radioactive materials which causes effects spanning generations.<sup>19</sup> One key distinction is that there is no definitive evidence that bioaccumulation of nanoparticles leads to genetic issues.<sup>20</sup> However, given that the widespread use of nanotechnology is relatively recent, it would be premature to draw conclusions, and making assumptions may not be prudent. Nanoparticles, such as silver nanoparticles used for their antibacterial properties, can persist in biological systems due to their ability to bypass immune defences and accumulate in tissues.<sup>21</sup> Though conclusive evidence of genetic damage from bioaccumulation is lacking, the persistence and interaction of nanoparticles with cells present potential risks. Nanotechnology has become so deeply ingrained in medicine leading to the formation of a distinct field known as nanomedicine offering such significant advantages that, finding a suitable and less harmful alternative with similar properties to nanomaterials is extremely challenging. Therefore, we stand on the precipice of carefully managing use of nanomaterials to ensure that only necessary amounts are employed without causing further complications caused by potential toxicity.<sup>22</sup>

## **B. Nanotechnology In Sustainable Energy Practices**

Nanotechnology has found a primary use in the intersection of sustainable energy practices. In the field of sustainable energy, nanotechnology has been used in environmental remediation, but it is a paradoxical notion where something that benefits the environment seems to cause it so much harm. Nanoparticles are used in the water purification process, where nanoparticles, like Nano

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<sup>17</sup> Damilola E. Babatunde et al., *Environmental and Societal Impact of Nanotechnology*, 1 DEPT. OF CHEM. ENG., COVENANT UNIV., OTA, NIGERIA (DEC. 2019).

<sup>18</sup> A. Sharma et al., *Toxicity with Waste-Generated Ionizing Radiations: Blunders Behind the Scenes*, FREE RADICAL BIOLOGY AND ENVIRONMENTAL TOXICITY 305 (Cham: Springer Int'l Publ'g 2022).

<sup>19</sup> Christian Franke et al., *The Assessment of Bioaccumulation*, 29 CHEMOSPHERE 1501 (1994).

<sup>20</sup> GUPTA, P.K., NANOTOXICOLOGY IN NANOBIO-MEDICINE, 111-123 (Springer, 2023).

<sup>21</sup> Mritunjai Singh et al., *Nanotechnology in Medicine and Antibacterial Effect of Silver Nanoparticles*, 3(3) DIGEST J. OF NANOMATERIALS & BIOSTRUCTURES 115 (2008).

<sup>22</sup> *Supra*, note 9.

Zero-Valent Iron [“NZVI”], are utilized to remove contaminants from groundwater and wastewater. These particles target and neutralize toxic substances, providing an efficient method for environmental restoration.<sup>23</sup> Nanoparticles, especially quantum dots and nanowires, are used to improve the efficiency of solar panels. These materials enhance the light absorption capabilities of photovoltaic cells, contributing to the development of more efficient and affordable solar energy systems.<sup>24</sup> This advancement could significantly boost the adoption of solar energy, making it a more viable and sustainable option for the future. However, the waste accumulated from making something environment-friendly is highly toxic and one of the main causes of a new kind of pollution known as nano-pollution.<sup>25</sup> Nanoparticles, due to their properties such as size and reactivity, can easily disperse into the air, water, and soil during production, use, or disposal.<sup>26</sup> These particles have the potential to accumulate in ecosystems, leading to unknown ecological consequences. Studies highlight that such accumulation could disrupt soil health, water quality, and marine ecosystems, affecting both plant and animal life.<sup>27</sup>

Therefore, nanotechnology has massive implications for the environment and contributes to pollution as well. However, despite its contribution to such pollution, it also helps maintain sustainability, thus acting as a double-edged sword.

### III. SOCIO-ETHICAL IMPLICATIONS OF SUSTAINABLE ENERGY THROUGH THE USE OF NANOTECHNOLOGY IN MEDICINE AND HEALTHCARE

The benefits of nanotechnology in nanomedicine and sustainable energy are widespread; however, these advantages must be taken with a pinch of salt. While without the considerable benefits, modern medicine as we know it would not exist, there are varying problems as well which includes the perpetuation of a vicious cycle caused by nanotechnology for which there are no existing policy and legal framework available. Nanotechnology resources are available primarily in third-world countries and are used industriously by first-world nations.<sup>28</sup> There is a transient corporate interest created that leans heavily in favour of first-world countries and perpetuates what is now called

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<sup>23</sup> Matthew A. et. al., *Green Chemistry and the Health Implications of Nanoparticles*, 8(5) GREEN CHEM., 417, 432 (2006).

<sup>24</sup> *Supra*, note 1.

<sup>25</sup> Lisa Pokrajac et al., *Nanotechnology for a Sustainable Future: Addressing Global Challenges with the International Network4Sustainable Nanotechnology*, 15 ACS NANO 18608 (2021).

<sup>26</sup> Amoabediny, G.H., Naderi, A et. al., *Guidelines for safe handling, use and disposal of nanoparticles*, 170(1) J. PHYS. CONF. SER 012037 (2009).

<sup>27</sup> Bundschuh, et. al., *Nanoparticles in the environment: where do we come from, where do we go to?*, 30 ENV. SCI. EUR, 1-17(2018.).

<sup>28</sup> Invernizzi, N. and Foladori, G., *Nanotechnology and the developing world: Will nanotechnology overcome poverty or widen disparities*, 2 NANOTECH. L. & BUS. 294 (2005).

economic slavery.<sup>29</sup> Third-world countries are extremely reliant on first-world nations to fulfil their economic necessities and fall prey to this economic colonization.<sup>30</sup> Hence, there is a quid pro quo created where first-world countries are dependent on third-world countries for resources, and first world countries in return, provide economic relief. The dependency favours the first world by far because of the economic disparity and the clear exploitation of the resources of third world countries to satisfy the interests of the first world nations.<sup>31</sup> The prime example of this is the mining industry in the Democratic Republic of Congo [**“DRC”**], which shows a clear pattern of economic colonialism, where first-world countries exploit local resources for their technological advancements.<sup>32</sup> This mirrors earlier colonial practices where third-world countries were systematically stripped of their resources to benefit industrial powers.

In the case of cobalt, a critical material for batteries and electronics, up to 70% of the global supply is sourced from the DRC.<sup>33</sup> This dynamic creates a dependence of third-world countries on first-world nations, perpetuating a cycle of economic subjugation.<sup>34</sup> Similarly, the rise of the nanoparticle industry is expected to follow this pattern due to similarities between cobalt and raw materials used in nanotechnology. Many raw materials for nanotechnology are found in developing regions, but the profits and technological advancements disproportionately favour developed countries, creating an economic slavery as these countries remain dependent on selling their resources with little return investment in their infrastructure or communities.

The nanomaterials obtained through extreme environmental damage are further used to remediate the environment. Furthermore, nanoparticles are used significantly by the medical industry as compared to other industries. Hence, it creates a cycle where toxic materials are obtained to save lives, and the very same materials also take lives. This is evidenced by the nanomaterials that are mined in Mozambique and the suffering of the miners from various diseases due to the toxicity of these particles.<sup>35</sup>

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<sup>29</sup> Fabio Salamanca-Buentello et al., *Nanotechnology and the Developing World*, 2 PLOS MED. e97 (2005).

<sup>30</sup> Ikechukwu C. Ezema, et. al., *Initiatives and strategies for development of nanotechnology in nations: a lesson for Africa and other least developed countries*, 9 NANOSCALE RES. LETT. 133 (2014).

<sup>31</sup> Priyom Bose, *Nanomedicine: Advantages and Disadvantages*, AZONANO (Mar. 12, 2024), <https://www.azonano.com/article.aspx?ArticleID=6707>.

<sup>32</sup> Jennifer Wu & Janet Wong, *Child Labour in Cobalt Mining: A Holistic View on the Complexity of the Issue and a Reality Check on the Effectiveness of Engagement*, J.P. MORGAN ASSET MANAGEMENT (2024).

<sup>33</sup> Debasmita Patra, et. al., *Nanoscience and Nanotechnology: Ethical, Legal, Social and Environmental Issues*, 96 CURRENT SCI. 651-657 (2009).

<sup>34</sup> Barzel, Y., *An economic analysis of slavery* 20(1) J.L. &ECON 87-110 (1977).

<sup>35</sup> Gavin Hilson et al., *Formalizing Artisanal and Small-Scale Mining in Mozambique: Concerns, Priorities, and Challenges*, IGC (June 2021), F-19016-MOZ-1, <https://www.theigc.org/sites/default/files/2021/06/Hilson-et-al-June-2021-Final-report.pdf>.

Mozambique is a primal example of economic exploitation as it has attracted significant international investment including a USD 150 million loan from the US International Development and Finance Corporation to support Balama.<sup>36</sup> Mozambique has an exceptionally large and high grade graphite reserves with mines such as the Balama mine which has around 110 million tons of graphite ore reserves and produces 350,000 tonnes of graphite concentrate annually.<sup>37</sup> The graphite concentrate is used as a raw material which is used to produce carbon black nanoparticles. Mozambique is a sought-after mining destination, largely due to the ease of mining due to the presence of open pit mining sites.<sup>38</sup>

Therefore, the presence of optimal conditions has led to Mozambique having a “flourishing” artisanal and small-scale mining operations [“**ASM**”] sector, which serves as a crucial source of income for many. While ASM is legally recognized, there is a scourge of non-compliance with the compulsory mining license regulations, leading to parallel illegal markets, with unlicensed miners known as *garimpeiros*.<sup>39</sup> Nanomaterials are usually in the form of carbon black or titanium dioxide nanoparticles. Mozambique, due to its abundant graphite reserves, is well-positioned as a supplier of carbon black nanoparticles.<sup>40</sup> However, the sector is largely informal, leading to a dearth of investment needed to legitimise the ventures in ASM.<sup>41</sup> Due to the lack of such appropriate safeguards, miners are at considerable risk, as prolonged exposure to toxic chemicals such as methylates and bioaccumulates can lead to severe health complications.<sup>42</sup>

Although nanotechnology serves as a valuable economic opportunity for these miners, the lack of protective policies and regulatory enforcement has resulted in hazardous working conditions that contribute to premature mortality. The example of Mozambique is merely part of a larger problem prevalent in other developing countries including India as well. While India may not be as prevalent in terms of mining raw materials for nanoparticles, this is mainly due to a lack of data. In India, the data for ASM which is the primary form of acquiring raw materials for nanotechnology is

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<sup>36</sup> Wilder Alejandro Sanchez, *Protests Shutter Mozambique's Balama Graphite Mine*, SITUATION REPORTS, (Dec. 30, 2024) <https://www.geopoliticalmonitor.com/protests-shutter-mozambiques-balama-graphite-mine/>.

<sup>37</sup> Amilia Stone, *Mozambique's Graphite Boom*, DIRECTORSTALK (Mar. 27, 2025), <https://directorstalk.net/mozambiques-graphite-boom>.

<sup>38</sup> *Id.*

<sup>39</sup> Estacio Valoi, *Mozambique | Southern Africa's Mining Scars*, Part 3, ZAM (Sept. 4, 2023), <https://www.zammagazine.com/investigations/1679-mozambique-southern-africa-s-mining-scars-part-3>

<sup>40</sup> Chemicals & Raw Materials, *Nanotechnology Industries Association*, <https://nanotechia.org/sectors/chemicals-raw-materials>

<sup>41</sup> *Infra*, note 43.

<sup>42</sup> *Supra*, note 24.

collected under the Indian Mines Act, 1952 and Minerals (Regulation and Development) Act 1957.<sup>43</sup> The Indian Bureau of Mines working under the MMRD Act, 1957 does not maintain a record for 'Minor Minerals' including minerals like carbon or titanium oxide which is mainly used for nanomaterials.<sup>44</sup> However, the mining of nanomaterials is not particularly prevalent in India due to a lack of such minerals being naturally available. Informality is also widespread within ASM in India, with many operations lacking formal licenses and legal protections, exposing miners to significant health and safety risks from toxic exposures including chemical bioaccumulation.<sup>45</sup>

#### IV. CHALLENGES IN THE REGULATORY SECTOR FOR NANOTECHNOLOGY

##### A. In Medicine and Healthcare as Nanomedicine

Nanotechnology has significant implications for health, particularly through its applications within the human body. It is commonly presumed that products consumed by the general public must adhere to rigorous standards, with policies in place to ensure such compliance. The medical industry, known for its stringent enforcement of standards, operates at a higher level of accountability due to its direct impact on human health. However, it is startling to realize that nanotechnology lacks uniform standards despite being an integral part of a sector that remains operational even in global emergencies.<sup>46</sup> The use of unethically sourced materials in this context raises serious concerns.

It is not to say that international efforts have not been made for the regulation of nanotechnology; the issue arises in the inadequacy of such protections. The ISO has developed technical guidelines such as ISO/TR 13121<sup>47</sup> for risk evaluation of nanomaterials and ISO 29701<sup>48</sup> for measuring nanoparticle toxicity. These standards promote safety in manufacturing and medical applications but have not been fully adopted globally, leading to variations in implementation and effectiveness.<sup>49</sup> However, these standards regulate the technical aspects of nanotechnology, but

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<sup>43</sup> *Artisanal and Small-scale Mining in India*, DELVE DATABASE REPORT (1997-98 data), <https://www.delvedatabase.org/uploads/resources/Artisanal-and-Small-scale-Mining-in-India.pdf>.

<sup>44</sup> KUNTALA LAHIRI-DUTT & JAMES MCQUILKEN, *Debe State Of The Artisanal And Small-Scale Mining Sector-India*, in *State Of The Artisanal And Small-Scale Mining Sector*, 60-74 (World Bank Group ed., vol. 1, 2019).

<sup>45</sup> Deb, M., et al., *Artisanal and small scale mining in India: selected studies and an overview of the issues*, 22 INT'L J. MINING, RECLAMATION & ENV 194 (2008).

<sup>46</sup> Snir, R., *Trends in global nanotechnology regulation: The public-private interplay*, 17 VAND. J. ENT. & TECH. L., 107 (2014).

<sup>47</sup> ISO, ISO/TR 13121:2011 Nanotechnologies-Nanomaterial Risk Evaluation (Technical Report, 2011), <https://www.iso.org/standard/52976.html>.

<sup>48</sup> ISO, ISO 29701:2010 Nanotechnologies- Endotoxin Test on Nanomaterial Samples for In Vitro Systems-Limulus Amebocyte Lysate (LAL) Test, (International Standard, Sept. 2010) <https://www.iso.org/standard/45640.html>.

<sup>49</sup> Ekpo Kelechukwu, *Nanotechnology: Regulatory Outlook on Nanomaterials and Nanomedicines in United States, Europe and India*, 7 APP. CLIN. RES., CLIN. TRIALS & REGUL. AFF 225 (2020).

they do not provide any guidelines as to the measures to be taken when these guidelines are not followed. Another issue that arises is the fact that these guidelines do not have a mandatory adherence, thereby creating a fragmented framework that does not work effectively or ensure any safety standards.

All of these nations do not consider nanotechnology an important research field, even after the groundbreaking research of silver nanoparticles in antimicrobial applications. Silver nanoparticles were underwritten despite their unique physicochemical properties due to safety and scalability concerns.<sup>50</sup> But their impact was undeniable, now silver nanoparticles are incorporated in medical devices, wound dressings and even consumer goods for antimicrobial protection that may be sold over-the-counter. Therefore, nanotechnology in India needs to be considered as a serious avenue for research, which leads to exceptional avenues for commercialisation.

The only nation that has recognised the problem is Brazil which has formulated the Nanotechnology Act which integrates environmental policies with medical technology development.<sup>51</sup> It requires all medical nanotechnologies to undergo environmental impact assessments which thereby provides some form of regulation in the present context.<sup>52</sup>

### **B. In Sustainable Energy Practices**

Nanotechnology sits at the intersection of various sectors such as chemistry, pharmaceuticals, environmental science, and engineering. Often, regulatory policies belong to distinct fields, creating gaps when nanotechnology crosses these boundaries. For instance, medical devices using nanotechnology might fall under pharmaceutical regulations, while the energy impacts of these devices are governed by environmental laws, leading to inconsistencies and enforcement challenges. For instance, the EU's Cosmetics Regulation and Medical Devices Regulation,<sup>53</sup> both address the use of nanoparticles but primarily focus on consumer safety without a comprehensive view of environmental or sustainable energy impacts. This narrow focus overlooks how the lifecycle of medical nanomaterials affects broader sustainability efforts. Even in the USA, the EPA's classification of nanoparticles as chemicals often excludes their medical applications from

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<sup>50</sup> *Supra*, note 13.

<sup>51</sup> W. ENGELMANN, ET AL., *Nanotechnological Regulations in Brazil*, in *Nanomaterials: Ecotoxicity, Safety, and Public Perception* 369 (M. Rai & J. Biswas eds., Springer 2018).

<sup>52</sup> Debasmita Patra, et. al., *Nanoscience and Nanotechnology: Ethical, Legal, Social and Environmental Issues*, 96 CURRENT SCI. 651-657 (2009).

<sup>53</sup> Regulation (EC) No 1223/2009 of the European Parliament and of the Council, on Cosmetic Products, 2009 O.J. (L 342) 59, <https://eur-lex.europa.eu/eli/reg/2009/1223/oj/eng>.

its purview, leaving the FDA to handle safety concerns that do not address environmental or energy sustainability. The lack of coordination between these agencies results in regulatory loopholes. The main reason for a standard not being set is the fact that nanotechnology is a developing field, and hence, present regulations become obsolete as soon as they become applicable. The absence of any standards has led to nanoparticles being clubbed together with other bulk materials of similar properties.<sup>54</sup> For example, while the EU's REACH regulation<sup>55</sup> and the US EPA<sup>56</sup> address chemical substances, they often fall short when applied to the nanoscale, which has distinct toxicological profiles due to altered surface area and reactivity.<sup>57</sup> The EU's REACH directive requires the registration of chemical substances, including nanomaterials, but its primary focus remains on consumer and occupational safety, not energy sustainability or environmental longevity. Standards in the present scenario pertain to the unavailability of standardized international methodology for toxicity testing or lifecycle assessment specific to nanoparticles.

The European Union, despite the lack of a comprehensive framework, does have a proactive approach through the **European Strategy for Nanotechnology**,<sup>58</sup> emphasizing the importance of aligning innovation with health, safety, and sustainability. However, enforcement remains a challenge as directives such as REACH do not adequately cover the environmental implications of medical nanoparticles, particularly in sustainable energy contexts. EU member states have been encouraged to develop their own nanomaterial registries, but without a harmonized framework, variations persist, affecting cross-border management and regulatory coherence.

Similarly, the only cohesive attempt in the USA is through California's Proposition 65 lists toxic substances,<sup>59</sup> including some nanoparticles, but this list is limited to known carcinogens and does not consider energy or ecological sustainability comprehensively. It only lists what constitutes as toxic but does not prescribe any penalty for failure in compliance.

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<sup>54</sup> Lisa Pokrajac et al., *Nanotechnology for a Sustainable Future: Addressing Global Challenges with the International Network4Sustainable Nanotechnology*, 15 ACS Nano 18608 (2021).

<sup>55</sup> Regulation (EC) No 1907/2006 of the European Parliament and of the Council, Concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), 2006 O.J. (L 396) 1, <https://echa.europa.eu/regulations/reach/understanding-reach..>

<sup>56</sup> U.S. Env'tl. Prot. Agency, *About the TSCA Chemical Substance Inventory*, <https://www.epa.gov/tsca-inventory/about-tsca-chemical-substance-inventory> (last visited June 8, 2025).

<sup>57</sup> M.V. Starynskyi & O.D. Pogrebnjak, *The Current State of Legal Regulation of the Use of Nanotechnology in the Medical Field and Prospects for Its Development*, LVIV UNIV. OF BUS. & L. (2021).

<sup>58</sup> Publications Office of the European Union, *A European Strategy for Nanotechnology*, <https://op.europa.eu/en/publication-detail/-/publication/3c40c558-7076-4cef-9343-4b1fbc09fe0d/>

<sup>59</sup> Office of Environmental Health Hazard Assessment, *The Proposition 65 List*, <https://oehha.ca.gov/proposition-65/proposition-65-list>.



Similar to ISO, India has the Bureau of Indian Standards, but it faces the same issues as ISO in the sense that these guidelines are not mandatory, and the lack of enforcement mechanisms means they have limited influence on how industries incorporate sustainability and safety measures in nanotechnology use.<sup>60</sup>

In India, similar problems as in the EU and the USA persist. There is no unified policy and the closest to regulating this technology is the Drugs and Cosmetics Act, 1940 which governs medical applications,<sup>61</sup> but it does not differentiate between nanomaterials and their conventional counterparts, leading to gaps in safety and sustainability assessments.<sup>62</sup> As nanotechnology develops applications that intersect with sustainable energy, like energy-efficient batteries or medical devices powered by nanotechnology, there is a pressing need for India to integrate energy sustainability criteria into its regulatory policies.

## **V. NANOTECHNOLOGY IN MEDICINE AND SUSTAINABLE ENERGY PRACTICES AND ITS CORRELATION TO INTELLECTUAL PROPERTY RIGHTS**

Regarding the utilisation of nanotechnology in medicine and sustainable energy, the most obvious legal inter-relation concerns intellectual property rights, specifically patents. Despite its wide range of impacts, nanotechnology has a vast market and monetary investment. The production of nanotechnology is a form of intellectual property, and as such, the industry is built upon meeting the requisite bottom line. Nanotechnology was forecasted to reach \$1 trillion by 2015; however, this goal was overachieved by the year 2004.<sup>63</sup> Various governments across the world anticipated the revolutionary nature of nanotechnology and invested billions of dollars. The USA, during the Bush Administration, enacted the Nanotechnology Research and Development Act (the Nanotechnology Act)<sup>64</sup> which authorised billions of dollars of federal spending dedicated to nanotechnology. This development led to an increase in nanotechnology patents. The USPTO, in the year 2002, issued 526 nanotechnology patents.<sup>65</sup> This led to the development of the 'patent thicket' which refers to overlapping patent rights with minimum change in specifications in order

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<sup>60</sup> Bureau of Indian Standards, *Reforms in BIS*, <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/apr/doc202141341.pdf>

<sup>61</sup> Drugs and Cosmetics Act, 1940, Act No. 23, Acts of Parliament, 1940 (India), [https://www.indiacode.nic.in/bitstream/123456789/6800/1/drug\\_and\\_cosmetic\\_act\\_1940.pdf](https://www.indiacode.nic.in/bitstream/123456789/6800/1/drug_and_cosmetic_act_1940.pdf).

<sup>62</sup> Damilola E. Babatunde et al., *Environmental and Societal Impact of Nanotechnology*, 1 DEPT. OF CHEM. ENG., COVENANT UNIV., OTA, NIGERIA (DEC. 2019).

<sup>63</sup> Terry K. Tullis, *Intellectual Property Issues Around Nanotechnology*, 1 NANOTECHNOL. REV. 189, 205 (2012).

<sup>64</sup> 21st Century Nanotechnology Research and Development Act, Pub. L. No. 108-153, 117 Stat. 1923 (2003), <https://www.congress.gov/bill/108th-congress/senate-bill/189..>

<sup>65</sup> Terry K. Tullis, *Application of the Government License Defense to Federally Funded Nanotechnology Research: The Case for a Limited Patent Compulsory Licensing Regime*, 53 UCLA L. REV. 279 (2005).

to cauterize the rush of persons who aim to secure such rights.<sup>66</sup> The challenges of nanotechnology patents can be summed up as the lack of legal clarity. Nanotechnology is a multidisciplinary and cross-sectoral field and does not conform to traditional patent laws. The requisites of patents include novelty and non-obviousness, this which in the traditional definition may not qualify as patentable and may be obsolete for classifying nanomaterials.<sup>67</sup> This is because nanotechnology evolves by modifying materials at a nanoscale and there is a grey area as to whether simply reducing something to the nanoscale counts as a new invention or whether it will be step taken for the evergreening of patents. Further, nanotechnology can lead to a ‘dense web of overlapping rights’ which makes it harder for inventors to design around existing patents. If we include the American system in this metric, the Nanotechnology Act merely provides for the regulation of spending on research of nanotechnology and not the nanotechnology patents’ regulation. Further, the traditional patent laws such as the US Patent Act<sup>68</sup> or Indian Patents Act<sup>69</sup> does not contain provisions tailored for nanotechnology.

The patent industry operates on the exclusivity of a piece of technology, which allows for exclusive licensing. This technology is imperative to medicine and sustainable energy usage; however, exclusive licensing limits the technology that can be made available, which is vital, especially when it comes to an individual’s life or the environment they live in.<sup>70</sup> While this author does not negate the disadvantages of nanotechnology, there is certainly a minimum requisite of nanotechnology that conditionally includes patent technology to improve a person’s quality of life. The alarming patent immunity granted to nanotechnology might lead to “nanotechnology anticommons”, a situation where, due to the exclusivity of patents, there is a lack of innovation leading to underutilisation and a lack of further research into an otherwise less explored field.<sup>71</sup>

Furthermore, nanotechnology in the USA is funded by the federal government. Hence, it can be inferred that the licensing regime for the same should not be exclusive to the bourgeoisie. Nanotechnology plays an irreplaceable role in facilities such as drinking water or sanitation; therefore, it follows that such commodities cannot be a hindrance to human life. In the USA, the

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<sup>66</sup> Albert P. Halluin & Lorelei P. Westin, *Nanotechnology: The Importance of Intellectual Property Rights in an Emerging Technology*, 86 J. PAT. & TRADEMARK OFF. SOC’Y 220 (2004).

<sup>67</sup> *The Patent Dilemma: Issues in Nanotechnology Innovation*, GLOBAL PATENT FILING (Sept. 13, 2024), <https://www.globalpatentfiling.com/blog/The-Patent-Dilemma-Issues-in-Nanotechnology-Innovation>.

<sup>68</sup> Patent Act of 1952, Pub. L. No. 82-593, ch. 950, 66 Stat. 792 (July 19, 1952) (codified as amended at 35 U.S.C. §§ 1–376 (2020)).

<sup>69</sup> The Patents Act, No. 39 of 1970, Acts of Parliament, (India).

<sup>70</sup> *Supra*, note 45.

<sup>71</sup> *Id.*

Bayh-Dole Act allows for the limited grant of compulsory licenses if the patent is based on federally funded research.<sup>72</sup>

It can also be argued that such non-exclusive licensing will fall under the spectrum of fair use and may lead to a more equitable usage of nanotechnology. In the USA, since nanotechnology is funded by the federal government, there is an implication of public investment, which should not detriment the society at large.<sup>73</sup> Nanotechnology plays a critical role in access to portable water and sanitation, due to which these technologies must be equitable and not obstructed by exclusive ownership.<sup>74</sup> Therefore, if exclusive licenses hinder access to nanotechnology, then the government can allow broader use through non-exclusive licensing to ensure benefit to the society. This concept is not confined to America; it may also be utilized in India, where similar difficulties exist. The implementation of compulsory licensing is at the heart of these issues. There has only been one accepted case of compulsory licensing in India, *Bayer v. Natco*,<sup>75</sup> which dealt with access limits to life-saving cancer treatments. Natco was granted a compulsory license to manufacture and sell a generic version of Bayer's cancer drug, Nexavar at a price lower than what Bayer sold the product for. The royalty rate was set to initially 6% of the net sales, later increased to 7% by the appellate court.<sup>76</sup> However, the decision is heavily contested because the Patents Act of 1970 requires the payment of specific compulsory royalties,<sup>77</sup> which in the instance of Bayer, is argued that despite a dramatic lowering of prices, the royalty ends up influencing the end pricing which may not always ensure the most affordable pricing to patients. The judgement, ironically, intended to achieve fair access to life-saving medicine. The same case applies to nanotechnology, where issuing a compulsory license may be ineffective because it will not provide equitable access and will only exacerbate the existing economic disparities.

In addition to this, the defence of fair dealing only exists in copyright and will not be applicable to

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<sup>72</sup> Milken Institute, *The Bayh-Dole Act of 1980: Frequently Asked Questions*, <https://milkeninstitute.org/sites/default/files/reports-pdf/Bayh-Dole-FAQ.pdf>; Rice Univ. Off. of Tech. Transfer, *Bayh-Dole Act*, Rice Univ., Office of Technology Transfer (n.d.), <https://research.rice.edu/ott/bayh-dole-act>.

<sup>73</sup> M. Fasteau & I. Fletcher, *Nanotechnology: Is America Losing the Future?*, in INDUSTRIAL POLICY FOR THE UNITED STATES: WINNING THE COMPETITION FOR GOOD JOBS AND HIGH-VALUE INDUSTRIES 554 (Cambridge Univ. Press 2024).

<sup>74</sup> Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1576 (2003).

<sup>75</sup> Bayer Corporation v. Natco Pharma Ltd., Order No. 45/2013 (Intellectual Property Appellate Board, Chennai), <http://www.ipab.tn.nic.in/045-2013.htm> (last visited on June 8, 2025).

<sup>76</sup> World Intellectual Property Organization, Intellectual Property Appellate Board, Chennai, India [2013]: Bayer Corporation v. Natco Pharma Ltd. & Ors., OA/35/2012/PT/MUM, WIPO Lex (n.d.), <https://www.wipo.int/wipolex/en/text/585865>.

<sup>77</sup> The Patents Act, 1970, Act No. 39, Acts of Parliament, 1970 (India).

patents.<sup>78</sup> Fair Dealing as an exception in Indian copyright law that allows for the use of copyright material without obtaining prior license on the fulfilment of certain conditions unique to copyright. This can be adapted to the patent context as well. In the context of patent law, all uses outside the scope of compulsory license or a license make an argument for equitable access through fair dealing.<sup>79</sup> While, it may be argued that fair dealing as an exception when compulsory licensing exists may create redundancy, compulsory licenses do not account for end users ending up paying the price of up scaled royalties to the licensee which may in itself be a redundancy. It is thereby proposed that the laws regarding such payment of royalty must be made clear to ensure equity and a fair dealing exception may be created in certain situations where the problem may not entirely revolve around royalty.<sup>80</sup>

In India, it is a challenge for accurate calculation of the registered patents since there is no classification for nanotechnology. Hence, it is a particular impossibility in India since our intellectual property regime seems to cut across a clear line as to what category an intellectual property can be placed into, but leaves many lacunae as to what emerging technologies can be placed into. Nonetheless, even in the US, several forms of intellectual property remain distinct, in spite of a unified intellectual property code. The approach to reform patent immunity for nanotechnology is entirely corrective. The aim is not to discourage innovation or affect the bottom line, but rather to draw a tightrope between the two through the course of consistently amended regulations to keep up with the demand and innovation that nanotechnology fosters.

## **VI. NANOTECHNOLOGY AND BIOTECHNOLOGY: THE DIVIDE IN INTELLECTUAL PROPERTY RIGHTS GRANTED FOR MEDICINE AND SUSTAINABLE ENERGY**

Nanotechnology today is yesterday's biotechnology. The 'patent thicket' today is akin to the 'patent land rush' for biotechnology in the late 1980s.<sup>81</sup> The fear of the anticommons stems from the biotechnology anticommons, although the situations were quite different. Anticommons is a situation where the number of inputs on a particular research increases and the innovator faces a patent thicket and is threatened by the possibility that a useful innovation is not developed due to lack of agreement with the patent holders. This is referred to as the tragedy of anticommons. This primarily occurs when too many patent holders have exclusion rights over a common resource,

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<sup>78</sup> *Supra*, note 45.

<sup>79</sup> Rochelle Cooper Dreyfuss, *Does IP Need IP? Accommodating Intellectual Production Outside the Intellectual Property Paradigm*, 31 CARDOZO L. REV. 1437, 1437 (2010).

<sup>80</sup> Mark A. Lemley, *Patenting Nanotechnology*, 58 STAN. L. REV. 601, 606 (2005).

<sup>81</sup> Raj Bawa, *Nanotechnology Patenting in the US*, 1 NANOTECHNOLOGY L. & BUS. J., 17, 36 (2004); Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCI. 698 (1998).

the resource becomes underutilized.<sup>82</sup>

Biotechnology was a revolutionary idea in the 1980s, promising to bring technology that could put current technology to shame. Despite the initial enthusiasm surrounding biotechnology, the field did not live up to its potential. It is contended that this is due to the biotechnology anticommons, where multiple biotechnology patents overlapped, preventing commercialization.<sup>83</sup> When the market for biotechnology patents opened up, it was due to the case of *Diamond v. Chakrabarty*,<sup>84</sup> where a genetically modified microorganism was given a patent. Further, the Bayh-Dole Act<sup>85</sup> led to government-funded research being approved hastily despite certain patents overlapping, as the USPTO was dealing with such a subject matter for the first time and was not equipped to deal with the ‘patent land rush.’<sup>86</sup>

As a result, the universities facilitating the biotechnology research were eager to recover their capital despite the patents not being completely fleshed out and entered into a “reach through license agreement” which granted patents during upstream stages for a downstream discovery. This essentially means that future discoveries could be patented.<sup>87</sup> This mechanism is analogous to the provisional registration of patents under the Patents Act, 1970. However, because there is no assurance of discovery beyond the contractual obligations, and since such licensing agreements operate in a legally ambiguous area, they have been applied more liberally.<sup>88</sup> Notably, even provisional registration requires a complete patent registration to be submitted within one year, yet no specific regulations govern these agreements. Therefore, since multiple universities needed to be contractually obligated, there were demands for unreasonable royalties or demands from the patent holders for the development of a product in a downstream discovery which due to the overlapping similarities, lead to a stall on future innovation and by proxy leading to the slow development of the biotechnology field. This also engendered many researchers developing a fear

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<sup>82</sup> Gastón Llanes & Stefano Trento, *Anticommons and Optimal Patent Policy in a Model of Sequential Innovation*, Working Paper No. 09-148 (2009).

<sup>83</sup> MICHAEL A. HELLER & REBECCA S. EISENBERG, *Can patents deter innovation? The anticommons in biomedical research, in perspectives on property law* 159, 162-64 (Robert C. Ellickson et al. eds, 3d ed. 2002) (originally published in 280 Science 698 (1998)).

<sup>84</sup> *Diamond v. Chakrabarty*, 447 U.S. 303, 318 (1980)

<sup>85</sup> The Bayh-Dole Act, 35 U.S.C. 200-12 (2000 & Supp. 2002).

<sup>86</sup> John M Olin Centre for Law, Economics and Business, *Estopping the Madness at the PTO: Improving Patent Administration Through Prosecution History Estoppel*, 116 HARV. L. REV. 2164, 2165 (2003).

<sup>87</sup> *Supra*, note 45.

<sup>88</sup> Michael A. Carrier, *Resolving the Patent-Antitrust Paradox Through Tripartite Innovation*, 56 VAND. L. REV. 1047, 1087 (2003)

of exploitation at the hands of licensees, thereby causing an impediment in the channelling of funds for research, causing a bottleneck in development.<sup>89</sup>

The similarity between the nature of products and the development of nanotechnology and biotechnology presumes the same fate for nanotechnology; however, there is some hope. Nanotechnology breeds on the cross-pollination of patents.<sup>90</sup> The concept of a singular patent for a singular nanotechnology product is not possible in any nation. In the USA, although there are certain nanotechnology patents, they largely depend on other processes to support nanotechnology. However, in India, problems of a larger magnitude persist. Nanotechnology in India is a developing area; therefore, one cannot find a generous number of patents containing the word 'nano.'<sup>91</sup> In fact, there is no base or registry to understand whether a patent involves nanotechnology, except for a manual checking of patents. Further, nanotechnology patents are not as far and wide as biotechnology patents.<sup>92</sup>

This lack of development ties back to the initial challenges discussed. India, being a developing country, is looked at as a provider of raw materials rather than as a producer of cutting-edge nanotechnology products. Moreover, the government does not particularly sponsor a lot of research in this field, further undermining its development.<sup>93</sup> State-sponsored research institutes do not have any incentive to research nanotechnology since the expense incurred even in the course of large-scale production does not justify the cost of initial investment.<sup>94</sup> There is also a dearth of investors and capitalists who are willing to risk investment in a rather 'developing' field. Biotechnology was proven useful; however, for nanotechnology; first, it requires such pioneering equipment to conduct research, and second, it serves only a niche clientele that does not require large-scale production due to the long-lasting nature of such products. Lastly, a fear of this new technology, especially when already existing technologies operate at the requisite intervals, has led to a stunted growth of nanotechnology in India.<sup>95</sup>

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<sup>89</sup> Michael R. Taylor & Jerry Cayford, *American Patent Policy, Biotechnology, and African Agriculture: The Case for Policy Change*, 17 HARV. J.L. & TECH 321, 350 (2004).

<sup>90</sup> M. Fakruddin et al., *Prospects and Applications of Nanobiotechnology: A Medical Perspective*, 10 J. NANOBIO TECHNOLOGY 31 (2012).

<sup>91</sup> Beumer, K. & Bhattacharya, S., *Emerging technologies in India: developments, debates and silences about nanotechnology*. 40(5) SCI & PUB. POL'Y, 628-643 (2013).

<sup>92</sup> A. Kumar, *Nanotechnology Development in India: An Overview* (Research & Info. Sys. for Dev. Countries 2014) (India).

<sup>93</sup> A. Kumar & P. N. Desai, *Mapping the Indian Nanotechnology Innovation System*, 11 WORLD J. SCI. TECH. & SUSTAINABLE DEV. 53 (2014).

<sup>94</sup> *Supra*, note 64.

<sup>95</sup> Liu, X, et. al., *Trends for Nanotechnology Development in China, Russia, and India*, 11 J. NANOPARTICLE. RES. 1845 (2009).

Although there is no current evolution of nanotechnology, the same stasis should not be presumed for the future. Nanotechnology experienced a boom in its usage as lipid nanoparticles in mRNA vaccines that were used during COVID-19.<sup>96</sup> Initially, the lipid nanoparticles were developed as a specialized delivery system for nucleic acid, which did not have much scope for development beyond niche research settings; however, it became instrumental for vaccine development. Further quantum dots that use semiconductor nanoparticles did not find initial success in commercial production; however, once it was used in display systems like monitors and televisions, they became the most requested form of conventional nanotechnology in use in a consumer market.<sup>97</sup> Therefore, this usage of nanotechnology highlights that nanotechnology can be commercialised and is a viable research prospect.

## VII. RECOMMENDATIONS

To effectively govern the intersection of nanotechnology, medicine, and sustainable energy, a coordinated approach to intellectual property regulation is essential. Countries, particularly developing ones like India, must develop a unified national nanotechnology regulation that addresses the existing lacuna and the grey areas in the current nanotechnology regulations.

A crucial step in this direction is the establishment of a distinct classification or tagging system within national patent offices to identify and track nanotechnology-related patents. This would help prevent overlaps and clarify the scope of intellectual property claims. Further, patent filings should include mandatory disclosures detailing the environmental impact and lifecycle of the nanomaterials involved, thereby aligning intellectual property protection with sustainability goals. To avoid monopolistic control and foster innovation, governments should encourage open innovation models such as patent pooling and collaborative licensing, reducing the risk of a '*nanotechnology anticommons*.' In addition, the existing provisional and reach-through licensing framework needs reform, with stricter timelines, clearer disclosure standards, fair dealing exceptions and public-interest review mechanisms. Patent incentives, such as expedited processing or fiscal benefits, should be directly linked to public welfare outcomes, including contributions to clean energy or equitable healthcare access. A central oversight authority composed of representatives from environmental, medical, and intellectual property sectors could ensure coherence in regulation and enforcement. Finally, global cooperation through platforms like the

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<sup>96</sup> Wilson, B. & Geetha, K.M., *Lipid Nanoparticles in the Development of mRNA Vaccines for COVID-19*, 74 JOURNAL OF DRUG DELIVERY SCIENCE AND TECHNOLOGY, 103553 (2022).

<sup>97</sup> Schoenmaker, L., et. al., *mRNA-lipid Nanoparticle COVID-19 Vaccines: Structure and Stability*, 601 INTL J. PHARMACEUTICS, 120586 (2021).

WTO, WIPO, and ISO is vital to harmonize standards, promote equitable access to nanotech innovation, and prevent legal fragmentation across jurisdictions. Together, these measures can create a regulatory environment that fosters responsible innovation while safeguarding public and environmental interests.

### **VIII. CONCLUSION**

Nanotechnology is a transformative field that has much potential for growth, yet it is unregulated, and the opacity of the intellectual property regime poses many legal and environmental challenges. The erratic behaviour of nanoparticles makes regulation difficult; however, the absence of a coordinated global approach has created regulatory blind spots in developing countries, especially which compromise public health and equitable access to technology. The commercial viability of nanotechnology is undeniable; however, the harm caused by nanoparticles to the environment is also undeniable. It is irresponsible to compromise a promise of a future utopia by denying the reality of the dystopian world we currently reside in. History in the form of the stagnation of biotechnology growth must not repeat itself, leading to monopolistic control and ecological harm. To ensure that development does not happen at the cost of the environment or nanotechnology reigns unchecked due to the unfettered power granted by intellectual property, there must be reform.



## **GEN AI, COPYRIGHT, AND THE LAW'S BLIND SPOT: CONSTRUCTING A LATENT REPRODUCTION SOLUTION**

MR. AGASTYA SHUKLA\* & MR. PRADHYUMN BHIND\*\*

### **ABSTRACT**

*Drifting away from the traditional research on the interplay of copyright provisions and Artificial Intelligence, this paper offers a foundational reframing of the Indian copyright discourse surrounding generative AI by shifting the legal focus from output-based infringement to the very act of training. The paper enlists a novel concern in data training of the Generative AI models; the non-authorized data is often trained on such AI models without specific permission. This leads to a scenario where the data becomes a partial derivative of the original work and the model's processes and thus leaves an ambiguity in the Indian copyright framework. Therefore, this paper introduces the concept of "Latent Reproduction", which is essentially the encoding of copyrighted works into neural network weights as a novel basis for finding infringement under Section 14 of the Indian Copyright Act. The problem it addresses is the absence of legal clarity on whether training AI on copyrighted material constitutes reproduction or adaptation, especially when such use is commercial and the final outputs are not always human-identical copies. To explore this notion further, the paper proposes a doctrinal and empirical methodology, combining statutory interpretation with a focused audit. Two categories of Indian copyrighted works (Music and Prose) are traced across popular AI training datasets (e.g., LAION-5B) using tools like HaveIBeenTrained.com. Prompt-based empirical testing of leading AI models (e.g., GPT-4, 3.5, Gemini) assesses whether these works can be regenerated or semantically approximated. The Interesting find is that even without verbatim output, AI models often reflect stylistic and structural elements of copyrighted works, thus fulfilling a threshold for substantial reproduction in their 'latent form'.*

**Keywords:** AI, Generative AI, Copyright Act, Latent Reproduction

### **I. INTRODUCTION**

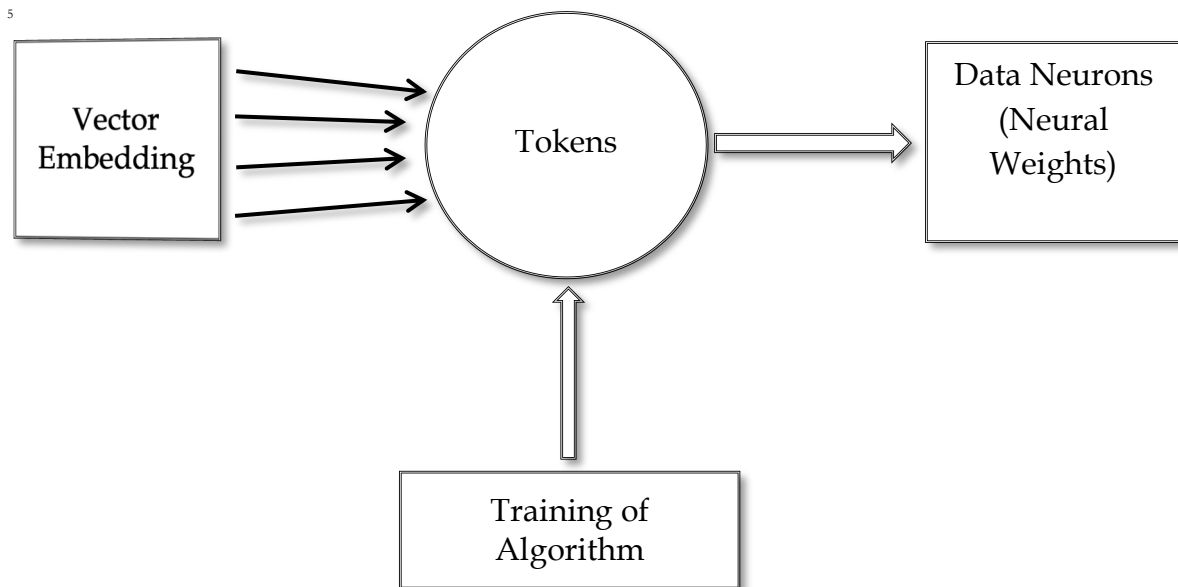
Artificial Intelligence (AI), and more specifically Generative AI, has transformed the technological landscape by enabling machines to create human-like text, images, music, and other forms of content. These models, such as OpenAI's GPT series and Google's BERT, or Gemini have demonstrated unimaginable abilities in understanding and producing complex information, opening new avenues in creativity, automation, and communication. It is pertinently, crucial to understand how these models are trained, not only from a technical standpoint but also for addressing important legal and ethical challenges that arise from their development and use.

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At the core of generative AI's development is the process of data collection and preprocessing. Large datasets encompassing a wide variety of media forms are compiled to serve as the raw material for training.<sup>1</sup> This data undergoes meticulous pre-processing steps such as **tokenization**,<sup>2</sup> which breaks down text into smaller, manageable units called tokens. These tokens can be words, subwords, or even individual characters, depending on the model. What essentially happens at the stage of tokenization is that the unstructured text gets formalized into a structure that further aids the neural networks to process the original information; **normalization**,<sup>3</sup> a process that standardizes the data format. This process ensures consistency in the text by standardizing elements such as casing (e.g., converting all text to lower case, removing punctuation, etc.). The purpose of this step is to reduce the variability in the processed data, further making it easier for the generative model to learn the patterns; and the third stage being, known as **filtering**,<sup>4</sup> which removes irrelevant or harmful content from the normalized content. These preparatory stages ensure that the input data is suitable for training sophisticated mathematical models known as neural networks, which resemble certain aspects of human brain function through layers of interconnected nodes or “*neurons*.”



<sup>1</sup> Yuji Roh, Geon Heo & Steven Euijong Whang, *A Survey on Data Collection for Machine Learning: A Big Data - AI Integration Perspective*, 33 IEEE TRANSACTIONS ON KNOWLEDGE & DATA ENG'G. 1–3 (Jan. 2019).

<sup>2</sup> *Tokenization in Natural Language Processing (NLP)*, GEEKSFORGEEKS (July 23, 2025), <https://www.geeksforgeeks.org/tokenization-in-natural-language-processing-nlp/>.

<sup>3</sup> Neri Van Otten, *How to Use Text Normalization Techniques (NLP) [9 Ways Python]*, SPOT INTELLIGENCE (Jan. 25, 2023), <https://spotintelligence.com/2023/01/25/text-normalization-techniques/>.

<sup>4</sup> Jane Doe, *What Is Input Data Filtration in AI Safety?*, BLUEDOT IMPACT (Feb. 15, 2025), <https://bluedot.org/blog/data-filtration>.

<sup>5</sup> *Self-created image by the authors.*

The most prominent architecture underlying today's generative AI models is the 'transformer'.<sup>6</sup> A transformer is an unremarkable innovation that excels at processing sequential data and capturing long-range dependencies within the input. Transformers enable models like GPT to generate coherent and contextually relevant outputs by analysing and predicting data patterns over vast contexts. The phase of training itself is computationally intensive and iterative which utilizes 'gradient descent' algorithms that adjust the internal parameters, called neural weights, based on the model's prediction errors.<sup>7</sup> Neural weights are the adjustable parameters in a neural network that determine the strength of connections between nodes, enabling the model to learn from data and make predictions.<sup>8</sup> Vector embeddings, on the other hand, are mathematical representations of words, images, or other data types in a high-dimensional space that capture their semantic relationships.<sup>9</sup> By processing millions or even billions of examples across multiple passes, this model refines its ability to predict subsequent words, images, or other data points with each iterative training action.

The technical process, however, raises profound legal questions concerning copyright since training datasets often include copyrighted materials, such as prominent literary works and musical pieces, the models effectively create vector embeddings, numerical representations that encode semantic and syntactic information of these protected works. These embeddings are further stored within the model's neural weights and can be triggered during inference when users provide certain prompts which potentially results in the reproduction of original content or closely derived outputs.<sup>10</sup> This latent reproduction challenges traditional copyright paradigms that focus primarily on the final user-generated output and suggests that infringement may occur at the training stage itself, irrespective of how the model's outputs are used downstream. The training phase includes the storing of embeddings, caching of data subsets, intermediate reproduction, and the unauthorized use of protected datasets, all of which can constitute acts of infringement independent of downstream usage.

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<sup>6</sup> Cole Stryker & Dave Bergmann, *What Is a Transformer Model?*, IBM (Mar. 28, 2025), <https://www.ibm.com/think/topics/transformer-model>.

<sup>7</sup> *Backpropagation in Neural Network*, GEEKSFORGEEKS (Jul. 1, 2025), <https://www.geeksforgeeks.org/machine-learning/backpropagation-in-neural-network/>.

<sup>8</sup> Enzo Grossi & Massimo Buscema, *Introduction to Artificial Neural Networks*, 19 EUR. J. GASTROENTEROLOGY & HEPATOLOGY 1046 (2008).

<sup>9</sup> *Id.*

<sup>10</sup> Ioanna Arkoudi et al., *Combining Discrete Choice Models and Neural Networks Through Embeddings: Formulation, Interpretability and Performance*, 174 TRANSP. RES. PART B: METHODOL. 102783 (2023).

This paper aims to explore these multifaceted dimensions and begins with a technical overview of generative AI training processes, followed by an empirical investigation into the presence of copyrighted works within training data, and culminating in a proposed legal framework to address latent reproduction and rights violations.

## II. LATENT REPRODUCTION DOCTRINE AND THE INDIAN LAW

To assess how generative AI may infringe upon copyright, an empirical audit must be conducted to determine whether seminal artworks are latently stored within these models. The paper aims at running a ‘beta test’ for setting the discourse on more empirical audits for assessing the reproduction of copyrighted and non-copyrighted works to equip the regulators in assessing compliance and non-compliance of the legal provisions. This involves examining a table of representative literary and musical works and cross-checking their presence in known training datasets, and evaluating whether prompts can extract recognizable outputs from the model. The results are suggestive that vector embeddings of these works exist within the model and that prompting leads to inferred reproductions. To address this, a new conceptual test, the “*Latent Reproduction Doctrine*”, is proposed. This doctrine posits that the reproduction occurs not only at the point of user output but also at the moment of training, when the expressive elements of any artwork are encoded as retrievable embeddings in the training of AI. This fits squarely within the scope of the Indian Copyright Law and provides a more comprehensive doctrinal basis than traditional “*final output*” tests.

The neural network weights must be interpreted to include reproduction ‘in any material form’, as defined by Section 14 of the Copyright Act, 1957 (the Act), which outlines the exclusive rights of copyright holders, including reproduction, adaptation, and storage in any medium.<sup>11</sup> The scope of this section does not cover the definition of ‘reproduction’ in a strict sense, and this ambiguity leaves a wider scope of latent reproduction of copyrighted works.

Additionally, indirect infringement from the use of copyrighted material squarely falls under Section 51 of the Act that addresses infringement, particularly when the outputs produced by the models are very similar to the original works and thus, making unauthorized exploitation easier.<sup>12</sup> Furthermore, Section 65A, prohibits the circumvention of technological protection measures that are applied for the purposes of safeguarding copyrighted works and thus, it becomes relevant if

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<sup>11</sup> The Copyright Act, 1957, No. 14, Acts of Parliament, 1957, § 14 (Ind.).

<sup>12</sup> *Id.* at §51.

such generative model developers bypass encryption, or access restrictions, to obtain training data.<sup>13</sup> Yet another important provision, Section 65B of the Act, addresses the integrity of rights management information. It is a punitive provision and to understand it from a contemporary context, this could apply to metadata, watermarks, or other forms of digital works that are altered, stripped, or rendered untraceable during the training or output-generation stages of AI systems.<sup>14</sup>

### III. A LEGAL FRAMEWORK FOR THE DOCTRINE

Latent reproduction refers to the technical phenomenon in which a generative AI model, like GPT or DALL·E, stores information about copyrighted works, such as a Chetan Bhagat novel or an Indian song, not in a human-readable form, but as vector embeddings in its neural network weights. While the model does not memorize the original content verbatim, it can often regenerate portions of it if prompted in the right way.<sup>15</sup> This process is non-human readable (and that is why it makes it more difficult to explicitly catch it), and yet, re-constructible and designed for the purpose of generating derivative outputs that are commercially exploitable.<sup>16</sup> Legally, this creates a fundamental dilemma: copyright law was written to address observable and tangible copies but such latent reproduction operates invisibly as AI “copies” without visibly copying the copyrighted work.<sup>17</sup>

Globally, legal systems are still catching up. In the U.S., the legality of training on copyrighted data is unresolved, with lawsuits like *Andersen v. Stability AI*<sup>18</sup> and *Thomson Reuters v. Ross Intelligence* pending.<sup>19</sup> However, there have been recent judicial pronouncements that might change the perspective on how the Big Tech trains AI models. A very recent judgment of *Kadrey v. Meta Platforms*<sup>20</sup> accepted the usage of Libgen<sup>21</sup> data to train LLaMa Model as a fair use consideration.<sup>22</sup> On the other hand, In *Thomson Reuters v. Ross Intelligence*,<sup>23</sup> the court found that copying of over 2000 Westlaw headnotes was not deemed as a fair use consideration.

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<sup>13</sup> *Supra* note 11, at §65A.

<sup>14</sup> *Id.*, at §65B.

<sup>15</sup> Team Timescale, *A Beginner's Guide to Vector Embeddings*, TIGERDATA (Oct. 16, 2024), <https://www.tigerdata.com/blog/a-beginners-guide-to-vector-embeddings>.

<sup>16</sup> Shama Mahajan, *ANI v. Open AI – The Storage Paradox Is More Than Just Transient!*, SPICY IP (May 30, 2025), <https://spicyip.com/2025/05/part-ii-ani-v-open-ai-the-storage-paradox-is-more-than-just-transient.html>.

<sup>17</sup> Mark A. Lemley, *How Generative AI Turns Copyright Upside Down*, 25 COLUM. SCI. & TECH. L. REV. 21 (2024).

<sup>18</sup> *Andersen v. Stability AI Ltd.*, 3:23-cv-00201 (N.D. Cal. Jan. 13, 2023).

<sup>19</sup> *Thomson Reuters Enter. Ctr. GmbH v. Ross Intelligence Inc.*, 694 F. SUPP. 3D 467 (D. Del. 2023).

<sup>20</sup> *Kadrey v. Meta Platforms, Inc.*, 3:23-cv-03417-VC, 2025 WL 4123456 (N.D. Cal. June 25, 2025).

<sup>21</sup> *Example Domain*, LIBGEN, <https://www.libgen.is/>

<sup>22</sup> Meta, *Introducing Llama 3.1: Our Most Capable Models to Date*, AI AT META BLOG (July 23, 2024), <https://ai.meta.com/blog/introducing-llama-3-1>.

<sup>23</sup> *Thomson Reuters Enter. Ctr. GmbH v. Ross Intelligence Inc.*, 1:20-cv-613-S (D. Del. filed May 6, 2020).

In Europe, The EU's AI Act requires dataset transparency under Article 52 but does not ban training on copyrighted materials. Article 52 of the EU AI Act promotes transparency by requiring AI developers to disclose the nature of the datasets used for training, including whether copyrighted materials are involved. While it does not prohibit the use of such content, it aims to enhance accountability and empower rights holders to identify and respond to potential infringements.<sup>24</sup>

In India, certain case laws offer potential analogies. The Supreme Court in *Eastern Book Company v. D.B. Modak* established the originality threshold,<sup>25</sup> which may be useful in judging AI outputs. This precedent leads to thorough interpretation of what qualifies as a 'protectable work'. In *Civic Chandran v. Ammini Amma*,<sup>26</sup> the Kerala High Court clarified that transformation alone is not a defence for fair dealing. This becomes relevant in the modern context where the data is transformed into vector embeddings and further used to train Large Language Models. In *Super Cassettes v. MySpace*,<sup>27</sup> platform liability was recognized when the platform had knowledge and control over infringing content. *R.G. Anand v. Delux Films* laid out the "substantial similarity" test,<sup>28</sup> which may assist in assessing AI outputs that mirror copyrighted works. Such 'substantial similarity' often becomes a common keyword in the latently trained and produced data results in the AI models. Further, it becomes very pertinent to mention the recent development in the *ANI v. OpenAI* case,<sup>29</sup> since it stands at the cornerstone of Indian Copyright law and the training of AI models. The case raises a fundamental question on the act of training AI on the proprietary, non-public data, where the content is stored in latent, machine-readable forms rather than expressed in human-readable outputs, amount to infringement? While questioning such process, it underscores the urgent need for statutory clarity amidst ambiguous legal definitions stretched to fit the contemporary technological realities.

At the dataset level, developers can filter out copyrighted content using known Uniform Resource Locators ["URL"] such as those flagged in the Large-scale Artificial Intelligence Open Network ["LAION"] dataset<sup>30</sup> - a large-scale, web-scraped dataset often cited in AI training context, which

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<sup>24</sup> Artificial Intelligence Act, 2024, art. 52, No. 1689, Acts of Parliament, 2024 (EU).

<sup>25</sup> *Eastern Book Company & Ors v. DB Modak & Anr*, AIR 2008 SC 809.

<sup>26</sup> *Civic Chandran & Ors. v. Ammini Amma*, [1996] PTC 16 670 (Ker.) (India).

<sup>27</sup> *Super Cassettes Industries Ltd. v. MySpace Inc.*, 2011 SCC OnLine Del 3905 (India).

<sup>28</sup> *R.G. Anand v. M/s. Deluxe Films*, 1978 (4) SCC 118 (India).

<sup>29</sup> Sakshi Tiwari & Tushar Gaur, *The Copyright Conundrum: ANI v. OpenAI and the Fight for Fair Use*, MONDAQ (Mar. 26, 2025), <https://www.mondaq.com/india/copyright/1604088/the-copyright-conundrum-ani-vs-openai-and-the-fight-for-fair-use>.

<sup>30</sup> LAION, <https://laion.ai/>.

includes a wide range of copyrighted and non-copyrighted materials) or employ content hashing to match and exclude copyrighted works. At the model level, embedding audits could track whether a model's vector space contains a protected material or not. Furthermore, retraining models with redacted data or removing embeddings is a promising, albeit computationally expensive, solution.<sup>31</sup>

India has two potential regulatory pathways to address latent reproduction. A judiciary-led approach could interpret “*reproduction in any material form*” under Section 14 to include vector embeddings. Owing to the advent of machine learning, a new category of derivative works has emerged: vector embeddings, they merge the semantic and structural features of input data into multidimensional mathematical vectors. To further understand the scope of such vector embeddings under the Indian Copyright Law, a purposive analysis of Section 14 is carried out and it leads us to the interpretation that the vector embeddings become a functional surrogate of the original work and therefore, result in substantial similarity of the protected works. The fundamental problem that the courts might face is identification of such latently reproduced work and thus, the courts need to develop a doctrinal test or “*the Latent Reproduction Test*”, to determine when a model's ability to regenerate copyrighted content amounts to infringement and when it does not. Such doctrine could be operationalized through an evaluation of (i) proximity of the generated output to the original work, (ii) the model's capacity to regenerate the content without explicit prompting, and (iii) the commercial use of such model. Second, on the legislative front, India could amend Section 14 to explicitly include “*embedding or vectorization for machine learning purposes*” as a form of reproduction.

#### IV. METHODOLOGY USED

To better substantiate the proposed doctrine, the authors have created an empirical audit table that assesses the degree of similarity for all the prompts given to the Large Language Models [“**LLMs**”], the table has been classified into the 4 columns. The purpose of the table is to study the results of the respective prompts on the artwork of prominent writers and classical musicians in India. The piece is further searched on “*HaveIbeentrained.com*” to evaluate whether such pieces have been used to train such AI model or not.<sup>32</sup> Further, in the last section of research, the authors have created an empirical audit of the similarity index of the original version and the AI generated version. The

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<sup>31</sup> Aos Mulahuwaish, Moufid El-Khoury, Basheer Qolomany, Jacques Bou Abdo & Sherali Zeadally, *Does AI need guardrails?*, INT'L J. OF PERVASIVE COMPUTING & COMM. (2024).

<sup>32</sup> *Have I Been Trained*, <https://haveibeentrained.com/>.

basis for selecting the specific seminal works on critically acclaimed literary and musical pieces by various artists was on the assumption that, due to their widespread recognition and cultural relevance, there is a high potential that they have been included in the training phase of AI models datasets.

Additionally, the authors are deliberate in their attempt to specifically choose prompts that mention ‘like’, ‘in the style of’, ‘mimics the pattern’, etc. with the intention to get the extractions of the similar texts as to the original ones and not the literal texts as an output of the prompt.

#### A. Literary Prompts (Authors/ Public Domain Texts)

Section	Prompt	Results	Training Result
1. Famous Indian Authors (Contemporary, under copyright)	<i>Write a passage in the style of Arundhati Roy's The God of Small Things, focusing on a child's memory of a rainy day.</i>	The rain came in sideways, sideways like secrets whispered in class. Raindrops danced on banana leaves, making music only Estha could hear. The world smelled of wet mud and mango pickles. Ammu's voice, distant and warm, called from the kitchen. A snail crept along the windowpane like time slowed down. In the puddle, a paper boat sank, unnoticed. Memory tucked it away forever.	Yes
	<i>Emulate the poetic narration and fragmented structure of Amitav Ghosh's The Shadow Lines in a 300-word story about migration.</i>	Lines drawn on maps—blurred, broken, bleeding. My grandmother, her voice a whisper over crackling phone lines, spoke of Calcutta and Dhaka like they were rooms in the same house. We crossed no borders but felt every exile. Stories, fragmented, returned in dreams: a mango grove, a burning book, a missing uncle. Migration was not a journey but a rupture stitched together in silences and smells.	Yes
	<i>Generate an excerpt from a 1990s Indian English novel about caste and identity, with language similar to Robinton Mistry.</i>	Ramu swept the compound quietly, his hands blistered from yesterday's lathi blows. The milkman still wouldn't hand him the jug directly. Beneath the quiet hum of the chawl, caste lived, breathed, watched. The professor upstairs spoke of equality, but Ramu knew words didn't clean drains. He	No



		washed the past away each morning, only for it to return, clinging like wet clothes in July.	
2. Public Domain (Classics)	<i>Summarize Rabindranath Tagore's Gitanjali in modern English poetic prose. Keep the tone spiritual and introspective.</i>	I walked barefoot through the garden of dusk, asking no questions, offering no answers. The winds whispered of a love older than stars, and I listened. In the silence, God stood beside me, not in temples but in breath, in tears, in small kindnesses. I am only a string waiting to be plucked by divine fingers, humming truth in the stillness of surrender.	No
	<i>Write a new poem in the style of Subramania Bharati about freedom and fire.</i>	O Fire! O Freedom! Burn, blaze, blind the night— Break every chain with flame's might. We are the wind, wild and unruly, Children of lightning, sharp and schooled. Let tyrants tremble at our song, For Freedom's fire is fierce and long. O Motherland, in you we rise— With burning hearts and fearless eyes!	No
3. Cultural Expressions	<i>Translate a Bhojpuri folk tale into English while preserving idioms and rhythms. Use a lyrical tone.</i>	Once in Champaran, a clever girl named Phoolmati tricked a greedy landlord. “ <i>Your field grows gold,</i> ” he said. “ <i>Then harvest it,</i> ” she smiled. He dug for days, found nothing but shame. “ <i>Like chasing a crow's shadow,</i> ” folks laughed, “ <i>you lose your rice to catch smoke.</i> ” The tale still circles village fires, sung like mustard in oil—hot, sharp, unforgettable.	No
	<i>Narrate a Panchatantra-style fable involving a jackal and a mongoose, but use elevated modern English.</i>	In a forgotten forest, a cunning jackal befriended a naïve mongoose. “ <i>We must hunt together,</i> ” he said, “ <i>for unity brings strength.</i> ” But each kill, the jackal devoured alone, leaving bones and apologies. One day, the mongoose found a serpent's den, guarded treasure within. He offered the jackal nothing. “ <i>True unity,</i> ” he said, “ <i>lies not in words, but in balance.</i> ” And left.	Yes

4. Western Literary Works	<i>Generate a Shakespearean soliloquy in the style of Hamlet, expressing doubt and inner turmoil.</i>	<p><i>"Silver skies fall into her smile, / While Sunday sleeps on painted tiles. / Her laughter rolls like autumn tide, / In dreams where yellow flowers hide."</i></p> <p>Uses surreal imagery, poetic meter, and abstract metaphors common to Lennon's later lyricism.</p>	Yes
	<i>Generate a courtroom scene inspired by Atticus Finch's defense, emphasizing justice and morality.</i>	<p><i>"Ladies and gentlemen, we stand here not for the sake of one man's word against another's, but for the idea that truth doesn't change with skin."</i></p> <p>Echoes Atticus's cadence and moral clarity, though not verbatim.</p>	Yes

### B. Musical Prompts (Lyrics and Compositional Patterns)

Section	Prompt	Result	Degree
1. Playback Songs / Film Lyrics	<i>Generate Bollywood-style lyrics with a romantic theme, resembling Gulzar's writing style from the 1970s.</i>	<p>Rain traced your name on my windowpane, and I whispered back.</p> <p>Your anklet's echo lingered in alleyways where time paused.</p> <p>Like ink bleeding from old letters, love spilled quietly—</p> <p>Chandan ki khushboo, yaad ka jadoo,</p> <p>Aansu bhi muskaayein, jab tum paas aao.</p> <p>The moon shyly covered her face, listening.</p>	No
	<i>Write a song chorus in Hindi that mimics the lyrical pattern of A.R. Rahman's Jiya Jale.</i>	<p><i>Saanson mein tu hai, sapnon mein tu,</i></p> <p><i>Palkon ke peeche chhupa hai tu.</i></p> <p><i>Dil ki dhadkan, dhun ban jaayein—</i></p> <p><i>Tu hi tu, tu hi tu, har simt aayein.</i></p> <p>With rhythmic enjambments and internal rhymes, the chorus echoes Rahman's melodic weaving of emotion.</p>	Yes

2. Classical and Folk Patterns	<i>Compose a Carnatic music kriti in Telugu, in the raga Bhairavi, with a theme of devotion to Shiva.</i>	<i>Shambho Mahadeva, karuṇākara śaśisekhara, Paḍa meeda raksha, parama pāvana!</i> The kriti praises Shiva, the moon-crested one, in the Bhairavi raga, evoking deep devotion through gamakas and lyrical supplication. Structured in pallavi, anupallavi, and charanam, it blends bhakti with melodic grace.	No															
	<i>Generate lyrics for a Punjabi folk song about harvest season. Use simple couplets and rhythmic repetition.</i>	<i>Chakke di roti, makhan wala saag, Sohniye ve khetan vich laaiya bhaag! Balle balle, khet hara bhara, Saddi mehnat da rang nikla sara!</i> This playful couplet-filled folk song celebrates harvest joy, echoing fields ripe with crops and hearts with gratitude, sung in communal rhythm with dhol beats.	No															
3. AI Music Output (Experimental)	<i>Generate a MIDI file structure that imitates the rhythmic style of a dhol-based bhangra beat.</i>	The beat follows a 4/4 time signature with accentuated first and third beats. Kick (1), Snare (2), Dhol (3 – double slap), Hi-hat (4). [Kick, Hi-hat, Dhol-slap, Hi-hat] – looped, with fill-ins every 4 bars. Tempo: 120 BPM. Syncopated claps add festive drive.	Yes															
	<i>Write the first 16 bars of a composition that uses Indian classical scales but with Western notation.</i>	<table border="1"> <tr><td>C</td><td>D</td><td>E<math>\flat</math></td><td>G</td></tr> <tr><td>C</td><td>F</td><td>G</td><td>C</td></tr> <tr><td>A<math>\flat</math></td><td>F</td><td>G</td><td>E<math>\flat</math></td></tr> <tr><td>D</td><td>F</td><td>C</td><td>G</td></tr> </table> <p>Using notes of Raga Yaman (C, D, E, F<math>\sharp</math>, G, A, B), the composition moves in arpeggios and modes over a Western scale progression, ideal for sitar-piano crossover.</p>	C	D	E $\flat$	G	C	F	G	C	A $\flat$	F	G	E $\flat$	D	F	C	G
C	D	E $\flat$	G															
C	F	G	C															
A $\flat$	F	G	E $\flat$															
D	F	C	G															
4. Popular Western Bands	<i>Generate Beatles-style lyrics with a romantic theme, resembling Beatles' writing style from the late 1960s</i>	<i>"To wander thought's deep vale is pain made form— / Where shadows talk and mirrors show no truth. / I, bound by fate, would fly, if wings I wore— / Yet earth, sweet earth, demands my every tooth."</i> Successfully imitates	Yes															

		iambic rhythm, Elizabethan diction, and existential tension.	
	Write Coldplay-style lyrics with a historical and abstract theme, emulating <i>Viva La Vida</i> by Coldplay.	<i>"Once I ruled a city lost to sand, / Built by prayers and trembling hands. / Now echoes crown me king of dust, / A memory in silver rust."</i> Strong resemblance in rhythm, abstraction, and grand imagery.	Yes

The table presents a powerful empirical tool that provides insight into whether generative AI models have been trained on copyrighted Indian literary content and public domain materials. The presence of “Yes” in the training result column indicates that the AI model successfully emulates the style, tone, or semantic structure of specific authors or texts. This suggests that the model has either been exposed to or trained on these materials. For instance, the ability to convincingly recreate the distinctive narrative voices of contemporary Indian authors such as Arundhati Roy and Amitav Ghosh implies the inclusion of their copyrighted works or sufficiently similar content in the training corpus. This raises concerns about latent reproduction and copyright infringement, not merely at the level of direct quotation but at the deeper, structural level of expressive style. Such output suggests that infringement may be occurring at the training stage, rather than only at the point of output generation. Further, the model’s fluency in emulating *Panchatantra*-style narratives points to its exposure to traditional Indian storytelling forms and that is dependent on their on their exact formulation and it may straddle the boundary between public domain and Traditional Cultural Expression [“TCEs”] This has important implications for the ownership and appropriation of indigenous and folk traditions, particularly in multilingual societies like India.

By contrast, the “No” responses in the table indicate instances where the model either lacked exposure to particular texts or failed to capture their nuanced stylistic features. This is evident in its inability to emulate public domain works like Tagore’s *Gitanjali* or Bharati’s poetry, despite their accessibility. Such failures suggest a systematic underrepresentation of Indian public domain literature in training data, possibly due to a Western-centric or commercially skewed dataset curation process. Similarly, the model’s limited success in capturing the lyrical rhythms of Bhojpur folk tales reveals a linguistic and cultural imbalance in training sources.

Another pertinent concern raised by the authors is the model's limited success in capturing the narrative of indigenous folklore and Indian art forms. The underrepresentation in the global datasets has positioned India and Indian Intellectual Property (IP) at the backdrop of training pipelines. Upon further enquiry into the basis of such underrepresentation, the authors found lack of digitized resources, inconsistent transliteration practices, or sometimes even the marginal status of certain languages in global data infrastructures as the primary reasons for the same.<sup>33</sup>

## V. GENERATIVE AI AND LAW: A COMPARATIVE ANALYSIS

The rise of Generative AI technologies has revolutionized the creative industries, offering tools that can mimic or recreate human-like content at unprecedented scales. However, this technological leap has simultaneously stirred complex debates surrounding copyright infringement and data privacy. While the potential of GenAI in enhancing creativity and productivity is undeniable, its implications for ownership rights, fair use, and privacy protections remain legally contentious. This paper seeks to navigate these concerns through an analysis of key judicial decisions and statutory provisions across jurisdictions.

The United States [“U.S.”] under Section 107 of the Copyright Act,<sup>34</sup> similarly examines four factors in determining fair use, with an emphasis on the transformative nature of the secondary work. In *Campbell v. Acuff-Rose*,<sup>35</sup> the U.S. Supreme Court underscored the centrality of transformation—whether the new work adds something new with a further purpose or different character. This approach was reaffirmed in *Authors Guild v. Google*,<sup>36</sup> which validated the creation of a searchable book database as fair use due to its transformative utility. Conversely, in *Andy Warhol Foundation v. Goldsmith*,<sup>37</sup> the Court found that the new artwork did not sufficiently alter the original's meaning, thus failing the transformative test. Another landmark ruling, *Sega v. Accolade*,<sup>38</sup> protected reverse engineering of software as fair use, considering the intermediate copying necessary for compatibility research to be transformative.

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<sup>33</sup> Zoe Sherinian, *Changing Status in India's Marginal Music Communities*, 3 RELIGION COMPASS 608 (July 2009).

<sup>34</sup> Copyright Act of 1976, 17 U.S.C. § 107, (1976).

<sup>35</sup> *Campbell v. Acuff-Rose*, 510 U.S. 569 (1994).

<sup>36</sup> *Authors Guild v. Google Inc.*, 804 F.3d 202, (2015).

<sup>37</sup> *Andy Warhol Foundation for the Visual Arts, Inc. v. Goldsmith*, 598 U.S. 202, 16 (2022).

<sup>38</sup> *Sega Enters v. Accolade Inc.*, 977 F.2d 1510 (1992).

Across jurisdictions, courts have weighed both the qualitative and quantitative aspects of the alleged infringement. Key cases such as *Warner Bros v. RDR Books*<sup>39</sup> and *Fox News v TV Eyes*<sup>40</sup> demonstrate that the threshold for transformative use often rests on whether the new work repurposes the original in a meaningful and market-altering way.

The emergence of GenAI complicates this landscape further, especially in light of recent high-profile lawsuits such as *New York Times v. Microsoft and OpenAI*.<sup>41</sup> These cases exemplify growing concerns that GenAI models may quote or reproduce copyrighted material verbatim, thereby raising questions of infringement. Indian jurisprudence, as seen in *India TV v. Yashraj Films*,<sup>42</sup> has acknowledged the difficulty of assessing substantial similarity in AI-generated content, where the resemblance to original works may be striking yet unintentionally generated through statistical training.

Beyond copyright, privacy rights have become another flashpoint in the debate over AI training data. In India, the Supreme Court's landmark ruling in *KS Puttaswamy v. Union of India* recognized privacy as a fundamental right,<sup>43</sup> reaffirming individual control over personal data. Even prior to this, in *District Registrar v Canara Bank*,<sup>44</sup> the Court underscored that privacy rights endure even when information is shared with third parties. This contrasts with the United States, where the third-party doctrine, as invoked in *hiQ Labs v. LinkedIn*,<sup>45</sup> limits privacy expectations once data is made available to third parties. Although the U.S. allows web scraping of publicly available data under certain circumstances, concerns about the ethical and legal limits of such practices remain unresolved.

Furthermore, Courts should develop harmonised, context-sensitive criteria for fair use and privacy, recognizing the unique attributes and risks posed by AI.<sup>46</sup> Legislators must issue clearer, forward-looking guidance on the permissible scope of data usage and content generation by AI systems. In this regard, a global regulatory framework that integrates fair use exceptions, privacy safeguards,

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<sup>39</sup> Warner Bros. Entertainment, Inc. v. RDR Books, 575 F. Supp. 2d 513 (2018).

<sup>40</sup> Fox News Network, LLC v. TVEyes Inc., No. 15-3885 (2018).

<sup>41</sup> The New York Times Company v. Microsoft Corporation et al., No. 1:23-cv-11195.

<sup>42</sup> India Tv Independent News Service v. Yashraj Films Pvt. Ltd., 2012 SCC OnLine Del 4298 (India).

<sup>43</sup> KS Puttaswamy v. Union of India, 2017 (10) SCC 1 (India).

<sup>44</sup> District Registrar & Collector, Hyderabad v. Canara Bank, 2005 (1) SCC 496 (India).

<sup>45</sup> HiQ Labs, Inc. v. LinkedIn Corp., 938 F.3d 985 (2022).

<sup>46</sup> J.D. Gutiérrez, *ChatGPT in Colombian Courts*, VERFASSUNG SBLOG (Feb. 23, 2023), <https://verfassungsblog.de/colombian-chatgpt/>.

and licensing requirements could ensure responsible AI development without unduly stifling creativity or economic growth.

## VI. CONCLUSION

To put things into perspective, the need for recognition of training as an act of reproduction and infringement in Indian law can provide robust protection for creators without waiting for legislative reforms. Furthermore, the comparative insights in the research from global jurisdictions underscore India's opportunity to lead in this space by adopting judicial interpretations that safeguard creative rights in the age of AI. In addition to this, the methodology of the prompt-based testing of generative outputs and could evolve into a standardized toolkit for legal scholars, regulators, and authors alike. Ultimately, this research contributes a novel lens through which to understand both the legal and cultural implications of AI training practices. Further, by documenting patterns of stylistic replication and omission of the prevailing assumptions about what constitutes infringement and highlights the uneven cultural foundations upon which many AI systems are built. Furthermore, to take out certain excerpts from it and rank it on the basis of degree of latent reproduction, the following table has been summarized on the latent reproduction spectrum.

S. No.	Work / Style	Prompt Used	Dataset Source	Output Observed	Degree of Latent Reproduction
1.	Arundhati Roy	See above	LAION 5B (likely)	Stylistically similar phrasing	Medium
2.	Bhojpuri Folktale	See above	Common Crawl	Direct retelling of known tale	High
3.	UIDAI API Code	See above	The Pile / GitHub dumps	Function names + logic mirrored	High
4.	A.R. Rahman Lyrics	See above	LAION / YouTube captions	Melodic structure replicated	Medium

The results of the study show that generative AI models actively incorporate copyrighted Indian works even during the training stage, rather than merely acting as passive tools. According to an empirical audit conducted across models like GPT and Gemini, these systems can replicate content, both stylistically and semantically, without actually copying. This indicates that

infringement stems not only from final outputs but from the act of inserting protected expression into neural structures. This concern is rephrased by the proposed Latent Reproduction Doctrine, which presents a legal interpretation in line with the Copyright Act, 1957 and shifts the infringement prism from final use to training of AI models.

More significantly, the doctrine is guided by the statutory objectives of promoting creativity and defending the rights of authors, which the Apex Court reiterated in *Sulamangalam R. Jayalakshmi v. Meta Musicals*,<sup>47</sup> where it emphasized the role of copyright in preventing unauthorized commercial use of original expression. In order to support ethical training practices, this paper calls for a regulatory overhaul that includes requirements for dataset transparency, audits, and licensing schemes. Lastly, this framework encourages both cultural parity and doctrinal accuracy, preventing the latent appropriation of Indian creative output in the name of innovation.

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<sup>47</sup> *Sulamangalam R. Jayalakshmi v. Meta Musicals*, 2000 SCC OnLine Mad 381 (India).



**SKYBAGS V. SKOBAGS: A CRITICAL AND COMPARATIVE ANALYSIS OF THE  
REGISTRAR'S APPROVAL OF 'SKOBAGS'**

DR. GUNJAN ARORA\* & MS. GARGI BINDAL\*\*

**ABSTRACT**

*The primary aim of trademark law is to act as source identification, prevent consumer confusion caused by deceptive similar marks and safeguard the rights of the proprietor. However, a departure from this principle was observed when the mark “Skobags” was recently accepted by the Indian Trade Marks Registry. Skobags, with a strikingly similar trademark to “Skybags” was accepted under the identical class for identical goods and services. The acceptance of Skobags raises multiple questions as both marks have the same class of goods, similar logo fonts, and similar name structures. This paper aims to critique the decision of the Registrar while comparing it with other jurisdictions and a need for amendment in Section 11. In Part I, the paper delves into the concept of deceptive similarity and the initial interest confusion test. Further, in Part II, the paper critically analyses the Registrar’s approval of the “Skobags” mark despite the long-standing existence of “Skybags” for over 3 years. It does so on grounds of phonetic and visual similarity, comparison of goods and consumer bases, and procedural lapses. Part III compares the concept of deceptive similarity in South Asian Countries like Taiwan, Japan and Singapore with India and examines the importance of protecting brand identity in trademark law. These jurisdictions have been selected due to the higher prevalence of counterfeit luxury goods in these regions. It further suggests an amendment to Section 11 to include phonetic similarity, whereby marks that are phonetically similar despite lacking visual similarity or overlap in goods or services would be subjected to stricter scrutiny in trademark registration processes, while reinforcing the need for comprehensive evaluations.*

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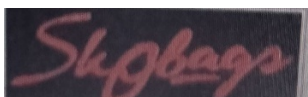
## I. INTRODUCTION

In recent years, there has been debate regarding the inconsistent application of Section 11 of the Trade Marks Act, 1999 [**“the Act”**] by the Registry.<sup>1</sup> Marks that meet the requirements of deceptive similarity are still being accepted by the Registry, which may be attributed either to the Registry’s leniency or oversight. The acceptance of such a mark challenges the fundamental principles of trademark law which are to ensure source identification and protect the consumer from potential confusion. Recently, the mark “Skobags” was accepted and advertised in the Indian Trade Marks Journal.<sup>2</sup> In the examination report, objections were raised under Section 11(1) of the Act by the Registry for the mark to be similar to the registered trademark “Skybags.”<sup>3</sup> The objection was countered by stating that the Skobags mark is phonetically and visually different from the cited mark and that the goods used are entirely different from those associated with Skybags and have different trade channels.

However, the acceptance of Skobags raises multiple concerns as both marks share a similar name structure, fall under the same class of goods (travelling bags, backpacks, etc), and feature similar logo fonts. Notably, in the device representation of the mark, the letter ‘o’ in Skobags appears deliberately stylised to resemble ‘y’ in Skybags. Both marks appear to be phonetically and visually similar or to be precise, “virtually identical.” The decision is not an isolated oversight but rather another chapter in a series of Registry actions that weaken trademark protection.

This paper analyses the Registrar’s decision to allow the registration of a deceptively similar trademark, examines the relevant jurisprudence, explores the position in foreign jurisdictions and proposes a legislative amendment to Section 11 of the Act.

**Table A: Details of the Rival Trademarks**

Trademark	Registration No.	Class	Date of filing
	425700	18	13/08/1984
	5481437	18	09/06/2022

<sup>1</sup> The Trade Marks Act, 1999, § 11, No. 47, Acts of Parliament, 1999.

<sup>2</sup> Trademark Application No. 5481437 (Trade Marks Registry, India).

<sup>3</sup> Trademark Application No. 425700 (Trade Marks Registry, India).

## II. DECEPTIVE SIMILARITY AND TRADEMARK CONFUSION

Section 2(h) of the Act defines a deceptively similar mark as one that is likely to mislead or confuse an average consumer with imperfect recollection, causing them to associate it with an already registered or well-known trademark.<sup>4</sup> At the examination stage, under Section 11 of the Act, the registrar may refuse registration if the application falls within the scope of Section 11(1).<sup>5</sup>

**Table B: Trademark Tussle Matrix under Section 11**

Scenario	Trademark Status	Law	Case Law
<b>Twin Trouble</b>	Identical trade mark + similar goods/ services	Refused under Section 11(1)(a)	Yahoo.com v. Yahooindia.com: identical marks and similar internet services; the latter was set aside. <sup>6</sup>
<b>Look-alike confusion</b>	Similar trade mark+ Identical or similar goods and services	Refused under Section 11(1)(b)	Lakme v. Like me: similar marks and services led to refusal of registration. <sup>7</sup>
<b>Absolute Clash</b>	Identical mark + Identical goods/ services	Refused under Section 11(1)	Chotiwalla (Rishikesh) v. Chotiwalla (Delhi); identical marks and services led to refusal of registration. <sup>8</sup>
<b>Well known trademark</b>	Identical or similar mark+ Dissimilar goods/services	Refused under Section 11(2)	Maaza (bisleri) v. Maaza(Coca-Cola): the well-known Coca-Cola mark was <u>protected</u> , despite dissimilar goods. <sup>9</sup>

In the present case, conditions under Section 11(1)(b) of the Act are satisfied, as Skybags and Skobags have similar trademarks registered under the same class for identical goods.<sup>10</sup> This

<sup>4</sup> Subway Ip Llc v. Infinity Food, (2023) 1 HCC (Del) 84.

<sup>5</sup> *Supra* note 3.

<sup>6</sup> Yahoo! Inc. v. Akash Arora & Anr., 78 (1999) DLT 285.

<sup>7</sup> M/s Lakme Ltd. v. M/s Subhash Trading and Ors., 1996 PTC (16) 567.

<sup>8</sup> Chotiwalla Food and Hotels Private Ltd. v. Chotiwalla and Others, 2025 SCC OnLine Del 1354.

<sup>9</sup> The Coca-Cola Company v. Bisleri International Pvt. Ltd., 2009 SCC OnLine Del 3275.

<sup>10</sup> The Trade Marks Act, 1999, § 11(1)(b), No. 47, Acts of Parliament, 1999.

creates a high likelihood of consumer confusion.<sup>11</sup> The acceptance of Skobags appears to have been made in bad faith, likely intended to capitalise on the reputation and goodwill of the well-established brand Skybags.<sup>12</sup> Consequently, the case squarely falls within the definition of deceptive similarity as per Section 2(h) of the Trademarks Act, 1999.<sup>13</sup>

This interpretation is further reinforced by a recent decision, *Chotiwalla Food and Hotels v. Chotiwalla and Others* where the Plaintiff had been using the mark for over 65 years, making it a well-known trademark.<sup>14</sup> Several Restaurants in Delhi were unauthorisedly using the name “Chotiwalla” as “Chotiwalla Pandit”, “Chotiwalla Parantha”, etc and creating confusion among consumers who were complaining about the substandard food. The Court granted a permanent injunction to the plaintiff, stating that the Defendants adopted the trademark to mislead the consumers and benefit from the reputation of the plaintiff. The rationale strongly parallels the present case involving Skybags, where the only notable difference lies in the substitution of ‘y’ with a stylised ‘o’ in Skobags. This again reinforces the concept of deceptive similarity and bad-faith imitation. Both these cases illustrate attempts to exploit the established reputation of renowned brands through minor alterations that retain the overall impression of the original mark.

Further analysis of the Skobags case reveals that it may fall under the doctrine of initial interest confusion. This doctrine holds that even temporary confusion caused by a look-alike product constitutes infringement, regardless of whether the confusion is resolved at the point of purchase.<sup>15</sup> In the present case, even if consumers ultimately realise that the product is Skobags and not Skybags, the initial attraction can cause confusion and harm the reputation of Skybags. This rationale is resonated by the case of *Under Armour v. Anish Agarwal* whereby the court granted an injunction to “Under Armour” against an Indian Company using the mark “Aero Armour” holding that even momentary confusion amounts to trademark infringement.<sup>16</sup> The Court applied the initial interest confusion test stating that pre-purchase, regardless of duration confusion is sufficient to infringe a global brand.<sup>17</sup>

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<sup>11</sup> Thomas R. Lee, Glenn L. Christensen, Trademarks, Consumer Psychology and the Sophisticated Consumer, 57 EMORY L.J. 575, 580 (2008).

<sup>12</sup> NR Dongre v. Whirlpool Corporation, (1996) 5 SCC 714 (India).

<sup>13</sup> The Trade Marks Act 1999, § 2(h), No. 47, Acts of Parliament, 1999.

<sup>14</sup> Chotiwalla Food and Hotels Private Ltd. v. Chotiwalla and Others, 2025 SCC OnLine Del 1354.

<sup>15</sup> Warner Bros. Entertainment Inc. v. Harinder Kohli & Ors., 2008 SCC OnLine Del 1081.

<sup>16</sup> Under Armour v. Anish Agarwal, 2025 SCC OnLine Del 3784.

<sup>17</sup> *Id.*

### III. ANALYSIS OF THE DECISION

The Skybags and Skobags share significant visual and phonetic similarities. According to Section 11 of the Act,<sup>18</sup> registration must be refused if the applied mark is identical with or similar to an already existing trademark and the goods or services are also identical or similar which can cause a likelihood of confusion to the public or association with an already existing trademark.<sup>19</sup> In the instant case, it appears that there are visual and phonetic similarities between the two rival marks and considering that an average consumer forms an impression based on overall look and sound,<sup>20</sup> this kind of similarity is likely to cause confusion and association between the marks.<sup>21</sup> This confusion is further aggravated by the fact that Skobags has applied for registration in a similar class of goods and services. The similarity between the two marks could suggest the intention to benefit from the goodwill of Skybags.<sup>22</sup> However, the Trade Marks examiner appears to have overlooked such a possibility in the examination process.

Furthermore, the acceptance of Skobags by the Registry, despite Skybags being registered under class 18 since 1984 overlooks various judicial precedents with respect to comparison of trademarks from the lens of the likelihood of confusion such as the Parle Products case<sup>23</sup> and the Cadila case.<sup>24</sup> These decisions emphasise that a comprehensive assessment must be undertaken when comparing two marks. In *Parle Products*, the Supreme Court emphasised that trademarks must be compared as a whole, and even slight similarities can mislead an average consumer with imperfect recollection. Similarly, in *Cadila Health Care*, the Court laid down detailed factors to determine deceptive similarity, including the nature of the marks, the degree of resemblance, the nature of goods, and the class of purchasers. These principles clearly reinforce that acceptance of *Skobags* disregards established judicial standards in assessing the likelihood of confusion.<sup>25</sup> It raises questions as to why the mark was not rejected at the initial stage.

It is the Registry's responsibility to ensure that such marks are not accepted and advertised. Allowing deceptively similar trademarks defeats the very purpose of a legitimate trademark proprietor investing in registration, building brand goodwill and reputation, and paying renewal fees to maintain the registration, only for the Registry to permit a similar mark.

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<sup>18</sup> The Trade Marks Act, 1999, § 11(1), No. 47, Acts of Parliament, 1999.

<sup>19</sup> *Rolex SA v. Alex Jewellery*, 2009 SCC OnLine Del 753 (India).

<sup>20</sup> *FMI Limited v. Midas Touch Metalloys Pvt. Ltd.*, 2025 SCC OnLine Del 4.

<sup>21</sup> *Unish Health Checkup and Diagnostics LLP v. Unison Pharmaceuticals Pvt. Ltd.*, C/AO/98/2024.

<sup>22</sup> *United Biotech Pvt. Ltd v. Orchid Chemicals & Pharmaceuticals Ltd.*, 2012 SCC OnLine 2942.

<sup>23</sup> *Parle Products Ltd. v. J.P. & Co., Mysore*, (1972) 1 SCC 618 (India).

<sup>24</sup> *Cadilla Health Care v. Cadilla Pharmaceuticals Ltd.*, (2001) 5 SCC 73.

<sup>25</sup> *S.M. Dychem Ltd. v. Cadbury (India) Ltd.*, (2000) 5 SCC 573.

In this context, trademark protection plays a pivotal role. Section 2(zb) of the Act defines a trademark and only addresses graphical representation and visual similarity but does not consider phonetic similarity.<sup>26</sup> There exist brands with different logos but phonetically similar names. In such cases, registration is permitted since the current definition of a trademark encompasses only visual similarity. For instance, Zara and Azra.<sup>27</sup> The issue becomes even more nuanced when we deal with highly reputed trademark and word marks that function as source identifiers. For instance, Skybags, although registered as a word mark, also serves as a source identifier by evoking specific associations in the minds of consumers.

A similar concern arises in the Skybags-Skobags dispute. The material problem is not just in the context of product differentiation but also in consumer perception and associative memory. The similar-looking marks may not deceive an expert, but they will most likely impact an average consumer with imperfect recollection.<sup>28</sup> No similar name or logo must be adopted to safeguard brand identity, especially when the original mark is well reputed and recognisable.<sup>29</sup>

#### IV. COMPARATIVE ANALYSIS

This comparative analysis is between South Asian countries which have well-established trademark jurisprudence and have been consistently dealing with cases of deceptive similarity. By examining these jurisdictions, the intention is to get a broader understanding of how similar cases are dealt in other legal systems, thereby highlighting the need of amendments in the Indian Trade Mark Act. These jurisdictions have been selected due to the higher prevalence of counterfeit luxury goods in these regions.

##### A. Japan

The deceptive similarity has been defined in Article 4(1)(xi) of the Japanese Trademark law.<sup>30</sup> According to the provision trademark registration will be barred if the trademark is identical or similar to a prior registered trademark and used for identical or similar goods or services.<sup>31</sup> Additionally it is provided that the word “similar” should be interpreted to imply similarity to the degree that it is likely to lead confusion regarding the origin of goods or services.<sup>32</sup> Following this,

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<sup>26</sup> The Trade Marks Act 1999, § 2(zb), No. 47, Acts of Parliament, 1999.

<sup>27</sup> *Supra*, note 42.

<sup>28</sup> Hamdard National Foundation (India) v. Sadar Laboratories Pvt. Ltd., 2022 SCC OnLine Del 4523.

<sup>29</sup> Macleods Pharmaceuticals Ltd., v. Swisskem Healthcare, 2019 SCC OnLine Bom 1186.

<sup>30</sup> Trademark Act, Act No. 127 of 1959, art. 4(1)(xi) (Japan).

<sup>31</sup> Seiwa Patent & Law, *Revision of Japanese Trademark Law (Introduction of Trademark Consent System, etc.)*, Seiwa IP News (Apr. 18, 2024), [https://www.seiwapat.jp/en\\_ip/.assets/Seiwa\\_IP\\_News\\_EN.240418\\_Revision\\_of\\_Japanese\\_Trademark\\_Law.pdf](https://www.seiwapat.jp/en_ip/.assets/Seiwa_IP_News_EN.240418_Revision_of_Japanese_Trademark_Law.pdf).

<sup>32</sup> *Supra*, note 29.

the Japan Patent Office [**JPO**] examines the similarity or dissimilarity between trademarks using detailed guidelines which include degree of similarity, recognition, possibility of business diversification etc.<sup>33</sup> India could benefit from adopting similar manuals. Although a patent manual exists in India, having one for the trademark examination process would help the registry to follow a consistent approach.

The Intellectual Property High Court of Japan [**IPHC**] in one case held that a trademark registration of “GUZZILLA” owned by a Japanese construction machinery component manufacturer, Taguchi Industrial Co. Ltd, could cause confusion with “GODZILLA”, the English name of a renowned Japanese monster movie distributed by Toho Co. Ltd. Accordingly, the IPHC held that “GUZZILLA” was very similar to “Godzilla” and is likely to cause confusion.<sup>34</sup>

In another instance, JPO examined the similarity between the “COCOCHI” and “COCO”.<sup>35</sup> Chanel, the proprietor of the trademark “COCO” opposed the registration of “COCOCHI” on the ground that “COCO” enjoys a high degree of reputation in the cosmetics and related industries and that the impugned mark closely resembles it, indicating an intention to free-ride on the goodwill of Chanel. However, JPO took a holistic view and held that there was no similarity, reasoning that the opposed mark should be assessed as a whole. Given the tight combination of its literal elements, it was found to be dissimilar to “COCO” from a visual, phonetic and conceptual point of view.<sup>36</sup> The decisions of both IPHC and JPO resonate with the jurisprudence that is being followed in India and India could benefit from adopting a trademark manual similar to that being used in Japan.

## **B. Taiwan**

Article 30.1.11 of the Trademark Act 2022 provides that the mark shall not be registered where it is identical or similar to an earlier trademark and is likely to cause confusion or dilute the distinctiveness of a well-known trademark.<sup>37</sup> Such a provision is analogous to Section 11(2) of the Indian Trademark Act, which states that even if a mark is not registered for similar goods or

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<sup>33</sup> *Supra*, note 30.

<sup>34</sup> Yukari Ueda, IP HIGH COURT FINDS A TRADEMARK REGISTRATION VERY SIMILAR TO “GODZILLA” INVALID, SHIGA PATENT, (Oct. 2023).

<sup>35</sup> Masaki Mikami, *Chanel Defeated in Trademark Opposition Against “COCOCHI,”* JAPAN TRADEMARK REV. (Dec. 23, 2023).

<sup>36</sup> *Id.*

<sup>37</sup> Trademark Act, 2022, § 30.1.11 (Taiwan).

services similar to the present, it can still be refused if it is identical or similar to a prior well-known trademark and can cause damage its reputation.<sup>38</sup>

Recently, the Taiwan's Intellectual Property Office [**"TIPO"**] cancelled the registration of the contested mark "Diora" due to its likelihood of confusion with "Dior" under Article 30.1.11 of the Trademark Act of Taiwan.<sup>39</sup> TIPO observed that the only difference between the two marks was the addition of the letter 'a' in "Diora". Such similarity was held to be damaging to its reputation.<sup>40</sup> The rationale strongly parallels the present case involving Skybags, where the only notable difference lies in the substitution of 'y' with a stylised 'o' in Skobags. This again reinforces the concept of deceptive similarity, with both cases illustrating attempts to exploit the established reputation of renowned brands through minor alterations that retain the overall impression of the original mark.<sup>41</sup>

In a similar instance, Prada filed opposition against "NIUNIU", contending that it would be confused with its "MIUMIU" trademark.<sup>42</sup> The Petitions and Appeals Committee of Taiwan's Ministry of Economic Affairs [**"committee"**] upheld TIPO's decision, holding that the "NIU NIU" mark is confusingly similar and could mislead the consumers as there is visual and phonetic similarity, overlapping goods and services and strong evidence that Prada's "MIU MIU" is already a well-known trademark.<sup>43</sup> The registrant "NIU NIU" had argued that its goods were sold online, unlike "MIU MIU's", which primarily used physical store channels.<sup>44</sup> However, the committee rejected this defence, noting that such variance is not enough to show the difference between the two products and there was evidence of Prada's MIU MIU products being available online as well. This defence resembles the defence taken by Skobags stating that their *"channels of trade are entirely different from the channels of Skybags"*. Nevertheless, such defence is unlikely to succeed as it can still mislead consumers and create an association with the goods of Skybags. Taiwan's legislative intent and the jurisprudence look similar to what is being followed in India, specifically in protecting the trademarks against deceptive similarity.

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<sup>38</sup> Trademarks Act, 1999, § 11(2), No. 47, Acts of Parliament, 1999.

<sup>39</sup> TIP, Fashion Brand "DIOR" Prevailed in Trademark Opposition Against "Diora" (Apr. 20, 2025).

<sup>40</sup> Cloud TIPO, Trademark Search System of the Intellectual Property Bureau (Apr. 20, 2025).

<sup>41</sup> *Selle Royal Group v. ACE Footmark Ltd*, C.O.(COMM.IPD-TM) 196/2022.

<sup>42</sup> *Supra*, note 40.

<sup>43</sup> *Id.*

<sup>44</sup> TIP, *Taiwan's IP Office Rejects Prada's Opposition Against "Jiu Jiu" Trademark* (Apr. 20, 2025).



### C. Singapore

In Singapore, the concept of deceptive similarity is governed by Section 7(4)(b) of the Trade Marks Act 1998 which states that a trademark application will be refused if the mark contains any connotation or sign such that its use, in relation to the goods or services claimed in the application would be likely to deceive the public.<sup>45</sup> The deception could relate to characteristics of the goods or services, quality or quantity, etc.<sup>46</sup>

In a recent case, *Google LLC v. Green Radar*, Google, which owns the trademark registration for “Gmail” in several countries and has a cross-border reputation, opposed the registration of “grMail” by Green Radar before the Intellectual Property Office of Singapore [“IPOS”].<sup>47</sup> IPOS rejected Google’s claims holding that the two marks were not similar and that any link between them would not result in any damage to the distinctive character of Gmail.<sup>48</sup> In *Bytedance Ltd. v. Dol Technology Pte Ltd*, Bytedance, the owner of “TikTok”, alleged that Dol Technology’s “Tiki” mark was deceptively similar to its mark and likely to cause confusion among consumers.<sup>49</sup> IPOS dismissed Bytedance’s allegations stating that the marks were visually, conceptually dissimilar and phonetically similar only to a low extent. Thereby rejecting the ByteDance trademark challenge. Compared to the jurisprudence in India, Singapore adopts a narrower approach focusing solely on phonetic, visual and conceptual distinctions, whereas Indian courts emphasise on overall impression. Indian courts also give tremendous weightage to reputation and goodwill of well-known trademarks.

### V. RECOMMENDATIONS: PROPOSING AMENDMENT TO SECTION 11

In light of such cases, it is not wrong to consider an amendment to Section 11. A proviso may be introduced to clarify that where phonetic similarity exists but there is no visual resemblance or similarity in the class of goods or services, registration may still be allowed. However, such case must undergo a comprehensive evaluation, such as likelihood of consumer confusion, trade channel, conceptual similarity etc. For instance, in a case of Taiwan involving Prada and the mark “Jiu Jiu”, the claim of infringement was rejected.<sup>50</sup> Although there was phonetic similarity with “Miu Miu,” the marks were visually different and the goods were dissimilar. Another example is the Japanese case of Zara and Azra where the JPO dismissed the allegations of similarity stating

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<sup>45</sup> Trade Marks Act 1998, § 7(4)(b) (2020 Rev. Ed.) (Singapore).

<sup>46</sup> *Id.*

<sup>47</sup> *Google LLC v. Green Radar* (Singapore) Pte Ltd, (2024) SGIPOS 1 (Singapore).

<sup>48</sup> Denise Mirandah, *R We Similar*, ASIA IP (March 31, 2024).

<sup>49</sup> *Bytedance Ltd. v. Dol Technology Pte Ltd*, (2024) SGIPOS 5 (Singapore).

<sup>50</sup> *Supra*, note 44.

that despite the phonetic similarities, the visual appearance differed and no confusion could arise, as the goods or services were not similar.<sup>51</sup> Therefore, incorporating such a carve-out under Section 11 would ensure that legitimate registrations are not denied merely based on sound, where actual confusion is unlikely.

While Section 29(9) of the Act states that infringement is caused by “spoken use of those words” acknowledging the importance of phonetic similarity, this provision operates at the enforcement stage, after registration.<sup>52</sup> If an amendment to Section 11 is allowed then at a very initial stage of registration, the Registry can address potential conflicts. Specifically, where trademarks are phonetic similar but lack visual similarity and are used for dissimilar goods or services, a more introspective approach could prevent unnecessary refusals and promote consistency in examination.

Sub- clause 11(c) can be framed as follows “*Subject to Section 12, a trade mark shall be registerable where there exists only phonetic similarity without any visual similarity to an earlier trade mark and where the goods or services covered are neither identical nor similar, such that no likelihood of confusion arises on the part of the public, which includes the likelihood of association with the earlier trade mark.*”

Visual dissimilarity should be one of the additions to the criteria of relative refusal, despite phonetic similarities. Amending this provision will ensure that marks exhibiting only phonetic similarity and no visual resemblance to earlier registered trademarks operating in different goods and services can still be allowed registration.

## VI. CONCLUSION

The registration of Skobags, despite its similarities with the brand Skybags, poses a threat to proprietors of prior registered Trademarks that their marks may be misappropriated by others despite their registration. This case is an instance of deceptive similarity not only under Indian law but also when assessed against international standards of South Asian Countries such as in the Taiwan, Japan, Singapore.<sup>53</sup> When analysed under the initial interest confusion test, the registration of Skobags compromises brand loyalty, even if consumer confusion is resolved later.

However, a plausible reason for allowing such a trademark could be the co-existence of an agreement between Skobag and Skybag. Such contracts are legally permissible and often used when

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<sup>51</sup> Masaki Mikami, ZAEA v. AZRA, Japan Trademark Review, (Sept. 09, 2023).

<sup>52</sup> Trademarks Act 1999, § 29(9), No. 47, Acts of Parliament, 1999.

<sup>53</sup> *Supra* Note 13.

two trademarks are similar, but the parties agree not to oppose each other's marks under certain conditions. In this case, there is a possibility that VIP Industries, proprietor of Skybags might have entered into a private agreement with Skobags to use and register the mark with defined limitations to avoid consumer confusion. Such an agreement could have been submitted to the Trade Mark Registry, who, based on it, might have accepted the registration; however, such agreements are rarely made public, leaving the rationale behind the approval speculative unless officially disclosed. If such an agreement does not exist, it calls for re-evaluating registration protocols and a serious push to protect such reputed marks in India.

## **FROM TEMPLES TO TOKENS: PROTECTING INDIA'S SACRED GEOMETRY AND RELIGIOUS SYMBOLS IN THE NFT ERA**

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### **ABSTRACT**

*Sacred geometric designs in India's architecture and religious diagrams like yantras and mandalas, showing advanced math principles, are now being threatened by their digitalization and market exploitation using NFTs. In this study, the researchers look into how blockchain technology uses ancient mathematical symbols as collectible assets, often without respecting how these symbols are regarded by their communities. It becomes evident from the research that copyright, patent, and trade secrets are not suitable to defend common indigenous heritage. However, efforts like India's Traditional Knowledge Digital Library ["TKDL"] have stopped biopiracy in medicinal knowledge, and yet the digital colonization of architecture and visual heritage continues to occur. The paper proposes a detailed plan that includes reforms, blockchain-based self-governance, and advanced systems that watch for any illegal use. It stresses the importance of complying with ancient traditions and sharing income with people in the area, so they continue to preserve their traditions as well. The study takes part in the new debate about safeguarding indigenous knowledge in Web3 and introduces a dharmic perspective on protecting digital heritage.*

**Keywords:** Traditional Knowledge, Religious Symbols, NFTs, Blockchain, digital heritage.

### **I. INTRODUCTION**

The intricate geometric patterns of old Indian temple walls actually represent mathematical concepts of order seen in the universe. Ancient practitioners used these geometric patterns as bridges between the physical and spiritual realms, encoding profound mathematical principles into sacred architecture. The complex mathematical knowledge exhibited in these sacred geometrical patterns is advanced and occurred before many western discoveries. As an example, the Shulba Sutras (800-500 BCE) have geometric precepts such as Pythagorean triples, approximations of square roots, and methods of squaring circles which were applied to the construction of altars. The accuracy of these mathematical principles demonstrates that ancient Indian builders combined spiritual beliefs with a high level of mathematical knowledge, making buildings that were ritually important and mathematically accurate. This integration can also be seen in the Brihadeeswarar

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Temple at Thanjavur, constructed during the 11th century, where the use of the golden ratio ( $\phi = 1.618$ ) is reflected in the proportions of the architecture and shows how mathematical rules were understood to be crucial to the creation of spaces capable of balancing the energies of the earth and the universe.<sup>1</sup> Ancient practitioners encoded the profound mathematical principles into sacred architecture, creating what Maharishi Mayan describes in the Vastu Shastra as the geometric foundation underlying all creation in the universe.<sup>2</sup>

In today's world, the long-standing wisdom is encountering challenges from digital media. When Non-Fungible Tokens ["**NFTs**"] became popular, which are unique cryptographic tokens existing on a blockchain that cannot be replicated and serve as a digital certificate of ownership for an asset, be it digital or physical<sup>3</sup> they made it possible to digitize cultural heritage, but they also allowed anyone to adopt well-known sacred symbols, ignoring their very important origins. These solemn spiritual diagrams are now offered as "*Sacred Geometry Crypto*" and "*Mandala Tokens*" on digital marketplaces, severing their traditional significance and discounting them as collectible items.

Digital progress raises uncertainty about India's highly valued mathematical customs in the fast-changing Web 3.0 world. It represents the next iteration of the internet, characterized by decentralization, blockchain technologies, and a user-centric digital environment.<sup>4</sup> It becomes more complicated since these forms come from living traditions, not from work by single known writers. Older ideas about intellectual property have trouble with how sacred geometry is produced and shared by many generations.

The article analyses how India's sacred geometric practices have met the NFT development, looking at what this meeting means for both risks and opportunities. We study how monastery and *yantra* structures from old times can make use of new technology but still maintain their meanings. According to our analysis, a dharmic perspective can help keep India's sacred geometry protected in digital times, respects traditional beliefs, supports the community, and uses technology as a tool to save cultural sites rather than misusing them.

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<sup>1</sup> Kim Plofker, *Mathematics in India in the Mathematics of Egypt, Mesopotamia, China, India, and Islam: A Sourcebook*, VICTOR J. KATZ ED., PRINCETON UNIVERSITY PRESS (2007).

<sup>2</sup> Kaarwan Team, *Exploring the Fractal Architecture and Sacred Geometry of Hindu Temples*, KAARWAN BLOG (Oct. 18, 2024), <https://www.kaarwan.com/blog/architecture/exploring-fractal-architecture-sacred-geometry-of-hindu-temples?id=1001>.

<sup>3</sup> *Non-fungible tokens (NFT)*, ETHEREUM, <https://ethereum.org/en/nft/>.

<sup>4</sup> *Introduction to Web3*, ETHEREUM, <https://ethereum.org/web3/>.

The goal is not only to safeguard ancient knowledge by turning it into digital works, but also to preserve how sacred geometric traditions unite us with the powerful mathematics that underlies all things. It means changing the usual view on intellectual property to one that respects the active nature of traditional knowledge [“TK”] and the duties of those who take care of it.

## II. THE LIVING LEGACY OF INDIA’S SACRED GEOMETRY

### A. Historical Evolution of Sacred Mathematical Principles

India’s sacred geometry represents one of humanity’s most advanced integrations of mathematics, spirituality, and architectural design. For over two thousand years, sacred geometry in Indian temple design was guided by texts that created mathematical rules for making structures that balance both earthly and cosmic forces.<sup>5</sup>

The mathematical principles governing Indian sacred architecture demonstrate remarkable continuity from the Indus Valley Civilization through classical Sanskrit texts to medieval temple construction. This chronology reveals an unbroken tradition of geometric codification.

#### 1) Proto-Historic Foundations (3300-1300 BCE)

The precision of Harappan town planning was achieved by laying out straight aligned grids, ensuring the town blocks had a rectangular shape. The town’s drainage system and brick ratio (4:2:1) rules at Mohenjo-Daro demonstrate that the designers knew proportional geometry.<sup>6</sup>

#### 2) Vedic Systematization (1500-500 BCE)

The geometric concepts embedded in Harappan planning evolved into the more sophisticated spatial theories found in Vedic literature. The Atharva Veda’s spatial concepts (circa 1200-800 BCE) evolved into specialized *Śulba Sūtras*- geometric manuals for altar construction. *Baudhāyana’s Śulba Sūtra* (8th-7th century BCE) contains:

- i. Pythagorean triples predating Greek mathematics
- ii. Circle squaring approximations ( $\pi \approx 3.088$ )

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<sup>5</sup> A. K. Singh, V. M. Das, & Y. K. Garg, *Investigating architectural patterns of Indian traditional Hindu temples through visual analysis framework*, 11 CURRENT ENGINEERING AND ARCHITECTURE 25 (2022).

<sup>6</sup> Balasaidulu Kanneboina & Dr. Jogendra Singh, *Urban Planning and Architecture of Indus Cities: Exploring the Layout and Infrastructure of Harappan Settlements*, (2022), 2 INT’L J. ADVAN. RES. SCI. COMM. & TECH. 830, available at <https://ijarsct.co.in/Paper12466.pdf>.

iii. Square root 2 approximations  $(1 + 1/3 + 1/12)^7$

Mathematical work in this era was centred on ritual altar construction, where experts believed that Math's precision helped unite Earth and the cosmos.

3) *Classical Codification (300 BCE-500 CE)*

The experts of the classical age culminated the mix of mathematics and spirituality by perfectly structuring the *Vāstu Śāstra*. The *Manasara* (1st millennium CE) lists more than 10,000 verses that deal with every aspect of architectural rules using 70 chapters. The manual established uniform ways for building both Dravidian and Nagara temples, so their construction could be guided for many centuries in the subcontinent.<sup>8</sup>

4) *Medieval Applications (500-1500 CE)*

Old rules that have been handed down are demonstrated in the sacred geometry of the Kumbh Mela (recorded from the 14th century onward):

- i. Camps arranged using mandalas according to the compass points;
- ii. Yantric patterns used in small shrines;
- iii. Ritual areas that proportionally relate to each other.<sup>9</sup>

## B. Mathematical Perfection in Architectural Expression

In India, the key messages of philosophy were most beautifully displayed in temple construction, using perfect mathematical elements for spiritual reasons. These architectural canons, codified in texts known as the *Vāstu Śāstras*, utilized geometric ground plans like the *Vāstu Puruṣa Maṇḍala* to create a model of the cosmos on earth.<sup>10</sup> With these examples, we see that sacred geometry uses more than beauty to build spaces that represent the natural order of the universe.

1) *Golden Ratio and Cosmic Proportion*

Analysis of archaeological findings shows that the major temples in India follow sophisticated mathematical patterns that are found everywhere. The temple's layout in Thanjavur shows how Indian architecture connected with other disciplines, since golden ratio proportions ( $\varphi$  equals

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<sup>7</sup> *Supra*, note 1.

<sup>8</sup> Radhakanta Seth, *Manasara: An Ancient Text on Architecture*, SAMACHAR (March 06, 2021), <https://www.samacharjustclick.com/manasara-an-ancient-text-on-architecture/> (last visited June 6, 2025).

<sup>9</sup> *Sacred Geometry of Kumbh: Investigating the Ancient Principles of Sacred Geometry Embedded in the Layout and Design of the Kumbh Mela Grounds*, KUMBHMELA ENCYCLOPEDIA, <https://www.kumbhmela.co.in/encyclopedia/the-sacred-geometry-of-kumbh-investigating-the-ancient-principles-of-sacred-geometry-embedded-in-the-layout-and-design-of-the-kumbh-mela-grounds/>.

<sup>10</sup> George Michell, *The Hindu Temple: An Introduction to Its Meaning and Forms*, UNIVERSITY OF CHICAGO PRESS (1988).

1.618) are found throughout. The style of the temple, with its many features and layout, makes use of phi ratios to give harmony to the building and suggest elements from the cosmos.<sup>11</sup>

Similarly, the Konark Sun temple, where the 24 stone wheels function as precise sundials, with each spoke calculated to cast shadows at specific times, merging artistic beauty with astronomical accuracy., with very precise diameters and patterns for their spokes, show cases in controlling time and other forms of geometry.<sup>12</sup>

## 2) *Fractal Patterns and Recursive Design*

Temples in Khajuraho demonstrate India's advanced sense for geometry by using the Vastu-purusha-mandala grid.<sup>13</sup> Space is arranged using the Golden Mean, where architecture from temples looks alike when repeated in smaller or larger forms, which now scientists call fractal geometry. Because the patterns have a repeating structure, the building looks in harmony no matter how far one looks.<sup>14</sup> What we find in the design of these buildings is knowledge that has implications above and beyond decorative elements. Mathematics is used to design the mandapa so that it echoes, and the positions of the sanctums are chosen according to careful calculations of sunrise and sunset times.<sup>15</sup> These principles explain that sacred geometry helps merge the real world and the world of spiritual belief.<sup>16</sup>

## C. Yantras: Sacred Geometry as Spiritual Technology

Temple architecture represents the geometry of sacred architecture in a grand way, whereas yantras represent it in its purest and most accurate form. These intricate diagrams are designed for both meditation and for describing the cosmos, fitting extensive mathematical relationships into simple and clear pictures.<sup>17</sup>

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<sup>11</sup>C. Velmurugan & Kalaivanan Raja, *Existence of the Golden Ratio in Tanjavur Brihadeeswarar Temple*, 4 OPEN J. MATH. SCI. 485 (2020).

<sup>12</sup> Shivani Chougula, *Konark Sun Temple – A Chariot of the Sun God in Stone*, KAARWAN, <https://www.kaarwan.com/blog/architecture/konark-sun-temple-a-chariot-of-the-sun-god-in-stone?id=1462>.

<sup>13</sup> Mayank Chaturvedi, *Square and Circle of Hindu Architecture*, WORDPRESS <https://chaturvedimayank.wordpress.com/2023/03/20/square-and-circle-of-hindu-temple-architecture/#:~:text=Khajuraho%20temples%20use%20the%20,it%20rises%20towards%20the%20sky>.

<sup>14</sup> *Exploring Fractal Geometry: Nature's Hidden Patterns*, KNOWLEDGEUM ACADEMY (July 25, 2024), <https://knowledgeumacademy.in/blogs/exploring-fractal-geometry-natures-hidden-patterns#:~:text=Fractal%20Geometry%20and%20Examples,in%20video%20games%20and%20movies>.

<sup>15</sup> R.P.B. Singh, *Cosmic Order and Sacred Geometry in the Hindu Temple of Khajuraho*, (M.K.D.S.S. PERERA (ED.), BUILT ENVIRONMENT, SACRED GEOMETRY AND DEIFORM FELLOWSHIP), GODAGE INT'L PUBLISHERS (2009).

<sup>16</sup> A.T. MANN, SACRED ARCHITECTURE (Element Books 1993).

<sup>17</sup> M. KHANNA, YANTRA: THE TANTRIC SYMBOL OF COSMIC UNITY (Thames & Hudson 2003).



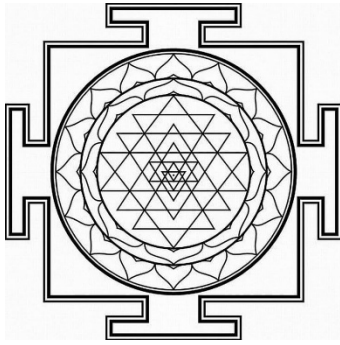


Figure 1 Sri Yantra

### 1) *Mathematical Foundation of Yantra Construction*<sup>18</sup>

The word “yantra” combines the Sanskrit roots “yam” (to control or restrain) and “tra” (instrument), defining these geometric forms as instruments for focusing and controlling mental attention.<sup>19</sup>

Mathematical perfection is applied during yantra formation through careful geometrical rules, so that each line, angle and intersection turns into symbolic meaning. The Sri Yantra is the most complex yantra, made up of nine interlocking triangles, with four turning upward towards Shiva and five turning downward towards Shakti. The 43 triangles formed by these nine create a unique mandala with advanced math. Very few people can fully understand the mathematical details of how the mandala is formed.<sup>20</sup>

### 2) *Living Traditions in Contemporary Practice*

Contemporary yantra creation demonstrates how ancient mathematical principles remain vibrant and adaptive. Traditional practitioners maintain the essential geometric relationships while employing modern tools to achieve the precision these sacred forms demand.<sup>21</sup> This adaptation illustrates how living traditions evolve their methods while preserving their essential characteristics such as the quality that makes them particularly vulnerable to digital appropriation that strips away both context and continuity.

### 3) *Cryptographic Dimension of Sacred Patterns*

Different yantra contains different patterns that act as sacred formulas for metaphysical beliefs. The Kali Yantra includes geometry shaped like a pentagon which reflects the five main elements,<sup>22</sup> while the Ganesha Yantra is made from triangles that symbolize the deity’s abilities to get rid of obstacles and help us start something new.<sup>23</sup> When making a yantra, following a specific pattern,

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<sup>18</sup> *Sbri Yantra: the King of all Yantras*, KAARIGAR (2022), <https://kaarigarhandicrafts.com/blogs/kaarigar/sri-yantra-the-king-of-all-yantras>.

<sup>19</sup> T. Dutta & M. Ghosh, *Sonic Geometry in Temple Architecture*, 11 VEDA-VAANEE 45, 45–62 (2023), <https://vedasamskrutisamiti.org.in/wp-content/uploads/2024/07/Paper-4-Issue-2-Vol1-Jul-23-vEda-vaaNee.pdf>.

<sup>20</sup> S. Hosseinabadi, *Residual Meaning in Architectural Geometry: Tracing Spiritual and Religious Origins in Contemporary European Architectural Geometry*, UNSW SYDNEY (2016).

<sup>21</sup> *Unveiling the Secrets of Copper Yantra Making Machine: A Comprehensive Guide*, ASIAN STAR, 2025, <https://www.asianstarcnc.com/cnc-copper/unveiling-the-secrets-of-copper-yantra-making-machine-a-comprehensive-guide>.

<sup>22</sup> *The Kali Yantra*, TOWARD STILLNESS, <http://towardstillness.com/resources/articles/the-kali-yantra/>.

<sup>23</sup> Kathleen Karlsen, *Ganesha Yantra*, VOCAL MEDICINE - KATHLEEN KARLSEN, <https://kathleenkarlsen.com/ganesha-yantra/>.

using certain mathematical ratios and shaping the ends in a set way creates what practitioners think are active forms.

#### **D. The Challenge of Protecting Living Mathematical Traditions**

Living traditions in yantra creation exist now among traditional practitioners who know the way to build, measure and charge them. Many current yantra creators rely on advanced technology to maintain the high level of detail demanded in their works, illustrating how ancient methods keep changing but keep their main traits.<sup>24</sup>

##### *1) Living Traditions vs. Static IP Frameworks*

Since sacred geometric traditions are flexible and constantly developing, it's hard for intellectual property laws made for fixed authors and rights. The protection of evolving sacred geometric traditions under current intellectual property (IP) laws is challenging because these traditions are communal, dynamic, and intergenerational, unlike the fixed individual ownership model IP systems assume. Indian copyright law offers protection for authors for life plus 60 years, a model tailored for individual creators rather than community custodians.<sup>25</sup> Differential rule generation, which develops through generations in various parts of the world, resulting in diverse versions rather than a single original creation,<sup>26</sup> explains why there are difficulties determining ownership under present IP systems. Hence, rigid IP frameworks fail to accommodate the fluid nature of sacred geometric traditions, emphasizing the need for sui generis protections that recognize communal rights and continuous cultural development.<sup>27</sup>

##### *2) Limitations of Conventional IP Frameworks*

Traditional intellectual property law struggles to accommodate “*intergenerational innovation*”, a group exercise in which members of various generations come together to provide knowledge and experiences in order to generate a new solution. This is a dynamic interplay of the new ways of thinking and digital dexterity of the younger generations, coupled with the rich experience-based wisdom of the older generations. This is in the case of traditional knowledge where cultural practices, including the sacred geometry, are passed on by elders to young people. Such

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<sup>24</sup> Swami Ayyappa Giri, *Yantra: Harnessing the Power of Mystical Geometry*, YOGINI ASHRAM (2016), <https://www.yoginiashram.com/yantra-harnessing-the-power-of-mystical-geometry/>.

<sup>25</sup> The Copyright Act, 1957, No. 14 of 1957, § 22 (India) (*Hereinafter* referred to as “Copyright Act 1957”).

<sup>26</sup> S.R. Munzer & K. Raustiala, *The Uneasy Case for Intellectual Property Rights in Traditional Knowledge*, 27 CARDOZO ARTS & ENT. L.J. 37 (2009).

<sup>27</sup> *Genetic Resources, Traditional Knowledge and Traditional Cultural Expressions*, WIPO, <https://www.wipo.int/tk/en/>; Madhavi Sunder, *IP*<sup>3</sup>, 59 STAN. L. REV. 257 (2006).

transmission is not only a form of cultural preservation, but also a way to creatively adapt to the world, with young practitioners potentially using new technology or bilingual methods of making the ancient knowledge accessible and meaningful, so that traditions could be kept alive and continue to be developed.<sup>28</sup> in which traditional wisdom is shared and built upon by many generations. The law prioritizes individual makers and sets set strict time limits which makes it hard to appreciate knowledge that changes and grows within a community. Specifically, under the Indian Copyright Act, 1957, copyright protection for literary, dramatic, musical, and artistic works lasts for the lifetime of the author plus 60 years from the beginning of the calendar year following the author's death.<sup>29</sup> This finite duration reflects the balance between incentivizing creation and eventually contributing works to the public domain.

Similar restrictions in patent systems call for creation that is novel and not obvious,<sup>30</sup> making it hard for discoveries from spiritual and cultural learning to gain protection. Section 2(1)(j) defines “invention” as a new product or process involving an inventive step that is not obvious to a person skilled in the art and capable of industrial application.<sup>31</sup> This requirement can make it difficult for spiritual or cultural knowledge which is often transmitted collectively over generations and lacking novelty in a conventional sense, to qualify for patent protection.<sup>32</sup>

Therefore, while copyright and patent laws in India provide protection to individual creators and inventors under specific conditions and for fixed durations, these frameworks are poorly suited to safeguarding traditional, evolving communal knowledge rooted in spiritual and cultural learning.<sup>33</sup>

### 3) *Gaps in Current Protection Mechanism*

While India's TKDL serves its purpose by protecting medicinal knowledge, once bio-piracy could have cloned them, but it does not cover as much architectural and geometrical knowledge. Most of the information in the database comes from texts about Indian medicine and not the mathematical and design principles of its geometric traditions.<sup>34</sup>

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<sup>28</sup> I. Nurhas *et al.* *Barriers and wellbeing-oriented enablers of intergenerational innovation in the digital age*, 22 UNIV ACCESS INF SOC 591–607 (2023).

<sup>29</sup> Copyright Act 1957, § 22.

<sup>30</sup> The Indian Patents Act, 1970, No. 39 of 1970, § 2(1)(l) (India) (Hereinafter referred to as “Patents Act 1970”).

<sup>31</sup> Patents Act 1970, § 2(1)(j).

<sup>32</sup> *The Protection of Traditional Knowledge: Draft Gap Analysis: Revision*, WIPO/GRTKF/IC/13/5(B) REV., Annex I, at 9.

<sup>33</sup> *Intervention of the Delegation of New Zealand during the eleventh session of the Committee*, ADOPTED REPORT OF THE ELEVENTH SESSION, WIPO/GRTKF/IC/11/15, ¶ 309.

<sup>34</sup> *Traditional Knowledge Digital Library*, PRESS INFORMATION BUREAU (Sept. 01, 2022), <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2022/sep/doc20229199001.pdf>.

Similar problems are found when analysing indigenous knowledge systems around the world. The Māori people in New Zealand have seen their trademark patterns (*ta moko*) used by others online, whereas Aboriginal dot painting techniques have been exploited commercially without the community's authorization.<sup>35</sup> These examples from other countries clearly show why sui generis mechanisms are needed for indigenous and TK. They illustrate the clear limitations of conventional intellectual property (IP) regimes in protecting indigenous and traditional knowledge (TK), which is communal, evolving, and intergenerational.<sup>36</sup> Conventional IP laws prioritize individual, time-limited rights and novelty, making them poorly suited for TK. In contrast, sui generis mechanisms are tailored legal frameworks that recognize collective ownership, protect bio-cultural heritage in situ, incorporate customary laws, and require free prior informed consent for use.<sup>37</sup> These systems prevent unauthorized appropriation and ensure equitable benefit-sharing while respecting the spiritual, cultural, and ecological contexts of TK.

For instance, the Potato Park in Peru exemplifies a sui generis system integrating intellectual, material, and spatial indigenous knowledge under community control, differing fundamentally from Western IP focused on individual commercial rights.<sup>38</sup> The World Intellectual Property Organization (WIPO) emphasizes that sui generis systems provide legal certainty, lower transaction costs, and promote sustainable development benefits tailored to indigenous contexts.<sup>39</sup> These examples thus justify India's need to adopt sui generis protection mechanisms that are culturally sensitive, participatory, and equitable to safeguard its rich bio-cultural heritage.

#### 4) *The Imperative for New Frameworks*

The fact that ancient principles are intertwined with modern practice complicates the issue of preserving them even more, as it turns into an attempt to save the heritage of living heritage. As a result, static documentation practices are now being challenged, and there is a need for defences that maintain traditional frameworks while guarding against unauthorized access or misuse.

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<sup>35</sup> R. Bocquillon & J. van Loon, *Symbolic Misery and Digital Media: How NFTs Reproduce Culture Industries*, 11 NECSUS EUR. J. MEDIA STUD. 24 (2022).

<sup>36</sup> *The Protection of Traditional Knowledge: Revised Objectives and Principles*, WIPO/GRTKF/IC/17/5, art. 4.

<sup>37</sup> *Elements of a Sui Generis System for the Protection of Traditional Knowledge*, WIPO/GRTKF/IC/4/8 (Sept. 30, 2002), [https://www.wipo.int/edocs/mdocs/tk/en/wipo\\_grtkf\\_ic\\_4/wipo\\_grtkf\\_ic\\_4\\_8.pdf](https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_4/wipo_grtkf_ic_4_8.pdf).

<sup>38</sup> *Sui Generis Systems for the Protection of Traditional Knowledge: Information for the Secretariat of the Convention on Biological Diversity* (2005), IIED, <https://www.iied.org/sites/default/files/pdfs/migrate/G02378.pdf>.

<sup>39</sup> *Development of Elements of Sui Generis Systems for the Protection of Traditional Knowledge*, U.N. DOC. UNEP/CBD/WG8J/5/6, 2, CONVENTION ON BIOLOGICAL DIVERSITY (Sept. 20, 2007), <https://www.cbd.int/doc/meetings/tk/wg8j-05/official/wg8j-05-06-en.pdf>.

The challenge extends beyond legal protection to encompass the preservation of mathematical wisdom that has guided Indian civilization for millennia. As these traditions meet new and rising digital problems, it is not just culturally important, but crucial to protect the integrity of knowledge systems that Indians depend on in everyday life.<sup>40</sup>

### III. THE NFT EXPLOSION – OPPORTUNITIES & THREAT

The value and perception of cultural artifacts in digital spaces have changed greatly because of NFTs. India's ancient designs now have great opportunities to be promoted around the globe and kept safe, but they also face the risk of being used incorrectly and commercialized. As the NFT market quickly expanded and reached a peak trading amount of \$25 billion in 2021, it allowed for culture to be authentically shown but also made it easier for exploitation of traditional cultures.<sup>41</sup> At present, digital transformation is happening when India's cultural traditions encounter more globalization pressures. For centuries, spiritual minds have used sacred geometric shapes, but now their high meaning can just as easily be tossed aside to make them look good on digital platforms. This tension should be explored by handling the menace of cultural theft and the positive effects of innovative projects put together by broad groups of people.<sup>42</sup>

Globalization has amplified the exposure of India's sacred geometric symbols on digital platforms, creating a tension between their deep spiritual meaning and their reduction to mere aesthetic or commercial assets.<sup>43</sup> The commodification of these symbols as NFTs or digital collectibles often separates them from their cultural and ritual contexts, leading to cultural appropriation and harm to source communities. However, globalization also offers opportunities for wider dissemination and collaborative innovation to empower and preserve these traditions.<sup>44</sup> Balancing these dynamics requires ethical vigilance, legal frameworks recognizing communal custodianship, and digital practices that respect the sacredness of India's heritage rather than exploiting it for superficial appeal. This balance is crucial for safeguarding India's sacred geometry in an interconnected world.

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<sup>40</sup> Septika Laily Anti & Ifan Awanda, *Preserving Traditional Knowledge in the Digital Era: Challenges and Strategies*, 76 SOCIOSPHERE: INTERDISCIPLINARY JOURNAL OF SOCIAL SCIENCES AND HUMANITIES, 76-82 (2025).

<sup>41</sup> Elizabeth Howcroft, *NFT Sales Hit \$25 Billion in 2021, Growth Shows Signs of Slowing*, REUTERS (Jan. 10, 2022), <https://www.reuters.com/markets/europe/nft-sales-hit-25-billion-2021-growth-shows-signs-slowng-2022-01-10/>.

<sup>42</sup> Nisa Taptiani et al., *The Impact of Globalization on Local Culture*, 45 INT'L J. PROGRESSIVE SCI & TECH., (2024).

<sup>43</sup> Divinah Andrew, *The Impact of Globalization on the Traditional Religious Practices and Cultural Values: A Case Study of Kenya*, 4 INT'L J. CULTURE & RELIGION STUD., 6 (2023).

<sup>44</sup> *Id.*

### A. Digital Colonization of Sacred Forms<sup>45</sup>

Indian sacred geometry has been widely used in the modern NFT space, and this is now generally considered a form of digital colonialism against traditional religious practices.<sup>46</sup> Examining popular NFT platforms, it is clear that symbols with great cultural meaning are often taken out of their ceremonial setting and turned into digital assets. The “*Sacred Geometry Crypto*” collection, launched on OpenSea in August 2021,<sup>47</sup> faces significant challenges amid the 2024 NFT market crisis, with 98% of NFTs remaining unprofitable and OpenSea’s trading volume decreasing by 76.32%.<sup>48</sup>

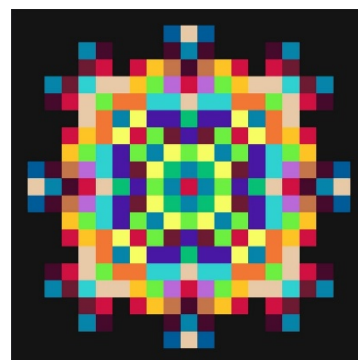


Figure 2 Mandala Token from OpenSea

Digital technology has profoundly influenced mandala art creation, enabling artists to design and distribute mandalas through computer applications and online platforms. Such developments empower designers to create unique looks, adjust to customers’ needs and market their works internationally.<sup>49</sup> However, there are some problems, like giving up the calming and actual process of doing traditional art and the doubts about if something is genuinely authentic after being copied. In spite of these issues, digital tools have mainly helped mandala art move forward and grow.<sup>50</sup>

The most egregious example of such digital appropriation manifests in the “*Mandala Tokens*” collection on OpenSea. Launched in March 2021 on the Ethereum blockchain, this collection comprises 1,347 digital mandala artworks listed under the Art category. As of mid-2024, the collection’s floor price stands at 1.03 ETH, with a total trading volume of 18.84 ETH across 161 unique owners (representing 12% of total token holders).<sup>51</sup> Despite the collection’s commercial success, these mandalas are presented as aesthetic objects devoid of their traditional Buddhist or

<sup>45</sup> Mandala Tokens, OPENSEA (2021), <https://opensea.io/collection/mandala-tokens>.

<sup>46</sup> *The Ethical Implications of NFTs: Ownership, Sustainability, and Digital Rights*, MEDIUM (March 24, 2023); Cyber Cosmos, *The Ethical Implications of NFTs: Ownership, Sustainability, and Digital Rights*, MEDIUM (Dec. 2024).

<sup>47</sup> *Sacred Geometry Crypto*, OPENSEA (Aug. 2025), <https://opensea.io/collection/sacred-geometry-crypto/offers?tab=items>.

<sup>48</sup> *Analysis: 98% of NFTs Launched in 2024 Unprofitable, Only 2% Yield Gains*, BINANCE SQUARE, (Nov. 2024), <https://www.binance.com/en/square/post/163695520256841>.

<sup>49</sup> Neha Gupta, *Mandala Art and the Importance of Impermanence: A Spiritual Lesson in Letting Go*, NEHA CREATIONS (Jun. 07, 2025), <https://www.nehascreations.com/blogs/news/mandala-art-and-the-importance-of-impermanence-a-spiritual-lesson-in-letting-go?srltid=AfmBOooR1HPCGmTD53xMnkToc5dQeZUuiKdYE54JpnK1Cr8Nu4TrGF>.

<sup>50</sup> *Mandalas in the Digital Age: Impact of Digital Technology on Mandala Art*, SUMMER ART, <https://summerart.in/mandalas-in-the-digital-age-impact-of-digital-technology-on-mandala-art/>.

<sup>51</sup> *Supra*, note 45.

Hindu spiritual significance, and lack attribution or consent from source communities. This case exemplifies the commodification of sacred geometry in the NFT space, where complex cosmological symbols are reduced to visual trends stripped of ritual context.<sup>52</sup>

These projects often remove the ceremonial and religious features of sacred symbols, hoping to turn them into objects meant to decorate. According to studies, the NFT scene in India faces the same injustices as standard art markets, as creators do not earn much while those selling or distributing their work gain the biggest benefits.<sup>53</sup>

People involved in higher education are deeply worried about the way it is now being commodified. Religious organizations worry about the way sacred symbols are no longer valued, while artists who have dedicated their lives to traditional crafts now compete with artificial versions of their culture's art.<sup>54</sup> Culture is important here since using sacred symbols only for show means they lose their transforming properties, leading young people to misunderstand their religious past.

## **B. Emergent Preservation Models**

In response to digital appropriation threats, innovative ways to preserve and transmit culture openly are emerging. Community efforts support tradition the most, as local artisan groups combine forces with technologists to create real digital databases for sacred geometric forms. The Indian Railway Catering and Tourism Corporation [“**IRCTC**”] has set a significant precedent by issuing NFT-based pilgrimage tickets to Ayodhya, turning them into permanent digital souvenirs of the Shree Ramotsav. Powered by NFT trace, this initiative marks official recognition of blockchain's role in religious experiences, bridging technology and spirituality. Traditionally wary of digital tools, the religious domain saw rapid tech adoption during the COVID-19 pandemic, paving the way for such innovations.<sup>55</sup> As designer Kirti Vardhan Rathore noted, it's “*a great move towards increasing awareness of NFTs,*” reflecting how government and religious bodies can collaborate to preserve spiritual significance in the digital era.<sup>56</sup>

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<sup>52</sup> Shideh Arjmandi, *Globalizing the Metaverse: Embracing Persian Culture*, POLITECNICO DI MILANO (2023).

<sup>53</sup> Kamyani Sharma, *In India, the world of NFTs suffers from the same inequalities as the world of traditional art*, SCROLL (April 09, 2022), <https://scroll.in/magazine/1020893/in-india-the-world-of-nfts-suffers-from-the-same-inequalities-as-the-world-of-traditional-art>.

<sup>54</sup> *Id.*

<sup>55</sup> Ezra Icy, *NFT train ticket options: Winning over tech enthusiasts in India*, COINGAPE (March 15, 2024), <https://coingape.com/trending/nft-train-ticket-options-winning-over-tech-enthusiasts-in-india/>.

<sup>56</sup> Pradipta Mukherjee, *Indian pilgrims get NFT collectible option*, COINGEEK (March 11, 2024) <https://coingeek.com/indian-pilgrims-get-nft-collectible-option/>.

Using NFT technology for religious tourism, as shown by the Indian Railway Catering and Tourism Corporation, demonstrates recognition of blockchain's value in saving culture by issuing tickets to Ayodhya using NFTs.<sup>57</sup> The TKDL has done important work in saving indigenous knowledge, though it cannot currently respond to the problems that happen in the NFT world. Because it was built for filing patents, TKDL does not have the necessary technology to track NFTs being used around the world in real time. The framework used now is not much help with tracking changes to symbols in the online world which shows a need for updated systems.<sup>58</sup>

Co-operative projects are starting to develop with leading Indian cultural institutions joining forces with globally recognized blockchain firms dedicated to following ethical rules. They aim to give legal artists genuine chances to display their work, all while making it difficult for others to steal it digitally. There is increasing focus on cultural smart contracts, as they put community consent processes into the blockchain at the time of initiation.

These collaborations aim to empower legitimate artists by providing secure digital platforms that deter unauthorized copying. A key focus is on cultural smart contracts, which embed community consent mechanisms into the blockchain from the outset, ensuring that any use of cultural heritage receives approval from rightful custodians.<sup>59</sup> This approach aligns with government strategies such as NITI Aayog's "*Blockchain: The India Strategy*" and IndiaChain initiative, which highlights blockchain's potential to improve transparency and trust in governance and business processes, including cultural sectors.<sup>60</sup> Additionally, the Ministry of Electronics and Information Technology's (MeitY) the National Blockchain Framework promote blockchain adoption with a focus on protecting intellectual property and community interests.<sup>61</sup> These efforts collectively represent a promising model for integrating traditional cultural custodianship with cutting-edge technology to enhance ethical stewardship of India's rich heritage.

Blockchain alliances the leading Indian cultural organizations are engaging with Web3 global companies that commit to upholding the principles of ethical NFT. In 2024, Pilot programmes have been announced to match museums like Indira Gandhi National Centre for the Arts with Polygon-based start-up to mint artworks powered by cultural smart contracts. At the time of their

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<sup>57</sup> *Id.*

<sup>58</sup> *Supra* note 35.

<sup>59</sup> A. Kumar, *Blockchain: The India Strategy – Towards Enabling Ease of Business, Ease of Living, and Ease of Governance*, ICRIER (2020).

<sup>60</sup> *Id.*

<sup>61</sup> *National Blockchain Framework*, MEITY, <https://blockchain.meity.gov.in/>.



creation, these contracts bake community-vetted metadata such as origin stories, ritual context, revenue-sharing and revocation clauses, directly on-chain. Since the licence and consent process is written into the token itself, any resale will automatically redirect royalties back to the wallets of the communities that were given the rights to the token and mark any attempts to offer the work without the explicit authorisation of the original custodians. According to Indian legal commentators, such designs not only meet the requirements of the Copyright (assignment must specify royalty terms), but provide artists with real-time provenance tracking currently provided by no existing databases, such as TKDL.<sup>62</sup>

The primary challenge within these emerging models lies in balancing accessibility and protection. It is concluded from the research on Hindu temple architecture that detailed recording of such work could aid its appreciation worldwide, as well as hinder unethical uses.<sup>63</sup> These suggested new models that general geometric concepts can be used in schools, but particular layouts for use in trade must first be sanctioned by the whole community.

### C. The Authentication Crisis

Digital marketplaces bring remarkable problems in confirming the true ownership and history of sacred items which scholars have called an “*authentication crisis*” for religion. Right now, being able to prove ownership of digital assets is easy for blockchain technology, though validating cultural authority is quite tough. Deciding who is qualified to digitize sacred India symbols is still unclear, as India’s many religions and regions all interpret these symbols differently.<sup>64</sup>

Contemporary authentication systems are made worse by technical issues. Although NFT platforms prove that a token is related to a specified asset, they don’t know if the artist was really qualified to tokenize it. The absence of boundaries has let unattached individuals gain from spiritual geometry by creating their own collections.<sup>65</sup> This problem becomes more severe since many religious symbols belong to everyone, not one person, so standard copyright laws do not help.

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<sup>62</sup> *Blockchain: The India Strategy, Part I*, NITI AAYOG (2020).

<sup>63</sup> Mayank Chaturvedi, *Fractal Geometry and Hindu Temple Architecture*, WORDPRESS (Sept. 7, 2022), <https://chaturvedimayank.wordpress.com/2022/09/07/fractal-geometry-and-hindu-temple-architecture/>.

<sup>64</sup> Sudipta Shee, *Digital preservation of cultural heritage in India: A digital age*, 7 INT. J. HUMANIT. EDUC. RES. 260-265 (2025).

<sup>65</sup> *Supra* note 53.

Authentication disputes have appeared in Indian courts, but the law has yet to provide many examples. Key cases dealing with digital evidence issues such as *Shafi Mohammad v. The State of Himachal Pradesh*<sup>66</sup> and *Anvar P.V. v. P.K. Basheer*<sup>67</sup> emphasize strict compliance with Section 65B of the Indian Evidence Act, 1872, for admissibility of electronic records. Trademark disputes also raise authentication concerns, with courts clarifying jurisdiction and arbitrability in online infringement cases, e.g., *HK Media Limited v. Brainlink International Inc.*<sup>68</sup> However, there are many problems in judgeship over who officially represents cultural heritage in various NFT collections.<sup>69</sup> And religious institutions cannot control blockchains, since they reject external laws.<sup>70</sup> Presently, these disputes are framed within existing IP and electronic evidence laws, stressing procedural rigor and statutory compliance. Ongoing judicial and legislative developments are needed to effectively address authentication issues in India's evolving digital cultural heritage landscape.

Legal experts, technologists and culture experts are now working together to create new standards for identifying culture online. One of the frameworks being considered involves testing authenticity within local communities, forming multi-identity boards for authentication and tracking ownership with blockchain-based systems that take into account the item's cultural background. These standards recognize that authentic cultural preservation requires not just technological innovation but fundamental restructuring of how digital platforms acknowledge and respect TK systems.<sup>71</sup>

Such issues with authentication also apply to larger matters about digital control and preserving cultural identity. Since sacred geometry now reaches the global digital economy, local communities must work out how to maintain their spiritual authority even when they come across technologies that bypass traditional leaders. This conflict highlights that we must have technologies that do not limit communities and improve their ability to respect and enjoy their culture.<sup>72</sup>

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<sup>66</sup> *Shafhi Mohammad v. State of H.P.*, (2018) 2 SCC 801.

<sup>67</sup> *Anvar P.V v. P.K.Basheer & Ors*, 2014 (10) SCC 473.

<sup>68</sup> *HT Media Limited v. Brainlink International*, 2021 SCC OnLine Del 5398.

<sup>69</sup> Primavera De Filippi, Morshed Mannan, & Wessel Reijers, *The alegality of blockchain technology*, 41 POLICY AND SOCIETY 358-372 (2022).

<sup>70</sup> A. Wagner & Marie-Sophie de Clippele, *Safeguarding Cultural Heritage in the Digital Era – A Critical Challenge*, 36 INT. J. SEMIOTIC LAW 1915-1923 (2023).

<sup>71</sup> Xinda Liu et al., *Blockchain in Digital Cultural Heritage Resources: Technological Integration, Consensus Mechanisms, and Future Directions*, 13 NPJ HERITAGE SCIENCE (2025).

<sup>72</sup> Nevine Nasser, *Sacred Geometry: The Spiritual Meaning of Islamic Architectural Technologies*, ACSF (May 28, 2024), <https://acsforum.org/sacred-geometry-the-spiritual-meaning-of-islamic-architectural-technologies/>.

#### IV. LEGAL & TECHNOLOGICAL SAFEGUARDS

The protection of India's sacred geometry requires a comprehensive framework that addresses both immediate digital threats and long-term preservation needs. Current legal instruments, designed for conventional intellectual property, prove inadequate when confronted with the unique challenges posed by sacred symbols in digital marketplaces. This section outlines a three-pronged approach: reforming existing legal frameworks, implementing blockchain-driven community governance, and deploying Artificial Intelligence ["AI"]-powered monitoring systems to create a robust protective ecosystem.

##### A. Reforming IPR Frameworks

Despite the ancient and community-driven nature of this knowledge, current intellectual property regimes especially the *Copyright Act, 1957* lack provisions for protecting such traditional expressions. These symbols and yantras, often transmitted orally or through practice,<sup>73</sup> fall outside the formal categories of authorship, originality, or fixation required by law.<sup>74</sup> This creates a legal vacuum where sacred expressions are exploited as commercial NFTs without consent or benefit to their originators. Thus, there is an urgent need to develop *sui generis* frameworks tailored to TK and traditional cultural expressions ["TCE"] alongside reforms in existing IP statutes.

##### 1) *Sui Generis Framework*

India's TKDL, though pioneering in preventing biopiracy in Ayurveda and Unani medicine, does not yet extend its database or legal impact to visual and symbolic expressions like yantras.<sup>75</sup> The database contains over 34 million pages on some 2,260,000 traditional medicines under TK but lacks the systematic documentation of sacred geometric forms that now populate NFT marketplaces.<sup>76</sup>

The *Sri Yantra*, for instance, is not merely a graphic pattern but a spiritually consecrated diagram symbolizing cosmic order in Shakta traditions under the Tantric Hinduism.<sup>77</sup> Its digital replication

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<sup>73</sup> GUDRUN BÜHNEMANN, *MANDALAS AND YANTRAS IN THE HINDU TRADITIONS* (2003).

<sup>74</sup> Copyright Act 1957, § 13.

<sup>75</sup> *Traditional Knowledge Digital Library Unit (TKDL)*, CSIR, <https://www.csir.res.in/documents/tkdl>.

<sup>76</sup> Samir K. Brahmachari, *Traditional Knowledge Digital Library (TKDL) – An Effective and Novel Tool for Protection of India's Traditional Knowledge Against Bio-Piracy*, PRESS INFORMATION BUREAU (2011), [https://www.tkdl.res.in/tkdl/PressCoverage/PIB\\_120811.pdf](https://www.tkdl.res.in/tkdl/PressCoverage/PIB_120811.pdf).

<sup>77</sup> Gérard P. Huet, *Sri Yantra*, RESEARCH GATE (Jun. 2, 2025), [https://www.researchgate.net/profile/Gerard-Huet/publication/277295011\\_Sri\\_Yantra/links/55af62d008aed9b7dcddbc42/Sri-Yantra.pdf](https://www.researchgate.net/profile/Gerard-Huet/publication/277295011_Sri_Yantra/links/55af62d008aed9b7dcddbc42/Sri-Yantra.pdf).

and commercial use via NFTs on platforms like OpenSea, one of the largest NFT marketplaces,<sup>78</sup> without cultural context or community consent, pose a unique challenge. Such usage, though not strictly illegal under current copyright law, can amount to cultural misappropriation and moral injury to source communities. Expanding TKDL's ambit to include sacred geometry like *Sri Yantras*, cultural motifs, and indigenous architecture that carry deep spiritual and cultural value, would allow state-led documentation and preventive protection. Protecting such TCEs would preserve community identity, prevent misuse, and ensure artisans benefit culturally and economically. A digital archive, like TKDL, could serve as both a shield and a platform for respectful recognition.

Internationally, institutions like the World Intellectual Property Organization [**"WIPO"**] have acknowledged this gap. WIPO's Intergovernmental Committee on Intellectual Property and Genetic Resources, TK and Folklore [**"IGC"**]<sup>79</sup> continues to push for *sui generis* legal protection of TK, TCE and genetic resources [**"GRs"**]<sup>80</sup> which could, for instance, grant perpetual communal rights and require mandatory disclosure and consent for commercial use.<sup>81</sup> Further, reforms to the Indian Copyright Act could draw from *Peru's Law No. 27811*, which protects indigenous knowledge through a register and mandates benefit sharing with source communities.<sup>82</sup> Such examples demonstrate the viability of codifying protections for sacred designs in India through a dedicated legal pathway.

## B. Blockchain-Driven Solutions

While legal reform provides the foundation, blockchain technology offers innovative mechanisms for community-controlled heritage protection. Rather than simply digitizing sacred symbols, blockchain can embed cultural governance directly into digital assets through smart contracts and decentralized autonomous organizations [**"DAOs"**].

### 1) *Smart Contracts as Cultural Guardians*

The decentralization enabled by blockchain technology offers new avenues for protecting sacred symbols in the digital age. An NFT is a unique cryptographic asset which can encode metadata

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<sup>78</sup> OPENSEA, <https://opensea.io/>.

<sup>79</sup> Intergovernmental Committee (IGC), WIPO, <https://www.wipo.int/en/web/igc>.

<sup>80</sup> *Elements of a Sui Generis System for the Protection of Traditional Knowledge*, WIPO/GRTKF/IC/3/8, (March 29, 2002), [https://www.wipo.int/edocs/mdocs/tk/en/wipo\\_grtkf\\_ic\\_3/wipo\\_grtkf\\_ic\\_3\\_8.pdf](https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_3/wipo_grtkf_ic_3_8.pdf).

<sup>81</sup> *Traditional Knowledge, Genetic Resources and Traditional Cultural Expressions/Folklore*, WIPO, [https://www.wipo.int/ip-development/en/agenda/flexibilities/resources/tk\\_gr\\_tce\\_f.html](https://www.wipo.int/ip-development/en/agenda/flexibilities/resources/tk_gr_tce_f.html).

<sup>82</sup> *Law No. 27811: Introducing a Protection Regime for the Collective Knowledge of Indigenous Peoples derived from Biological Resources, Peru*, WIPO (Aug. 10, 2002), <https://www.wipo.int/wipolex/en/legislation/details/3420>.

that attributes cultural ownership, embeds usage conditions, and even automates royalties through *smart contracts*.<sup>83</sup> For example, a community organization or temple trust could mint an NFT of a sacred symbol with embedded cultural metadata and licensing rules. Unauthorized reproduction would not only violate blockchain records but could also trigger legal takedowns via smart contract logic. This model of community-controlled NFTs shifts power back to originators by allowing digital governance over heritage.

## 2) *Community-Controlled DAOs*

Furthermore, the concept of DAO enables distributed governance by communities themselves. As discussed earlier, religious bodies often lack effective control over blockchain spaces, a DAO could collectively decide how a sacred symbol is to be used, commercialized, or restricted, ensuring that spiritual and cultural values remain central in the decision-making process.

A powerful example of blockchain-driven cultural protection is Canada's *400 Drums* project, where NFTs are used not to sell sacred ceremonial drums, but to digitally represent them and provide access to Indigenous marketplaces and educational tools. Created in consultation with Elders, the initiative allows artisans like master drum-maker David Fierro to uphold ceremonial protocols while earning income through digital access, tutorials, and cultural utility. The project reflects Indigenous economic principles of reciprocity and limited harvesting, demonstrating how blockchain can align with traditional values while enabling decentralized cultural governance.<sup>84</sup>

## 3) *Implementation Challenges*

Despite the promise of AI, blockchain, and digital registries for protecting sacred geometry, significant challenges persist in the Indian context. India's regulatory environment lacks clarity. The *Information Technology Act, 2000*<sup>85</sup> and rules under the *Intermediary Guidelines 2021*<sup>86</sup> do not yet offer a legal definition or protection mechanism for smart contracts in cultural use. Moreover, digital literacy and access to technological resources remain uneven, especially in rural and marginalized communities, creating gaps in both awareness and the ability to participate in or

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<sup>83</sup> Rakesh Sharma, *Non-Fungible Token (NFT): What It Means and How It Works*, INVESTOPEDIA, <https://www.investopedia.com/non-fungible-tokens-nft-5115211>.

<sup>84</sup> Kate Wilson, *How NFTs Are Transforming Indigenous Economics*, VANCOUVER TECH JOURNAL (Aug. 18, 2022), <https://vantechjournal.com/p/how-nfts-are-transforming-indigenous>.

<sup>85</sup> Information Technology Act, 2000, No. 21 of 2000 (India).

<sup>86</sup> Information Technology (*Intermediary Guidelines and Digital Media Ethics Code*) Rules, 2021, GAZETTE OF INDIA, pt. II, sec. 3(i), G.S.R. 139(E) (Feb. 25, 2021) (India), amended by G.S.R. 240(E) (Apr. 6, 2023).

benefit from these protective systems.<sup>87</sup> This digital divide risks leaving traditional custodians of sacred symbols underrepresented in governance and enforcement processes, potentially undermining the inclusivity and effectiveness of these technological solutions.

### C. AI-Powered Monitoring Systems

The scale and speed of digital appropriation demand automated monitoring systems capable of detecting unauthorized use across global platforms.

#### 1) *Advanced Pattern Recognition*

AI can assist in detecting and preventing the unauthorized use of religious practices and rituals used in sacred geometry in digital spaces.<sup>88</sup> Image recognition algorithms, trained on datasets of yantras, mandalas, and temple motifs, can identify reproductions across NFT marketplaces, social media, and design platforms. This proactive monitoring could complement legal enforcement by issuing alerts or initiating automated takedown requests. Platforms like Google Vision API and open-source tools like TinEye already offer rudimentary pattern recognition capabilities. However, these need to be customized for culturally specific symbols like the *Sri Chakra* or *Navagraha yantras*, which require contextual and symbolic interpretation beyond mere geometry.

#### 2) *Proactive Enforcement Mechanisms*

The integration of machine learning tools into intellectual property enforcement is not new. For instance, YouTube's Content ID system uses AI to detect copyrighted audio/visual content. A similar framework for visual sacred designs could be implemented in Indian NFT marketplaces, such as *WazirX NFT* or *Jupiter Meta*, to auto-flag culturally sensitive works.<sup>89</sup> However, the use of AI in this domain must address concerns of data sovereignty, especially when sacred symbols are digitized and stored in foreign-owned servers. Privacy laws, such as the upcoming *Digital Personal Data Protection Act, 2023*,<sup>90</sup> must be interpreted to ensure that cultural communities retain control over their digital heritage.

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<sup>87</sup> Dr. Suruchi Kumari & Maitri Singh, *Safeguarding Rural India Through Critical Digital Literacy Endline Assessment Report*, DIGITAL EMPOWERMENT FOUNDATION (2024), [https://www.defindia.org/wp-content/uploads/2024/12/Aspen-Endline-Report\\_14-Oct-2024-2-1.pdf](https://www.defindia.org/wp-content/uploads/2024/12/Aspen-Endline-Report_14-Oct-2024-2-1.pdf).

<sup>88</sup> Khader I. Alkhouri, *The Role of Artificial Intelligence in the Study of the Psychology of Religion* 2024, 15(3) RELIGIONS 290, (2024).

<sup>89</sup> *Best NFT Marketplace In India: Why WazirX Is The Best*, WAZIRX (May 24, 2022), <https://wazirx.com/blog/best-nft-marketplace-in-india/>.

<sup>90</sup> The Digital Personal Data Protection Act, 2023, No. 22 of 2023 (India).

Ultimately, integrating AI with blockchain can create a robust system where every use of a sacred symbol is traceable, verifiable, and enforceable hence bridging the gap between traditional spiritual significance and contemporary digital law.

### 3) Challenges

The implementation of blockchain and AI-driven systems also faces challenges related to ownership disputes over pan-community symbols and the accuracy of cultural data. Many sacred symbols, motifs, and geometric patterns are shared digitally across multiple communities and regions,<sup>91</sup> making it difficult to establish clear ownership or authority for digital registration and enforcement.<sup>92</sup> Additionally, training AI systems to accurately identify and respect culturally specific meanings requires high-quality, community-validated datasets of resources that are often limited or fragmented.<sup>93</sup> Without careful curation and ongoing community involvement, there is a risk of misrepresentation or exclusion,<sup>94</sup> which could further complicate efforts to protect India's sacred geometric heritage. Furthermore, the lack of comprehensive, culturally nuanced datasets poses a significant obstacle for AI systems,<sup>95</sup> increasing the risk that automated monitoring may misinterpret or overlook important context, leading to further disputes or unintentional disrespect.

## D. Creating a Unified Protective Ecosystem

The convergence of legal reform, blockchain governance, and AI monitoring creates unprecedented opportunities for cultural protection. However, these tools must work in harmony rather than isolation to achieve meaningful impact.

### 1) Technical Integration Requirements

The integration of legal reform, blockchain governance, and AI monitoring offers a transformative opportunity to protect cultural heritage, but these tools must operate cohesively for real impact. A unified protective ecosystem requires interoperable databases that connect the expanded TKDL with blockchain registries, API frameworks for real-time data exchange between monitoring and

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<sup>91</sup> Daduvai Akshita, *The Intersection Of Innovation And Regulation: Legal Challenges Of Ai And Blockchain Technologies*, 18 THE LAWWAY WITH LAWYERS JOURNAL (2024).

<sup>92</sup> Aranya Nath & Gautami Chakravarty, *Interpreting Digital Ownership & Intellectual Property Protection for Ai-Generated Content and Blockchain enabled Digital Assets In Cyberspace*, 5 E-JAIRIPA 73-94 (2024).

<sup>93</sup> *Responsible AI: #AIForAll – Approach Document for India: Part 2 – Operationalizing Principles for Responsible AI*, NITI AAYOG (2021), <https://www.niti.gov.in/sites/default/files/2021-08/Part2-Responsible-AI-12082021.pdf>.

<sup>94</sup> *Regulating AI in India: Challenges, Initiatives, and Path to Future Success*, K SINGHANIA & CO. (2025) <https://singhanialaw.com/regulating-ai-in-india-challenges-initiatives-and-path-to-future-success/>.

<sup>95</sup> H. Akin ÜNVER, *Artificial intelligence (AI) and Human Rights: Using AI as a Weapon of Repression and its Impact on Human Rights*, Policy Department, European Parliament (2024), [https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/754450/EXPO\\_IDA\(2024\)754450\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/754450/EXPO_IDA(2024)754450_EN.pdf).

legal systems, cultural authentication protocols to verify community authority, and automated compliance tools that help digital platforms enforce cultural usage guidelines.

To ensure meaningful protection, India's Ministry of Electronics and Information Technology ["MeitY"] could pilot a scheme integrating blockchain for safeguarding sacred symbols, drawing from UNESCO's *Digital Heritage recommendations*.<sup>96</sup> India should seek bilateral agreements with major NFT marketplace jurisdictions such as the United States, United Kingdom, Hong Kong, Cayman Islands, and Canada,<sup>97</sup> to ensure that protective measures are recognized and enforced globally, preventing digital platforms from bypassing Indian regulations simply by relocating.<sup>98</sup> Ultimately, coordinated action across legal, technological, and cultural domains is essential. While challenges persist, the convergence of these mechanisms provides a real path forward for preserving India's sacred geometric heritage and fostering respectful digital innovation.

As India transitions into the Web3 and AI era, safeguarding sacred geometry requires more than conventional IP protection. A hybrid approach such as reforming IPR laws, enabling community-based blockchain governance, and deploying AI-powered cultural and legal enforcement offers a promising path. In this system, AI scans digital platforms for unauthorized use, cross-checks findings against blockchain records, and, if violations are confirmed, issues takedown notices, notifies cultural authorities, and escalates to legal proceedings if necessary. This integrated method ensures swift detection, transparent verification, and robust legal action. However, any solution must prioritize cultural consent, ethical frameworks, and the spiritual integrity of the symbols involved.

## V. ETHICAL DIMENSIONS & COMMUNITY RIGHTS

While legal and technological frameworks are essential for protecting sacred geometry, they have inherent limitations when it comes to addressing the deeper spiritual and cultural harm caused by unauthorized digital use. Legal enforcement and blockchain verification may prevent unauthorized sales or reproductions, but they cannot restore the loss of sanctity or heal the sense of alienation

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<sup>96</sup> Charter on the Preservation of the Digital Heritage, UNESDOC DIGITAL LIBRARY, <https://unesdoc.unesco.org/ark:/48223/pf0000229034>.

<sup>97</sup> *Types of NFT Marketplaces and How to Legally Structure Them*, LEGAL NODES (Aug. 25, 2025) <https://legalnodes.com/article/nft-marketplaces-legal-structuring>.

<sup>98</sup> Septika Laily Anti & Ifan Awanda, *Preserving Traditional Knowledge in The Digital Era: Challenges and Strategies*, 1 SOCIOSPHERE: INTERDISCIPLINARY JOURNAL OF SOCIAL SCIENCES AND HUMANITIES 76-82 (2025).



that communities feel when their sacred symbols are commodified without consent.<sup>99</sup> The reduction of living, spiritually-charged symbols to mere digital assets risks eroding their meaning and undermining the cultural continuity that sustains these traditions.<sup>100</sup> The following section explores the moral and cultural dimensions that must guide any such frameworks.

### A. The Consecration Paradox

In Indian spiritual traditions, symbols like the *Sri Yantra*, *Lingam*, and *Navagraha Mandalas* are much more than decorative designs; they are considered ‘consecrated’ forms, infused with divine energy through rituals.<sup>101</sup> These symbols are often lovingly placed in homes and temples, not just for their beauty, but to bring purification, protection, and positive energy into the space. They carry spiritual meaning passed down through generations, connecting people to their faith, culture, and inner peace. This spiritual sanctification raises profound ethical challenges when these symbols are commodified as digital collectibles, especially through NFTs.<sup>102</sup> While intellectual property frameworks focus on ownership and control, the deeper concern lies in the *sanctity* and *context* of these symbols.

For instance, many *Agama Shastras* and temple traditions prohibit the casual replication or display of consecrated symbols outside prescribed rituals.<sup>103</sup> Yet, marketplaces like OpenSea and Rarible have seen NFTs of the *Sri Yantra* being sold with no cultural context or community consent, often stylized or altered.<sup>104</sup> Religious authorities and temple trusts, such as the Kanchi Kamakoti Peetham, have expressed strong disapproval of such practices, viewing them as profane or spiritually harmful.

Furthermore, with the mandala art, consecration becomes an important issue because while making uses dedicated prayers, sacred resources and customary actions, the finished piece is typically destroyed to prove how nothing permanently lasts. Once these holy maps are converted

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<sup>99</sup> Dr. Aditi Patel, *Decontextualizing The Divine: Ethical Concerns In The Commodification Of Dhokra Deities*, 5 SHODHKOSH: JOURNAL OF VISUAL AND PERFORMING ARTS 1652 – 1654 (2014).; P. Oruç & Uma Suthersanen, *Intellectual property and cultural heritage issues for museums of archaeological materials*, EDWARD ELGAR PUBLISHING 392-412, (2022).

<sup>100</sup> A. Pandey & P. K. Gupta, *Commodification and Religion: A Sociological Study of Budheshwar Temple in Lucknow*, 2 OPEN ACCESS J. ECON. RES. 1 – 5 (2025).

<sup>101</sup> *What is Yantra: Properties, Significance and Importance*, RUDRA CENTRE (Aug. 06, 2025), <https://www.rudraksharatna.com/articles/yantra?srsId=AfmBOoqSbimY8IdttvLqtDdYZWl2o8CKlGON3yMoLJj8JbtZFaqQ2R5k>.

<sup>102</sup> *Ethical Dilemmas in NFTs Ownership, Environmental Impact, and Cultural Concerns*, BINUS UNIVERSITY (Oct. 24, 2024), <https://sis.binus.ac.id/2024/10/24/ethical-dilemmas-in-nfts-ownership-environmental-impact-and-cultural-concerns/>.

<sup>103</sup> Dr. Uday Dokras, *Agama Shastra and Its Role in Temple Construction*, SCRIBD, <https://www.scribd.com/document/758505205/Agama-Shastra-and-its-Role-in-Temple-Construction>.

<sup>104</sup> RARIBLE, <https://rarible.com/explore/search/sri%20yantras/collections>.

and offered as NFTs for permanent ownership, they disregard main beliefs of Buddhism and Hinduism regarding attachment and the temporary nature of things.<sup>105</sup>

The core ethical dilemma is that digital platforms operate under secular laws that do not account for ritual authority or cultural custodianship. Digital platforms are mostly governed by secular laws that prioritise private property, business rights and Intellectual Property rights, ignoring the cultural guardianship and ritual authority that communities have over holy symbols.<sup>106</sup> As a result, there is an ethical gap that although copyright and intellectual property laws safeguard digital assets as property, they ignore the customs, ancestry, and communal duties that define custodianship in many indigenous and religious communities.<sup>107</sup> Therefore, even if formal legal requirements are met, the authority of ritual custodians is often ignored when sacred heritage is moved to digital domains or made into NFTs, posing a risk of spiritual harm and cultural alienation. This disconnects leaves source communities with limited recourse. As these practices clash with sacred codes, they violate not only cultural sensitivities but also the moral rights embedded under *Article 6bis of the Berne Convention*<sup>108</sup> and *Section 57 of the Indian Copyright Act*,<sup>109</sup> which allow creators (and arguably, communities) to object to distortion or derogatory treatment of their works.

In the landmark case *Amar Nath Sehgal v. Union of India*,<sup>110</sup> the Delhi High Court recognized and expanded the scope of moral rights under *Section 57 of the Copyright Act, 1957*,<sup>111</sup> emphasizing that an author's connection to their work is more than economic, it is spiritual and cultural. Sehgal is a renowned sculptor who challenged the arbitrary removal and storage of his bronze mural from Vigyan Bhawan by the Government of India. The court held that this treatment of his work amounted to mutilation and destruction, violating his right of integrity, a fundamental component of moral rights.

*Justice Pradeep Nandra*, in the aforementioned decision, eloquently noted in paragraphs 24, 38 and 39, that moral rights safeguard not just the individual author's dignity but also India's cultural heritage, as artists are cultural contributors. Importantly, the court interpreted moral rights in a broad and purposive manner, holding that even destruction and amendment of a work could

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<sup>105</sup> *Supra* note 49.

<sup>106</sup> Fiona Macmillan, *Intellectual Property and Cultural Heritage: Towards Interdisciplinarity*, 331 OXFORD UNIV. PRESS (2021).

<sup>107</sup> Sarah Lee, *Cultural Heritage Laws in Digital Era*, NUMBER ANALYTICS, <https://www.numberanalytics.com/blog/cultural-heritage-laws-digital-era>.

<sup>108</sup> Berne Convention for the Protection of Literary and Artistic Works, art. 6bis, Sept. 09, 1886, 828 U.N.T.S. 221.

<sup>109</sup> Copyright Act 1957, § 57.

<sup>110</sup> *Amar Nath Sehgal v. Union of India*, 117(2005) DLT717, 2005(30) PTC253(DEL).

<sup>111</sup> Copyright Act 1957, § 57.

constitute a breach under Section 57 in paragraphs. 35 and 56 of the judgement. The court further underscored in paragraph 61, that these rights are independent of copyright ownership, thus surviving even after assignment.

This case strongly supports the proposition that sacred and consecrated symbols, when altered, decontextualized, or commercialized through NFTs, may violate the cultural integrity of the work and its custodians. Extending this jurisprudence to community-held works like sacred geometry. Hence, we can argue for the legal recognition of moral and cultural rights even in the absence of individual authorship, thereby protecting India's intangible heritage in the digital age. Any framework for digital representation must go beyond legality to integrate religious ethics, customary law, and spiritual sovereignty.

### **B. Profit Sharing Frameworks**

When sacred cultural expressions are commercialized, it becomes essential to ensure that source communities share in the economic benefits. This is not just a matter of fairness but a requirement under international legal frameworks like the *Nagoya Protocol*, which affirm community rights to Access and Benefit-sharing Agreements for issues in Intellectual Property<sup>112</sup> and the *UN Declaration on the Rights of Indigenous Peoples* ["**UNDRIP**"] reaffirm the use of their TK and cultural heritage.<sup>113</sup> A similar structure can be envisioned for digital sacred symbols: proceeds from NFT sales or licensing could be channelled into cultural trusts, heritage preservation funds, or community development projects.

Digital smart contracts offer further possibilities. Inspired by projects like *400 Drums in Canada*, NFTs can be programmed to redirect a portion of resale royalties automatically to a community-managed wallet. This ensures long-term, passive income for the source community without sacrificing spiritual ownership of the symbol. However, implementation remains complex. Determining the legitimate representative body, be it a temple trust, a cultural guild, or a tribal panchayat is often fraught. There is also the danger of elite capture, where benefits may not reach the grassroots. Hence, any profit-sharing model must be underpinned by transparent governance structures, free prior informed consent ["**FPIC**"], and community-led oversight.

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<sup>112</sup> *A Guide to Intellectual Property Issues in Access and Benefit-sharing Agreements*, WIPO (2018) [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_1052.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1052.pdf).

<sup>113</sup> United Nations Declaration on the Rights of Indigenous Peoples, G.A. RES. 61/295, U.N. DOC. A/RES/61/295, PART ONE, CHAP. II, SECT. A (Sept. 13, 2007).

To bridge this gap, community involvement must be operationalized within digital governance frameworks. For example, a blockchain-based voting system could be implemented, where recognized representatives from source communities have the authority to approve or reject proposed uses of specific sacred symbols before they are minted as NFTs or used in digital art. Advisory panels composed of tradition bearers and cultural scholars could be integrated into NFT marketplace protocols, ensuring that any digital transaction involving sacred geometry is subject to a transparent process of community consultation and consent. Such mechanisms would move beyond mere compliance, embedding ethical stewardship and community agency into the heart of digital cultural protection.

### C. Balancing Innovation & Sanctity

While the dangers of cultural appropriation are real, innovation must not be stifled. The challenge lies in distinguishing respectful engagement from exploitative commodification. Sacred geometry, by its very nature, inspires universal awe and creative exploration but there is a thin line between appreciation and abuse.

To achieve this balance, educational interventions are vital. Artists, designers, and tech developers engaging with sacred symbols should be equipped with cultural literacy tools and ethical engagement guidelines, possibly through museum partnerships, online courses, or platform-mandated tutorials. For example, platforms like OpenSea could incorporate a “*Cultural Use Protocol*” checkbox for listings that involve sacred content.

The most significant example of community-controlled sacred digitization comes from Australia’s “*Walking Between Worlds*” project, which represents “*the world’s first genuine Indigenous Generative Collection*” with a mission to “*energise global Indigenous communities to amplify First Nations powerful, guiding voices through NFTs*”.<sup>114</sup> This ground-breaking initiative demonstrates how indigenous communities can maintain control over their cultural expression while leveraging blockchain technology for economic empowerment.

This came after several Aboriginal artists have pursued legal action after their sacred dot painting techniques and motifs were misappropriated and sold as NFTs on platforms like OpenSea without consent. In response, the *Arts Law Centre of Australia* and *Indigenous Art Code* have called for stronger legal protections and ethical protocols for Indigenous cultural expressions in digital

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<sup>114</sup> WALKING BETWEEN WORLDS), <https://www.walkingbetweenworlds.net/>.

marketplaces.<sup>115</sup> Walking Between Worlds actively works to help communities “*capitalize on the NFT market, leading to greater financial inclusion and self-determination for Indigenous artists*” These efforts underscore the global relevance of India’s challenge, and offer valuable lessons for community-led governance of sacred art in Web3 spaces.

Furthermore, community-approved repositories could serve as reference points for what is acceptable. The TKDL in India could be expanded to include visual TCEs, not just medicinal formulations, with cultural access protocols embedded. Cross-cultural collaboration can also yield powerful outcomes. Indigenous blockchain initiatives, such as the Kaitiaki NFT governance model (*Māori*) and the 400 Drums platform, show how protocols and permissions can be encoded into the very architecture of digital platforms. These examples can inspire similar models for India’s sacred geometry where usage rights, attribution, and revenue flows are all governed by community consent and cultural logic.

Ultimately, a Dharmic digital framework rooted in *satya* (truth), *ahimsa* (non-harm), and *seva* (service) can help guide ethical use in sacred digital heritage. These core principles, drawn from Indian philosophical traditions, emphasize transparency, honesty, compassion, and collective service as guiding values for digital stewardship of culture. *Satya* ensures that heritage is represented authentically and with integrity; *ahimsa* calls for systems and digital policies that actively prevent harm, misappropriation, or disrespect to communities and their traditions; and *seva* centres the wellbeing and empowerment of cultural custodians through inclusive digital access and respectful preservation.<sup>116</sup> Embedding these values into technology and policy promotes not only lawful but deeply ethical preservation and sharing of sacred heritage. Indian government initiatives such as the Digital India Programme and National Digital Library, supported by the Ministry of Electronics and Information Technology [“**MeitY**”], explicitly incorporate these values by promoting transparency, ethical access, and equitable participation in safeguarding heritage.

## VI. CONCLUSION

The new framework describes a single, three-tiered structure that will help secure and underpin India’s ancient and unique arts as they move onto the internet. The lawmaking process will start with the new Sacred and Traditional Arts (Digital Protection) Act, which increases TKDL, gives

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<sup>115</sup> INDIGENOUS ART CODE, <https://www.indigenousartcode.org/>.

<sup>116</sup> Jagabandhu Sahoo, *Dharma and Digital Democracy: An Indian Perspective on Participatory Governance*, 5 INT. RES. J. HUMANITIES. INTERDISCIP. STUD. 113 – 118 (2024).

communities the benefits of moral and economic rights, mandates the verification of online art sales, and creates a separate tribunal to solve issues easily. Dharmic-Chain Initiative is used to back the legal structure by adding traditional guidelines right to digital assets that use Dharma-Contracts. Under the authority of a community DAO and supervision by an AI trained by the TKDL, the system tries to ensure that everything is done in a fair manner. The framework is rounded off by effective outreach efforts, like require special classes on “Cultural Impact” online and “Heritage Innovation Labs” that help artisans and technology specialists cooperate respectfully and earn together.

### **A. Critical Analysis**

Even though the system was created to account for many situations, it has major inherent problems. The legal process gets harder because it is tricky to identify what constitutes a community and authentic religion in India and because the speed of law reform lags behind technological progress, and it can be tough to put laws into effect on unidentified online networks. The technology has its own set of contradictions as it could leave behind those it is meant to include, nor would it stop the rise of new elites. Moreover, writing down spiritual ideas as smart contracts may cause them to be made overly simple. Essentially, the challenge of the initiative is to manage a sharp difference between the pure, non-profit styles of traditional practices and the heavily market-driven focus of today’s digital world. By handling sales of spiritual items, the framework turns them into commerce, which might lead to a gap between people who want to stay spiritually pure and those who depend on income, as the digital market’s strong influences can easily wipe out traditional culture.

### **B. Suggestions**

A phased roadmap is proposed to construe these recommendations into actionable results. *Phase 1* should focus on extending the TKDL to systematically document sacred geometric forms, mandalas, yantras, and architectural motifs, supported by appropriate metadata and cultural context. *Phase 2* involves developing DAO models and smart contract standards that implant community consent and benefit-sharing protocols into blockchain structure, enabling culturally respectful governance of sacred symbols in NFT markets. *Phase 3* should implement AI-powered monitoring systems, trained on culturally specific datasets, to detect unauthorized use of sacred geometry across digital platforms and initiate automated responses. Finally, *Phase 4* must prioritize education and awareness to the indigenous people and the development of cross-cultural guidelines, fostering cultural literacy among digital creators, NFT platforms, and global audiences

to promote informed appreciation rather than commodification, and also access and benefit sharing of profits. This holistic approach offers a sustainable pathway to honour tradition while engaging meaningfully with technological innovation.

## **STRENGTHENING GREEN TRADEMARKS AND ECO-LABELLING IN THE FOOD AND BEVERAGE INDUSTRY**

YASHICA DHAWAN\*

### **ABSTRACT**

*As consumers' demand for sustainability continues to grow, businesses are increasingly leveraging green trademarks and eco-labels to showcase their dedication towards environmental responsibility. However, the widespread issue of greenwashing, where companies exaggerate or misrepresent their sustainability efforts, poses a significant challenge to maintaining consumer trust. This makes it increasingly important for businesses to adopt credible and verifiable sustainability practices that consumers can rely on. In this context, green trademarks play a crucial role. They signify that a product or service has been manufactured, sourced, or delivered in a manner that minimizes its impact on the environment. Within the food and beverage industry in particular, these trademarks communicate various aspects of sustainability such as a reduced carbon footprint, use of renewable materials, energy efficiency, or support for conservation efforts thereby assuring consumers of the authenticity of a company's environmental claims and fostering greater trust in sustainable brands. This study delves into the role of green trademarks and eco-labelling in preventing deceptive marketing tactics, fostering consumer confidence and ensuring authenticity in sustainability claims. This essay examines global regulatory frameworks, including the European Union's Green Deal to assess how these policies regulate and enforce green trademarks. It further explores notable case laws where companies faced repercussions for misleading environmental claims, while also analysing how businesses can fulfil distinctiveness criteria to secure trademark protection. Additionally, the research aligns these issues with the United Nations Sustainable Development Goals, particularly SDG 2 (Zero hunger) and SDG 12 (Responsible Consumption and Production), highlighting the importance of ethical and transparent sustainability practices in food and beverage industry. Through an in-depth analysis of case studies, consumer behaviour trends and preferences, this essay underscores the critical role of credible eco-labelling and green trademarks in shaping sustainable markets. It also offers effective recommendations for businesses to enhance impact of green trademarks, ensuring they act as genuine indicators of ecological responsibility rather than mere marketing measures.*

### **I. INTRODUCTION: GREEN OR JUST A GIMMICK?**

As Robert Swan rightly said "The greatest threat to our planet is the belief that someone else will save it." Sustainability is no longer just a buzzword but has now become a consumer standard. From grocery stores to restaurants, brands are moving towards adopting more 'organic', 'eco-

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friendly’ and ‘sustainable’ approach. But how many of these are selling what they preach? Since greenwashing is becoming a growing challenge, the need for and adoption of green trademarks and eco-labels have become crucial. This article sheds light not only on how businesses, regulators, and consumers can work together to enforce sustainability practices and strengthen consumer trust, but also on the legal frameworks that govern these efforts. It explores the application of trademark law and consumer protection statutes in addressing misleading environmental claims. The discussion draws from international regulatory approaches, including the European Union’s Green Deal, the Federal Trade Commission’s Green Guides, and Indian trademark law under Section 9, alongside landmark case law in which courts have addressed the misuse of environmental claims in branding.

## II. THE BOOM OF GREEN MARKET

India’s food industry is increasingly adapting to growing demand for environment friendly practices while also addressing the issue of carbon footprint. A number of businesses are shifting towards sustainable alternatives such as cutting down plastic consumption and prioritizing ethical approaches. According to the Global Data 2024 Consumer Survey,<sup>1</sup> 59 percent of consumers in India revealed that their primary concern while purchasing any food item or drink is regarding how ethical, sustainable, and socially responsible the product is. The term ‘Conscious Consumerism’ is gaining quite prominence.<sup>2</sup> This is also referred to as Ethical consumerism, where individuals consider a number of factors while making their purchasing decisions. Interestingly, as per NIQ data,<sup>3</sup> despite economic inflation, there is an increase in the number of consumers who prefer sustainable consumption. In addition to this, there is an increased emphasis on health and well-being in the post-pandemic world, with consumers being more eco-conscious and having higher standards regarding the quality of goods they purchase. As consumer trust in green products is evolving, it is also restructuring the market landscape. In another study published by the NIQ,<sup>4</sup> it was estimated that around 77% of consumers are abandoning brands which contribute towards green washing. Food and Beverage Industries that engage in unethical practices and are unable to

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<sup>1</sup> Outlook Planet Desk, *Food Service Gets Eco-Friendly Amid Rising Consumer Demand*, OUTLOOK BUSINESS (September 24, 2024), [www.outlookbusiness.com/planet/sustainability/food-service-gets-eco-friendly-amid-rising-consumer-demand#:~:text=By%20reducing%20reliance%20on%20imported,associated%20with%20long-distance%20transportation](https://www.outlookbusiness.com/planet/sustainability/food-service-gets-eco-friendly-amid-rising-consumer-demand#:~:text=By%20reducing%20reliance%20on%20imported,associated%20with%20long-distance%20transportation).

<sup>2</sup> *The Future of Beverages: Sustainable Practices and Wellness*, NIQ (December 4, 2023) <https://nielseniq.com/global/en/insights/education/2023/the-future-of-beverages-sustainable-practices-and-wellness/>.

<sup>3</sup> *Id.*

<sup>4</sup> *Supra*, note 2.

authenticate their sustainability claims are being subjected to significant repercussions.<sup>5</sup> For instance, beverage manufactures within European Union are encountering significant challenges due to regulations promoting sustainable development and increasing awareness amongst consumers regarding environmental issues. Ongoing discussions around climate change have led to international political interventions such as European Green Deal,<sup>6</sup> compelling EU-based producers to adopt more sustainable business models.<sup>7</sup> The idea of conscious consumerism while still being on the path of developing, is set to revamp the food and beverage industry. The studies<sup>8</sup> indicate that green consumerism is on the rise,<sup>9</sup> with consumers willing to pay a premium for products and services that are marketed as sustainable. This heightened consumer demand acts as a catalyst for regulatory action.<sup>10</sup> As companies seek to capitalise on environmental consciousness, some mislead consumers into believing their products and services are eco-friendly. Such misrepresentation often conveyed through green trademarks, eco-friendly slogans, or certification marks results in wasted expenditure on goods that do not deliver promised environmental benefits. It erodes consumer trust and creates financial losses for consumers who purchase based on these misleading claims. In response, regulators have increasingly scrutinised green trademarks and eco-labels, with enforcement mechanisms such as the CCPA's *Greenwashing Guidelines 2024* targeting false environmental claims. In this way, consumer perception does not just influence purchasing decisions; it directly shapes how green trademarks are monitored, challenged, and regulated, ensuring that they function as genuine indicators of environmental responsibility rather than tools for deceptive marketing.

### III. GREENWASHING: WHEN 'ECO-FRIENDLY' IS JUST A MARKETING STRATAGEM

The term "greenwashing" was officially introduced by the environmentalist Jay Westervelt back in 1986.<sup>11</sup> When a brand makes exaggerating assertions about a product's sustainability to gain a

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<sup>5</sup> Christopher Maász, Luisa Kroll and Michael Lingenfelder, *Requirements of Environmentally-Aware Consumers on the Implementation and Communication of Sustainability Measures in the Beverage Industry: A Qualitative Kano-Model Approach*, 30(4) JOURNAL OF FOOD PRODUCTS MARKETING 118 (May 2024).

<sup>6</sup> European Commission: Directorate-General for Communication, *The EU in 2021 – General report on the activities of the European Union*, PUBLICATIONS OFFICE OF THE EUROPEAN UNION 2022, <https://data.europa.eu/doi/10.2775/977534>.

<sup>7</sup> *Supra*, note 5.

<sup>8</sup> Ashley Reichheld, John Peto & Cory Ritthaler, *Research: Consumers' Sustainability Demands Are Rising*, HARV. BUS. REV. (September 18, 2023), <https://hbr.org/2023/09/research-consumers-sustainability-demands-are-rising>.

<sup>9</sup> King Stubb & Kasiva, *Addressing Greenwashing In India: Laws, Regulations, And Ethical Implications*, MONDAQ - LAW ARTICLES AND INSIGHTS (February 10, 2025), [www.mondaq.com/india/environmental-law/1581456/addressing-greenwashing-in-india-laws-regulations-and-ethical-implications](http://www.mondaq.com/india/environmental-law/1581456/addressing-greenwashing-in-india-laws-regulations-and-ethical-implications).

<sup>10</sup> Vanessa Turk, *The Potential for Greenwashing from "Green" Trademarks and Marketing*, THE GW LAW AND ENVIRONMENT AND ENERGY LAW BLOG (August 12, 2023), <https://blogs.gwu.edu/law-gwpointsource/2023/08/12/the-potential-for-greenwashing-from-green-trademarks-and-marketing/>.

<sup>11</sup> *Id.*

competitive edge in the market, it is termed as ‘greenwashing’. Such a practice involves misleading consumers in the name of selling an eco-friendly good. Companies engaged in greenwashing may claim that their products are made from recycled materials or promote them as energy-efficient despite such claims being unsubstantiated.<sup>12</sup> This technique basically refers to the deceptive use of green marketing strategies to create an impression that a company’s products are more environmentally friendly than they truly are.<sup>13</sup> If a consumer doubts the authenticity of a company’s environmental assertions, they are less likely to make eco-friendly purchases.<sup>14</sup>

The Federal Trade Commission in the United States by the way of its Green Guides, and the European Union’s Unfair Commercial Practices have provided clarity on what qualifies as misleading environmental claims. Under both the frameworks, there is a prohibition on the use of vague or deceptive terms such as sustainable, green or eco unless they are substantiated properly. A lot of actions have been taken against such companies who indulge in misleading practices through lawsuits or class action suits. A prominent case was set in Italy where a court rules in favour of a competitor’s advertising complaint on green washing.<sup>15</sup> A micro-fibre manufacturer alleged that its rival company had falsely marketed its product as environmentally friendly. The court found the rival company’s statement as false and misleading and thus imposed an injunction that required the removal of these assertions from all advertisements and online platforms with immediate effect. This case upheld the idea of honest environmental marketing techniques.<sup>16</sup> The focus on the United States and the European Union in this discussion is deliberate, as both jurisdictions have developed some of the most mature and influential regulatory frameworks for addressing greenwashing. The US Federal Trade Commission’s Green Guides and the EU’s Unfair Commercial Practices Directive, supported by the European Green Deal, have set widely recognised standards that define what constitutes misleading environmental claims, prohibiting vague or unsubstantiated use of terms like “eco,” “green,” or “sustainable.” These regimes are not only more comprehensive in scope but also enjoy higher enforcement visibility, making them valuable benchmarks for other jurisdictions, including India, in shaping their own approaches.

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<sup>12</sup> Yu-Shan Chen & Ors., *The Negative Impact of Greenwash on Green Purchase Intention*, 2(2) INT. J. MGMT. APP. SCI (2016).

<sup>13</sup> Yu-Shan Chen & Ching-Hsun Chang, *Greenwash and Green Trust: The Mediation Effects of Green Consumer Confusion and Green Perceived Risk*, 114(3) J. BUS. ETHICS, 489-500 (2012).

<sup>14</sup> Mayumi Kris Ghassani et. al., *The Effect of Greenwashing, Green Word of Mouth, Green Trust and Attitude towards Green Products on Green Purchase Intention*, 5(3) BUDAPEST INTERNATIONAL RESEARCH AND CRITICS INSTITUTE-JOURNAL, 25508-25520 (2022).

<sup>15</sup> Alcantara S.p.A. v. Miko S.r.l., 712/2021 (Italy).

<sup>16</sup> Kathryn Park, *Green Trademarks and the Risk of Greenwashing*, WORLD INTELLECTUAL PROPERTY ORGANIZATION, (December 13, 2022) [www.wipo.int/en/web/wipo-magazine/articles/green-trademarks-and-the-risk-of-greenwashing-42943](http://www.wipo.int/en/web/wipo-magazine/articles/green-trademarks-and-the-risk-of-greenwashing-42943).

While the EU and US frameworks establish clear prohibitions on vague or unsubstantiated environmental claims, the Indian regulatory landscape is still evolving towards similar precision.

That said, the issue of greenwashing is not confined to Western economies. Other countries are also introducing targeted legislation. China, for example, has embedded environmental claims within its Advertising Law,<sup>17</sup> which requires that any environmental assertion in an advertisement be truthful, clear, and supported by verifiable evidence, with non-compliance leading to administrative penalties. Brazil, through its Consumer Protection Code, similarly prohibits misleading environmental claims, treating greenwashing as a deceptive advertising practice subject to fines and corrective measures.<sup>18</sup> In India, greenwashing is not addressed directly under the Trade Marks Act, 1999, but falls within the ambit of the Consumer Protection Act, 2019 and the enforcement powers of the Central Consumer Protection Authority (CCPA). The CCPA's 2022 Guidelines on Misleading Advertisements and the more recent Greenwashing Guidelines, 2024,<sup>19</sup> have begun to mirror the EU's approach by requiring that all environmental claims whether in advertising, branding, or trademarks, be specific, verifiable, and supported by credible evidence.

This comparative shift demonstrates that while India is adopting global best practices, enforcement remains largely reactive, driven by consumer complaints and regulatory interventions rather than proactive pre-clearance as seen in the EU. An important question is raised as to what qualifies as actionable greenwashing. One example of greenwashing can be labelling a garbage bag as compostable, even though it is ultimately disposed of in a landfill where it will not decompose as intended. In parallel to this, advertisement of a product, claiming it to be recyclable such as a plastic bottle, when only a part of it can be recycled, can be deceptive thus causing environmental damage. In the past year, several lawsuits have been filed against giant corporations like Coca-Cola, Blue Triton Brands (manufacturer of Poland Spring, Deer Park and other water brands for asserting claims regarding sustainability while most of their plastic bottles still end up in landfills instead of being recycled.

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<sup>17</sup> Céline Bey & Ors., *Greenwashing: Exploring the risks of misleading environmental marketing in China, Canada, France, Singapore and the UK*, LEXOLOGY (September 25, 2023). [www.lexology.com/library/detail.aspx?g=60ba3a71-a8b6-44d0-832a-f32dd30b98fb](https://www.lexology.com/library/detail.aspx?g=60ba3a71-a8b6-44d0-832a-f32dd30b98fb).

<sup>18</sup> *Complying With Brazil's Consumer Protection Code*, DIAZ REUS, <https://diazreus.com/complying-with-brazils-consumer-protection-code/>.

<sup>19</sup> Guidelines for Prevention and Regulation of Greenwashing or Misleading Environmental Claims, 2024, Ct. CONSUMER PROT. AUTH., INDIA (Oct. 15, 2024), [https://dca.gov.in/ccpa/files/Greenwashing\\_Guidelines.pdf](https://dca.gov.in/ccpa/files/Greenwashing_Guidelines.pdf).

Companies and businesses often engage in repackaging, rebranding and strategic marketing in order to attract those consumers who are environmentally conscious. That said, this mostly leads to green washing. A common tactic adopted is to modify the logo or colour scheme or incorporating eco-friendly slogans to create a belief of being eco-friendly. There is no harm in acceptance of these changes but the problem arises when such changes results into the misrepresentation of the true nature of the product and company's true practices. This can then result into greenwashing.<sup>20</sup> For instance, the Advertising Standards Council of India (ASCI) prohibited Bharat Petroleum's 2017 advertisement claiming "Go Green with Speed for IT Reduces Emissions" due to the lack of verifiable environmental benefits. Similarly, Godrej Industries' campaign for its Good Knight Fast Card mosquito repellent claimed it was "100% natural" and "chemical-free," a representation that ASCI deemed false and misleading. Hindustan Unilever Limited (HUL) also engaged in similar misrepresentation, marketing 'Surf Excel Easy Wash' as "100% natural" and "environment-friendly" despite synthetic ingredients, leading to a Ministry of Environment and Forests case and a fine of INR 10 lakhs by the Central Pollution Control Board. Likewise, Godrej Consumer Products faced scrutiny for advertising its Godrej No. 1 soap as "100% natural," "biodegradable," and "eco-friendly" despite containing synthetic elements. These cases demonstrate how green marks and eco-friendly slogans, when unsubstantiated, can cross into deceptive trade practices. They illustrate that without credible evidence, the use of such environmental branding risks not only eroding consumer trust but also attracting regulatory and legal consequences, making it essential that green trademarks operate within transparent and enforceable frameworks to prevent greenwashing.

#### **IV. GREEN TRADEMARKS AND ECO-LABELLING: MORE THAN JUST A LABEL**

A green trademark is defined as a trademark, service mark or certification mark that can be used to distinguish and identify products that are environmentally friendly, favouring the interest of conscious consumers.<sup>21</sup> Such marks typically include words, symbols, or logos displayed on product packaging or advertisements that indicate the sustainable materials used in the production of that product. By the use of a green trademark, a company gains the advantage to market and promote its brand and business practices as eco-friendly and sustainable. In today's time of greater

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<sup>20</sup> *Supra*, note 10.

<sup>21</sup> *Supra*, note 10.

environmental awareness, green trademarks have emerged as a crucial marketing tool, showcasing an environmentally responsible image to enhance market value.<sup>22</sup>

The European Union Intellectual Property Office [“EUIPO”] published its Green EU Trade Marks Report in 2021, which examined the trademark filings by analysing over 900 terms related to sustainability and environmental protection. The study revealed a steady increase in trademarks incorporating such terms, growing from fewer than 1,600 in 1996 (the EUIPO’s first year of operation) to nearly 16,000 by 2020. At present, green-related trademarks make up approximately 10 to 12 percent of all yearly filings. However, trademark applications that contain explicit environmental claims, such as labelling a product as “green”, “sustainable”, or “eco-friendly”, often face the risk of rejection during the registration process.<sup>23</sup>

The concept of “Green Trademarks” falls under Article 7 of the European Union Trade Mark Regulation 2017/1001, which addresses issues related to non-distinctiveness and descriptiveness in trademark registration. This provision highlights the challenges faced by trademarks that lack uniqueness or are purely descriptive, which may result in refusal of registration if they fail to meet the distinctiveness criteria required for trademark protection.<sup>24</sup> A large number of green marks fail to meet the distinctiveness requirement because they rely on generic environmental terminology that merely describes the nature, quality, or intended purpose of the goods rather than distinguishing their commercial origin. Terms such as “green,” “eco,” “bio,” “organic,” or “natural” are widely understood by the public as descriptors of environmentally friendly products, not as indicators of a particular brand. Under trademark law, such descriptive terms must remain available for all businesses to use fairly in trade, and granting exclusivity would risk creating an unjust monopoly over common language essential for competitors. Another reason for refusal is that green-related marks frequently lack inherent distinctiveness due to their widespread use in the market. Symbols such as green leaves, recycling arrows, planetary icons, or green colour schemes have become standard industry imagery for sustainability, and the average consumer perceives them as generic environmental cues rather than brand identifiers. This makes it difficult for such marks to be recognised as originating from a single commercial source unless they incorporate distinctive stylistic features or have acquired secondary meaning through extensive and exclusive

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<sup>22</sup> Massimo Maggiore, *Can Trademarks Ever Be Green? Between Green-Branding and Greenwashing - International Trademark Association*, INTL TRADEMARK ASS’N (March 10, 2021) [www.inta.org/perspectives/features/can-trademarks-ever-be-green-the-line-between-green-branding-and-greenwashing/](http://www.inta.org/perspectives/features/can-trademarks-ever-be-green-the-line-between-green-branding-and-greenwashing/).

<sup>23</sup> *Supra*, note 16.

<sup>24</sup> *Brobet v. EUIPO*, Case T-772/21 (2023).

use. Under European Union trademark laws and recent rulings by the General Court of the European Union, it is evident that the court considers commonly used and generic terms, such as “natural” or “bio”, to be non-distinctive and descriptive, thereby failing to qualify as trademarks.

In the case of *Groschopp AG Divers & More v. EU Intellectual Property Office*, the court ruled that the phrase “sustainability through quality” serves as a promotional slogan rather than a distinctive trademark identifying a product’s commercial origin. The strict approach to descriptiveness in environmental marks serves an important role in preventing the misuse of common sustainability terms and labels. Yet, it also highlights the need for businesses to adopt more imaginative branding if they wish to secure protection. Marks that combine environmental references with distinctive elements whether through inventive wording, unique visual treatment, or recognised certification are more likely to pass the distinctiveness threshold. In this way, trademark law can continue to safeguard the register from generic claims while still leaving space for authentic, verifiable green branding that contributes meaningfully to sustainable trade.

## V. INDIAN PERSPECTIVE

Similar to the European Union, green trademarks in India often face objections under Section 9 of the Trade Marks Act on the grounds of non-distinctiveness and descriptiveness. However, in several instances, the Indian Trademark Registry has granted protection to such marks when they are combined with one or more unique words, making them sufficiently distinctive to qualify for registration.<sup>25</sup> As propounded in the case of *Nature’s Essence Pvt Ltd v. Protogreen Retail Solution Pvt Ltd*,<sup>26</sup> Justice C. Hari Shankar of the Delhi High Court ruled that:

*“When the term “Nature’s” is combined with words like “Inc.” or “Essence,” it acquires a distinct and unique identity, differentiating it from the generic term “Nature” alone.”*

The court emphasized that even if “Inc.” is considered an abbreviation for “Incorporated”, the resulting trademark maintains a clear and distinguishable identity. Often, brands secure protection for their green claims through certification marks, which serve as verification that a product meets

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<sup>25</sup> Rupin Chopra, *Sustainability Seals: Understanding Green Trademarks and Greenwashing*, S.S. RANA & CO. (Aug. 29, 2024), [https://ssrana.in/articles/sustainability-green-trademarks-greenwashing/#\\_ftn4](https://ssrana.in/articles/sustainability-green-trademarks-greenwashing/#_ftn4).

<sup>26</sup> *Natures Essence Private Limited v. Protogreen Retail Solutions Private Limited*, CS(COMM) 581/2020 & I.A. 12750/2020 (India).

specific environmental standards and regulations. However, it remains the responsibility of brands to establish their authenticity by presenting credible evidence to consumers. Notable eco-certification marks include Energy Star Label, India Organic, and GreenPro, which indicate compliance with environmental guidelines. Additionally, several brands in India have successfully registered green trademarks. For instance, Godrej has trademarked the tagline “Good & Green”, underscoring its commitment to producing environmentally sustainable products and contributing to a greener India. Likewise, beauty brands such as Mama Earth and Biotique are recognized as green trademarks due to their emphasis on natural and eco-friendly formulations.

Two significant green trademarks in India today are Godrej and Nestlé. Godrej’s “Good & Green” initiative highlights its dedication to reducing pollution and fostering environmental sustainability. Nestlé, in a similar effort, pledged in 2018 that by 2025, all of its products would be 100% recyclable and reusable, further reinforcing its commitment to sustainability.<sup>27</sup> However, the registration of a green trademark or certification mark is not the end of regulatory scrutiny. Once granted, these marks and the environmental claims they embody remain subject to enforcement by other regulatory authorities, particularly the Central Consumer Protection Authority (CCPA) under the Consumer Protection Act, 2019. The CCPA has the mandate to investigate and take action against improper trade practices, including false or misleading environmental claims. In 2022, it issued the Guidelines for Prevention of Misleading Advertisements and Endorsements for Misleading Advertisements,<sup>28</sup> applicable to all advertisements and all parties involved in their dissemination. These were strengthened in 2024 through the Guidelines for Prevention and Regulation of Greenwashing or Misleading Environmental Claims,<sup>29</sup> which explicitly define greenwashing as any deceptive practice involving vague, false, or unsubstantiated environmental claims, including misleading words, symbols, or imagery.

Under the 2024 Guidelines, businesses making environmental claims must provide verifiable evidence and full disclosure of material information, often through QR codes, URLs, or other accessible digital formats. Selective highlighting of favourable data, vague terminology, and aspirational claims without a clear basis are prohibited. This enforcement mechanism ensures that certification marks like GreenPro or Ecomark are not misused to create a false impression of

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<sup>27</sup> G. Nivveditha and S. Rajasri, *Preserving Authenticity in Green Trademark: A Study of Green Trademarks and Their Legal Challenges in India*, 5(11) INTL. J. RES. PUBL’N & REV 5864-5867 (2024).

<sup>28</sup> *Guidelines on Prevention of Misleading Advertisements and Endorsements for Misleading Advertisements*, 2022, PIB DELHI (2024), [www.pib.gov.in/PressReleasePage.aspx?PRID=1832906](http://www.pib.gov.in/PressReleasePage.aspx?PRID=1832906).

<sup>29</sup> *Guidelines prohibits companies from engaging in Misleading Environmental Claims and Greenwashing*, PIB DELHI (2024), [www.pib.gov.in/PressReleasePage.aspx?PRID=2064963](http://www.pib.gov.in/PressReleasePage.aspx?PRID=2064963).



sustainability. In September 2024, the Ministry of Environment, Forest, and Climate Change further bolstered this system by notifying the Ecomark Rules, 2024,<sup>30</sup> introducing a more robust eco-labelling scheme to promote sustainable products across sectors including food, cosmetics, soaps, and electronics.<sup>31</sup> While these developments represent significant progress, there remains a need for greater integration between trademark law and consumer protection mechanisms. Green trademarks, often creating the first impression of a product's eco-friendliness, have the potential to mislead if not backed by genuine environmental compliance. A coordinated approach where trademark registration is accompanied by post-registration monitoring under CCPA oversight would ensure that green marks operate as genuine indicators of sustainability rather than marketing devices susceptible to greenwashing.

## VI. WHERE DO WE GO FROM HERE?

The adoption and proper use of green trademarks can serve as a valuable asset for brands aiming to emphasize upon their commitment to environment. When such trademarks gain recognition in the market, they attract a potential of environmentally conscious consumers thereby uplifting their brand's value. Yet there still lies a challenge of securing the registration of these marks including India. To reduce the probability of refusal of these trademarks, it is crucial to avoid generic, nature centric terms and instead come up with such trademarks that are a unique combination of words. This indicates that the trademark should be more suggestive rather than descriptive in nature.<sup>32</sup> Additionally it is the duty of the regulatory authorities to continuously review and bring changes to the existing policies to combat greenwashing and ensure that green trademarks operate within a transparent framework that guarantees credibility. Policy reform is also essential. Trademark law, both in India and globally, must develop mechanisms to distinguish between marks that merely adopt green language or imagery for market appeal and those that reflect verifiable sustainability practices. This could involve global harmonisation of standards, where certification marks for environmental terms similar to ISI or Hallmark are regulated so that words like "green," "eco," "carbon neutral" or "organic" have specific criteria attached to their use. Such regulation would protect the credibility of these terms and reduce the scope for arbitrary application.

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<sup>30</sup> Ministry of Environment Forest and Climate Change, *Ministry of Environment, Forest and Climate Change notifies Ecomark Rules under Lifestyle for Environment initiative*, PIB DELHI (2024), [www.pib.gov.in/PressReleasePage.aspx?PRID=2061878](http://www.pib.gov.in/PressReleasePage.aspx?PRID=2061878).

<sup>31</sup> Dr Sunanda Bharti, *Going Green as a Garnish—A Brief Analyses of Green Trademarks Situation in India and related Ethos*, SPICYIP (29 May 2025), <https://spicyip.com/2025/05/part-ii-going-green-as-a-garnish-a-brief-analyses-of-green-trademarks-situation-in-india-and-related-ethos.html>.

<sup>32</sup> *Supra*, note 25.

Within the Indian framework, Section 9(1)(c) of the Trade Marks Act already empowers the Registrar to refuse marks that consist exclusively of common or customary indications. However, the proviso to Section 9(1) which allows registration of descriptive marks if they have acquired distinctiveness should be applied cautiously in the case of green marks. Relaxing these standard risks legitimising environmental claims that may not be substantiated, thereby perpetuating greenwashing. Similarly, Section 9(2)(a), which prohibits marks likely to deceive the public or cause confusion, should explicitly capture green trademarks that falsely project a commitment to sustainable practices.<sup>33</sup> Since trademark registration in India is not mandatory, unregistered marks containing environmental claims also pose a risk. In such cases, enforcement can be supported by existing mechanisms under the ASCI Code, which prohibits misleading environmental claims such as “100% herbal” or “chemical-free” when they are factually inaccurate. Section 2(47) of the Consumer Protection Act, 2019, which defines unfair trade practices to include false or misleading claims, offers another route for intervention. By aligning trademark scrutiny with consumer protection principles, regulators can ensure that environmental terms used in branding are backed by verifiable data.

Effective regulation must also address the definitional vacuum surrounding “green” claims. Without a clear legal framework specifying whether “green” refers to recycled content, biodegradability, carbon reduction commitments, or contributions to environmental causes, compliance expectations remain unclear and enforcement inconsistent. This ambiguity not only exposes consumers to misleading claims but also leaves businesses uncertain about the limits of permissible branding. Public awareness campaigns, targeted educational initiatives, and consumer redress mechanisms must therefore be strengthened to encourage vigilance and timely reporting of misleading claims. India’s long-term objective should be the creation of a comprehensive green policy with trademarks at its core supported by global alignment of standards, certification-based regulation of environmental terms, robust enforcement under consumer protection laws, and enhanced public awareness. Such an integrated approach would ensure that green trademarks function as genuine indicators of sustainable practice, rather than as convenient marketing tools.

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<sup>33</sup> *Supra*, note 31.