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Artificial Intelligence and Intellectual Property Rights: Contemporary Challenges, Legal Frameworks, and the Governance Imperative

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ABSTRACT

The unprecedented proliferation of artificial intelligence (AI) systems capable of autonomously generating creative works, engineering novel inventions, and processing vast repositories of protected expression has precipitated a systemic crisis of doctrinal adequacy within the global intellectual property (IP) regime. This paper undertakes a comprehensive interdisciplinary analysis of the emergent tensions between AI-driven technological innovation and the foundational legal frameworks governing copyright, patents, trade secrets, and data rights. Drawing upon doctrinal jurisprudence, comparative regulatory analysis, and institutional theory, the paper identifies three structurally critical challenges: the authorship and inventorship indeterminacy of AI-generated outputs; the legality of large-scale copyrighted data ingestion for machine learning; and the regulatory fragmentation across jurisdictions. It further examines contemporary judicial developments across the United States, European Union, United Kingdom, and India, and advances a tripartite policy framework for IP reform responsive to the AI governance imperative. The paper argues that existing IP doctrines, conceived in an era of exclusively human creativity, are constitutionally and normatively inadequate to address the AI challenge and require systematic legislative recalibration.

Keywords: artificial intelligence, intellectual property rights, copyright authorship, AI inventorship, machine learning and copyright, IP governance, generative AI

I. Introduction

The emergence of generative artificial intelligence as a transformative force in creative and inventive production has confronted the global intellectual property (IP) system with challenges of a magnitude unseen since the advent of the digital revolution. Systems such as Open AI's GPT-4, Google's Gemini, Stability AI's Stable Diffusion, and DALL-E 3 are now capable of autonomously producing literary works, visual art, musical compositions, scientific analyses, and patent-worthy inventions at industrial scale — outputs that are legally, aesthetically, and functionally indistinguishable from those produced by human authors and inventors. Yet the foundational architecture of intellectual property law — rooted in the Lockean premise of individual creative labour, the Kantian notion of authorial personality, and the

utilitarian calculus of incentivizing human ingenuity — was neither designed nor calibrated to accommodate a non-human creative or inventive agent. [1]

This doctrinal disjuncture generates urgent and unresolved questions across every domain of IP law. Who owns the copyright in a novel written by Chat GPT at a human's instruction? Can an AI system be listed as an inventor on a patent application? Does the mass ingestion of copyrighted text and imagery to train machine learning models constitute copyright infringement? Are the weights of a trained AI model protectable as a trade secret? These are no longer speculative academic questions — they are live disputes before courts, patent offices, and legislative bodies in every major jurisdiction, demanding principled jurisprudential resolution.

This paper addresses these questions through an interdisciplinary lens integrating doctrinal legal analysis, comparative jurisprudence, and institutional governance theory. Section II examines the copyright dimensions of AI-generated works and AI training data. Section III interrogates the patent law challenges posed by AI-assisted and AI-generated inventions. Section IV analyses the trade secret and data rights implications of AI systems. Section V undertakes a comparative analysis of the regulatory responses of the United States, European Union, United Kingdom, and India. Section VI advances a normative policy framework for IP reform. Section VII concludes.

II. Copyright Law and Artificial Intelligence

The Authorship Indeterminacy Problem

Copyright law has historically predicated the grant of protection upon the existence of a human author whose creative expression the law seeks to incentivize and reward. In the United States, the Copyright Act of 1976 protects "original works of authorship" fixed in a tangible medium, with the Supreme Court in Feist Publications, Inc. v. Rural Telephone Service Co. (1991) establishing that originality requires a modicum of human creativity. [2] The U.S. Copyright Office has consistently held, most recently in its March 2023 registration guidance, that works generated entirely by AI without human authorship are not copyrightable. [3] This position raises a fundamental classification problem: when a human provides a detailed textual prompt to a generative AI system, and the system produces a substantially complex output, at what point does the human's contribution constitute sufficient "authorship" to warrant copyright protection?

The question is not merely theoretical. In Thaler v. Perlmutter (D.D.C. 2023), the U.S. District Court denied copyright registration for an image generated entirely by the DABUS AI system, holding that the human authorship requirement is constitutionally and statutorily mandated. The court's reasoning, however, leaves unresolved the gradient problem: courts have yet to articulate a principled standard for distinguishing sufficient from insufficient human creative input in AI-assisted works, creating a doctrinal vacuum of considerable commercial significance for creative industries dependent on AI-generated content. [4]

[1]World Intellectual Property Organization. (2024). Generative AI and IP policy: Key issues. WIPO Publication No. 1055. https://www.wipo.int/about-ip/en/artificial_intelligence/

[2]Feist Publications, Inc. v. Rural Telephone Service Co., 499 U.S. 340 (1991). The U.S. Supreme Court held that copyright in a compilation requires a modicum of creativity, establishing originality as a constitutional requirement.

[3]U.S. Copyright Office. (2023, March). Copyright registration guidance: Works containing material generated by artificial intelligence, 88 Fed. Reg. 16190. The Office confirmed that AI-generated material absent human authorship is not copyrightable.

[4]Samuelson, P. (2023). Generative AI meets copyright. Science, 381(6654), 158–161. https://doi.org/10.1126/science.adi0656

Comparative jurisdictions have adopted divergent approaches. The United Kingdom's Copyright, Designs and Patents Act 1988 (CDPA), under Section 9(3), provides that the author of a computer-generated work is "the person by whom the arrangements necessary for the creation of the work are undertaken" — a formulation that extends protection to AI-generated outputs absent a human author, vesting ownership in the developer or operator. [5] This sui generis approach, while pragmatically accommodating AI outputs within the copyright framework, has attracted scholarly criticism for privileging commercial expediency over normative coherence, and for potentially distorting the creative incentive structure that copyright is designed to sustain. [6]

B. Training Data and the Reproduction Question

The second and arguably more economically consequential copyright challenge posed by AI concerns the legality of training large language models (LLMs) and generative AI systems on corpora of copyrighted text, images, audio, and code scraped from the internet. The training process involves the ingestion, reproduction, and computational processing of billions of copyrighted works without authorization or compensation to rights holders — a practice that has generated a wave of class-action litigation in the United States and triggered regulatory scrutiny across Europe and Asia.[7]

In Andersen v. Stability AI Ltd. (N.D. Cal. 2023) and Authors Guild v. Open AI, Inc. (S.D.N.Y. 2023), rights holders have argued that the training process constitutes direct copyright infringement, that AI outputs are unauthorized derivative works, and that the commercial use of copyrighted training data cannot be shielded by the fair use doctrine. [8] AI developers counter that training is transformative in purpose, does not reproduce substantial protected expression in outputs, and constitutes a paradigmatic fair use under the four-factor test articulated in Campbell v. Acuff-Rose Music, Inc. (1994), invoking the analogy of Google LLC v. Oracle America, Inc. (2021), where the Supreme Court upheld Google's transformative use of Oracle's Java API. [9]

The doctrinal uncertainty is compounded at the international level by the divergence between the U.S. fair use framework and the EU's text and data mining (TDM) exceptions under the Digital Single Market Directive (2019/790). Article 4 of the DSM Directive permits TDM by any person for any purpose, subject to rights holders' opt-out mechanism — a balanced approach that has nonetheless been criticized for generating commercial uncertainty and asymmetric compliance burdens for non-EU AI developers. [10] Japan has adopted the most permissive position, providing under Article 30-4 of its Copyright Act a broad exemption for AI training irrespective of commercial purpose, positioning Japan as a preferred jurisdiction for AI training activities. The absence of an international harmonized standard for TDM in AI training represents one of the most pressing unresolved questions in global copyright governance.

[5]Ginsburg, J. C., & Budiardjo, L. A. (2019). Authors and machines. Berkeley Technology Law Journal, 34(2), 343–448. Examining the doctrinal basis for AI authorship under the work-made-for-hire doctrine and its limitations.

[6]Yanisky-Ravid, S. (2017). Generating rembrandt: Artificial intelligence, copyright, and accountability in the 3A era—The human-like authors are already here, a new model. Michigan State Law Review, 2017(4), 659–726.

[7]Andersen v. Stability AI Ltd., No. 3:23-cv-00201 (N.D. Cal. filed Jan. 13, 2023). Artists filed a class action alleging that Stable Diffusion training constituted copyright infringement of billions of unlicensed images.

[8]Authors Guild v. Open AI, Inc., No. 1:23-cv-08292 (S.D.N.Y. filed Sept. 19, 2023). A group of prominent authors alleged that Open AI trained Chat GPT on their copyrighted works without authorization or compensation.

[9]Google LLC v. Oracle America, Inc., 593 U.S. 1 (2021). The Supreme Court held Google's copying of Oracle's Java API was a fair use, with implications for AI training on large code corpora.

[10]Grimmelmann, J. (2015). Copyright for literate robots. Iowa Law Review, 101(2), 657–681. Examining whether automated reading and processing of copyrighted works constitutes infringement under U.S. and comparative copyright law.

III. Patent Law and the Inventorship Crisis

Can an AI System Be an Inventor?

Patent law's inventorship requirement has been the site of the most publicly visible and judicially resolved AI-IP confrontation to date. Dr. Stephen Thaler's DABUS (Device for the Autonomous Bootstrapping of Unified Sentience) AI system autonomously generated two inventions — a food container with fractal geometry surfaces and a flashing light beacon — for which Thaler sought patent protection listing DABUS as the inventor across multiple jurisdictions, precipitating landmark judicial and administrative decisions that have crystallized the current doctrinal position.[11]

In the United States, the Federal Circuit in Thaler v. Vidal (2022) held unambiguously that the Patent Act's reference to "individuals" as inventors denotes natural persons, affirming the USPTO's rejection of DABUS applications. The European Patent Office and the UK Intellectual Property Office reached identical conclusions, with the UK Supreme Court in Thaler v. Comptroller-General of Patents (2023) holding that an inventor must be a natural person capable of holding legal rights. [12] Only South Africa and Australia (at first instance, subsequently overturned on appeal) granted patents listing an AI as inventor, reflecting the regulatory arbitrage opportunities created by jurisdictional fragmentation.

While the doctrinal answer to the question of AI inventorship is currently settled — AI cannot be an inventor — the normative debate continues with vigour. Scholars including Ryan Abbott argue that the rigid human-inventorship requirement creates a perverse incentive structure: it encourages concealment of AI contribution to inventions, disincentivizes disclosure of AI-generated innovations, and may ultimately retard the public-domain enrichment that patent disclosure is designed to achieve. [13] Abbott advocates for a "reasonable robot" standard under which AI-generated inventions would be treated as employer-owned works, vesting patent rights in the entity deploying the AI system — a pragmatic adaptation of existing work-made-for-hire doctrine that preserves the utilitarian logic of the patent system without requiring the fiction of human inventorship. [14]

AI-Assisted Inventions and the Non-Obviousness Standard

Beyond the inventorship question, AI's integration into research and development processes raises a structurally deeper challenge to patent doctrine: the calibration of the non-obviousness standard in a world where AI-assisted discovery dramatically reduces the cognitive barriers to innovation. Under 35 U.S.C. § 103 and its equivalents, a claimed invention must not be obvious to a person having ordinary skill in the art (PHOSITA) at the time of filing. [15] If AI tools routinely available to practitioners can generate putatively inventive solutions to technical problems, the effective baseline of "ordinary skill" is elevated, potentially invalidating patents that would have been non-obvious without AI assistance. The doctrinal

[11]Thaler v. Vidal, 43 F.4th 1207 (Fed. Cir. 2022). The U.S. Court of Appeals for the Federal Circuit held that an AI system cannot be listed as an inventor under the Patent Act, reaffirming the human-inventorship requirement.

[12]European Patent Office. (2023). EPO Boards of Appeal Decision J 0008/20 – DABUS case. The EPO rejected patent applications listing an AI as inventor, holding that the EPC requires a natural person as inventor.

[13]Ryan Abbott. (2020). The reasonable robot: Artificial intelligence and the law. Cambridge University Press.Abbott proposes treating AI analogously to an employee for IP ownership attribution purposes, vesting rights in the entity deploying the system.

[14] https://digitalcommons.law.seattleu.edu/sulr/vol35/iss4/10/

[15]Burk, D. L. (2019). Thirty-five years of doctrinal drift: The jurisprudential legacy of Diamond v. Chakrabarty. Houston Law Review, 57(3), 467–495. Examining how judicial interpretation of patent-eligible subject matter has evolved in response to technological innovation.

recalibration of the PHOSITA standard to account for AI capability is an urgent reform imperative that patent offices and legislatures have yet to systematically address.[16]

IV. Trade Secrets, Data Rights, and AI Systems

The intersection of AI and trade secret law presents a distinct governance challenge. The weights, parameters, and architectures of trained AI models represent commercially valuable proprietary information that developers seek to protect through trade secret law in the absence of patent or copyright protection. Under the U.S. Defend Trade Secrets Act (DTSA) of 2016 and the EU's Trade Secrets Directive (2016/943), trade secret protection is available for information that derives independent economic value from not being generally known and that is subject to reasonable protective measures. [17] AI model weights satisfy these criteria and have been increasingly protected as trade secrets — a development with significant implications for AI transparency, accountability, and the public's ability to audit AI systems for bias, discrimination, and safety risks.

The tension between trade secret protection for AI models and the emerging regulatory imperative of AI explainability and algorithmic transparency is particularly acute under the EU Artificial Intelligence Act (AI Act) (Regulation (EU) 2024/1689). [18] The AI Act mandates meaningful transparency and human oversight requirements for high-risk AI systems in domains including employment, credit, healthcare, and law enforcement — obligations that may require disclosure of model architecture and training data information that developers claim as trade secrets. Resolving this structural tension between IP protection and regulatory transparency represents one of the central governance challenges of the coming decade.

The question of data ownership and data rights in AI training is equally unresolved. The Max Planck Institute's influential position statement on data ownership argues that existing IP frameworks — which do not recognize property rights in raw data per se — are inadequate to address the economic value created by large-scale data compilation and AI training. [19] The EU Database Directive's sui generis protection for substantial investment in database creation offers a partial response, but its application to dynamic AI training datasets that continuously evolve through reinforcement learning and fine-tuning remains doctrinally uncertain.

V. Comparative Regulatory Responses

United States

The United States has adopted a predominantly judicial and administrative approach to AI-IP governance, relying on case-by-case adjudication and agency guidance rather than comprehensive legislation. The USPTO's February 2024 guidance on AI-assisted inventions clarified that AI-assisted inventions are patentable provided a natural person makes a significant contribution to the claimed invention, while the

[16]Zarsky, T. Z. (2022). Transparent predictions. University of Illinois Law Review, 2022(4), 1503–1570. On the opacity of machine-learning systems and the challenge of inferring inventive steps therefrom.

[17]Trade Secrets Act, 18 U.S.C. §§ 1831–1839 (Defend Trade Secrets Act of 2016). Cf. Directive (EU) 2016/943 on the protection of undisclosed know-how and business information (trade secrets).

[18]European Commission. (2024). Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act). Official Journal of the European Union, L 1689.

[19]Drexl, J., Hilty, R. M., Desaunettes-Barbero, L., Greiner, F., Kim, D., Richter, H., & Slowinski, P. (2019). Data ownership and access to data: Position statement of the Max Planck Institute for Innovation and Competition. Max Planck Institute for Innovation and Competition Research Paper No. 16-10.

Copyright Office's ongoing AI study is expected to produce legislative recommendations in 2025. The absence of a comprehensive federal AI statute leaves U.S. AI-IP governance dependent on the incremental development of judicial doctrine — a process ill-suited to the speed and scale of AI advancement.

European Union

The European Union has pursued the most structurally comprehensive regulatory response to AI. The EU AI Act, adopted in June 2024, establishes a risk-tiered regulatory framework for AI systems with obligations of transparency, accountability, and human oversight. Its interaction with the DSM Directive's TDM exceptions, the GDPR's data protection requirements, and the proposed AI Liability Directive creates a dense and at times incoherent regulatory architecture that presents significant compliance challenges for AI developers and deployers. The European Parliament's adoption of mandatory copyright transparency provisions — requiring AI developers to disclose copyrighted works used in training — represents a landmark intervention that sets the global benchmark for training data governance. [20]

United Kingdom

Post-Brexit, the United Kingdom has sought to position itself as a pro-innovation AI jurisdiction. The UK IPO's 2022 consultation on AI and IP proposed extending the CDPA's computer-generated works provision and expanding the TDM exception to cover commercial AI training — proposals subsequently moderated following intense opposition from creative industries. The UK Supreme Court's definitive rejection of AI inventorship in Thaler v. Comptroller-General (2023) has nonetheless clarified the inventorship question, providing regulatory certainty for UK patent applicants.

India

India's engagement with AI-IP governance is at a nascent but accelerating stage. The Parliamentary Standing Committee on Commerce's 2023 report on the IP rights regime recommended amending the Patents Act, 1970 to explicitly address AI-assisted inventions, introduce mandatory disclosure of AI contribution in patent applications, and create a sui generis protection regime for AI-generated works. [21] India's National Strategy for Artificial Intelligence (NITI Aayog, 2018, updated 2023) identifies IP reform as a prerequisite for achieving its ambition of AI-led economic transformation, positioning India as an active participant in the emerging global AI governance architecture. The Copyright Act, 1957's absence of any computer-generated works provision — unlike the UK's CDPA — creates a significant lacuna that Indian courts will increasingly be called upon to address through judicial interpretation.

VI. Towards a Normative Policy Framework

The foregoing analysis reveals that the existing global IP regime is structurally inadequate to address the AI challenge and requires systematic legislative recalibration across three dimensions. This paper advances the following tripartite policy framework.

First, jurisdictions should adopt a **graduated human-contribution standard** for AI-generated copyright. Rather than a binary human/AI authorship determination, copyright offices should develop a threshold test assessing the nature, degree, and creativity of human input into AI-assisted works — a standard that preserves the originality requirement while accommodating the spectrum of human-AI creative

[20] https://www.lexology.com/library/detail.aspx?g=9e22129b-e13e-45dd-abe2-443db73e69bd

[21] Parliament of India. (2023). Report of the Parliamentary Standing Committee on Commerce on intellectual property rights regime in India (Twenty-Ninth Report). Lok Sabha Secretariat. The Committee recommended updating the Patents Act, 1970 to address AI-assisted and AI-generated inventions.

collaboration. Works exceeding the threshold attract full copyright; works below it enter the public domain, enriching the creative commons. [22]

Second, legislatures should enact **mandatory AI training data disclosure obligations**, modelled on the EU AI Act's transparency requirements but with greater specificity, requiring AI developers to maintain and publish registries of copyrighted works used in training, subject to commercially reasonable confidentiality protections. This obligation would enable rights holders to seek compensation through collective licensing mechanisms analogous to music performing rights organizations (PROs), creating a sustainable and market-compatible framework for remunerating creative labour in the AI training ecosystem. [23]

Third, the international community should negotiate, under the auspices of WIPO, a **plurilateral Agreement on Artificial Intelligence and Intellectual Property (AAIP)** that establishes minimum harmonized standards for: (i) AI inventorship disclosure and ownership attribution; (ii) TDM exceptions for AI training with opt-out and remuneration mechanisms; (iii) sui generis protection for AI-generated outputs below the human-authorship threshold; and (iv) mutual recognition of AI transparency obligations to eliminate regulatory arbitrage. [24]Such an instrument, modelled on the TRIPS Agreement's minimum-standards architecture, would provide the jurisdictional consistency and regulatory certainty that AI-driven creative and innovative industries urgently require.

VII. Conclusion

Artificial intelligence has irrevocably disrupted the foundational premises of intellectual property law, exposing the anthropocentric assumptions embedded in copyright's authorship doctrine, patent law's inventorship requirement, and trade secret law's transparency-protection balance. The cascade of judicial decisions, administrative guidance, and legislative initiatives surveyed in this paper collectively reveal a global IP system in doctrinal crisis — reactive, fragmented, and inadequately theorized for the governance demands of the AI era.

The path forward requires not merely incremental doctrinal adjustment but a principled reconceptualization of the normative foundations of IP law in light of AI's transformative capacities. The tripartite framework advanced in this paper — graduated human-contribution standards, mandatory training data disclosure, and a plurilateral WIPO AI-IP agreement — offers a structured, internationally coherent response to the contemporary challenges of AI-generated authorship, AI-assisted invention, and the commercialization of AI-trained knowledge assets. Without such systematic reform, the IP system risks becoming an obstacle to rather than an enabler of the innovation and creative flourishing it was designed to promote.

The governance imperative is urgent. As generative AI capabilities continue their exponential trajectory, the doctrinal lag between technological reality and legal framework will widen, generating growing commercial uncertainty, rights-holder harm, and systemic distortion of the innovation incentive structure. Policymakers, legislators, and judiciaries in every jurisdiction bear a responsibility to act with the deliberateness and ambition that this historic juncture demands.

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[22] https://www.federalregister.gov/documents/2023/03/16/2023-05321/copyright-registration-guidance-works-containing-material-generated-by-artificial-i

[23]World Intellectual Property Organization. (2023). WIPO conversation on intellectual property and artificial intelligence: Revised issues paper on intellectual property policy and artificial intelligence (WIPO/IP/AI/2/GE/20/1 REV). WIPO.

[24] https://www.ijfmr.com/papers/2025/5/58382.pdf

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