A Unified Framework for IP Governance in AI-Generated Content Using Blockchain and Artificial Intelligence

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***Abstract*—The rapid rise of AI-generated content has exposed key limitations in existing intellectual property (IP) systems, particularly around authorship attribution, legal recognition, and cross-border enforceability. This paper introduces a four-tier framework that integrates blockchain technology, smart contracts, and international legal standards to manage the lifecycle of IP rights associated with AI outputs. The architecture consists of: (i) authorship classification reflecting levels of human and machine contribution, (ii) blockchain-based registration and automated licensing, (iii) legal mapping aligned with global agreements such as the Berne Convention and TRIPS Agreement, and (iv) a governance layer enabling oversight and regulatory access. Applications across creative media, open-source development, digital publishing, and academic research illustrate the model's relevance in diverse sectors. By addressing current gaps in attribution models, legal-tech integration, and institutional enforcement, the framework offers a structured path toward more reliable and interoperable IP governance in AI-driven environments.**

***Index Terms*—Artificial Intelligence, Blockchain, Digital Transformation, Digital Rights Management, Intellectual Property (IP) Rights, IP Protection Technologies, Machine Learning**

I. INTRODUCTION

Digital transformation—the integration of digital technologies across industries—has reshaped how intellectual property (IP) is created, managed, and protected. According to WIPO, this shift is pressuring existing IP systems to adapt [1]. With advances in AI, machine learning, and blockchain, traditional IP frameworks are increasingly inadequate. IP refers to legal rights over creations of the mind, such as inventions, artistic works, and proprietary knowledge. Generative AI, which produces novel content from large datasets, challenges core legal assumptions around authorship, ownership, and originality.
Generative AI tools such as ChatGPT, DALL·E 2, and Stable Diffusion have collectively produced over 15 billion synthetic images by mid-2023, with an average of 34 million new images generated daily [2]. Stanford's 2024 AI Index further reported that 17.5% of peer-reviewed computer science papers in 2023 incorporated text generated by large language models (LLMs) [3]. In the publishing industry, the New York Times sued OpenAI and Microsoft in late 2023 over alleged copyright infringement involving thousands of its articles used in model training [4].

The creative sector has witnessed similar upheavals. A major lawsuit filed by three artists against Stability AI, Midjourney, and DeviantArt alleged unauthorized use of over five billion images scraped from the web as training data [5]. Getty Images filed a separate suit claiming Stability AI used 12 million copyrighted visuals without consent [6]. In June 2025, Disney and Universal initiated legal action against Midjourney for generating images that closely resembled their protected characters, citing unauthorized commercial replication [7].

Meanwhile, the US Copyright Office issued a 2024 report emphasizing the growing misuse of generative AI for creating synthetic media, especially Deepfakes. It found that 97% of Deep Fake content on the internet was pornographic, with a 550% increase in incidents since 2019 [8]. A separate study by Sumsub identified a 1,740% rise in Deep Fake fraud in North America and a tenfold global increase from 2022 to 2023 [9]. With the deepfake industry valued at $550 million in 2023 and projected to grow to $19 billion by 2033, the IP stakes are substantial [10].

This paper proposes a four-tier framework to govern IP in AI-generated content, combining authorship classification, blockchain-based registration, legal alignment, and transparent oversight. Applied across domains like creative arts, software, and academia, it offers a scalable approach to bridge legal gaps in a rapidly evolving digital landscape.

II. RESEARCH OBJECTIVE

The objective is to establish a structured model for the governance of intellectual property associated with AI-generated content, integrating blockchain technologies, smart contract mechanisms, and internationally recognized legal frameworks. This model aims to facilitate transparent attribution of authorship, efficient rights registration and licensing, and reliable cross-jurisdictional enforcement. It is particularly intended to address regulatory and operational gaps in domains such as digital media, academic publishing, and open-source software development, where conventional IP systems struggle to keep pace with automated content generation.

III. LITERATURE REVIEW

A. Practical Implementations

This strand of literature focuses on real-world applications and system-level implementations that demonstrate the operational use of blockchain and AI technologies for intellectual property (IP) protection. Alketbi [11] introduces the Blockchain-based IP Management Framework (BCIP), developed using Ethereum tools to enable secure IP registration and retrieval in the UAE. While functionally robust, the framework exposes challenges related to scalability and regulatory compliance. Hermansyah and Sujaini [16] examine Indonesia's IP regulatory landscape amid rapid digital transformation, identifying infrastructural limitations and enforcement gaps. Xiao et al. [17] propose a blockchain-based algorithm integrating cryptographic watermarking and matrix transformations, demonstrating high traceability and low computational overhead for real-time use. Li [20] develops a quantum homomorphic encryption system backed by smart contracts and NFTs to secure music IP, offering resistance to piracy while noting computational trade-offs. Lin et al. [22] propose a blockchain–IoT hybrid framework for real-time IP lifecycle management, while Xiao et al. [25] present a tamper-proof blockchain solution for copyright protection using smart contracts and hashed ownership records.

B. Domain Research and Theoretical Contributions

The second body of literature includes scholarly and conceptual analyses addressing the broader legal, technical, and policy implications of blockchain and AI integration in IP governance. Ikonne et al. [12] explore blockchain's potential for automating licensing and timestamping originality but highlight persistent legal fragmentation and lack of standardized frameworks. Šarčević et al. [13] survey technical protections for training data in generative AI, including watermarking and adversarial perturbation, while emphasizing the need for parallel legal safeguards. Frantsuz-Yakovets et al. [14] analyze Ukraine's constitutional approach to IP, proposing judicial reforms and alignment with EU IP laws to counter digital threats. Singh [15] examines the disruption posed by autonomous AI systems to traditional IP law, particularly around authorship and inventorship, and calls for AI-specific legal structures. Hamza and Pradana [18] advocate a hybrid model combining blockchain, AI, and legal policy for Big Data IP protection, while Mavani et al. [19] stress the need for integrated cybersecurity mechanisms to protect IP in high-risk sectors. Hauck [21] and Shatkovskaya et al. [23] explore blockchain's potential to improve licensing transparency and reduce transactional overhead, whereas Gürkaynak et al. [24] focus on the evidentiary limitations and institutional resistance to blockchain-based IP records in legal systems.

The intersection of artificial intelligence (AI) and blockchain has introduced both potential and complexity in the protection of intellectual property (IP), especially concerning the authorship, registration, and enforcement of rights over AI-generated or AI-assisted creative outputs. While existing proposals in the literature touch on technical mechanisms or isolated legal issues, there remains a lack of an integrated, policy-aware framework that can holistically address the evolving realities of digital IP creation and management.

IV. LEGAL LANDSCAPE AND CASE STUDIES

A. Existing Laws and Regulations

Global intellectual property (IP) systems are having difficulty adjusting to the emergence of AI-generated content because they are based on legal principles established before the digital age. Conventional treaties like the Berne Convention and the TRIPS Agreement were established under the presumption of human authorship, thus they cannot adequately address the legal standing of creative works generated independently by artificial intelligence systems. In the United States, the Copyright Office (USCO) has clearly determined that works without significant human input do not qualify for copyright registration. Likewise, the European Union Intellectual Property Office (EUIPO) asserts that originality and legal authorship must be connected to a human being, thereby ruling out entirely autonomous AI-created works.

The challenge also applies to patent law. In the significant case Thaler v. Commissioner of Patents, courts in the United States, United Kingdom, and European Union unanimously determined that artificial intelligence cannot be legally acknowledged as an inventor under current laws. In comparison, nations such as South Africa and Australia have displayed a restricted willingness towards AI inventorship, highlighting an increasing gap in worldwide legal understandings. Even with these advancements, achieving harmonization continues to be difficult. Recent regulatory developments, including the EU AI Act and the U.S. AI Bill of Rights framework, acknowledge the significance of IP in AI governance but still lack defined enforceable measures for safeguarding AI-generated content. These changing circumstances emphasize the need for cohesive frameworks that connect technological advancements with legal acknowledgment and implementation.

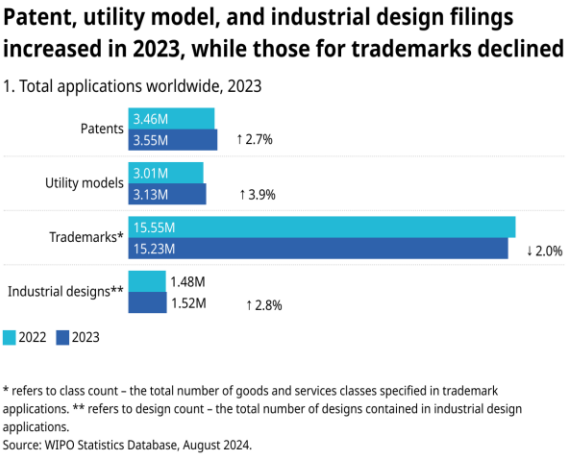

Fig. 1. Global filings for patents, utility models, trademarks, and industrial designs in 2023. The data shows a year-over-year increase in patent (+2.7%), utility model (+3.9%), and industrial design (+2.8%) applications, while trademark filings declined by 2.0%. These trends reflect the growing demand for IP protection across innovation sectors. Source: WIPO Statistics Database, August 2024.

B. Precedent and Practice: Case Studies

1) *Thaler v. Patent Commissioner (United States, United Kingdom, EU, South Africa, and Australia) [26]*

Dr. Stephen Thaler submitted patent applications in various regions, designating an AI system, DABUS (Device for the Autonomous Bootstrapping of Unified Sentience), as the only inventor. The primary legal question was if an AI system could be recognized as an inventor under existing patent laws, which typically necessitate human inventors. The submissions led courts and patent offices in the U.S., U.K., E.U., South Africa, and Australia to address this developing legal issue. Courts in the United States, United Kingdom, and European Union determined that AI systems such as DABUS do not fulfill the legal criteria for an inventor, which requires human participation. Consequently, the applications were denied for not specifying an individual as the inventor. In contrast, South Africa approved the application, granting the first patent that acknowledged an AI as the inventor. Australia first decided in Thaler's favor but changed the ruling on appeal, conforming to the prevailing global understanding.

The decisions highlighted the differences in global legal methodologies. Although most regions uphold that only individuals can be acknowledged as inventors, South Africa's unique position highlights increasing pressure to revise intellectual property systems to include AI-created inventions. The cases together emphasize the absence of uniformity in international patent regulations related to AI and the necessity for integrated, AI-responsive legal frameworks.

2) *Zarya of the Dawn vs. U.S. Copyright Office (2023) [27]*

Kristina Kashtanova sought copyright protection for her comic Zarya of the Dawn, which included images created with Midjourney, an AI image generation tool. The main legal question was if content generated by AI—devoid of significant human creativity—met the criteria for copyright protection according to U.S. law. The U.S. Copyright Office evaluated the application and concluded that although the text and layout produced by Kashtanova qualified for copyright protection, the images generated by AI did not. The office asserted that protection applies solely to works showing adequate human authorship and creative contribution, which the AI-generated images did not possess.

The ruling reinforced the U.S. Copyright Office's position that material produced by artificial intelligence with insufficient human participation is not eligible for copyright. It established a standard for upcoming cases related to mixed-authorship content and highlighted the legal constraints on safeguarding AI-created artistic works in the United States.

3) *Getty Images vs. Stability AI (2023–Current) [28]*

Getty Images filed a lawsuit against Stability AI, claiming that the firm utilized millions of copyrighted images without authorization to train its AI model, Stable Diffusion. The legal concerns relate to allegations of copyright violation, the limits of fair use, and the validity of extensive data mining for AI training objectives. While the case remains active, it has sparked global discussions regarding the legality of utilizing copyrighted content for AI training datasets. Getty Images claims that unauthorized usage of its images infringes copyright, while Stability AI might present defenses rooted in fair use, transformative use, or current data mining exceptions, relative to jurisdiction.

The result of this case may have extensive consequences for the creation and regulation of datasets utilized in training generative AI systems. It could redefine the legal interpretation of data scraping, guide the creation of more explicit licensing systems, and impact the obligations of AI developers concerning content ownership and recognition.

4) *German Patent Office vs. Thaler: Recognition of AI as Inventor [29]*

The primary challenge in this case was whether an artificial intelligence system, DABUS, could be recognized as the inventor and whether the designation of DABUS as the inventor complied with the legal requirements under Sec. 37 (1) PatG. The applicant sought to have DABUS recognized as the inventor, which raised questions about the legal status of AI-generated inventions and the attribution of inventorship to a non-human entity. The courts determined that the designation of DABUS as the inventor did not meet the legal requirements of Sec. 37 (1) PatG, which mandates that the inventor be a natural person. The applicant's attempt to designate DABUS directly was rejected because it did not satisfy these statutory criteria. The court also found that the applicant had not remedied this deficiency despite being asked to do so.

The appeal was dismissed, and the application in the version where DABUS was designated as the inventor was rejected. The court emphasized that, under current law, an inventor must be a natural person, and AI systems cannot be recognized as inventors. The decision reinforced that the attribution of an invention to a natural person remains necessary, even when AI is involved in the inventive process.

5) *Feilin vs. Baidu : Legal Approaches to AI-Generated Works [30]*

The case centered on whether the Feilin Report, created with significant AI assistance, could be protected under Chinese copyright law. The key legal issue was whether the work qualified as an original,

human-created work, given that parts of it were generated using AI software (Wolters Kluwer Database). The defendant, Baidu, argued that the report lacked originality and that Chinese law only protects works created by natural persons, not AI-generated content. The Beijing Internet Court conducted a detailed analysis of the creation process and the content of the Feilin Report. It found that the report was not automatically generated by the AI software but was created by Feilin's employees who input data and supervised the process, thus involving human intellectual effort. The court distinguished the Feilin Report from the automatically generated reports (Reports 1 and 2), which were produced solely by entering keywords into the database without human creative input. The court concluded that the Feilin Report demonstrated sufficient originality and human authorship, satisfying the requirements of Chinese copyright law.

The court ruled that the Feilin Report was a protected written work under Chinese copyright law, as it met the criteria of originality and human creation. Consequently, Baidu's unauthorized use of the report was deemed an infringement of Feilin's copyright. This decision set a significant precedent, affirming that AI-assisted works can be protected when human involvement is substantial enough to confer originality. It clarified that works generated with AI assistance are not automatically excluded from copyright protection, provided there is meaningful human contribution.

6) *Sarah Andersen v. Stability AI Ltd : Legal Disputes Over AI-Generated Art [31]*

The core challenge involves determining whether AI-generated images infringe on artists' rights, including trade dress, copyright, and trademark protections. Plaintiffs argue that AI models like Midjourney, Stable Diffusion, and DeviantArt's use of copyrighted works and artist identities without permission constitute false endorsement, trade dress infringement, and copyright violations. Courts face the complex task of assessing whether the use of training data and the outputs of AI models violate existing IP laws, especially given the technical intricacies of AI training and output generation. Courts have generally allowed plaintiffs' claims to proceed past initial motions to dismiss, emphasizing the need for further factual development. They have denied motions to dismiss claims related to trade dress, copyright infringement, and DMCA violations, highlighting that allegations about AI training processes, dataset use, and the potential for consumer confusion are sufficiently plausible at this stage. Courts also clarified procedural issues, permitting amendments to complaints to better articulate technical and factual details.

The legal process remains ongoing, with courts permitting claims to move forward for further factual investigation and trial. While some statutory claims, such as certain DMCA violations, have been dismissed, copyright and trade dress claims are allowed to proceed. This indicates a cautious approach, recognizing the novelty and complexity of AI-related IP issues, and setting the stage for detailed factual and legal analysis in subsequent proceedings.

V. INTELLECTUAL PROPERTY GOVERNANCE FOR GENERATIVE AI: A CROSS-DISCIPLINARY FRAMEWORK

This section outlines a conceptual framework for governing intellectual property (IP) rights in AI-generated content, integrating legal principles with blockchain infrastructure. It begins by identifying the shortcomings of current IP laws in addressing machine-generated works, emphasizing the urgency for reform. The proposed framework does not offer a deployable prototype but rather a structured vision to guide future policy, legal harmonization, and system design.

The framework enables: (1) classification of authorship based on AI involvement; (2) immutable content registration via blockchain; (3) automated licensing through smart contracts; (4) legal alignment with international IP standards; and (5) a governance layer for regulatory access and transparency.

A. Layer 1: Authorship Attribution and Content Classification

To resolve the ambiguity surrounding ownership of AI-generated content, the framework introduces a structured classification model that distinguishes between four content types: Human-Created, AI-Assisted, AI-Directed, and Autonomous AI. Each category reflects the extent of human involvement in the creative process. Metadata—including creation

date, tool or model used, and the identity of the human contributor—is linked to each content record to support claims of originality, authorship, and ownership under existing legal standards.

B. Layer 2: Blockchain-Based Registration and Licensing

This layer employs blockchain technology to create immutable, time-stamped records of IP ownership. Digital content is converted into a cryptographic hash (e.g., SHA-256), which is stored alongside metadata on a distributed ledger. To support monetization and usage control, licensing terms are encoded as smart contracts that define royalty structures, access permissions, and jurisdiction-specific usage restrictions. This decentralizes the registration process and ensures security, traceability, and interoperability across platforms.

C. Layer 3: Legal Mapping and Jurisdictional Integration

To facilitate legal recognition and cross-border enforcement, this layer aligns blockchain-anchored records with national and international legal frameworks, including the Berne Convention and the TRIPS Agreement. Each IP entry is tagged with jurisdiction-specific identifiers, while smart contracts are modeled on enforceable licensing terms. Content records are formatted to satisfy evidentiary standards for use in judicial proceedings, thereby making them admissible as proof of authorship, ownership, and transfer history.

D. Layer 4: Transparency, Oversight, and Governance

This layer supports institutional accountability and platform interoperability through a governance interface. Rights holders can monitor registrations, track licensing activity, and flag suspected infringements via a dedicated dashboard. Regulators and IP authorities are granted controlled access to audit blockchain records and validate claims while maintaining user privacy. The framework also promotes API-based integration with content platforms, enabling them to verify the IP status of AI-generated works before publication or monetization.

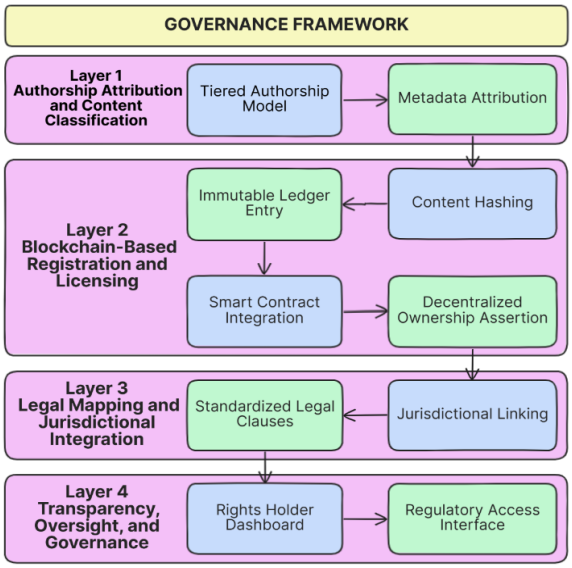

Fig. 2. A Cross-Disciplinary Framework

E. Framework Contribution in Relation to Existing Models

The framework distinguishes itself through a comprehensive and integrated approach to the governance of intellectual property rights in the context of AI-generated content. Unlike the Blockchain-based IP Management Platform (BCIP) developed by Alketbi *et al.*, which focuses primarily on blockchain-enabled registration, the present framework incorporates a multi-layered structure encompassing authorship classification, legal mapping, and governance mechanisms to support the full lifecycle of IP management. While Ikonne *et al.* and Li explore blockchain and NFT-based licensing automation, they do not address the complex attribution issues posed by generative AI systems. Šarčević *et al.* emphasize technical measures such as watermarking for training data protection but do not extend their analysis to institutional enforcement or system-level governance. Singh identifies critical gaps in the legal treatment of AI-generated content, particularly regarding authorship and inventorship, but does not propose an operational structure. Gürkaynak *et al.* raise important concerns regarding the evidentiary validity of blockchain-based IP records, which this framework addresses through a compliance-oriented legal interface.

F. Implications and Prospective Domains of Deployment

The framework has broad applicability across multiple sectors where AI-generated content introduces legal ambiguity and operational risks. In creative industries such as music, visual design, animation, and synthetic media, platforms like DALL·E, Soundful, and RunwayML face growing concerns around authorship, content provenance, and fair compensation. By applying structured authorship classification and smart contract–enabled licensing, these platforms can clearly define ownership rights, streamline attribution, and implement enforceable royalty mechanisms. In software development and AI research environments—including widely used platforms like GitHub and Hugging Face—the framework allows contributors to immutably register AI-generated code, pretrained models, and dataset versions. This enhances traceability, secures intellectual contributions, and reduces the risk of unintentional duplication or appropriation in collaborative projects.

In digital publishing, journalism, and content platforms, the framework provides tools for verifying originality before release, embedding legally relevant metadata, and reducing the risk of unauthorized reuse or copyright infringement. IP regulatory bodies such as the United States Patent and Trademark Office (USPTO) and the European Union Intellectual Property Office (EUIPO) can use the legal mapping layer to align blockchain-anchored records with statutory requirements, making such records admissible in formal legal proceedings across jurisdictions. The framework also supports integration with national IP databases, enhancing transparency and enforcement capacity. Academic and research institutions—where AI-generated data, texts, and visualizations are increasingly common—can leverage the governance interface to document generation parameters, contributor roles, and tool usage. This enables reproducibility, enforces ethical standards, and supports accurate attribution of machine-assisted scholarly output.

Collectively, this framework offers a scalable, compliant, and interoperable infrastructure to manage the complexities of intellectual property in AI-driven digital environments.

VI. FUTURE SCOPE

Current IP systems struggle to handle the complexity of AI-generated content due to structural and legal limitations. Traditional frameworks assume human authorship and cannot classify or register works with varying levels of AI involvement. Important metadata—such as the AI model used, the degree of human input, and the nature of training data—is typically excluded from content records, making attribution unclear. Blockchain-based registration alone often fails to meet legal standards for admissibility in courts, and smart contracts lack the flexibility to account for jurisdiction-specific licensing terms. Regulatory oversight is also limited, as IP authorities have no streamlined access to verify ownership or licensing activity across fragmented platforms.

The framework directly addresses these issues through a combination of structured metadata integration, legal formatting, and modular smart contracts. By embedding technical details—like model identifiers, contributor logs, and content generation context—into blockchain records, the framework enables precise authorship classification and verifiable ownership. Smart contracts are designed to support region-specific IP rules, automating licensing conditions based on legal jurisdiction. The legal mapping layer ensures all records are formatted for evidentiary compliance, while the governance interface provides regulators with controlled access to perform real-time audits and ownership verification. Together, these advancements create a scalable, enforceable, and legally aligned system for managing IP in AI-driven content ecosystems.

VII. CONCLUSION

The rise of generative AI is rapidly reshaping the contours of intellectual property governance, introducing new complexities around authorship, attribution, and legal enforceability. Traditional IP systems, built around human creators, are increasingly strained by outputs that involve varying degrees of machine contribution, making existing legal definitions and registration mechanisms insufficient. In response to these challenges, structured, cross-disciplinary approaches that combine legal standards with emerging technologies are becoming essential.

Integrating tools such as blockchain, smart contracts, and metadata-driven classification holds promise for improving transparency, traceability, and enforcement. As AI continues to evolve, developing adaptable governance models that align with both technical capabilities and legal frameworks will be crucial in ensuring that ownership rights, licensing norms, and regulatory oversight remain effective and equitable across jurisdictions.

REFERENCES

[1] World Intellectual Property Organization, "IP Facts and Figures 2024," WIPO. [Online]. Available: https://www.wipo.int/web-publications/ip-facts-and-figures-2024/en/global-intellectual-property-applications-and-active-ip-rights.html

[2] A. Vincent, "AI models have already generated over 15 billion images," *The Verge*, Aug. 2023. [Online]. Available: https://www.theverge.com/2023/8/17/ai-image-generation-stats-stability-ai-midjourney

[3] Stanford Institute for Human-Centered AI, "AI Index Report 2024," Mar. 2024. [Online]. Available: https://aiindex.stanford.edu/report/

[4] N. Perlroth and K. Roose, "The Times Sues OpenAI and Microsoft Over Use of Copyrighted Work," *The New York Times*, Dec. 2023. [Online]. Available: https://www.nytimes.com/2023/12/27/business/media/new-york-times-openai-lawsuit.html

[5] J. Vincent, "Artists file copyright lawsuit against AI art generators," *The Verge*, Jan. 2023. [Online]. Available: https://www.theverge.com/2023/1/15/stability-ai-lawsuit-artists-copyright

[6] The Times, "Getty Images sues Stability AI over copyright breach," Jan. 2023. [Online]. Available: https://www.thetimes.co.uk/article/getty-images-copyright-trial-sr8s6fk9b

[7] A. Hern, "Disney and Universal sue AI image creator Midjourney," *The Guardian*, Jun. 2025. [Online]. Available: https://www.theguardian.com/technology/2025/jun/11/disney-universal-ai-lawsuit

[8] Reuters, "Report on deepfakes: what the Copyright Office found," Dec. 2024. [Online]. Available: https://www.reuters.com/legal/legalindustry/report-deepfakes-what-copyright-office-found-2024-12-18/

[9] Sumsub, "Identity Fraud Report 2023," Sep. 2023. [Online]. Available: https://sumsub.com/blog/identity-fraud-report-2023-deepfakes/

[10] Spherical Insights, "Deepfake Market Size, Share, Growth and Forecast to 2033," Oct. 2023. [Online]. Available: https://www.sphericalinsights.com/reports/deepfake-market

[11] S. Alketbi and M. B. Mahmuddin, "Intellectual Property Blockchain," 2024 6th International Conference on Blockchain Computing and Applications (BCCA), pp. 372–374, 2024. doi: 10.1109/BCCA62388.2024.10844459

[12] D. Ikonne, B. Sodipo, T. Olorunnipa, and G. Okorie, "The Impact of Blockchain Technology on Intellectual Property," NAU Journal of Commercial and Property Law, vol. 11, no. 2, pp. 122–126, 2024.

[13] T. Šarčević, A. Karlowicz, R. Mayer, R. Baeza-Yates, and A. Rauber, "U Can't Gen This? A Survey of Intellectual Property Protection Methods for Data in Generative AI," arXiv preprint arXiv:2406.15386, 2024. [Online]. Available: https://arxiv.org/abs/2406.15386

[14] T. A. Frantsuz-Yakovets, K. Anisimov, A. G. Biryukova, H. V. Kolisnykova, and T. V. Yaroshevska, "Constitutional Guarantees of Intellectual Property Protection in the Context of Digital Transformation: Ukrainian Experience," Journal of the University of Latvia. Law, vol. 17, pp. 209–222, 2024. doi: 10.22364/jull.17.13

[15] M. Singh, "The Impact of Artificial Intelligence on Intellectual Property Rights in the Legal Perspective," ILE Lex Speculum, vol. 1, no. 1, pp. 407–411, 2023.

[16] H. Hermansyah and H. Sujaini, "Digital transformation in protecting intellectual property rights in Indonesia," Russian Law Journal, vol. 11, no. 4, pp. 115–130, 2023.

[17] L. Xiao, W. Huang, Y. Xie, W. Xiao, and K.-C. Li, "A Blockchain-Based Traceable IP Copyright Protection Algorithm," IEEE Access, vol. 8, pp. 49532-49542, Jan. 2020.

[18] R. Hamza and H. Pradana, "A Survey of Intellectual Property Rights 418, Nov. 2022.Protection in Big Data Applications," Algorithms, vol. 15, no. 11, p.

[19] C. Mavani, H. K. Mistry, R. Patel, and A. Goswami, "The Role of Cybersecurity in Protecting Intellectual Property," International Journal on Recent and Innovation Trends in Computing and Communication, vol. 12, no. 2, pp. 1-10, 2024.

[20] N. Li, "Combination of blockchain and AI for music intellectual property protection," Computational Intelligence and Neuroscience, vol. 2022, pp. 1–8, Apr. 2022.

[21] R. Hauck, "Blockchain, Smart Contracts and Intellectual Property: Using Distributed Ledger Technology to Protect, License and Enforce Intellectual Property Rights," Legal Issues in the Digital Age, no. 1, pp. 17–41, 2021.

[22] J. Lin, W. Long, A. Zhang, and Y. Chai, "Blockchain and IoT-Based Architecture Design for Intellectual Property Protection," International Journal of Crowd Science, vol. 4, no. 3, pp. 283–299, 2020.

[23] T.V. Shatkovskaya, A.B. Shumilina, G.G. Nebratenko, Ju.I. Isakova, and E.Yu. Sapozhnikova, "Impact of Technological Blockchain Paradigm on the Movement of Intellectual Property in the Digital Space," European Research Studies Journal, vol. XXI, Special Issue 1, pp. 397–406, 2018.

[24] G. Gürkaynak, İ. Yılmaz, B. Yeşilaltay, and B. Bengi, "Intellectual Property Law and Practice in the Blockchain Realm," Computer Law & Security Review, vol. 34, no. 4, pp. 847–858, 2018.

[25] L. Xiao, W. Huang, Y. Xie, W. Xiao, and K.-C. Li, "A Blockchain-Based Traceable IP Copyright Protection Algorithm," IEEE Access, vol. 8, pp. 31591–31601, 2020.

[26] Thaler v. Hirshfeld, 1:20-cv-09084, United States District Court, 2021.

[27] Kristina Kashtanova, "Zarya of the Dawn," U.S. Copyright Office Review Decision, Case File No. 1-11727625881, 2023.

[28] Getty Images (US), Inc. v. Stability AI Inc., Civil Action No. 1:23-cv-00135, U.S. District Court for the District of Delaware, 2023.

[29] BGH, "Decision of the Federal Court of Justice in appeal proceedings concerning patent application 10 2019 128 120.2 (DABUS)," X ZB 5/22, Federal Court of Justice, Germany, Jun. 11, 2024.

[30] J. Y. Lee, "Artificial Intelligence Cases in China: Feilin v. Baidu and Tencent Shenzhen v. Shanghai Yingxin," China and WTO Review, vol. 7, no. 1, pp. 211–222, 2021.

[31] Andersen v. Stability AI Ltd., No. 23-cv-00201-WHO, U.S. District Court, N.D. California, Aug. 12, 2024.